

A DEFENCE OF NON-EXTENSIVE PRESENTISM

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Introduction

Presentists (those who think that everything is present - Tallant and Ingram 2023) are a curious bunch. They tend to believe in one special time, *the present*, and yet they have said little about its duration or temporal extension - *how long is the present?* In this thesis, I examine whether presentists should believe in a present time and, if so, how long this present time is. There are exactly three options in this logical space. The first is instantaneous presentism: everything is present, there is a present time, and it is a durationless instant. The second is extended presentism: everything is present, there is a present time, with a duration greater than zero. I'll argue against instantaneous and extended presentism in favour of the third option: non-extensive presentism. This version of presentism denies a key assumption of the other two views, namely, *that there are times and that there is duration or temporal extension*. The central claim of this thesis is that *presentists ought to be non-extensive, not instantaneous or extended*.

Throughout this thesis, I will only be concerned with which version of presentism is most plausible. I will mostly ignore what *non-presentists* might say in response to this or that argument. Thus, judgements I make about which version of presentism is most plausible should be understood as restricted to exclude presentism's rivals. It may therefore be helpful to pretend to be a presentist while reading this thesis. There are a couple exceptions to this restriction of attention, including chapter (1), where I give an overview of the arguments for and against presentism to motivate this investigation into three of its versions. The other is Part II, where I will sometimes discuss non-presentist views in relation to physical theories.

This thesis is divided in two parts. Part I of this thesis aims to evaluate the three versions of presentism and argue that non-extensive presentism is the most plausible. Part II has two aims. First, to formulate, and respond to what I take to be the principal objection to non-extensive presentism: the abundance of talk about times in ordinary discourse, semantics, and physics). The second aim falls out of the first: to undermine a rarely questioned and implicit assumption of much of metaphysics, namely, that times exist, by showing the arguments for realism about times to be weak.

In chapter (2) I examine four arguments against instantaneous presentism: the Temporal Dichotomy, Beginning and Ceasing, No Persistence, and the Temporal Extension Argument. I argue against the received view that the Zeno-esque Temporal Dichotomy gives us good reason to reject instantaneous presentism. My verdict on Beginning and Ceasing is the same - it counts as little to no reason to reject instantaneous presentism. No Persistence gives us weak to moderate reason to reject instantaneous presentism, since every response to the argument comes with at least a modest cost. Then I argue that the Temporal Extension Argument also provides little to no reason to reject instantaneous presentism. Taking the arguments cumulatively, the conclusion of chapter (2) will be that there's weak to moderate reason (for presentists) to reject instantaneous presentism.

In chapter (3) I argue that extended presentism fares better against the Temporal Dichotomy and Beginning and Ceasing, and equally well against the latter two objections. I then examine three additional objections which are unique to extended presentism: a McTaggart-style problem, Boundary Points, and Maximum-Minimum Duration. I argue that each of these is individually stronger than the previous four arguments and therefore that, cumulatively, there is stronger reason to reject extended presentism than there is reason to reject instantaneous presentism. If presentists must be either instantaneous or extended, they should be instantaneous.

In Chapter (4) I examine a key assumption common to both instantaneous and extended presentism, namely, that there are times and that things have (either zero or non-zero) duration/temporal extension. I argue that presentists should *reject* this assumption. Instead, presentists should be non-extensive: everything is present, nothing is a time, and so duration/temporal extension does not apply to anything. I'll argue that non-extensive presentism fares just as well, if not better, against the seven objections faced by instantaneous or extended presentism. It also has one main advantage: qualitative ontological parsimony. I then look at some objections to non-extensive presentism: whether it really is more parsimonious than its rivals; whether it's committed to anti-realism about *time* as well as *times*; whether it conflicts with an intuitive space-like conception of time; and, chiefly, whether times are indispensable to the truth of ordinary discourse, physics, or semantics. In chapters (5)-(7) I develop this objection into two indispensability arguments and evaluate a number of different responses to it.

In chapter (5) I formulate a “Quantification-Reference” indispensability argument: some literal and true sentences quantify over or refer to times, and therefore we’re ontologically committed to times. In the rest of chapter (5) I formulate what I call “type-A strategies”, versions of times anti-realism which accept the broadly Quinean assumption of the indispensability argument, namely, that we’re ontologically committed to what true sentences quantify over or refer to. I argue that non-extensive presentists who accept this Quinean assumption should opt for a divide-and-conquer approach to time talk: fictionalism for physics and semantics, and a paraphrase strategy for ordinary time talk.

In chapter (6) I formulate versions of times anti-realism which reject this Quinean assumption, which I call “type-B strategies”. I argue that non-extensive presentists who favour type-B strategies should also take a combined approach: a positive free semantics with dual domains coupled with an ontologically neutral interpretation of the outer domain quantifiers.

In chapter (7) I formulate an *explanatory* indispensability argument for the existence of times, according to which we should believe in times because they play an indispensable explanatory role in our best scientific theories. I show that only type-A strategies can be successful in responding to this version of the argument, the most plausible of which is fictionalism. Chapter (8) summarises each chapter to conclude, finally, that presentists should reject the existence of times, duration, and temporal extension, that is, they should be non-extensive presentists.

PART I

1. A Brief Overview of Presentism

1.1 Defining Presentism

Before examining the three versions of presentism, it's worth getting clear on what it is, and why we might accept or reject it. Presentism is the view that everything is present (Tallant and Ingram 2023).¹ The world includes me, you, the University of Nottingham, cats, and Saturn, because we are present. And the world does not include the Jewish Second Temple or the human colony on Mars, because these are past and future (respectively). Growing-blockers deny this, they hold that present *and* past things exist, but not future things. Moving-spotlighters disagree with both presentists and growing-blockers – all the aforementioned things exist, because all past, present, and future things exist. To my knowledge, all presentists hold that what's present changes - the University of Nottingham is (now) present but it will, alas, eventually be nothing, just as the Jewish Second Temple was once something but is now nothing.

Many presentists (along with growing-blockers and moving-spotlighters) also endorse the A-theory of time (Craig 2000; Markosian 1993; Zimmerman 2011;). It has been formulated in various different ways. According to one formulation, the A-theory says that there are the properties *presence*, *pastness*, and *futurity*, and that these are not reducible to B-relations like *earlier/later-than* and *simultaneous with* (Markosian 1993: 832). Another formulation says that there is an absolutely present time (Deasy 2016). There are problems with each formulation. The first formulation assumes that pastness and futurity are exemplified. Presumably, the presentist denies this, for if either is exemplified then there are past and future things. If the A-theory is supposed to be compatible with presentism, then this is not the A-theory.² The second formulation of the A-theory assumes that there are *times* (instants or intervals) at which things are located. To my knowledge, only Chisholm explicitly denies this³, but it seems to be an option in logical space, and, crucially, one which I will defend in this thesis. An A-theoretic version of *times*-less presentism would say that

¹ Some self-described presentists think that there are non-present things. I stipulate that these people are not presentists. See Tallant and Ingram (2021) for an overview of all the views described by their adherents as versions of presentism.

² But see which Rasmussen (2012) and Tallant (2012) for arguments that presentists needn't be A-theorists.

³ Other possible anti-realists about times include Craig (2000), Merricks (2007), and Tallant (2014).

everything is present, and that this cannot be analysed in terms of everything being simultaneous with everything else. This retains the spirit, if not the letter, of the A-theory. Another way of formulating the A-theory in a way compatible with anti-realism about times is to construe it as the view that there are temporary propositions - propositions that change their truth-value over time (Deasy 2016: 271). Fortunately, it's not relevant to the central argument of this thesis what the A-theory is or isn't. Nor whether, strictly speaking, it's compatible with presentism. If the version of presentism I defend is not a version of the A-theory, so be it.

1.2 Arguments for Presentism

A number of different arguments have been given in favour of presentism. I will outline four of the best or most prominent. I don't claim that any of these arguments is individually strong, nor will I respond to or anticipate every objection. What I hope to do is show that these arguments are strong enough that someone could quite reasonably be persuaded of presentism by their cumulative evidential force, for that will show that presentism is worthy of serious consideration, and therefore that the subject of this thesis is worthy of investigation.

First, presentism is made more probable than its rivals by two seemingly obvious facts: that headaches exist only if they hurt, and that past and future headaches don't hurt (Zimmerman 2011). Consider a headache you once had - does it hurt? No. Consider (if you can) a headache that you will have - does it hurt? No. It follows that past and future headaches don't exist. Similar reasoning goes, *mutatis mutandis*, for other mental states, and simplicity recommends that we say the same for all other things - everything is present, nothing is past or future.

Second, presentism offers a plausible solution to the problem of temporary intrinsics (Merricks 2007: 120-123): if I'm sleeping at t_1 and not sleeping at t_2 , then I'm sleeping at one (temporal) location and not at another. But this entails that I'm sleeping and not sleeping, which is impossible. A plausible solution to this is as follows: I *was* sleeping, but I'm not (now) sleeping. Presentism implies that my sleeping doesn't exist, and so the contradiction is avoided. Of course, there are other solutions: maybe it's not I who sleeps, but a part of

me; or maybe sleeping isn't a property of me, but a relation. Both of these options sound implausible to me. Since there's nothing special about me or sleeping, all this *goes mutatis mutandis* for everything else. Thus, everything is present, and nothing is past or future.

Third, presentism is the only theory compatible with the apparently obvious fact that things come into and go out of existence. Growing-blockers say that things come into existence but do not go out of existence. Once something exists, it may cease to be present, but will never cease to exist, for it will always be past (*mutatis mutandis* for shrinking-blockers). Eternalists deny that anything comes into or goes out of existence; past things are always in the past, and future things always in the future. Fourth, and finally, presentism best explains why all the obvious examples of existing things are present.⁴ Out of all the things you can imagine, choose one that obviously exists. Is it present? Probably. Now choose another, and another. You will inevitably pick out only present things. Why do we find that all the paradigmatic cases of existents are present? Because only present things exist.⁵

Thus are the best arguments for presentism. Again, I don't claim that any is individually strong. Nor, of course, have I anticipated every objection. But I hope to have shown that someone could reasonably be convinced of presentism by the cumulative evidential force of these arguments, which is enough to justify this thesis-long endeavour into three versions of presentism.

1.3 Arguments Against Presentism

I will outline four of the best or most prominent arguments against presentism and offer what I take to be the best response to each.⁶ First, presentism is charged as being either trivially true or obviously false. This objection is usually advanced by presenting three interpretations of the sentence

⁴ I don't know of anyone who explicitly defends this argument.

⁵ Other arguments for presentism include it being the only version of the A-theory that avoids McTaggart's paradox (Craig 2000), and the best account of the apparently special status of the present compared with the past and future (Tallant & Ingram 2023). Arguments from further afield include: arguments from moral redemption, and theological eschatology (Mullins 2014; Pezet 2017).

⁶ I won't address the problem of cross-temporal relations because the second and third objections are instances of this problem.

Pr) Only present things exist

and arguing that each is either trivial, obviously false, or false by presentist lights. Here are the three interpretations:

(Pr_a) Only present things exist now.

(Pr_b) Only present things existed, exist, or will exist.

(Pr_c) Only present things (tenselessly) exist.⁷

As we'll see below, even these alleged candidate interpretations of (Pr) are ambiguous (at least, it's not clear what they mean), so take them to be *sentences* rather than candidate interpretations of (Pr). Many think that (Pr_a) is trivially true (Crisp 2004; Ludlow 2004; Meyer 2013), because if something exists now then it presently exists i.e. exists in the present, which is obviously what only and all present things do. Even eternalists agree with this, says the trivialist.⁸ (Pr_b) is supposed to be false on account of obvious counterexamples: the Second Temple existed but is not present, thus, it's false that only present things have existed. (Pr_c) is charged with being unintelligible because existential quantification must be understood as tensed e.g. "there existed, exists, or will exist", because the English verb "to exist" is always tensed (Stoneham 2009: 202-203).⁹

I say that presentists should interpret (Pr) as equivalent to (Pr_c) and deny that the quantifier must be read as tensed. As Deasy (2019: 3372-3373) argues, tenseless occurrences of "to exist" are commonplace in English: I am in Nottingham at 2:15; Josh plays guitar; momentum is conserved in elastic collisions; the area of a circle is $2\pi r$. The quantifier in (Pr_c) should be understood in this tenseless way. Thus, (Pr_c) is an acceptable reading of (Pr); it is

⁷ This is Crisp's formulation of the argument.

⁸ See Correia and Rosenkranz (2020) for a response to this.

⁹ Meyer has a related objection to defining presentism as the view that only present things exist *simpliciter*. He says that existence simpliciter is disjunctive: existing in a merely possible world, existing in the actual world, existing outside of time, or existing temporally (2013: 69-71). The final disjunct is the one the presentist thinks applies to everything. Meyer thinks this is equivalent to Pr_b and so obviously false. His mistake is thinking that existing simpliciter is a disjunctive notion. In fact, each disjunct presupposes the notion of existing simpliciter e.g. existing in the actual world is i) existing simpliciter, and ii) being actual.

denied by non-presentists, non-trivial (it is false if eternalism is true), and not false by presentist lights.¹⁰

Second, presentism is in tension with sentences that apparently refer to or quantify over past entities (Lewis 2004; Sider 1999). The simple sentence

SS) The Second Temple was in Jerusalem

apparently refers to a merely past thing, and the existential sentence

ES) Dinosaurs once walked the earth

apparently quantifies over merely past things. ES is easiest to deal with. Sider (1999: 327) notes that the presentist can analyse it as follows:

ES_{pres}) WAS (dinosaurs walk the earth)

where “WAS” is a temporal operator with the same meaning as “it was the case that” and is not shorthand for quantification over times. Since the quantifier occurs within the scope of the operator, the truth of (D) doesn’t carry ontological commitment to dinosaurs, and thus the truth of the sentence is compatible with presentism. SS is trickier for the presentist to deal with. To my mind the best response here is to accept something like Crane’s (2013) view of reference and aboutness. Crane holds that true sentences can be genuinely *about* x even if x doesn’t exist and is therefore not referred to. The sentence “Pegasus is a mythical horse” is, on the face of it, true and about Pegasus (2013: 9), even if it doesn’t refer to Pegasus, since Pegasus doesn’t exist. A Cranean view of SS, then, holds that it is *about* the Second Temple, even if it doesn’t refer to it. It might seem costly to deny that “The Second Temple” refers, but reference has become something of a technical term across philosophy, understood as the relation between terms and objects such that “a” refers only if a exists (Crane 2013: 9; Searle 1969: 77; Williamson 2006;). To deny that sentences about the past refer to past things is not to deny a piece of common-sense. Of course, there is *some* sense in which “The Second Temple” refers. If someone joins in a conversation about the Second Temple and asks, “what are you referring to?” the felicitous thing to say is “the Second

¹⁰ It’s also worth noting that if presentism is trivially true or obviously false then non-presentism is trivially false or obviously true, which is equally bad news for non-presentists. It’s in our best interests to think that presentism is either non-trivially true or non-obviously false.

Temple”, but this is little reason to think that it must exist. Similarly, it might seem costly to say that there are (now) no singular propositions about the Second Temple, but “singular proposition” is a term of art, defined in such that the existence of a singular proposition entails the existence of the thing it is about. Thus, to deny that there are any singular propositions about the Second Temple is to say little more than that the Second Temple doesn’t exist. There is still a perfectly good and intuitive sense in which SS expresses something about the Second Temple.

Third, presentism is apparently in tension with truth-maker theory, according to which (some class of) truths are made true by something (Armstrong 2004: 145-50; Keller 2004; Sider 2001: 35-42). Virtually all presentists think that there are truths about the past, but since they deny that there are any past things, it’s not immediately clear what the truth-makers for such propositions would be. Various candidates have been proposed by presentists: ersatz times (Crisp 2007), Lucretian properties (Bigelow 1996), and temporal distribution properties (Cameron 2011, 2013). Such presentists are *upstanding* (Tallant & Ingram 2015: 355-356), they endorse truth-maker theory and seek to meet its demands.

I think presentists should get off the boat earlier on in the dialectic. What the objector must show is that (i) propositions about the past have truth-makers and that (ii) the only plausible candidate truth-makers for such propositions are things which are incompatible with (or unlikely conditional on) presentism. This is where *nefarious* presentists come in. They see little reason to accept both (i) and (ii) (what argument can be given for them? I confess I see little to no reason to think that either is true). Granted, it’s somewhat intuitive that there are truth-makers, but it’s *not* intuitive (even if not *unintuitive*) that there are no presentist-friendly truth-makers. The truth-maker theorist says that truths cannot just be brutally true, but it’s hard to see why this justifies truth-maker theory over less ontologically inflationary alternatives. If truths need explanation, says the nefarious presentist, then explain them like so: $\langle p \rangle$ is true because p . The proposition $\langle \text{Caesar crossed the Rubicon} \rangle$ is true because Caesar crossed the Rubicon - what else could we want (Tallant & Ingram 2015; Tallant 2017)? Jago (2018) responds to this move by saying that truth-maker theorists want more of an explanation than this. Interestingly, Jago thinks that truth-maker theorists are *not* after an explanation for the *truth* of any given proposition: “‘True’ is a convenient expressive

device [...] in each specific case, we can make our demand directly.” (2018).¹¹ Jago isn’t explicit about what this demand is, but I take it that one such demand is the following: *in virtue of what were there dinosaurs?* I don’t see how this question can be asking anything that makes trouble for the presentist. If it’s asking for an explanation of the truth of the proposition <there were dinosaurs> then the explanation is that there were dinosaurs. If it’s asking how dinosaurs came about then that’s a question for Palaeontologists, not metaphysicians. The demand could be made more specific: show me some ontology that grounds, makes true, or non-causally explains why there were dinosaurs. This demand is perfectly *intelligible*, but I do not see why it must be met. Why should there be a *metaphysical* explanation of the fact that there were dinosaurs?

Fourth, presentism is in tension with the special theory of relativity (SR). Simplifying greatly, the orthodox physical interpretation of SR says that which events are simultaneous with one another is relativised to reference frames: with respect to some reference frames, events e and e' are simultaneous, but not so in others.¹² Now, given presentism, if e and e' are simultaneous then they are both present. Since simultaneity is relative, it follows that presence is also relative: in some reference frames, e and e' are present, but not so in others. It follows that what exists is relativised to reference frames, which seems unacceptable.¹³

In response, I think the presentist should adopt some empirically adequate presentist-friendly interpretation of SR. Luckily, there is such an interpretation. Inspired by Lorentz’ own interpretation of SR, the neo-Lorentzian interpretation is recognised to be empirically equivalent to its rivals (Balashov & Janssen 2003: 339; Baron 2018: 9; Callender 2008: 52-

¹¹ This seems to put him at odds with fellow truth-maker theorists Asay and Baron, who say that the “central motivation behind” truth-making is to make sure that truth is never brute or floating free from the world (2020: 6-7). Perhaps, then, there is no singular thing that all non-presentist truth-maker theorists are driving at when they ask why past propositions are true. If so, this undermines the view that there is some particular, widely agreed upon, intuitive principle – truths are made true/depend on the world/supervene on being etc. – which presentism is incompatible with.

¹² This is the Minkowskian interpretation, which also entails that a four-dimensional spacetime manifold exists. The original Einsteinian interpretation features the relativity of simultaneity but does not entail that a four-dimensional spacetime manifold exists. See Craig 2008 for an overview of these physical interpretations.

¹³ Others have slightly different objections. Saunders (2002: 279-280) says that presentism postulates something (a privileged class of things) which SR is “blind” to. The problem being that presentism has an empirically unconfirmed postulate. Putnam’s (1967) argument proceeds not by showing that the conjunction of SR and presentism is unacceptable, but by simply proving from SR (plus some minimal assumptions) that some future (and past) things exist. There are also arguments from SR against dynamic theories more generally (Baron and Miller 2018).

53). Setting aside various details, the important difference between the neo-Lorentzian and Minkowskian (and Einsteinian) interpretations is that the former holds that simultaneity is *not* relative. Thus, by adopting the neo-Lorentzian interpretation, the presentist can avoid the unacceptable consequence that what exists is relativised to reference frames.

There are three claimed theoretical disadvantages of the neo-Lorentzian interpretation. The first claimed disadvantage is that the Lorentz transformations (equations for relating the coordinates of events relative to different inertial frames) cannot be derived from the neo-Lorentzian postulates. Rather, they must simply be assumed, which is theoretically costly. The second claimed disadvantage is that the neo-Lorentzian theory implies that inertial frames aren't Lorentz invariant, even though they appear to be. (An inertial frame is Lorentz invariant if one of its physical quantities remains unchanged by a Lorentz transformation, which is an equation relating quantities in different reference frames). So the neo-Lorentzian must explain why inertial frames appear to be like this when in fact they aren't (Balashov & Janssen 2003: 337-338). The third claimed disadvantage is that Lorentz failed to extend his theory to include a theory of gravitation, and so the neo-Lorentzian has no good way of crafting a theory of gravity (Baron 2018; Callender 2017).

On the first claimed disadvantage, Ives (1945) derives the Lorentz transformations from the conservation of energy and momentum, and the transmission of radiant energy. So the neo-Lorentzian needn't simply assume them. On the second disadvantage, Prokhovnik (1985) has argued that the apparent Lorentz invariance of inertial reference frames is due to a retarded potential effect. He argues that if we take the whole universe to be an inertial frame (Builder 1958), then motion with respect to it brings about retarded potential effects (1985: 84-85). For example, if a body is in motion with respect to the universal inertial frame, then its gravitational or electromagnetic field will be compressed in the direction of motion. To compensate for this compression, the body itself will be compressed, becoming elliptically shaped. Prokhovnik's point is that this process can be interpreted as length contraction (and time dilation), and that this explains why inertial frames appear Lorentz invariant. In response to the third objection, it's unclear why presentist neo-Lorentzians should have to *extend* their theory into a general one. It's enough for presentists that there is presentist-friendly version of general relativity, and Crisp (2008) has developed such a theory.

1.4 Conclusion

Those are the best arguments for and against presentism. At the very least, the above arguments and responses should convince you that presentism has *something* going for it, specifically, enough to make the following investigation into three of its versions worthwhile.

2. Instantaneous Presentism

Instantaneous presentism is the first of the three versions of presentism I will assess in this thesis. It is the conjunction of presentism with the view that the present is a temporal point, having no temporal extent or duration:

Instantaneous Presentism: everything is present and the present time has a duration of zero seconds.

To get a feel for how this works, consider how change works on instantaneous presentism: different times come and cease to be present: t_2 is (now) present, t_1 was present, and t_3 will be present. Each time, if present, is present at itself. But absolutely and unrestrictedly, only one time is ever present. It's hard to find recent explicit endorsements of this view. This is probably because the literature on the extent of the present petered-out (during the late twentieth century) just as the literature on presentism was beginning, and so discussions of both end up being rare. Gale (1971) believes in a punctual (instantaneous) present, though it's unclear whether he's a presentist. Brentano might be another: "past and future do not exist in actuality, and the present has no extension" (1988: 10). Bachelard is probably an instantaneous presentist:

"time is the instant, and it is the present instant that bears the full weight of temporality. The past is as empty as the future. The future is as dead as the past. The instant holds no duration at its core; it does not thrust a force in one direction or another. It does not have two faces. It is whole and alone." (1932: 28)

Though even here there is no explicit endorsement of presentism e.g. "everything is present" or "only present things exist". Explicit endorsements or not, there are many presentists, and some of them are probably of the instantaneous variety. In this chapter I'll examine four arguments against this view and conclude that (by presentist lights) there's weak to moderate reason to reject instantaneous presentism.

2.1 Temporal Dichotomy: Three Versions

The first objection to instantaneous presentism is inspired by Zeno's dichotomy or racetrack paradox (Sainsbury 2009: 4-5). Zeno's original argument concerns motion across space, but it has also been adapted to show that motion through time (or change) is impossible. I'll call this temporal version of the argument "Temporal Dichotomy". I'll examine three versions of it: James' (1911), Whitehead's (1978), and Craig's (2000), and argue that each of them is deficient because they're invalid or contain unstated or unsupported premises. In their place I will formulate two of my own arguments which retain the spirit, if not the letter, of the Dichotomy paradox, and then consider objections to it. I'll conclude that the Temporal Dichotomy gives us little reason to reject instantaneous presentism.

Let's start with James' version of the temporal dichotomy:

the real difficulty [...] concerns the 'growing' variety of infinity exclusively [...] whose actually *traverses* a continuum, can do so by no process continuous in the mathematical sense. [...] Be it short or long, each point must be occupied in its due order of succession; and if the points are necessarily infinite, their end cannot be reached 'Enumeration' is, in short, the whole possible method of occupation of the series of positions ... ; and when Mr. Russell solves the puzzle by saying as he does, that 'the definition of whole and part without enumeration is the key to the whole mystery, * he seems to me deliberately to throwaway his case. (1911: 181-183).

As Craig (2000: 231-232) points out, James applies the dichotomy to time rather than space, and he also thinks that the paradox only threatens a certain picture of time. While he doesn't say exactly what this picture is, it's natural to think that it's some kind of A-theoretic or dynamic theory of time. This is suggested by James' talk of growing, enumeration, and succession, and is all the clearer when compared to the opposing view of time - apparently not threatened by the argument - as a space-continuum with its parts "already standing in it" (1911: 182). This "already" and "all at once" language sounds like a B-theoretic view where, quantifiers wide open, what there is and how things are doesn't change.

Whitehead agrees "in substance" with James' argument (Whitehead 1978: 68), though his version is slightly different:

Consider, for example, an act of becoming during one second. The act is divisible into two acts [...] and so on indefinitely. Thus if we consider the process of becoming up to the beginning of the second in question, and ask what then becomes, no answer can be given. For, whatever creature we indicate presupposes an earlier creature which became after the beginning of the second and antecedently to the indicated creature. Therefore there is nothing which becomes, so as to effect a transition into the second in question. The difficulty is not evaded by assuming that something becomes at each non-extensive instant of time. For at the beginning of the second of time there is no next instant at which something can become. (1978:68)

Whitehead and James' language is slightly different. Whitehead thinks the conclusion of the Temporal Dichotomy is that nothing *becomes* (comes into existence), and so, presumably, nothing changes, whereas James thinks the conclusion is that the continuum cannot be *traversed* (if it's continuous). It's not clear that either of these conclusions entails the other. Both James and Whitehead seem to think that the crux of the Temporal Dichotomy is that no instant has an immediately next instant – for any two instants there is at least one between them. Whitehead is explicit about this, and James probably has it in mind when talking about the “continuum”.

The story is much the same with Craig's argument. He thinks that an “analysis of A-theoretical becoming” entails that the passage of time must be consecutive, that is, one instant becoming and ceasing to be present after the next. Yet the passage of time cannot be consecutive if times are instants, for between any two instants is at least one other, and so A-theoretic becoming is impossible, assuming an instantaneous present. Here is Craig's A-theoretical analysis, with my explanations in brackets:

- i. only one part of time is actual or present (for all instants, exactly one instant is present at that instant)
- ii. the parts of time are actual one after another (one instant is present, then the next)
- iii. every part (instant) of time was, is, or will be actual (present) (2000: 235).

Conditions (i) and (ii) entail that no two instants can be present at the same instant, and so they must become and cease to be present one at a time, so to speak. Condition (iii) entails that no instant is “skipped over” - every instant that has and will ever exist has or will be

present. Craig says that these three conditions jointly “seem to leave no room for the non-consecutive passage of parts of time”, which is precisely what must occur if times are instants rather than intervals, since “instants are non-consecutive” (2000: 235), that is, between any two instants is at least one other instant. Craig reiterates this reasoning “from another angle” (2000: 235-236): for the present instant to elapse it must be succeeded by another, but there is no immediate successor to the present (or any) instant. Craig doesn’t go on to state the conclusion explicitly: the present instant cannot elapse, and thus A-theoretic becoming does not occur, because conditions (ii) and (iii) are not met.

2.2 Criticism of the Three Dichotomy Arguments

The above three Zeno-style arguments are unsatisfactory in one way or another. James does not give a very compelling argument his crucial premises, namely, that a continuum cannot be traversed (1911: 182), because “the [number of] points [is uncountably] infinite” (1911: 182-183). Whitehead’s argument is similar. After illustrating that the “process of becoming” is infinitely divisible, he concludes that nothing becomes (comes into existence or changes), but he does not show how this conclusion follows from the preceding sentences (1978: 68).

Craig’s argument is better because more rigorous. He provides us with an analysis of the picture of time that faces the paradox, and proceeds to argue that, given the analysis, time cannot pass because no instant can immediately or non-immediately succeed the present. Because “there is no immediate successor to the present instant” time cannot pass immediately and successively. Moreover, Craig argues, nor can time pass non-immediately. The argument for this is less clear. Craig uses the phrase “non-immediately” only once, and the phrase “non-consecutive” twice:

“Condition (iii) precludes any parts of time's being skipped over in the process of temporal becoming. One by one, one after another, every part of time becomes actual and transpires. These conditions for A-theoretical becoming seem to leave no room for the *non-consecutive* passage of parts of time [...] For no instant can immediately succeed the present, nor can any instant *non-immediately* succeed the present”. (2000: 235-236) [emphasis added]

His argument that time can't pass non-consecutively is this: if time passed non-consecutively, that is, via instants being succeeded by a non-immediate-successor instant, then some instants would be *skipped over* in the passing of time e.g. If t_1 were succeeded by t_3 then t_2 would be skipped, and this is forbidden by condition (iii). This seems right; it's hard to understand what it would be for there to be, or have been, a time that is never present, especially given presentism. The problem with Craig's argument, however, is that condition (ii) is not a necessary condition of time passing. Condition (ii) says that the parts of time are actual one after another. If this means that each instant should have an immediately next instant, then the instantaneous presentist should simply reject this. Of course, given a view of time on which there are instants, no instant has an immediately succeeding instant. But why must things be otherwise in order for time to pass? Craig leaves us without an argument for this.

In sum, all three versions of the Temporal Dichotomy contain the following reasoning, with varying degrees of clarity: if time passes, then times come and pass away one by one. But this implies that each time has an immediate successor, which is not the case given a continuous picture of time, according to which there are instants. I'll take this to be the core of the Temporal Dichotomy. In what follows, I'll develop two versions of the Temporal Dichotomy that make this reasoning explicit and rigorous.

2.3 Temporal Dichotomy Improved

Consider again the spatial version of the dichotomy. There seem to be two reasons why it's impossible for the runner to reach the end of the track. First, the track can be divided into smaller and smaller sections without limit, and so no point has an *immediately next* point. How can the runner progress towards the end of the track if there is never any next point for them to get to? Second, before getting to the end, they must get half the way there, and before that a quarter of the way, and before that an eighth of the way, and so on, in which case there is no *first* task for them to complete, and how can someone begin, let alone complete, a series of tasks without completing a first task? I will formulate two arguments corresponding to these two reasons: *No Immediate Successor*, and *No First Member*. Each appeal to the first and second reasons (respectively) to conclude that the passage of time is

impossible. More specifically, I'll take each argument as a reductio of the conjunction of instantaneous presentism and the thesis that, unrestrictedly, things change. This should be acceptable to almost all presentists, since all (to my knowledge) presentists think that what's present changes, and if everything is present then, unrestrictedly, what exists changes. Even mereological nihilists who deny the existence of all but fundamental physical simples will think that how things are changes, since how simples are arranged changes. So it's hard to see how this could be denied. In what follows, I'll use "things change" and "time passes" interchangeably.

2.3.1 No Immediate Successor

Here is the first Temporal Dichotomy argument:

- 1) The present is an instant and time passes.
- 2) If the present is an instant and time passes, then an uncountable set instants, I , will have passed.
- 3) An uncountable set of instants, I , will have passed only if some $i \in I$ has an immediate successor.
- 4) No member of I has an immediate successor.
- 5) It is not the case that an uncountable set of instants, I , will have passed.
- 6) Either the present is not an instant or time doesn't pass.

Instantaneous presentism implies premise (1). Why accept premise (2)? If the present is an instant, then the passage of time consists in instants elapsing one after another. A world in which only one and the same instant ever existed would not be a world at which time passes. These times intuitively form a set, I , that corresponds to the past, present, and future of the actual world. The passage of time is therefore akin to the movement of a point along a number line of real numbers.¹⁴ Since lines can be bisected into segments without

¹⁴ It is *akin*, but I do not claim that it is completely analogous, because many presentists and A-theorists deny that the passage of time literally involves *movement*. Talk of passage (and related notions like flow) is metaphorical or figurative for many presentists and A-theorists. What do I mean passage is akin to movement along a line? I mean that there is an isomorphism between passage and movement: times stand in the same C- and B-relations as points of a line: t_2 is *between* t_1 and t_3 , and earlier (later) than the latter (former), just as 2 is between 1 and 3, and 2 is earlier (later) than the latter (former).

limit, it follows that they are composed of uncountably many points. Hence, if something has moved any non-zero distance along the line, then it has passed through uncountably many points on the line. Mapping this on to the temporal case, the passage of times requires that uncountably many instants have been present: for any instant you pick (other than the first instant, if there was one), by the time it is present, uncountably many instants will already have passed.

Moving on, the intuitive gloss of premise (3) is that time can pass only if it happens successively, one instant after the next. Let us define the notion of an immediate successor as follows:

i_x is the immediate successor of $i_y =_{\text{def}}$ there is a tuple, I , such that $i_x, i_y \in I$ and $S(x) = y$.

Informally: one instant is the immediate successor of another if the latter's corresponding number is the successor of the former's number. The function, S , is the successor function from arithmetic, $S: \mathbb{N} \rightarrow \mathbb{N}$, which satisfies the following conditions:

- For all $x \in \mathbb{N}$, $S(x) \neq x$
- S is one-to-one.
- There is some element $e \in \mathbb{N}$ such that, for all $x \in \mathbb{N}$, $S(x) \neq e$.
- \mathbb{N} is the minimal set on which you can define such an S (S cannot be defined for any proper subset of \mathbb{N}).

Premise (3) is intuitively plausible. For some number of things to happen sequentially (rather than all simultaneously) each one must happen right after the one that precedes it. If I type a sentence, each character must come right after the preceding one; "e" comes immediately after "b" in "be", there are no letters between them. The question "which character comes next?" seems as though it must always have a correct answer (except in the case of the final character). Since there seems to be nothing special about typing sentences, there's reason to think that the point generalises to all happenings, including the passing of time. In fact, it seems especially intuitive in the case of time. Consider the instant which is now present (for you, anyway). Things are always changing, so *that* present instant has just vanished, it's been replaced by the next one. It's very natural to imagine these instants as immediately next to each other, without any other instants between them, as

though they were frames on a film. This is what the definition of immediate succession in terms of the successor function intends to capture. Just like the natural numbers, each time should have a successor.

There is a complication regarding (3). As it stands, it's not presentist-friendly, and so without further revision the presentist is free to reject it out of hand. This is because the present tense "has" suggests that presentists ought to think that, presently, there is more than one time, which many presentists deny.¹⁵ I don't think this is a problem for the argument. Presentists must make sense of talk about spans of time one way or another; they should not deny that Monday has or will have an immediate successor simply because Tuesday doesn't exist. Similarly, then, they shouldn't deny that the present instant, i_1 , has or will have an immediate successor simply because i_2 doesn't exist (given that i_1 is present). If presentists can make sense of talk about days of the week, then they can make sense of talk about non-present instants. A presentist-friendly rendering of (3) could involve an infinite conjunction of sentences each starting with a primitive "was" operator. Such a sentence is not expressible, and so I cannot type it (there is neither the time nor the hard drive space). I can, however, ascend semantically to talk about it indirectly: the proposition expressed by the presentist-friendly rendering of (3), *that* proposition, is true.

Moving on, premise (4) says that no member of the set of instants has an immediate successor. This is a consequence of time's passing being akin to movement along the line of real numbers. No real number has an immediate successor, since any two real numbers have another number between them, and so no instant of time has an immediate successor either. Premise (5) follows from (3)-(4). Premises (2)-(5) imply the conclusion. Thus, if instantaneous presentism is true, then time doesn't pass. I now turn to objections to No Immediate Successor.

2.3.2 Objections to No Immediate Successor

¹⁵ Crisp (2007) endorses something like this, for on his view all ersatz times are present in one sense, though not in another sense.

The first objection says that the passage of time is *skippy* or *gappy* – some of the instants that make up the history of the world never get to be present, they are skipped over, contrary to Craig’s condition (iii) of the A-theoretical analysis of becoming.¹⁶ On a skippy view of passage, premise (3) (time can pass only if each instant elapses immediately after the preceding one) is false. To see the motivation for this objection, consider that premise (3) is plausible only on a *discrete* model of time, where the timeline of the world is composed of parts with finite, non-zero magnitudes, such that every part has an immediate successor (excluding the end part, if there is one). But, the objection goes, it’s implausible on a *continuous* model of time, where the timeline is composed of uncountably many points. This latter model is what proponents of instantaneous presentism will accept, and so they have reason to deny (3).

To illustrate why (3) is plausible on a discrete account of motion, consider a virtual object like Mario from *Super Mario Bros*. Mario travels from left to right across a screen, *S*.¹⁷ *S* is composed of pixels, each of which is given by a pair of Cartesian coordinates, (x, y) . Usually, when the player moves Mario from left to right, he misses no pixels on the *x*-axis - there is no value of *x*, such that Mario is never located at (x, y) . It follows from this that for any pixel, *p*, on *S*, at which Mario is located, if Mario is moving then he will be located at *p*’s immediate successor (the pixel directly to its right). This instance of (virtual) motion satisfies premise (3), but it is possible that for Mario to move across the screen *without* moving through every immediate successor pixel. For example, we could program him to *skip* or *gap* pixels: if he is 16 pixels wide and the screen is 256 pixels wide then he could skip every 16 pixels, thereby halving the number of pixels he will have been located at compared to not skipping any pixels. In doing so he would move across the screen *without* moving through every pixel which is the immediate successor of some pixel.

How might this thought be extended to continuous motion, as is akin to the passing of time (assuming instantaneous presentism)? This amounts to holding that some instants are *skipped over* in the passing of time: out of all the instants there will ever have been, some

¹⁶ Gale uses the “gappy” language (1971: 44).

¹⁷ We can ignore his vertical movement by supposing that he faces no obstacles.

will never have been present.¹⁸ Such a response seems to allow the passing of time to get going, since instants get to elapse despite not having immediate successors.

There are two problems with this, however. First, which instants get skipped over? There seems to be no well-motivated and non-arbitrary answer to this question. Second, the idea that any instants might get skipped over or missed in the passing of time is implausible or almost unintelligible. After all, *I* is the set of instants that represent all of history. If some of these instants get skipped over then some of history was missed out. For all we know, then, the battle of Hastings was missed out, in which case it never happened. If instead *I* includes not just all the instants of history but some extra, bonus instants, whose sole purpose is to make continuous A-theoretic temporal becoming possible, then some puzzling questions arise. What happens at these instants? Is each of them an intrinsic duplicate of some non-skipped instant? Where do the duplicate instants come from? Does God throw them in to get time's passing kick-started? Finally, the suggestion that there are, or will have been, instants that were never present entails that there will have been things that were never present, which is incompatible with the presentist's claim that, always, everything is always present.¹⁹ So skippy passage has little to recommend it.

The second objection to No Immediate Successor is this: it's *indeterminate* which time is the present time, so that no time is determinately present.²⁰ Moreover, this indeterminacy is metaphysical – it isn't a mere lack of knowledge or specificity regarding the phrase "the immediately next time" that generates this indeterminacy. This objection denies an assumption of premises (1) and (2), namely, that there is such a thing as *the* present instant, and therefore denies the premises themselves. It also denies (3) on the grounds that it is vague which instant is the immediate successor, there is no such thing as *the* immediate successor if it's vague which instants are and will be present.

There are problems with this objection. First, the conjunction of this view and presentism entails that it's indeterminate what exists, *nothing* is such that it determinately exists, which

¹⁸ This involves denying what Craig takes to be essential to an A-theoretical analysis of becoming, "that every part of time was, is, or will be actual" (2000: 235).

¹⁹ You might think that the presentist should deny this on account of there being past things which have existed. This is a mistake. The presentist denies that there are any such things. That is, they deny that for some *x*, *x* is the Second Temple and is not present. But they affirm that it was the case that for some *x*, *x* is the Second Temple (Crisp 2004).

²⁰ Thanks to Steve Barker for raising this.

seems to introduce an enormous amount of indeterminacy into the world, and for reasons other than familiar ones pertaining to material composition (van Inwagen 1990; Korman 2015), and quantum mechanics (Lowe 1994). This would be a surprising consequence of instantaneous presentism. Second, the indeterminacy of the present is incompatible with there being determinately true tenseless propositions. For consider that the proposition <the battle of Hasting happens at 1066> seems always determinately true, but then it must have been determinately true when the battle of Hastings was present. But this cannot be so if it is (always) indeterminate what's present, and so the tenseless proposition is not always determinately true. So little seems to motivate this objection. So far, then, we've not seen a good objection to No Immediate Successor. But below I'll consider objections that target both it and the next argument.

2.3.3 No First Member

The next Temporal Dichotomy argument is as follows:

- 7) The present is an instant and time passes.
- 8) If the present is an instant and time passes, then an uncountable set of instants, I , will have passed.
- 9) An uncountable set of instants, I , will have passed only if some $i \in I$ is the first member of I .
- 10) No member of I is the first member.
- 11) It is not the case that an uncountable set of instants will have passed.
- 12) Either the present is not an instant or time doesn't pass.

Premise (7) is identical to (1), so the same considerations apply. Premise (8) is identical to like (2). Premise (9) says that time can pass only if there is (or will be) some time which is the *first* time of the set. In this argument, take I to be an uncountable set whose members are *ordered* by the earlier-than (or later-than) relation. This seems plausible: if I want to complete, in order, every task in a series of tasks then it seems I must do a *first* task in particular. Following a recipe in a cookbook requires me to complete the first step; if there

were no first step then I would never start or finish following the recipe.²¹ Gale makes this same point, arguing that it would be “conceptually absurd” for Zeno’s runner to reach the end of the track by following this sort of infinite-step recipe (1971: 46). Now, as with premise (3), (9) is not currently presentist-friendly, but it can be made to be in much the same way as before.

Premise (10) says that the ordered tuple of instants has no first member. To see why (10) is plausible, consider how things must go in order for time to pass: to get from 2:00 to 4:00 we must first get to 3:00, but before that we must get to 2:30, and so on. Assuming that the present is an instant and, therefore, that the passage of time is akin to movement along the line of real numbers, nowhere in this list do we reach a first task - there is no first time we must get to. Equivalently: 2:00 has no immediate successor, for any time t after 2:00 there is a time t' earlier than t such that $t' \neq 2:00$. Premise (11) follows from (9)-(10), and (12) from (8)-(11). Thus, if instantaneous presentism is true, then time doesn’t pass. I now turn to objections to No First Member.

2.3.4 Objections to No First Member

You might object to (10) that the ordered set of instants *does* have a first member, namely, 2:00, the time you start at. It’s wrong to think of the task of getting from 2:00 to 4:00 as one composed of smaller tasks whose order and arrangement is such that the last task is getting 4:00, the second last getting to 3:00, the third last getting to 2:30, and so on, such that there is no first member. No First Member begs the question against instantaneous presentism by setting things up in such a way as to preclude there being a first member. This way of construing the task (a backwards infinite dividing of times) isn’t incumbent upon us, so proponents of instantaneous presentists are free to reject it.

Now, if the task of getting from 2:00 to 4:00 is not formed in this way, how is it formed? Intuitively there must be some order or arrangement of events, some step-by-step process which is the passing of time. If not in this infinitely backwards-halving way (4:00, 3:00, 2:30,

²¹ If I had the misfortune of following a recipe with no “step 1” I might instead complete the step named “step 2” first, but then *that* would be the first task. Either way, I must complete some first task or other to finish the recipe.

2:15), then how? One moment after another? No, for then we run back into the problem of no instant having an immediate successor. Any other proposal seems just as unmotivated as any other: one half, then the next, or one third, then the second, and the third, etc. The instantaneous presentist should have some answer it seems, but no answer seems forthcoming.

Another objection is that we might accept that there isn't a first member of the relevant ordered set but deny (9) – there needn't be a first member of the set for time pass. Gale makes a similar point in his treatment of the original, spatial version of the dichotomy. The recipe we use in running from one end to the other is simply: put one foot in front of the other until you arrive at the end (197: 46). There is nothing difficult about following this recipe. The temporal analogue of this point is this: one minute passes, then the next, and eventually it's 4:00. Of course, this isn't exactly a recipe (nobody follows it), but there seems to be nothing difficult about it happening.

The problem with this objection is as follows. The process of getting from 2:00 to 4:00 is describable with two different sorts of recipes. One with a finite number of steps, and a first step, and another with uncountably many steps (and no first step). When described with the former, the process seems possible; when described with the latter, the process seems impossible. Can it be shown that the latter recipe is, in some sense, not the correct recipe, the one that the world follows when getting from 2:00 to 4:00? I don't see that it can. But only then would this response give us grounds for thinking that instantaneous presentism and Time Passage are compatible. This response leaves us in dialectical stalemate.

2.4 Other Objections to Both Arguments

Before moving on from the Temporal Dichotomy, I'll consider four objections to both arguments. First, you might object that the passage of time is akin to movement along the line of some *countable* set of numbers, such as the naturals (1, 2, 3,...). If times can be put into a one-to-one correspondence with natural numbers, then premises (4) and (10) come out false – there is *both* an immediate successor for some $i \in I$ and a first member of I . This view has problems. First, any non-identical instants, i_n, i_m , must be at some temporal distance from each other, for otherwise they would be simultaneous and hence identical.

Yet, on this view, no instants are between i_1 and i_2 , because they form a one-to-one correspondence with natural numbers, and no natural number is between 1 and 2. If there are no instants between them then there is no temporal distance between them either, for temporal distances are intervals, which are composed of instants. You might object that this proves too much, since similar reasoning apparently shows that 1 and 2 must be identical because there are no natural numbers between them. This is mistaken; the identity of 1 and 2 would follow only if there were no numbers of any kind, natural or non-natural, between them. This is false, there *are* numbers between 1 and 2, non-natural ones - non-integer reals and irrationals. But the view under consideration just is the view that the only instants which exist are ones which correspond to natural numbers. One could modify this view by postulating extra instants between the ones that correspond to the naturals, but this is just to adopt the skippy passage view.

Second, you might think that instantaneous presentists can avail themselves of Aristotle's response to the dichotomy, namely, that traversing any segment of the racetrack takes half of the time it took to traverse the previous segment, so that it's demonstrable that the total time to traverse the region is finite (Huggett 2019; *Physics* 263a15). This response, however, challenges no premise of No Immediate Successor or No First Member. It merely points out that that the racetrack is not infinitely long. In any case, it's not clear how this solution can be extended to the *temporal* dichotomy. Aristotle solves the original spatial version by appealing to time, but what is there to appeal to in the case of the Temporal Dichotomy? Not time, for that would be to offer as a solution to the problem the problem itself. And not space either, for that would involve a vicious regress - the problem with motion across space is solved only by raising a problem for the passing of time and vice versa. An appeal to hypertime kicks the problem up a step – how does hypertime pass, when there's no next hyper-instant and no first hyper-instant? It seems that the Aristotelian solution is not fit for dealing with No Immediate Successor and No First Member.

The third objection to both arguments says that modern mathematics solves the Temporal Dichotomy (Salmon 2001; Dowden n.d.) Proponents of this objection point out that, in the spatial case, Zeno's runner must complete the following series of non-overlapping distances:

$$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots$$

Which demonstrably sums to 1. Salmon, in particular, claims that insofar as the dichotomy raises problems about summing infinitely many (finite) terms, the modern calculus solves such problems (2001: 25). This is surely true, but it's unclear which premise(s) of No Immediate Successor or No First Member are undermined by this. Perhaps the idea is that the history of the world is not composed of uncountably many instants, but rather countably many intervals, each one half the duration of the last. This would undermine premises (2) and (8) – instants would have immediate successors, and there would be a first member of the infinite sequence. This response *rejects* instantaneous presentism since it construes each successive present as an interval of positive non-zero duration. In the next chapter I'll argue that this is a successful response to the argument, but this chapter is concerned only with instantaneous presentism.

The fourth and final objection is probably the most promising. The instantaneous presentist may concede that their view has the consequence that no instant has an immediate successor but maintain that this is just one of the many weird consequences of dealing with infinity. Sure, in most ordinary cases, we complete tasks by doing the first step, then the immediately next one. But the passage of instants isn't an ordinary case, we should expect it to be different. Infinities often have strange consequences, but it's hard to judge whether the weirdness is grounds for thinking they're impossible.

This dialectical situation is not unfamiliar in philosophy. For example, Craig (2009) argues that there cannot be an infinite number of things because otherwise absurdities would result. One of his arguments concerns Hilbert's hotel - a hotel with a countably infinite number of rooms (Hilbert 2013). Craig points out that even if the hotel is full, more guests can be accommodated: if, for every person, and room n , the person in room n moves to room $n+1$, then room 1 will become available for a new guest. Stranger still, if the hotel is full, and the person in room one leaves, then there is no change in the number of people in the hotel, but if everyone except the person in room one leaves then there is a change in the number of people in the hotel - from infinity to one. Oppy's response to Craig is to "embrace the conclusion of one's opponent's *reductio ad absurdum*" (2006: 48). *Infinity is just weird*, says Oppy. The dialectical situation here seems to be something of a stalemate. Craig thinks that Oppy has done nothing to show that Hilbert's hotel isn't absurd, and Oppy thinks Craig has not shown that it's impossible.

I think something similar applies to Temporal Dichotomy. It really is strange to think both that the present is an instant and what's present changes. For any time you pick, if you ask, "what's next?" the answer must always be "nothing is (immediately) next", and yet it's still true that, say, I will still be typing in two seconds, or I will drink coffee within the next 24 hours. So, premise (3), that an infinite number of instants will have passed only if instants have immediate successors, is undermined. Similarly for premise (9) – it is weird to suppose that tomorrow will arrive when there's no first time to arrive at (before arriving at all the later times). But it's hard to conclude from this that such things are impossible. If a weird thing isn't contradictory, or unlikely conditional on other things we think are true, there's always room to embrace the weird thing, and then the dialectic ends in stalemate.

In conclusion, then, instantaneous presentism plus the passage of time produces strange results – no instant has an immediate successor, and no member of the relevant sequence of intervals is the first member. But we should expect weirdness in metaphysics, at least sometimes, and I can't see any reason to think that this weirdness is evidence of the impossibility of time passing *given* instantaneous presentism. I conclude, then, that the Temporal Dichotomy is, at most, weak reason to reject instantaneous presentism.

2.6 Beginning and Ceasing

The second objection to instantaneous presentism is the problem of Beginning and Ceasing. This is inspired by an argument from Priest (2006). He assumes that there are instants, and that things change, and uses this to prove dialetheism. For the purposes of this thesis, I assume that dialetheism is false. Thus, Priest's argument becomes an argument against the view that the passage of time consists in instants beginning and ceasing to be present. I assume that instantaneous presentists will not want to deny that time passes in this way, and so the argument ends up targeting instantaneous presentism as such.

Let's start with a *prima facie* plausible principle about change

BC) *x begins* to Φ at t only if $x \Phi$ s at t , and *x ceases* to Φ at t only if x doesn't Φ at t .

Of course, ordinary objects can begin and cease to Φ , but so can times – they begin and cease to be present. Applying BC, t begins to be present only if it's present, and ceases to be

present only if it isn't present. When does t begin to be present? At itself. When does t cease to be present? Assuming instantaneous presentism, there seems to be no answer. After all, t must cease to be present at some point, assuming things change, for otherwise it will always be present. Intuitively, you might think that t ceases to be present at the first time at which it isn't present. But, as we saw with the Temporal Dichotomy, there is no first time at which t isn't present. Could t cease to be present, not at the first time that it isn't present, but at the last time at which it's present? No, because the last time at which t is present is t itself, and so t would begin and cease to be present at the same time, namely, itself. But BC implies that beginning to Φ entails Φ -ing and ceasing to Φ entails not- Φ -ing. Thus, t would both be present and not present, which is impossible.

Instantaneous presentists might respond by denying BC and propose instead that x begins to Φ at t only if t is the first time at which x Φ s, and x ceases to Φ at t only if t is the last time at which x Φ s. This allows, without contradiction, that the present instant begins and ceases to be present at the same time, namely, itself. How plausible is this revised account of beginning and ceasing? It's hard to say anything definite, so just consider this. Ceasing to Φ seems to imply not Φ -ing. On the face of it, if I cease to type then I'm not typing. The revised account is not compatible with this intuitive fact. It also treats beginning and ceasing as asymmetric: if x begins to Φ at t then it's Φ -ing at t . But not so for ceasing, otherwise we end up with BC, which caused problems for instantaneous presentism. I think, then, that rejecting BC in favour of the revised account therefore counts as a small cost for instantaneous presentism.

2.7 The No Persistence Objection

The third objection to instantaneous presentism concerns persistence. It is due to Merricks and Tallant:

Presentists deny that everything is instantaneous; they think that many objects not only exist but also have existed and will exist. (Merricks 2007: 122);

Suppose the present is of no duration [...] So far as I can tell this is false. *I* have duration, even if nothing else does. (Tallant 2010: 272).

Assuming that something persists iff it exists and either has existed or will exist, Merricks and Tallant's argument can be formalised as follows:

- 1) If instantaneous presentism is true, then everything is instantaneous.
- 2) If everything is instantaneous then everything wholly exists at only one instant.
- 3) If everything wholly exists at only one instant, then nothing persists.
- 4) If instantaneous presentism is true, then nothing persists.

I will assume that we should give up instantaneous presentism if (4) is true, because we know that *we* persist, we remember existing and know we will continue to for some time. Premise (3) seems obvious – existing wholly and only at one instant seems as good a definition of a non-persistent as you could get.

Instantaneous presentists should accept (1): for suppose that the present is an instant but that some *x* has a temporal extension of one second (so that it isn't instantaneous). Now, either *x* has temporal parts or it doesn't. If it doesn't then it is wholly present, by virtue of not having any non-present parts, but, for the same reason, it's also wholly non-present, by virtue of not having any present parts – this is impossible. If instead *x* has temporal parts, then it has parts which are not present. But instantaneous presentism implies that such non-present parts are non-existent, and we should reject that anything has parts that don't exist. Merricks makes this same point in his argument against the compatibility of presentism and perdurantism, "An object cannot have another object as a part if that other object does not exist." (1995: 524). He thinks this is "unimpeachable" and he is entirely right. Knowing that something does not exist is decisive evidence against the hypothesis that it is a part of something. Consider Merricks' own example: does the universe have "massive crystalline spheres" in which heavenly bodies are contained? That the answer is "no" is obvious precisely because there are no such spheres. Consider one more example for good measure: did the Saturn V have a hyperdrive as one of its parts? No, because (alas) there are no hyperdrives. Once we have settled the existence question, we do not need to wonder any further about mereology. Of course, we can come up with views on which things have non-existent parts e.g. Meinongian parts, lesser-degree-of-reality parts, or atemporal parts, but little seems to motivate such views. Brogaard (2000: 343) defends something like this view. She proposes that objects have an "unfolding temporal dimension", which consists in "infinitely thin" (presumably instantaneous) slices of objects

each existing at only one time. Thus, given presentism, only one stage of an object ever exists (though which stage this is changes). Unfortunately, Brogaard doesn't defend the possibility of this view from Merricks' objection. For, on this view, we should say that these four-dimensional, stage-y objects exist, and yet they have stages which do not exist, which is no more acceptable than having parts which do not exist.

On to premise (2). If this were false, impossible states of affairs would obtain together. Suppose x is instantaneous, but exists at both t_1 and t_2 . Since presentism is true, both times are present. But if x is F at one time and not- F at another, then it's presently both F and not- F . Since, presently A entails A , the view that two discernible instants are co-present entails a contradiction. Thus, always, only one instant exists, and so everything exists at the one and only instant.

Premise (3) is plausible by instantaneous presentist lights. If you accept the existence of times, and that things exist at them, then it makes sense to define persistence in terms of times: something persists if it exists at many times. But, of course, instantaneous presentism implies that things exist at only one time, and so is incompatible with persistence. Tallant anticipates a response to premise (3) from the ersatz presentist, according to which "my duration consists in my existing at many different [ersatz] times." (2010: 272). Thus, persistence can be defined in terms of existing at many ersatz times.

This ersatz times account of persistence has three problems. First, as Merricks and Tallant point out, it implies that claims about my duration are fundamentally about ersatz times rather than *me*, which seems like the wrong result (Merricks 2007: 147; Tallant 2010 272-273). The proposition $\langle I \text{ persist from one time to another} \rangle$ should be made true by the fact that I persist from one time to another. This is a standard requirement of making-true, that truths be made true by what they're about (Macbride & Daly 2025). The ersatz account contravenes this, propositions about persistence are made true by ersatz times, not the concrete particulars that they're about. This counts against the ersatz account of persistence.

The second problem is this: how do ersatz times come to accurately represent the past? Something must ensure that e.g. if there were dinosaurs then some of the past ersatz times represent the world as having contained dinosaurs. The facts of history and the ersatz

temporal series must be in accord with each other; the ersatz times should represent the way history really was. I think Crisp's temporal ersatz view can answer this objection. He holds that there are many ersatz B-series of times – one for every possible way history could have been – and only one of them represents the history of the actual world (2007: 103-104). Thus, most of the ersatz B-series do not accurately represent the world. However, since all possible ersatz B-series exist, it's guaranteed that *one* of them accurately represents the history of the actual world (after all, the actual is possible). The suggestion that the ersatz times might get things wrong assumes that it's possible that only the *wrong* times exist, the ones which don't represent the actual past. This is impossible on Crisp's view, since every possible ersatz series exists.

The third problem for the ersatz account of persistence is due to Tallant and Ingram (2015: 361-362). They say that ersatz presentists should hold that the truth-maker for <Caesar existed> exists in virtue of *Caesar's having existed*. Whatever this latter thing is, *Caesar's having existed*, it explains why the truth-maker for the corresponding proposition exists. This seems plausible; surely the way the ersatz world is depends on what actually happens in the concrete world. But once you accept this, you undercut the motivation for ersatzism. That is, if you allow that the *truth-maker* for <Caesar existed> exists in virtue of Caesar's having existed, then you should also allow that the proposition itself, <Caesar existed>, is true in virtue of Caesar's having existed, in which case there is no need to postulate the "middle-man", the truth-maker. In this case, the truth-makers are the ersatz times. The upshot of this is that the existence of ersatz times is not well motivated.

I can think of two more responses that neither Merricks nor Tallant and Ingram consider, though each comes at the cost of undercutting the motivation for instantaneous presentism. First: the instantaneous presentist might analyse persistence in terms of having been (and going to be) located at concrete, non-ersatz times. Of course, literally, there are no times given instantaneous presentism (and non-ersatzism). But even by presentist lights there are true sentences about past (and future) things: the Second Temple was in Jerusalem, the 100th prime minister will (probably) be a human being. These are true even though, assuming presentism, neither the Second Temple nor the 100th prime minister exists. If presentism is consistent with these truths, then it's also consistent with truths that suffice for persistence, such as "I was located at *t*" and "I will be located at *t*". A presentist

who endorses these sorts of truths can analyse persistence in terms of them, thereby denying premise (3).

The second response: analyse persistence in terms of having existed and being such as to be going to exist, where these expressions are not analysed in terms of times, whether ersatz or concrete. This is to appeal to irreducible temporal operators, operators not analysable in terms of anything else, including quantification over times.

Now the cost for each response. I have no general objection to these sorts of presentist strategies for preserving truths about the past in the absence of truth-makers (ersatz or otherwise). But if any of these views is adopted by the instantaneous presentist, then a key motivation for their view is undercut. As I'll argue in Part II, the main reason to believe in times is a kind of indispensability argument: we should believe in times because they're indispensable to ordinary, physical, or semantic talk. I'll respond to this argument by developing various versions of anti-realism about times. But if the instantaneous presentist wants to analyse persistence in one of these deflationary ways then they have to accept that non-extensive presentists can appeal to them too. In doing so, the instantaneous presentist concedes that their presentist rival has a good response to the main objection to their view, thereby undercutting a motivation for instantaneous presentism. It's in the instantaneous presentist's best interest to *not* be a deflationary ontological cheat in this way. So, the instantaneous presentist can go one of three ways: deny that things persist; adopt an unmotivated ersatz account of persistence; or reject the need for ersatz times and concede ground to the non-extensive presentist rival. None of these is especially plausible. Thus, the No Persistence Argument provides some reason to reject instantaneous presentism.

2.8 The Temporal Extension Argument

The fourth and final argument against instantaneous presentism is what I will call the Temporal Extension argument. It has been defended by McKinnon (2003) and Hestevold (2008). They argue that events and changes take longer than an instant to occur, and so the present must be longer than an instant in order to accommodate them. We can formulate the argument as follows:

- 5) If instantaneous presentism is true, then nothing is temporally extended.
- 6) Some things take time to happen.
- 7) If some things take time to happen then some things are temporally extended.
- 8) Some things are temporally extended.
- 9) Instantaneous presentism is false.

The argument for (5) is much the same as the argument for premise (1) of the No Persistence Argument, so I won't defend it further. Premise (6) is obvious, pretty much any event you could think of takes some non-zero amount of time to happen. Premise (7) is the all-important link from the obvious premise (6) to the unobvious premise (8). Premise (9) clearly follows from (8). So, why think (7) is true? I'll take Hestevold's and McKinnon's arguments in turn.

The thrust of Hestevold's argument is this: we are sometimes aware of *present changes* (2008: 331). That is, not only are there changes and occurrences, but there are present changes, changes which are themselves present. Since changes take time to happen, the present must include temporally extended changes, and so it must be long enough to include them, and hence not instantaneous. Hestevold offers some examples of present changes: believing a proposition, listening to notes of a musical scale being played, listening to a bird call with distinct parts, and pain subsiding.

It's slightly difficult to follow Hestevold's argument here. Obviously, the things he lists take time to happen. Moreover, when they are happening, they are present. So they are present happenings, which take time to occur. How does it follow from any of this that the changes are *temporally extended*? To assume that *taking time to happen* is the same as *being temporally extended* is just to assume that (7) is true. Given the philosophers that Hestevold references, I think he's getting at the following point: sometimes, entire changes take place within the *specious present*.²² The specious present is a period of time short enough that if a change occurs in its entirety in the specious present then it appears to have happened, *in its entirety*, in the present, rather than appearing to be spread across the past and present. As James explains:

²² He mentions Lowe (2001: 88) and Russell (1948: 186) who both think that perceptions and sensations take time to happen, though it's not clear that either use this as an argument against the view that the present is an instant.

“We do not first feel one end and then feel the other after it, and from the perception of the succession infer an interval of time between, but we seem to feel the interval of time as a whole, with its two ends embedded in it.” (1890: 630)

All well and good: there is a specious present, and some changes and events take place entirely within it. But the specious present may not be the present that the metaphysician is concerned with. And so it remains unclear why we should accept the following conditional: if entire temporally extended changes or events occur within the specious present, then entire changes or events are present *in the sense relevant to presentism*. Only if this is true is instantaneous presentism in trouble, and I don't see any reason to accept it.

McKinnon's examples of alleged temporally extended events are neural correlates of consciousness (2003: 309-310). The neuro-biological details are not important; all we need to know is that neuron firings take time to happen. But, again, why should it follow from this that they occur, in their entirety, in the present? Instantaneous presentism is refuted only if this is the case. I think, then, that the crucial premise (7) is unmotivated.²³ The upshot of this is that Temporal Extension Argument provides no reason to reject instantaneous presentism.

2.9 Conclusion: Instantaneous Presentism

Instantaneous presentism faces four objections: Temporal Dichotomy, Beginning and Ceasing, No Persistence, and the Temporal Extension Argument. In order of evidential strength: Temporal Dichotomy, Inconsistent Change, and Temporal Extension each individually provide, at most, weak reason to reject instantaneous presentism. No Persistence provides more than weak, but less than strong, reason to reject instantaneous presentism. Cumulatively, then, there's *weak to moderate* reason to reject instantaneous presentism. The next chapter will consider whether extended presentism can do any better.

²³ You might respond that there clearly are events and changes, and since there are temporally extended, instantaneous presentism is false. But this argument proves too much. For if there are brief events, like those which fit into the specious present, there are also very long ones, like the expanding of the universe. To accommodate these events the present would have to be extremely long, but surely, say, the big bang is not present. If there are events, and they are temporally extended, then they are a problem for presentists of every variety.

3. Extended Presentism

A natural alternative to the view that the present is a durationless instant is the view that the present is an *interval*, a time of greater than zero duration:

Extended Presentism: everything is present, and the present time has a duration of greater than zero.²⁴

This view sometimes goes by other names: durational presentism (McKinnon 2003), and thick presentism (Hestevold 2008).²⁵ Different versions of this view can be distinguished along three dimensions. The first dimension is just how long the present is – a fraction of a second, or thousands of years? The second is whether the present has mereological structure – does it have earlier and later parts? The third is whether the present is the minimal physically (or metaphysically) possible temporal extent. I will not consider every possible combination of these positions along the dimensions, though I will distinguish them when relevant. In what follows I will assess how extended presentism fares against the above objections and then raise objections to it that instantaneous presentism doesn't face. I'll conclude that extended presentism is less plausible than instantaneous presentism.

3.1 Temporal Dichotomy Redux

Historically, extended presentism has sometimes been preferred to its instantaneous rival because it avoids the Temporal Dichotomy.²⁶ If the present is an extended time, an interval,

²⁴ The greater-than-zero number could be either a real number or an infinitesimal (smaller than any real number). I don't know what could motivate this latter alternative, so I won't discuss it.

²⁵ Craig calls this view of *the present* (omitting presentism) "the atomic present" (2000: 239). James (1911) and Whitehead (1978) held to an atomic present but may not have been presentists.

²⁶ Whitehead seems to have held this view: "time is the succession of elements in themselves divisible", where such elements are so-called "epochal durations" (1925: 125-126).

then the passage of time is akin to movement along a line divided into countably many segments. Thus, each interval has an immediate successor, and so the Temporal Dichotomy is avoided.

One dissenter to this claimed advantage of the extended present is Barker (manuscript), who argues that the extended present still faces a dichotomy-style paradox. Here is how Barker sets up the paradox: assume the present is extended, and take two times, t_1 and t_2 , where the latter is (supposed to be) the immediate successor of the former. Assuming that what's present changes, Barker argues that there is some *thing*, a "stage", which is the change from t_1 to t_2 , call it " $t_1 \rightarrow t_2$ ". Barker thinks that t_1 , t_2 and $t_1 \rightarrow t_2$ are all stages, and therefore that passage of time can be modelled as follows:

$$t_1, t_1 \rightarrow t_2, t_2.$$

Barker argues that there are more stages that comprise the passage of time. After all, $t_1 \rightarrow t_2$ exists because t_1 and t_2 exist. But for the same reason it follows that there are the further stages $t_1 \rightarrow (t_1 \rightarrow t_2)$ and $(t_1 \rightarrow t_2) \rightarrow t_2$. The passage of time is therefore more accurately modelled as:

$$t_1, t_1 \rightarrow (t_1 \rightarrow t_2), t_1 \rightarrow t_2, (t_1 \rightarrow t_2) \rightarrow t_2, t_2$$

Repeating the above reasoning sets us off on a regress which results in there being not only an infinite number of stages between t_1 and t_2 , but an infinite number of stages between any two stages. In other words, no stage has an immediate successor. Additionally, the n -tuple of stages has no first member. Thus, the Temporal Dichotomy appears to rear its head against extended presentism too.

To my mind, extended presentists should reply as follows. It's *not* the case that there exists some *thing*, $t_1 \rightarrow t_2$, which occurs between t_1 and t_2 . Why think that, in addition to one time being present, and then the next, there is such a thing as *the change from one time to the next*? There's no more reason to think this than there is reason to think that there is some *thing* which is *the variation* from the hot end of a poker to the cold end. If there is no such thing then there is no such thing temporally between t_1 and t_2 , and so the infinite regress cannot get started. In sum, then, if the present is an interval, then each interval has an

immediate successor, and any set of intervals (starting at one time and ending at a later time) has a first member. Extended presentism solves the Temporal Dichotomy.

3.2 Beginning and Ceasing Redux

Extended presentists are better off than instantaneous presentists with respect to the problem of Beginning and Ceasing since they have two responses available to them. The first is nearly identical to the instantaneous presentist's response: things can begin and cease to Φ at the same time, in this case an interval. The second response: if there have been and will be only countably many intervals in the history of the world, then there will be a first (and last) interval at which things begin (cease) to be present. Thus, there *is* an answer to the question "when does the present interval cease to be present?", namely, at the interval immediately after the present interval.

This latter response to the argument *can* be independent of the first, but only if two conditions are met. The first condition is that, assuming extended presentism, there must be only countably many *instants*. For suppose otherwise. If intervals are composed of *uncountably* many instants then, plausibly, some things begin (or cease) to Φ at instants, and since no instant has an immediate successor, things must begin (and cease) to Φ at the same time, in which case this response entails the first response, namely, that it's possible for x to begin and cease to Φ at the same time. Thus, the latter response wouldn't be independent of the first. The second condition is that there must be only countably many *intervals*, for the same reason: if there are uncountably many intervals then there will be no answer to the question "at which interval does x begin to Φ ?" . The satisfaction of this second condition requires that intervals aren't gunky, that is, composed of shorter and shorter intervals, without a lower limit. The extended presentist can satisfy both these conditions by taking the present to be mereologically simple. I'll argue in section 3.5 that a simple extended present is independently plausible, too, since it offers the extended presentist a response to another argument against their view.

3.3 No Persistence Redux

You might think that extended presentism fares better than instantaneous presentism with respect to persistence because it denies that putatively persisting things are instantaneous. This is true, but extended presentism isn't that much better-off. Recall that persistence is a problem for instantaneous presentism because the present is shorter than the amount of time many things persist for. But the same is true of almost any plausible version of extended presentism – if the present is less than a second long (but greater than zero seconds), then it's shorter than the amount of time many things obviously persist for e.g. people (if the present is much longer, say, a hundred years, then many demolished buildings will count as present, which is surely the wrong result). I'll return to the question of exactly how long the extended present is below. For now, what matters is that the No Persistence argument also targets extended presentism: if extended presentism is true then everything wholly exists at a very short, fraction-of-a-second interval. This puts the extended presentist in a slightly better position – at least they have some persistence, however short. But some things persist for longer than a fraction of a second. Of course, extended presentists can avail themselves of one of the instantaneous presentist's other responses: persistence as location at many ersatz times; or persistence can be analysed in a deflationary way. But, as before, these responses come at some cost. So, extended presentism does marginally better than instantaneous presentism when it comes to persistence, but not much better. No Persistence therefore provides weak to moderate reason to reject extended presentism.

3.4 Temporal Extension Redux

You might think that extended presentism improves over instantaneous presentism because it's compatible with temporally extended events and changes. But, like the above objection, this is only marginally the case true. If you accept the existence of temporally extended events and changes, like the playing of notes in a scale, then you should also accept the existence of *very long* events or changes, like the expansion of the universe or the increase of entropy. There is no principled, non-arbitrary reason to accept the short events and changes but not the longer ones. And these latter events and changes are *billions* of years long, in which case the presentist is saddled with a present time which is billions of years long. But no presentist should believe in the things this entails: dinosaurs, the Jewish Second

Temple, the initial high entropy state of the universe, and so on. These are paradigmatic examples of things that do not exist given presentism.

So, the extended presentist should respond to the Temporal Extension argument in way the instantaneous presentist does, by rejecting that *taking time to happen* implies *being temporally extended*. Thus, the Temporal Extension argument favours neither version of presentism over the other, and so it provides, at most, weak reason to reject extended presentism.

3.5 Extended Presentism McTaggarted

Having covered all the objections common to both instantaneous and extended presentism, I now come to objections unique to the latter. Tallant (2010) has argued that a McTaggart-style paradox affects any view on which the present has some non-zero temporal extent.²⁷ To see this, consider the nature of the extended present. It has *regions*, such that some regions are earlier or later than other regions. Take two regions of the present, r_1 and r_2 , such that r_1 is earlier than r_2 . Since only present things exist, r_1 and r_2 are both present. But since r_2 is later than r_1 , and r_1 is present, r_2 must be future. So r_2 is both present and future, which is impossible. Another way to see the problem here for extended presentism is by thinking about the problem of temporary intrinsics.²⁸ The presentist solves this problem by denying that anything, x , is both F at t and not-F at t' (where $t \neq t'$). They do affirm that x was F and x is (now) not-F, but the tensing of the verbs blocks the inference to a contradiction, since $\langle x \text{ was F} \rangle$ doesn't entail $\langle x \text{ is F} \rangle$. In short, the presentist avoids commitment to the instantiation of incompatible properties by "shaving-off" states of affairs which would generate contradiction if they existed. With this in mind, it's clear how extended presentism generates a problem – it undoes the "shaving-off" (if only by a little), because it postulates regions of the present which are earlier or later than each other, even though all such regions are present.

²⁷ Craig (2000: 242) also mentions this problem but doesn't associate it with McTaggart's argument.

²⁸ Craig (1998) is responsible for pointing out the similarity between McTaggart's paradox and the problem of temporary intrinsics.

Tallant considers three potential solutions to this problem. The first is to give a tenseless semantics for tense sentences which blocks the inference to the contradiction. Tallant proposes the following tenseless semantics:

At r_1 a sentence token, u , of ' r_2 is future ' is true if and only if r_2 is later than r_1 .

This proposal fails by the presentist's own lights, for if the above is admissible for the presentist then so should the following:

At t , a sentence token, u , of 'it will rain in Nottingham', is true if and only if u is earlier than it raining in Nottingham.

But this is not admissible for the presentist, because given presentism, nothing is literally earlier than anything else, because everything is present. This shouldn't be surprising; tenseless solutions won't work because they will either quantify over or refer to non-present things. The second proposed solution is a tensed semantics, which would entail that nothing is both past and present or both present and future. At most, things are present but were (will be) past (future). Tallant says that it's hard to see how this can even get off the ground (2010:279), assuming an extended present. If r_2 is later than r_1 , and r_1 is present, r_2 must be future, even though it is present, which is just the contradiction we wanted to avoid. An extended presentist might respond by denying that if x is earlier/later than y then either x or y is past or future. On this view, r_1 and r_2 would be neither past nor future, despite r_2 being later than r_1 (and r_1 earlier than r_2). There are two modest costs for this response. First, it's just hard to see how things which are present can stand in non-zero temporal distance relations to each other. Of course, *if* the present is extended and mereologically complex then present things can be temporally separated, but this makes it no easier to see how this is possible. Second, some A-theoretic presentists hold that B-relations are reducible to A-relations.²⁹ If they are right then r_2 cannot be later (earlier) than r_1 without also being future (past), since, according to the A-theoretic reduction, to be later (earlier) than something involves being future (past). An extended presentist may reject this reduction, but since no other reduction seems forthcoming the extended presentist would be introducing two primitives to their theory, which is somewhat costly.

²⁹ Mellor (1981: 140) offers three such analyses.

The final potential solution Tallant considers is one he pre-empts when discussing whether the extended present is mereologically composed or simple. The solution is that the extended present is mereologically simple, so that talk of its regions is illegitimate because there are no such things. Tallant objects to this response on the grounds that even mereological simples have portions or regions in some sense. He thinks that even if e.g. your body were an extended simple, you would still have hands, and these would be portions of you (2010: 277). Similarly, then, even if the extended present is simple, it still has portions. I doubt this. I concede that something can *have* things that aren't *parts* of it; I have a phone, it is not part of me. But there is a difference between my phone and my hands. I have my hands somehow *more* so than my phone, and what else could this mean other than that my hands, but not my phone, are parts of me? If my hands are amputated, then they are no longer attached to me or bonded with any of my particles. So, I have things that are attached and bonded to me which can also fail to be attached or bonded to me. These things sound suspiciously like (proper) parts. What else is needed for my hands to be part of me, other than that I have them, and they are attached and bonded to me? (I don't take bondedness as a necessary condition of parthood, but in the case of hands and arms it certainly seems to be a sufficient condition).

One potential objection here is that none of attachment, connectedness, or bondedness can suffice for parthood because there is no such thing as parthood. But talk of parts seems true - "part of the cup has broken off" or "my Lego model is missing a part". You might want to object here that the notion of parthood in mereology is a formal, technical notion not found in ordinary language utterances, so that the truth of ordinary talk of parts has no bearing on whether talk of this technical notion of parthood is true. This is implausible, however, because the notion of parthood in mereology is introduced and explained using examples of ordinary objects. Consider some examples from the *Stanford Encyclopedia* entry on mereology:

- The handle is part of the mug.
- The remote control is part of the stereo system.
- The left half is your part of the cake.
- The cutlery is part of the tableware.
- The contents of this bag is only part of what I bought.

- That area is part of the living room.
- The outermost points are part of the perimeter.
- The first act was the best part of the play.

These “illustrate the general notion of ‘part’ that forms the focus of mereology” (Varzi 2019). Understanding these ordinary examples is the only way we have any kind of grasp of the notion of parthood as used in mereology, but then it’s plausible that the ordinary notion of parthood just *is* the notion of (proper) parthood in mereology, and so the truth of ordinary talk about parts does bear on whether there are parts. Since ordinary part talk seems true, we should think that there is such a mereological notion as parthood, and that it applies to some things.

The upshot of all this is that the extended present cannot have regions or portions unless it has (proper) parts. But then shouldn’t the extended presentist just deny that there are any parts or portions to the present? Tallant objects to this in the following way: even if the extended present doesn’t have parts or portions, in *some* sense it is extended over two instants, namely, the instants that mark its beginning and end. And if it’s extended over these instants, two bits of it must overlap those instants.³⁰ Whatever these temporal “bits” are, which overlap the beginning and end points of the interval, they’re enough to get the McTaggart argument up and running. Thus, extended presentism cannot avoid Tallant’s McTaggart-style objection, even if the present is mereologically simple.

3.6 Boundary Points

Even supposing that a mereologically simple extended present can solve this worry, there’s another McTaggart-esque objection in the vicinity. Recall that the extended present is an *interval* of time, rather than an instant. Given this, it’s natural to suppose that it has *boundary points*, like any other interval. Intervals are given by their boundary points: whenever we specify which interval we are talking about, whether it be spatial or temporal, we have to specify its end points. Suppose I have two non-identical intervals, x and y . What individuates them? Their boundary points: x just is the interval (a, b) , and y just is the

³⁰ Jonathan Tallant, personal communication.

interval (c, d) (where $a \neq c$ and $b \neq d$).³¹ Boundary points, however, create a problem for extended presentism.

Suppose that the extended present is the *closed* interval (a, b) , that is, it's boundary points (instants) lie *on* the interval rather than outside it. If this is the case then a and b are both present, since anything in the present interval is present. But a must be earlier than b , because they are the boundary points of the *extended* present,³² and so either a is past or b is future. It follows from this that something is either both past and present, or both present and future, which is impossible.³³ If we suppose instead that the extended present is the *open* interval (a, b) , so that neither boundary point lies on the interval, then neither a nor b are present, because something is present iff it is in the present, and open-interval boundary points are by definition not located on the interval. This view, open-interval extended presentism, entails that not everything is present, and so it entails its own falsity. (The view that the extended present is a semi closed/open interval, where exactly one of its boundary points lies on it, inherits the problem of both of the above views).

3.6.1 Intervals Without Boundary Points?

You might think that the extended presentist should get off the boat earlier: deny that the present interval has boundary points. Whatever the extended present is, it's not (quite) like a mathematical interval. An alternative approach could be to define intervals (and their magnitudes) using something like a pointless geometry, roughly, a geometry in which various familiar geometric notions (length, size, location) are defined without points.³⁴ To see how this works, consider that two (non-identical) spatial regions can have the same area. Suppose R and R' are both one square meter. In a typical geometry, they have different boundary points and are thereby non-identical. In a pointless geometry, R and R' aren't given or individuated by boundary points. Instead, they're individuated by their

³¹ This is the standard mathematical definition of an interval (Earl and Nicholson 2021).

³² There are so-called degenerate intervals, where the end points are really only one point e.g. (a, a) , but to identify the present with a degenerate interval is to abandon extended presentism, since there is nothing between its boundary points and so *a fortiori* no temporal extension or length or duration between them.

³³ This has been a common assumption in the philosophy of time since McTaggart, though I don't know of any argument for it. I will continue to assume it in this paper.

³⁴ See Vakarelov 2020 for an overview of pointless geometries and their application to space and time.

subregions: R exactly fills the union of subregions r_1 , and r_2 , and R' exactly fills the unions of subregions r'_1 and r'_2 .

Of course, minimal spatial regions cannot be individuated in this way, since they have no subregions. *Mutatis mutandis*, then, for a pointless theory of time. Two intervals, each of the minimal duration, can be individuated if they are longer than the minimal temporal extent, since they will have non-identical subregions, but not otherwise. Now, whether extended presentists should think of the present as the minimal temporal extent, or as longer than it, is unclear. I think the former is more plausible because the latter is somewhat arbitrary. Let's suppose that, however long the minimal temporal extent is, its length is fixed by some fundamental physical fact. If we suppose that the extent of the present is longer than this, then it's hard to see what would explain this fact. If e.g. the minimal temporal extent is a Planck second, and the present is five times as long, what explains this? The extent of the present would appear to be something of a nomological dangler, in Putnam's words. It's difficult to imagine that future physics will reveal an answer to the question "how much longer is the present than the minimal temporal extent and why?". Better to identify the minimal temporal extent with the extent of the (extended) present.³⁵ If the present is the minimal temporal extent, however, then it can't be individuated from previous and soon-to-be presents, for the same reason that minimal spatial regions can't be individuated from each other – there aren't any sub intervals/regions, by stipulation. The upshot of this is that extended presentists should look to individuate intervals in some other way.

Another option is to individuate intervals by what exists at them (or the ways those things are at them, or what's true at them): Socrates exists at I_1 but not I_2 , so $I_1 \neq I_2$. Whether this solution works depends upon the nature of times. Suppose that what exists (how things are/what's true at) at a given time is metaphysically contingent: I could have been sleeping (rather than typing) at *this* very time. If this is possible then any two times are possibly qualitatively identical³⁶, and so they cannot be individuated by what exists at them. Absent boundary points, then, nothing could serve to distinguish I_1 from I_2 - they would just be brutally non-identical. But we should avoid brute non-identities where possible. This follows

³⁵ For similar reasons we should reject the view that there is no (non-zero) minimal temporal extent.

³⁶ You might think this entails that time can pass in the absence of change: if I_1 and I_2 were next to each other, then two seconds could pass where nothing changed. But the possibility of I_1 and I_2 being qualitatively identical doesn't entail this, because it doesn't entail that they could be next to each other.

from a plausible more general principle that, *ceteris paribus*, we should prefer theories which explain some fact to those that don't. And here an explanation *is* available in terms of boundary points: $I_1 \neq I_2$ because I_1 has boundary points (a, b) and I_2 has boundary points (c, d) , where each $a \neq c$ and $b \neq d$. Granted, the points themselves can't be individuated by anything else, but we still avoid a brute non-identity by postulating them (compare: what makes one proton different to another? They're composed of numerically different quarks). Moreover, absent boundary points, nothing explains *why*, say, I_1 is one second long, rather than two or half a second. We should prefer an explanation to no explanation, and there is a good one in terms of boundary points.

On the other hand, if what exists (how things are/what's true) at a given time is not metaphysically contingent, then any change results in a new time: a time just like the present one at which I'm sleeping rather than typing is simply a different time. If times are fragile in this way, then it is *not* the case that any two times are possibly qualitatively identical. Is it plausible that times are fragile in this way? It's hard to say. On many accounts of times, the answer is yes: if times are sets of events, or conjunctions of propositions or sentences, then any change in the members of the set, or conjuncts, makes for a change in which time we are considering.³⁷ Let's assume that times are fragile, such that any change in what exists at a time results in a new time. This provides a way of individuating times without boundary points.

But a problem remains: if, as seems plausible, the extended present is only finitely long, then it seems it must have boundary points. To say that the present is finitely long is to say that it has a beginning, or earliest point, or part. And what else are these except boundary points?³⁸ Thus, the McTaggart-style problem persists.

3.6.2 Other Options in Logical Space

Might the extended presentist hold that it's indeterminate whether the present has boundary points? I think not. Intervals are differentiated from each other by their boundary points: x and y have different boundary points iff they are non-identical. If it's indeterminate

³⁷ See Meyer (2011) for an overview of different accounts of times.

³⁸ Or boundary sub-intervals, in which case the same McTaggart-style argument can be run again.

as to what x and y 's boundary points are then, by the biconditional, it's indeterminate whether they are identical, and there is a well-known and powerful argument against the possibility of vague objects (Evans 1978). There's one more option in logical space (so far as I can see): the present is finitely long, but has the topology of a circle, and so has no end points. Both of these options would be very surprising (and borderline unintelligible) consequences of extended presentism, so they should probably be rejected.

Let's take stock of all this. Extended presentists should respond to the Boundary Points problem by taking intervals to be individuated by what exists at them, rather than their boundary points. But the very concept of an interval seems to include boundary points, and so the general McTaggart worry remains. Thus, the Boundary Point argument gives us moderate reason to reject extended presentism.

3.7 Discontinuous Motion

The next objection to extended presentism concerns discontinuous or jerky motion.

Grunbaum (1970: 247-249) points out that extended presentism entails that change is jerky rather than smooth. Consider a particle, A , moving towards a stationary particle, B .

Intuitively, there is a time when A is in line with B , which we can model as the time when A and B share a coordinate on some axis. But if there is a minimal non-zero duration, then this can fail to be the case. To see this, consider a simple toy model. Suppose that A is traveling at 1m/s towards B , and that the minimal duration is 1s . If A 's displacement from B is -0.5m at t_1 then it's displacement from B at t_2 will be 0.5m .³⁹ By hypothesis, there is no time between t_1 and t_2 , and therefore there is no time at which A 's displacement from B is 0 , and hence they will never have been in line with each other. Thus, A can be on one side of B , and then the other side, even though there is no time when they were in line with each other.⁴⁰

³⁹ Displacement is a vector, that is, a magnitude and a direction. When dealing with vectors one simply stipulates the positive and negative directions.

⁴⁰ This bears some resemblance to Zeno's stadium paradox, but they're different arguments. Zeno (according to Aristotle, of course) thinks that relative motion involves a *contradiction*. Suppose we have three rows of three particles, the A s, B s, and C s, laid on top of each other. The A s are at rest, the B s are moving to the right, and the C s to the left. To begin, the right-most B , and left-most C are in-line with the middle A . At a later time, the rows will be in perfect alignment, in such a way as to form a square shape. At this time, the B s have travelled past all the C s, but not past all the A s. Zeno takes these two different relative distances travelled, divides them by the speed of the particles, and concludes that the motion has taken both some amount of

Craig takes this as reason to reject extended presentism because it implies that whether something is an event depends on the relative velocities of the bodies in question (Craig's own example involves three rows of three particles stacked on top of each other. The columns they form go out of alignment as the top and middle rows move in opposite directions). The problem with this is supposed to be that "present day kinematic knowledge give[s] no hint of [this]" (2000: 243).

I don't know why Craig thinks that *if* something's being an event depends on relative motion, *then* our current physical theories would say so. Nor is it clear that something's status as an event does in fact depend on relative motion. In the above scenario, it's not as though *A's being 0 meters from B* exists and but *fails* to be an event, it just doesn't exist at all. If it had existed it would have been an event. It's hardly implausible that which events exist depends on relative motion. Mundane examples show that this is the case: if I had, right now, been moving with respect to my desk then *my being stationary at my desk* would not have obtained. Nothing is objectionable about this. Extended presentists disturbed by jerky motion may lessen the weirdness by postulating a minimal *spatial* extent, such that no "missed" alignment is possible (in our toy model this would be 1m). I don't know of any independent reason to think that the minimal temporal and spatial extents 'match up' in such a way as to foreclose missed alignments, and so this response is somewhat *ad hoc*. Jerky motion is weird, but it's *just* weird, and so not a reason to reject extended presentism.

3.8 Minimum and Maximum Duration

The final objection to extended presentism is as follows. Suppose the present is $n (> 0)$ seconds long. A natural question is *why* is it n seconds long? One candidate answer is that n seconds is the minimum physically possible duration. There are at least two different ways of calculating a minimum physically possible duration. The first is to take the diameter of an elementary particle like a photon or electron and divide it by the velocity of light: $10^{-15}\text{m}/10^8\text{ms}^{-1} = 10^{-23}\text{s}$. The second way is to divide the Planck length by the velocity of light:

time and half that time – contradiction. Huggett (2019) observes that most philosophers think Zeno is just mistaken about how relative velocities work. Discontinuous motion does not claim that the extended present gives rise to a contradiction.

$10^{-35}\text{m}/10^8\text{ms}^{-1} = 10^{-43}\text{s}$ (Craig 2000: 240): So the extended presentist has, at least, a candidate explanation of why the present is n seconds long. But could present have been longer, is that metaphysically possible? Say, 10^{-20} seconds, or 10^{-5} seconds, or longer. This is conceivable, and I do not know of any argument for thinking that these longer durations are not possibly the duration of the present,⁴¹ so we should accept that they are metaphysically possible – the present could (metaphysically) have been 10^{-5} seconds long.

This raises a problem for extended presentism: if these other durations are possible, then why not other, larger durations, say, one thousand, or a tenth of a second? There seems to be no principled reason to stop at one duration and say that it is the largest metaphysically possible duration of the present. And so we can keep going: one second, one hour, one year, a millennium. Assuming that the present is extended, there seems to be no upper limit on how long the present can be. Yet a two thousand yearlong present is plausibly *not* metaphysically possible. If it were, then the Second Temple would be present, rather than past, even though its destruction is two thousand years earlier than my typing of this sentence.⁴² This, then, is the problem with an extended present: if the present were extended then there would be no maximum duration of the present, but there must be a maximum, since anything which exists at a large temporal distance from us (like the Second Temple) is, for that reason, plausibly not present. No amount of time greater than zero seconds is a plausible maximum – one Planck second seems just as arbitrary as one millionth of a second, or one million seconds. Thus, the arbitrariness of extended presentism gives us moderate reason to reject it.

3.9 Conclusion: Extended Presentism

How does extended presentism stack up against instantaneous presentism? The former has an easy response to the Temporal Dichotomy and Beginning and Ceasing, both of which provided little to no reason to reject instantaneous presentism. Extended presentism fares

⁴¹ Except perhaps that the laws of physics are metaphysically necessary, and therefore that it is metaphysically necessary that the present be n seconds long because it is a consequence of the laws. But this is not a majority view, and nor is it especially plausible conditional on extended presentism and so appeal to it is slightly *ad hoc*.

⁴² It may exist in the present epoch or age, *Anno Domini*. Sometimes “the present” has a blank space to the right which must be filled in with a time, e.g. the present *year*. I take it this is not the sense of “(the) present” relevant to presentism.

equally well with respect to the No Persistence and Temporal Extension arguments. Conditional only on these four arguments, then, they're roughly on par - there's weak to moderate reason to reject both.

But extended presentism, unlike its rival, faces the McTaggart-style problem, Boundary Points problem, and Maximal-Minimum Duration. Each of these provides moderate reason to reject extended presentism. Conditional on all seven arguments thus far, then, there is more than moderate, perhaps strong, reason to reject extended presentism, and so we should prefer its instantaneous rival, unless another option is available.

4. Non-Extensive Presentism

Can presentists do better than instantaneous and extended presentism? I'll argue that they can. A third option for the presentist here is to reject some assumptions that underlie both instantaneous and extended presentism: that there is a present time, that there were and will be other times, and that things have duration or temporal extension, whether zero or non-zero. This view is inspired by Merricks' view. It's worth quoting him in full:

...consider a view that starts with the eternalist's picture of time and existence at a time, and then 'shave off' the past and the future, leaving only a thin (instantaneous?) slice called 'the present'. This view agrees with eternalism that existing at a time—at any time, past, present, or future—is like being located at a place. But, unlike eternalism, this view says that while objects exist at the present time, they exist at no other times, since there are no other times at which to be located. Such a view implies that everything is instantaneous. This view is not presentism. Presentists deny that everything is instantaneous; they think that many objects not only exist, but also have existed and will exist. But I can see why some might think this view is presentism. They think this view is presentism because they (wrongly) ascribe to presentists the eternalist's claim that to exist at a time is to be located at some super-thin slice of being. But presentists should no more accept this than the non-Lewisian should accept that to possibly exist is to be located in some universe. In fact, I think presentists should deny that there is anything at all—much less some super-thin slice of being—that is the present time, just as they should deny that there are past times or future times... (2007: 124-125)

Merricks explicitly rejects instantaneous presentism and thinks other presentists should too. He would, presumably, also reject extended presentism for similar reasons: it implies that

everything exists only for a very short period of time, but many things have existed for a very long period of time.⁴³ Let us define this view as follows:

Non-Extensive Presentism: everything is present, and nothing is a time.⁴⁴

In particular, non-extensive presentism entails that there is no *present* time. It is still compatible with the view that there is a present, just so long as it isn't a time. The present could just be the collection of everything in existence. It also entails that nothing at all has a duration or temporal extension, zero or otherwise, because there are durations (or durative things) only if there are times: for x to have a duration of, say, one second, is for there to be two times, t , t' , separated by a second, such that x begins (or comes into existence, or whatever) at t and ends (goes out of existence, or whatever) at t' . Additionally, there are times only if there are durations, because times have either zero or non-zero duration, and even zero duration is a duration.⁴⁵ Moving on, it's hard to find explicit endorsements of non-extensive presentism. Chisholm is close; Feldman & Feldman (2024) think he's a presentist, and he's an anti-realist about times: "There seems to me to be no sufficient reason, therefore, to suppose that this temporal world includes such entities as 'times'." (Chisholm 1990: 425). Tallant is also close, modelling his "existence presentism" after Merricks' view (2014: 492-494).

4.1 Intelligibility Worries

⁴³ Admittedly, later on Merricks seems to be less hardline in his rejection of times:

"presentists insist that there are objects that exist at the present time (or, equivalently, that presently exist). Since they do not believe in a region called the 'present time', presentists cannot reduce existing at the present time to being located at that region. I think presentists should, instead, say that existing at the present time just is existing. Thus, given presentism, if something exists, then, obviously enough, it exists at the present time. So, given presentism, since everything exists, everything exists at the present time." (2007: 125)

This is confusing. Merricks thinks that there is no such region as the present time, and yet also thinks that everything exists at the present time. Are we to think that Merricks thinks there is a present time, but that it is not a region nor a super-thin (or even slightly thin) slice of being? I don't know. In any case, I will defend the more hardline Merricksian view - that there are no times, not even the present time.

⁴⁴ This is a version of what Hestevold calls "time-free presentism" (2008: 326), the conjunction of presentism with the view that there are no irreducible times. Time-free presentism can therefore be reductionist or eliminativist about times. Non-extensive presentism is the latter.

⁴⁵ In ordinary language we sometimes use the word "duration" to talk about how long something lasts, e.g. "the duration of the film is two hours". I'm not rejecting that there are two-hour films, or thirty-minute train journeys, and so on. What I'm rejecting is that these things imply that the world is made up of temporally extended things.

You might think this version of presentism is unintelligible – surely everything has zero or greater than zero duration, what other option is there? To see why this isn't so, consider structurally analogous views in other areas of philosophy.

Space: some conceivable things have neither zero nor greater than zero spatial extension. Abstract objects and (on some views) God have neither zero nor greater than zero spatial extension. Rather, they have no spatial extension whatsoever, they are not spatially located at all. Spatial discourse about such things is wholly misguided; it tracks nothing in reality.

Morality: moral error theory implies that lying is not wrong. But nor does it imply that lying is permissible either. Actions are neither impermissible nor permissible according to the error theorist. Rather, moral discourse is wholly misguided, it tracks nothing in reality.

Modality: a modality-without-worlds view says that there are no possible worlds, not even an actual world. This is not to say, however, that everything is impossible because nothing is located in any world. Rather, modality is simply not about worlds. To be possible is not to modally located, to be necessary is not to occupy the maximal modal region. Such discourse is wholly misguided; it tracks nothing in reality. But there's still the collection of everything in existence, and there are still modal facts (possibly, I have blue hair; necessarily, God exists), it's just that none of this is to be analysed in terms of facts about modal location.⁴⁶ Moreover, this view is compatible with actualism: everything is actual, nothing is merely possible.

Non-extensive presentism is structurally similar to these views. Nothing has duration or temporal extension, there is no such thing as temporal location. Such discourse is wholly misguided; it tracks nothing at all in reality. But there are still present things, persisting things, facts about history, and facts about what the future holds.

You might worry that non-extensive presentism is unintelligible for another reason: without a present time, it's no longer clear what it is for something to be present. What other account of presence can be given? There are a few accounts in the literature. Each is

⁴⁶ This is similar to Aristotelian theories of modality, where modal facts are analysed in terms of essences or powers (Fine 1994, Lowe 2008, Jacobs 2010).

compatible with non-extensive presentism, and none imply or are implied by non-extensive presentism:

Existence presentism: presence is existence.

Reality (Priorian) presentism: presence is reality.

Craigian presentism: presence is the temporal mode of being.

Cameronian presentism: presence is being located in the maximal spatial region.

These views are defended by Tallant (2014), Prior (1970), Craig (1997), and Cameron (2016), respectively. The first can be understood either as a claim about property identity or category identity. We could also understand Reality presentism in either of these ways. Craig's view is hard to understand. He says that a mode is a way of exemplifying properties, and that there are two modes of existing: timeless existence and temporal existence. He identifies the latter with presence. I take it that this is not supposed to be the view that there are many *varieties of kinds* of existence (for which we might use different quantifiers, for example). Instead, there is simply existence, and two modes which modify how a given thing exists. Confusingly, Craig also says that "presentness is the act of temporal being" (1997: 37), where "act" is understood in the Thomistic sense. It's not my purpose here to unpack Thomistic metaphysics, so I'll just move on.⁴⁷

Since none of the above three views implies or is implied by non-extensive presentism, I won't take a stand on which is most plausible. That these views are compatible with non-extensive presentism serves to dispel the worry that unintelligibility results from rejecting the existence of a present time. (Even if this were not the case, the view that presence is being located at the present time does not tell us what it is for a time to be the *present* time. So, whether presentists believe in times or not, they will need to explain what it is to be present).

4.2 Non-Extensive Presentism and Similar-Sounding Views

⁴⁷ These views of presence can be used to generate views of *the present*: the present is the collection of everything that exists/is real, and the present is the collection of all the things that have the temporal mode of being, the present is the maximal spatial region.

Non-extensive presentism sounds somewhat similar to two other views in the literature: Craig's non-metrical present, Pezet's non-extensive duration, and Bergson's real duration. It's worth getting clear on how they differ.

4.2.1 The Non-Metrical Present

It's not entirely clear to me what Craig's (2000) view is. Depending on which parts of pages 245-246 one focuses on, one gets the impression of maybe three different views. On one impression, the view seems to be that there is no such thing as the present *simpliciter*, because the expression "the present" must be followed by an amount of time e.g. the present year or day, or whatever. Even this is ambiguous between a claim about the present and one about the expression 'is present'. On another impression, the view seems to be that the *concept* of the present is "pre-metrical" (2000: 246). I *think* this means that it's *not* part of the concept of the present that it has any temporal length, extent, or duration (this is in contrast to, say, the concept of an event: it is part of the concept that an event have a duration, whether zero or greater than zero). The third impression is of the view that presentness itself (not the concept but perhaps a property) is not metrical. By "metrical" I think Craig means that the present isn't extended or unextended, rather the notion of temporally extension simply doesn't apply at all to the present. This is most similar to non-extensive presentism. I think "non-extensive" is the better term here. A metric is a distance function (Earl & Nicholson 2021: 562), but something's being extended doesn't imply that there is a metric over it. For example, a space is a set of points, and between any two points is line. Of course, lines are extended, but unless a metric is defined over the space, the axioms characterising the set do not entail anything about the distance between the points. The notion of a metric-less space is a common and coherent one in mathematics; some topological spaces are not metrizable, that is, a metric cannot be defined on them. For example, Steen and Seebach show that a two-point set with an indiscrete topology is not metrizable (1978: 42-43). We could say that a line in a metric-less space is "non-metrical", but it's still *extended*. What Craig (and I) wants to deny is not only that there is no metric on the present, but that temporal extension doesn't apply to the present (or presence, or present things). Thus, Craig says that it's "wrong-headed to ask how long the present is" and

endorses Christensen's (1993: 123) view that "there is no such metrical particular as simply 'the present'" (2000: 245). This view is implied by non-extensive presentism. In any case, non-metrical and non-extensive presentism are not the same view, since the latter says nothing about the meaning of "is present", nor the concept of presence.

4.2.2 Non-Extensive Duration

Pezet (2020) develops an account of duration according to which duration is not temporal extension. Call this "non-extensive duration".⁴⁸ Roughly, something has non-extensive duration if it can persist unchanged while other things change. Pezet thinks this account has two key virtues: it offers a presentist-friendly account of events and solves a version of Zeno's arrow paradox (2020: 417-418). Importantly, he quotes the passage from Merricks that I quoted above (2007: 124-12) and endorses Craig's non-metrical present (2000: 179). It looks like Pezet would probably endorse non-extensive presentism, but so far as I can see, neither my view nor his imply each other. If Pezet's right that duration isn't temporal extension, it doesn't follow that temporal extension doesn't apply to anything, which is what non-extensive presentism implies. Similarly, if everything is present and nothing is a time (and so temporal extension doesn't apply to anything), it doesn't follow that duration is not temporal extension. So, as much as Pezet and I might be sympathetic to similar presentist-type views, his account of duration is not at all the same view as non-extensive presentism.

4.2.3 Real Duration

Finally, non-extensive presentism sounds a bit like Bergson's real duration. An important caveat here is that Bergson is notoriously opaque. Since I'm not interested in exegesis, I only claim to describe a Bergson-esque view, not Bergson's actual view. Bergsonians think that we tend to have a spatialised view of time as akin to a line, composed of point-like entities. But this is inaccurate. Rather, time as it really is, so-called "real" or "pure" duration, is

⁴⁸ This is my terminology. Pezet simply calls his account "Duration" in bold text.

entirely non-spatial. What, positively, is real duration? It's psychological, lived, unfolding, and qualitative (Guerlac 2006: 45-60). What does this mean? I don't know, but perhaps Prior can help us out. Here he is commenting on (something like) Bergson's view:

[...] the basic reality is things acting. But even in this flux there is a pattern, and this pattern I try to trace with my tense logic, and it is because this pattern exists that men have been able to construct their seemingly timeless frame of dates. Dates, like classes, are a wonderfully and tremendously useful invention, but they are an invention; the reality is things acting.... I think it is important that people who care for rigorism and formalism should not leave the basic flux and flow of things in the hands of existentialists and Bergsonians and others who love darkness rather than light, but we should enter this realm of life and time, not to destroy it, but to master it with our techniques. (Prior n.d)⁴⁹

Ignoring Prior's bashing of existentialists and Bergsonians, a Bergson-style view might go as follows: time is real duration, and real duration is things happening and changing. These happenings and changings *can* be thought about as though they were space-like e.g. event e is located between t and t' , but this is at best a useful fiction or convention, the world is not (mind-independently) like this.

Non-extensive presentism has something in common with this view, namely, that there are no times. But non-extensive presentism doesn't entail that there is real duration. In fact, at face value, it seems to say otherwise, since it entails that there are no durations. But perhaps something else is going on: the non-extensive presentist takes duration to be identical to temporal extension, and the Bergsonian takes it to be something else entirely, something non-spatial, and hence unlike temporal extension. If so, then the non-extensive presentist and Bergsonian are just talking past each other, they use the word "duration" differently. Perhaps the Bergsonian sees the non-extensive presentist's use of "duration" as evidence that the latter has been duped by our spatialisation and mathematisation of time. Ultimately, I don't know. Does either entail the other? Probably not.

⁴⁹ This quote is from an unpublished manuscript. Craig quotes it (2000: 246) and was given access to the manuscript by Peter Øhrstrøm and Per Hasle.

4.3 Parsimony

The main advantage of non-extensive presentism compared to its previous two rivals is *qualitative ontological parsimony*. That is, it postulates numerically fewer ontological kinds: times and durations. I will simply assume that qualitative ontological parsimony is a theoretical virtue; we should prefer theories which are more parsimonious in this sense, all else being equal. Non-extensive presentism is also more *quantitatively* ontologically parsimonious - it postulates numerically fewer things. Whether quantitative ontological parsimony is a theoretical virtue is a more controversial matter. But examples suggest that it is: if muddy paw prints are found on the carpet, a plausible hypothesis is that a cat made them. A less plausible hypothesis is that five cats made them. Each hypothesis is equally qualitatively parsimonious, since each postulates cats. So, what makes the former more plausible? A natural answer: it's more quantitatively ontologically parsimonious.

You might think that non-extensive presentism isn't more qualitatively ontologically parsimonious than its rivals. To see why, consider the general form of a dispute between reductionists (who are realists) about Gs and eliminativists (who are anti-realists) about Gs. The reductionist says that there are Fs, and Gs are just Fs.⁵⁰ The eliminativists says that there are Fs but no Gs. Both believe in Fs, and though the reductionist believes in Gs, they identify them with Fs, and so it looks like each ultimately believes in the same number of kinds. Hence, reductionism seems to be no less qualitatively ontologically parsimonious than eliminativism. This carries over to the dispute between the three types of presentists in this thesis. Non-extensive presentism entails eliminativism about times. Instantaneous and extended presentism don't *entail* reductionism about times, but reductionism is the more plausible option for parsimony reasons, at least *prima facie*. So, if instantaneous and extended presentists reduce times to, say, propositions, and the non-extensive presentist is (for some reason or other) committed to propositions, it looks as though the latter doesn't ultimately make any gain in parsimony.

I have two responses to this objection. First, while the above argument shows that the reductionism and eliminativism are equally *qualitatively* ontologically parsimonious, it

⁵⁰ Here I stipulate that reduction is identity: Gs are reducible to Fs iff G-ness is F-ness, or the categories G and F are identical).

leaves open whether they are equally *quantitatively* ontologically parsimonious. The reductionist might believe in a greater *number* of Fs, because, say, they postulate extra Fs to reduce the Gs to. For example, a times reductionist who thinks that times are composite objects may believe in more composite objects than a times eliminativist: the former believes in (say) one time, the present, which is an object of which everything is a part (such that nothing is at any temporal distance from anything else). The eliminativist may believe in composite objects, but need not believe in *this* particular composite object, and so their view is more quantitatively parsimonious than the reductionist's.

This response doesn't work for all views of times, however. For suppose that times are *collections* (whether of events or objects). If the times eliminativist believes in events then they're committed to collections of events, since a collection of events just is some events. They therefore make no gain in parsimony because they, like the reductionist, both believe in the relevant collection(s) of events or objects. The only difference between them is that only the reductionist thinks that these collections are times. This point applies to three other views: that times are spaces, sentences, and propositions. The spaces, sentences, and propositions that times are reduced to are things that the times eliminativist has equally good reason to believe in.⁵¹ This first response, then, is only partial, because it succeeds only assuming a particular account of times.

The second response is better: if the reductionist thinks that Gs have a property that the eliminativist thinks Fs lack, then the reductionist postulates more ontology than the eliminativist, namely, more properties (or at least more ideology, in the form of predicates or concepts). For example, the reductionist who thinks that times are collections of events thinks that these collections have duration and stand in various temporal relations to each other. Of course, non-extensive presentism entails that nothing has duration or stands in temporal distance relations. *A fortiori*, then, collections of events (which the reductionist thinks are times) don't have duration or stand in temporal distance relations. So, even if the non-extensive presentist is committed to events, they postulate fewer ontological kinds (durations, temporal distance relations) and thereby have a more plausible view, all else

⁵¹ I ignore the view that times are temporal parts because temporal parts are incompatible with presentism.

being equal. So, on parsimony grounds, non-extensive presentism still comes out as more plausible than instantaneous and extended presentism.

4.4 The Temporal Dichotomy Once Again

You might think that non-extensive presentism fares better than instantaneous presentism with respect to the Temporal Dichotomy because it denies a presupposition of No Immediate Successor and No First Member, namely, that times exist. If there are no times, then *a fortiori* there is no sequence of uncountably many instants such that none has an immediate successor. Craig seems to have something like this in mind when he says that the question “what is the duration of the present?” is malformed or wrong-headed (2000: 245), and appears to endorse Prior’s view that talk about times is “disguised talk about what is and has been and will be the case” (Prior 1968). I think this is a mistake; the Temporal Dichotomy can get up and running without assuming the existence of times.

For convenience, here the No Immediate Successor argument from the first chapter (all of what follows also goes *mutatis mutandis* for No First Member):

- 1) The present is an instant and time passes.
- 2) If the present is an instant and time passes, then an uncountable set instants, I , will have passed.
- 3) An uncountable set of instants, I , will have passed only if some $i \in I$ has an immediate successor.
- 4) No member of I has an immediate successor.
- 5) It is not the case that an uncountable set of instants, I , will have passed.
- 6) Either the present is not an instant or time doesn’t pass.

Instants are times, and so every premise assumes (entails) the existence of times. But we can swap out talk of instants for events and obtain much the same kind of argument:⁵²

- 7) Things change.

⁵² I intended the premises of the arguments in chapter 1 to entail that there really are times, and so strictly speaking there can be no *genuine* paraphrase, only a fictionalist replacement, but the language of paraphrase is more straightforward.

- 8) If things change then an uncountable set of events, E , will have occurred.
- 9) An uncountable set of events, E , will have occurred only if some $e \in E$ has an immediate successor.
- 10) No member of E has an immediate successor.
- 11) It is not the case that an uncountable set of events, E , will have occurred.
- 12) It is not the case that things change.

It might be objected that No Immediate Successor cannot have a no-times paraphrase, because the temporal dichotomy has bite only if the members of the infinite set of things are appropriately *ordered*. Otherwise premise (8) might be true simply in virtue of an infinite number of events occurring simultaneously.

That is, to get the argument up and running, premise (8) must say that an uncountable series of events have occurred, one after the other. Only then does it follow that no member has an immediate successor. We can express this by using the concept of a maximal event. A maximal event is a snapshot of a possible world. Take all the events that obtained one second ago, the maximal event which happened one second ago is the event that all those other events are a part of. There is (or was) exactly one maximal event obtaining one second ago. Now, for all real numbers, n , between 0 and 1, there is a maximal event that obtained $1/n$ seconds ago. The set of these maximal events can be ordered, such that they play a similar role in the argument as the uncountable set of instants. Moving on, the notion of an immediate successor can similarly be paraphrased, letting “ e ” denote maximal events:

e_x is the immediate successor of $e_y =_{\text{def}}$ there is an uncountable set, E , such that $e_x, e_y \in E$ and $S(x) = y$

where S is the successor function, $S: \mathbb{N} \rightarrow \mathbb{N}$, which satisfies the following conditions:

- For all $x \in \mathbb{N}$, $S(x) \neq x$
- S is one-to-one.
- There is some element $e \in \mathbb{N}$ such that, for all $x \in \mathbb{N}$, $S(x) \neq e$.
- \mathbb{N} is the minimal set on which you can define such an S .

Now that we have the events paraphrase of the argument, we can see that the crucial premises are still just as plausible. (8) is plausible because (barring extended presentism) it is the case that at least one thing happened one second ago, and another half a second ago, and so on, *ad infinitum*. And (9) is plausible for the same reason premise (3) is. Premise (10) is obvious, at least if we start counting *not* from the event that happened one second ago but from the other end. If we do start counting from the event that happened one second ago then the premise should say that there is no *last* member (whether it's first or last depends on whether we think of the dichotomy as showing that the runner never *arrives* at the end or never *leaves* the beginning).

So, it seems the non-extensive presentist hasn't solved the underlying problem. They could deny that there are events, but, just as before, a no-events (and no-times) paraphrase can be formulated:

- 10) Things change.
- 11) If things change then C will be true.
- 12) C will be true only if some term in C has an immediate successor.
- 13) It is not the case that some term in C has an immediate successor.
- 14) It is not the case that C will be true.
- 15) Things don't change.

We can analyse (10) as

Sometimes $\exists x Fx$ and sometimes $\exists x \neg Fx$.

which doesn't refer to or quantify over times or events.

"C" is shorthand for a nested infinitary conjunction which says that something is a certain way, and before that something is another way, and so on. The nested nature of the infinitary conjunction guarantees that the things that happened in the past are appropriately ordered for the argument to get off the ground. The non-shorthand version cannot be written down precisely because it has uncountably many conjuncts.

Let us turn to the consequent of (12). What we want to say is that the infinitary conjunction is true only if one of its terms has an immediate successor. But what does immediate succession amount to in the case of terms of a sentence? It's not temporal succession, since

the components of sentences aren't temporally ordered.⁵³ Nor is it spatial succession, since it's wholly a matter of convention that words on a document are in the locations they are. It is instead what we might call "syntactic succession". To get a handle on this notion, consider that linguistic objects (words and sentences) have locations which aren't reducible to their spatial or temporal locations.⁵⁴ In the sentence "I went to Wales last year", the word "Wales" comes before "year". This would still be the case even if our language conventions were such that every sentence was typed backwards. Similarly for sentences: this very sentence would come syntactically after the preceding sentence even if our conventions were such that sentences were typed in reverse spatial order (left/top to right/bottom). Since words and sentences can be ordered, there is a corresponding notion of syntactic of succession, such that e.g. "year" is not the successor of "Wales" but "last" is. Letting " l_x " denote a linguistic object, we can define immediate succession as follows:

l_x is the immediate successor of $l_y =_{\text{def}}$ there is an uncountable set L , such that $l_x, l_y \in L$ and $S(x) = y$.

This won't yet do for the argument, however. Just as we needed to specify some conditions on sets of events to get them ordered correctly for the argument to get off the ground, we need to specify some conditions on the tuple. The tuple's members must be all and only the terms of the infinitary conjunction, and they must appear in the same order e.g. " Fa " comes before " Gb " (or we could use larger syntactic units e.g. " $WAS(Fa)$ " comes before " $WAS(Gb)$ "). The successor function is defined as before. Informally, then, one lexical item is the immediate successor of another if there are no other lexical items between them in the syntactic ordering. We can now finally state (15): $WILL(WAS(Fa \wedge WAS(Gb \wedge \dots)))$ only if some $l \in L$ has an immediate successor.⁵⁵

So, denying the existence of times doesn't help non-extensive presentism avoid the temporal dichotomy, since the argument can get off the ground even without times. This leaves the non-extensive presentist with two options: embrace the weirdness of there being no immediate successor - as the instantaneous presentist does - or affirm that the relevant

⁵³ Of course, when we speak some words come before others, but this is plausibly a limitation on our part. The sentences themselves are not so temporally ordered.

⁵⁴ See Gilmore (2018) for more on the "topic-neutrality" of location.

⁵⁵ If L is the infinitary conjunction itself rather than its corresponding tuple, then the consequent of (15) must be stated meta-linguistically.

events/world-states/linguistic objects have immediate successors, as the extended presentist does. These options correspond to two versions of non-extensive presentism: continuous and discrete. This distinction is usually thought of as defined in terms of time as a series of uncountably many instants vs a series of countably many intervals. But it can be defined without times. Time is continuous if, for all numbers $0 < n < 1$, something was (will be) the case n seconds ago (hence). This captures the idea that every amount of time, no matter how small, is physically meaningful. Conversely, time is discrete if not continuous. I argued in chapters (3) and (4) that instantaneous and extended presentism fare roughly equally well against the Temporal Dichotomy. Plausibly, then, both continuous and discrete non-extensive presentism fare roughly equally well against the reformulated temporal dichotomy. Let us therefore look at the rest of the objections to see how these versions of non-extensive presentism fare.

4.5 Beginning and Ceasing Again

With times out of the picture, the problem of Beginning and Ceasing looks a little different, since nothing begins or ceases at a *time*. But things can still begin and cease, even if not *at* anything. So, non-extensive Presentists may respond as instantaneous presentists do (presently, things both begin to ϕ and cease to ϕ), or as extended presentists do (things begin to ϕ , and the earliest they can cease to ϕ is after the smallest amount of time has passed). I argued that instantaneous and extended presentism were roughly on par with respect to this objection, and so the objection doesn't help us decide between continuous and discrete non-extensive presentism.

4.6 No Persistence Again

Both instantaneous and extended presentists can secure persistence by analysing it in terms of having existed at many (ersatz or concrete) times. Non-extensive presentists cannot do this, they must give other account. On the face of it, denying the existence of times makes non-extensive presentism inconsistent with most definitions of persistence in the literature:

Merricks (1999b: 986): “A person enjoys personal identity over time just in case that very same person exists at more than one time.”.

Hawley (2001: 9): “we can say that persistence occurs when something exists at more than one time”.

McKinnon (2002: 288): “It is now usual to say that something persists iff it is located at more than one time”.

Hofweber and Velleman (2011: 41): “To persist just is to be extended in time”.⁵⁶

Daimon (2017: 58): “Let us say that an object persists through time if and only if it exists at various times.”.

Tallant (2018: 2213): “In order for an object, O, to persist over time, as opposed to simply being an instantaneous object, O must itself be (wholly) located at more than one time”.

Baron (2019: 663): “An object O endures from the past to the present iff O is wholly located in the present and either O was wholly located at some time in the past when that time existed or O will be located at some time in the future when that time comes into existence.”

All the above make the existence of times a necessary condition of persistence and are therefore incompatible with non-extensive presentism. Only two definitions of persistence in the literature appear to be compatible with non-extensive presentism:

Haslanger (1989a: 4): “If A persists through a change, then A exists both before and after the change”.

Crisp (2005: 215): “A thing persists through time, loosely speaking, when it exists at various times.”

There is just enough wiggle room in Haslanger’s definition to interpret “before” and “after” in terms of primitive temporal operators, thereby avoiding any appeal to times. And Crisp’s

⁵⁶ The incompatibility is less obvious here, but I take it that something is extended in time iff it exists at many times.

loose talk is loose enough, I think, to be compatible with there being no times at all. To see this, consider his no-times friendly definition of endurance:

Crisp (2005: 215-216): "A thing x endures iff (i) it never has a temporal extent (i.e., it is not "spread out" in time in the way that my desk is "spread out" in space) and (ii) for some $m \neq n$, it was (will be) the case n units of time ago (hence) that, for some y , $x = y$, and it was (will be) the case m units of time ago (hence) that, for some z , $x = z$."

If we interpret the "was" and "will" operators as primitive (not quantification over times) then Crisp's definition is consistent with non-extensive presentism.

Hochstetter and Hess raise a problem for this definition, however. they think it allows persisting things to have "temporal gaps" in their existence. An object has temporal gaps in its existence if it exists, goes out of existence, and then comes back into existence.

Hochstetter and Hess think it an important intuition that enduring things have no temporal gaps during the time period over which they endure.⁵⁷ I don't know whether this intuition is widely shared, but I agree with Hochstetter and Hess; if I die in the year 2090 and am miraculously resurrected in 5090, then the correct account of persistence should not have the consequence that I persist from 2090 to 5090. Strictly speaking, Crisp's definition does not entail that anything persists through temporal gaps, because it does not specify a period through which enduring things endure. Nevertheless, you might want to *add* a no temporal gaps condition to your account of persistence. And this is what Hochstetter and Hess do. But their account is incompatible with non-extensive presentism. Their definition is long and complicated, but what's important here is that part of it quantifies over times: "there are some x s and distinct times t_m and t_n ..." (2020: 1845-1846). With this in mind, the non-extensive presentist should adopt the following account of persistence:

O persists (from x seconds ago/hence to y seconds ago/hence) =_{def} for some $x \neq y$, x seconds ago (hence) O exists, and y seconds ago (hence) O exists, and for all numbers z between x and y , z seconds ago (hence): O exists.⁵⁸

⁵⁷ As I read them, they do not think that enduring things cannot go out of and come back into existence, just that if they do, then they do not endure or persist for the time during which they do not exist.

⁵⁸ We might add, of course, that O persists (now) only if it exists (now), and then define what it is to have persisted or being going to persist.

The third conjunct guarantees that a persisting object has no temporal gaps during the period through which it persists (and allows that it go out of existence, come back into existence, and then persist for as long as it stays in existence for). Then, following Crisp, we can turn this into a definition of endurance (or something endurance-esque) by adding a conjunct such as “O never has temporal extent” or “O never has temporal parts”. I can’t foresee any objections to this account of persistence that would be levelled by either instantaneous or extended presentists, except that it implies that persisting things can exist without existing at any time. So, persistence is no reason to reject non-extensive presentism.

4.7 The Temporal Extension Argument Again

I argued that the Temporal Extension argument has roughly equal evidential force against both instantaneous and extended presentism because the responses they should give are nearly identical. The same goes for non-extensive presentism.

4.8 McTaggart, Boundary Points, and Maximum-Minimum Duration

What about the objections unique to extended presentism? Non-extensive presentism doesn’t face McTaggart or Boundary Points because it denies that there is a present with earlier and later portions or beginning and ending points. As far as I can see, the only one of these objections that non-extensive presentism might face is Maximum-Minimum Duration. Recall that the extended presentist should have some answer to the question “how long is the minimal temporal extent?”, to which they lack a plausible answer. An analogue of this question faces the non-extensive presentist: what is the smallest value of n such that there is a fact of the matter as to what was the case n seconds ago? As before, the objection seems a difficult one to answer unless the answer is zero. If it’s, say, 10^{-20} seconds, it presumably could have been longer, and yet, assuming that it is greater than zero, there is no plausible upper limit. But there must be some upper limit, since one second is clearly too large – there’s a fact of the matter as to what was happening half a second ago. The solution, which wasn’t available to the extended presentist, is to set the upper limit at zero.

This implies the continuous form of non-extensive presentism. Thus, we should favour it over fares better than discrete non-extensive presentism.

4.9 Interim: Non-extensive, Extended, and Instantaneous Presentism

Thus far we have considered all the objections levelled against instantaneous and extended presentism and reached the following conclusions:

- i. There's weak to moderate reason to reject instantaneous presentism.
- ii. There's moderate to strong reason to reject extended presentism.
- iii. Non-extensive presentism more parsimonious than instantaneous and extended presentism, and fares no worse against the other arguments.
- iv. Continuous non-extensive presentism is more plausible than discrete non-extensive presentism.

I will now consider some objections unique to non-extensive presentism and argue that they pose little problem for non-extensive presentism vis-à-vis instantaneous and extended presentism.

4.10 Isn't Time Space-like?

You might worry that non-extensive presentism makes time radically unlike space in a way that's highly counter-intuitive. If times don't exist then nothing is literally temporally between any other things, nor is anything literally earlier or later than anything else. This might seem counterintuitive – isn't the First World War *between* the First Sino-Japanese war and the Second World War, and the Bronze Age earlier than the Iron Age? Let's say that we *spatialise* time when we think of and describe things as standing in such space-like relations. Spatialising comes naturally to us, we use it in calendars, clocks, and schedules; it helps us think about time. It's deeply intuitive that time is space-like in this way. But non-extensive presentism rejects this spatialised view of time entirely: there are no times, not even a present time, and so there isn't a space-like ordering of things along a line composed of

times. By contrast, instantaneous and extended presentism can account for the intuitive pull of space-like time by postulating ersatz times.

I think the non-extensive presentist should respond by undermining the spatialising of time, that is, show that this intuition is not a reliable guide to the nature of time. The general strategy here is as follows. Consider that we spatialise other things that are plausibly not space-like, such as sound and colour. Sounds are often described as related to each other in space-like ways: notes can be *higher* or *lower* than each other; D is *between* C and E; there is a kind of *distance* between A and C, namely, an interval of a minor third; modes (sets of notes) *overlap* each other, such as the dorian and ionian mode. Colour is much the same. Programs that allow the user to change the colour of something e.g. fonts, usually feature an RGB *colour space*, where every colour is assigned a point in a space, given by a triple specifying the value of each of the three additive colours e.g. the triple (0, 100, 255) is (or corresponds to) a blue-ish cyan; it contains no red, some green, and the maximum amount of blue. This amounts to spatialising colour: cyan is *between* blue and green; the colour distance between the colours corresponding to the RGB tuples (0, 0, 0) and (0, 0, 1) is equal to 1; Cyan *overlaps* the green-blue region.

Now, we *could* take this as evidence that there really is such a thing as musical betweenness and colour distance. This is what possible worlds realists think do with the spatialisation of modality – it's not just useful to say that, say, possible things are modally located somewhere, or that unicorns overlap far away modal regions. Instead, it's a reliable guide to the metaphysics of modality. But taking the spatialisation of sound and colour as a reliable guide to metaphysics isn't the only option. We can just as plausibly be deflationary: talk of musical betweenness and colour space is just a turn of phrase. To say that D is between C and E is just to say that D has a greater frequency than C and a lesser frequency than E. To say that Cyan is between blue and green is just to say that it's a mixture of blue and green. Of course, there could be theoretical reasons to accept a genuinely spatial view of sound and colour, but the point here is that intuition *by itself* doesn't make this particularly plausible. The upshot of this is that intuitiveness of spatializing sound and colour is little reason to think that they are literally space-like. If anything, it's evidence of the opposite: we tend to spatialise things because it makes them easy to imagine and understand, not

because they're really space-like.⁵⁹ So too, then, for time. Spatialising of time is useful, but it's *just* useful, it's not a reliable guide to the nature of time.⁶⁰ Thus, the counter-intuitiveness of non-extensive presentism is not evidence against it.

4.11 No Time Without Times?

The next argument against non-extensive presentism is as follows: non-extensive presentism says that there are no times, but there's no time without times, and so non-extensive presentism implies that time doesn't exist, which is surely false. After all, what is it that clocks measure? And didn't yesterday really happen? We can construct an argument against non-extensive presentism along these lines:

- 1) If time is (composed of) all of the times, then: if time exists, times exist.
- 2) Time is (composed of) all of the times.
- 3) Time exists.
- 4) Therefore, times exist.

Non-extensive presentism is inconsistent with (4) because it entails its negation. I'll take each premise in order. Premise (1) is obvious; if a thing exists and it is (composed of) a collection of things, then the collection of things exists. Premises (2) and (3) are less obvious, I'll take them in order.

4.11.1 Premise (2)

Why think that (2) is true? A natural thought is that time is a *dimension*. Dimensions are something like sets (or mereological fusions) of points, endowed with a structure. For example, a single spatial dimension is a set of spatial points with a structure specifying the

⁵⁹ Why do we spatialise things? Perhaps because our sight being better developed than our other senses, evidence of which might be born out in the prevalence of sight-oriented natural language expressions e.g. "I see what you mean", "we see eye to eye". This might also explain why there is much more research on vision than any other sense (Hutmacher 2019), and why philosophers of perception talk about vision more than other senses.

⁶⁰ Of course, there may be theoretical advantages to treating time as space-like e.g. postulating spacetime, but this response is unavailable to all three versions of presentism in this thesis, because spacetime is incompatible with presentism, and so this consideration doesn't favour any version over any other.

order of the points. If time is a dimension, and dimensions are something like sets of points, then time's being a dimension entails the existence of time points, and so (2) is true. I grant that it's intuitive that time is a dimension, and therefore that it's intuitive that there are times. But I've already argued above that this is little if any reason to think that time is actually like this.

We might be able to do better than this in defence of (2). Looking across the literature in the philosophy of time, there are perhaps two implicit arguments that time is (composed of) all the times. The first argument is that all the leading theories of time in metaphysics presuppose the existence of times, and probably one of them is correct, so time requires that times exist. The second is that times are part of the folk concept of time, and this is defeasible reason to believe premise (2). I'll take each in order.

Consider two debates in the philosophy of time: presentism vs eternalism, and the A-theory vs the B-theory. These debates are often cast in the following way: is there only the present time, or past and future times, too? Are times past, present, and future, or only earlier or later-than each other? Most of the candidate answers to these questions entail the existence of times. That is, lots of our leading theories of time say that there are times. Assuming that philosophers of time aren't radically mistaken about the nature of time, this looks like some evidence in favour of premise (2).

I have two responses. First, many of these leading theories of time (eternalism, moving-spotlight, growing-block) are not presentist theories. Since this thesis assumes presentism, we can discount such theories, and so the fact that they postulate times such does not give us reason to think that time requires the existence of times. Of course, some presentists believe in times, but some don't (see the start of chapters 2, 3 and 4 for examples); it's not exactly a consensus report that presentists (do or should) believe in times. Second response: where there *are* arguments for the existence of times, they're not arguments available to presentists, and so they can't be used by instantaneous or extended presentists against non-extensive presentists. The truth-maker objection is effectively an argument for the existence of past, non-ersatz times, but such times are incompatible with presentism.⁶¹ The upshot of

⁶¹ Effingham and Melia think that the existence of time requires (more than one) time(s), since a single instant world would be a timeless world (2007: 144). But this is plausible only if you already accept the existence of

all this is that extant theories of time give us little to no reason to think that time is (composed of) all the times.

Moving on to the second argument for premise (2), are times are part of the folk concept of time? It's hard to say. Two of the *Sydney Time Studies* (conducted by Kristie Miller, Andrew Latham, and James Norton - see Baron, Miller, and Tallant 2022 for the full discussion) suggest that, while there is no single, shared folk concept of time, a majority of people think that the existence of a C-series is unconditionally necessary for time: there is time only if there is a C-series (necessary), and this is the case regardless of whether the actual world is C-theoretic (unconditional) (2022: 75). So, if the existence of a C-series entails the existence of times, then a majority of the folk think that times are necessary for time, which is some defensible evidence in favour of premise (2).

Baron, Miller, and Tallant caution against concluding too readily that the C-series is part of the folk concept of time. In another of the studies, discussed by Latham and Miller (2020), participants were presented with vignettes of worlds containing only one instant. They were then asked to judge whether one-instant worlds were worlds in which there was time. Roughly half judged that there was time in one-instant worlds. Latham and Miller offer two interpretations of these results (2020: 151-152). The first is that there are two groups among the participants: those who think that an A-, B-, or C-series is necessary for time, and therefore judge that the one-instant world has no time; and those who think that none of the A-C series is necessary for time, and therefore judge that there is time in the one-instant world. The second interpretation of the results is that most participants think that a C-series *is* necessary for time, but they are split over *what it takes for there to lack a C-series*. One group thinks that a world lacks a C-series only if it has at least two instants that aren't ordered. The other group thinks that a world lacks a C-series if *either* there are at least two un-ordered instants, or the world has only one instant, and hence lacks an ordering of instants (plural). So, the latter group think there are two ways for a world to lack a C-series, and the former think there is only one way for a world to lack a C-series.

times in the first place. *If* the space-like view of time is plausible, then the existence of time requires many times. But if you reject the space-like view of time entirely, there's just no reason to think that time requires the existence of many times.

Latham and Miller do not say which interpretation they think is true - their results do not make one more likely than the other. The relevance of this in the present context is that *for all we know*, roughly half of Latham and Miller's participants think that a C-series is not necessary for time (the first interpretation). And so, for all we know, they don't think that any times at all are necessary for time. So, it's hard to draw conclusions about what the folk think about premise (2) from these findings, which is just to say that, given our current evidence, there's little reason to believe premise (2) on the basis of folk belief.

Even supposing a majority of the folk *do* think that the C-series is necessary for time, there needn't literally be an *ordering of instants* in order for there to be a C-series. Latham and Miller allow views without an ordering of instants to count as "orderist" theories e.g. theories on which there is a C-series. It's worth quoting them at length:

"Even if not all such views *strictly* take there to be a substructure along which the instants are ordered [footnote: "As for instance, presentists surely do not."] they all agree that there is some appropriately robust ordering relation that obtains between these instants, where we could correctly represent that ordering in terms of there being a substructure along which said instants are arrayed. Henceforth, then, when we say a theory is one on which there is a substructure of ordered instants, we intend to include theories on which strictly speaking there is no such substructure, but we can correctly represent the true ordering of instants in terms of a substructure along which said instants are arrayed." (2020: 9458; emphasis in original)).

This passage is admittedly slightly confusing. On the one hand, the thrust of the point seems to be that presentism is compatible with orderism, even though presentists needn't believe in instants. On the other hand, Latham and Miller never say anything to the effect that talk of instants can be swapped out or paraphrased in terms of anything else. Exegesis aside, however, it seems the non-extensive presentist can construct a robust enough ordering to count as a C-series: some things were the case, others are now the case, and yet others will be the case. Moreover, some things happened one day ago, and others one hour ago, and so on. These facts are obviously ordered in some sense (if we use a variable, as in "*n* seconds ago" then the order is a function of the numerical ordering of the value of the variables), and so non-extensive presentism is compatible with the C-theory. If this is the

case, then non-extensive presentism is compatible with the folk thinking that the C-series is necessary for time. The upshot of all this is that there's little reason to think that premise (2) is true.

4.11.2 Premise (3)

Why think that time exists? There are two broad categories of reasons. First, time is required for x , where x is something that obviously exists. Baron, Miller, and Tallant (2022) discuss two candidates: agency and causation (they don't think that these reasons are particularly strong; their thesis is that, for all we know, time doesn't exist). Second, the folk believe that time exists, and this is defeasible evidence in favour of (3). I'll take these in turn.

Baron, Miller, and Tallant (2022) note that there are two types of arguments for the conclusion that causation requires time: arguments from intuition, and arguments from theory (2022: 174). There are three arguments from intuition. The first goes like this. Take an example of a cause preceding an effect, then eliminate the temporal ordering and replace it with some other ordering. Intuitively, this results in scenario where there is no causation. And this suggests that causation requires time. For example, the kicking of a ball happens before and causes the breaking of the window. Suppose we eliminate the temporal separation in favour of spatial separation: the ball is kicked at the same time as the window smashes, and these two events are a kilometre away from each other. This is not a case of the kicking causing the smashing, but rather a case of a ball being kicked, and a faraway window mysteriously smashing at the same time. This is supposed to show that causation requires temporal separation, which in turn requires time. Baron, Miller, and Tallant respond to this first intuition argument by saying that all this shows is that, sometimes, there is no causation without time, but not that causation cannot occur without time (2022: 176).

The second argument from intuition is this: when we reflect on the concept of causation, we find a strong intuition that causation requires the temporal separation of cause and effect and therefore time. The third argument from intuition is similar: when we reflect on causation, we see that causation requires the existence of an ordered sequence of times, a C-series. In response to the second, Baron, Miller, and Tallant respond that simultaneous

causation seems possible in some ordinary cases – a weight causing an indent on a cushion, or two objects propping each other up (2022: 176-177). This response seems also to work for the third objection. Moreover, do we really see (a kind of rational intuition, one imagines) that causation requires a C-series, or merely find it's strange to image causation in the absence of a C-series? Baron, Miller, and Tallant are sceptical of our ability to distinguish these two things (2022: 178).

What should we make of these arguments from intuition? I'll leave the second and third arguments alone and just consider the first. I think Baron, Miller, and Tallant's assessment of the first intuition argument is too quick. Let's multiply examples like the ball and window, where temporal separation is replaced with spatial separation: putting the kettle on and the water boiling; a slow car causing other cars to slow down (call these examples "separation cases"). These give us good inductive evidence that everyday causation requires time. Granted, this still falls short of showing conclusively that causal relations necessitate temporal relations, but it's a good inductive argument. At least, it's as good as other inductive arguments in metaphysics which you might already accept. For example, there's a lot of inductive evidence for the principle of sufficient reason, according to which every event has an explanation why it happened (just think about events you know of). Of course, principles like this aren't without their objections⁶², but so far as I know, they aren't objections to the effect that there isn't good inductive evidence for the principle. I think, then, that the argument from intuition provides modest support for premise (3).

The second type of argument from the existence of causation to time is the argument from theory. It looks at popular accounts of causation and argues that since they all assume that time (or spacetime) exists, we should believe that time exists. To give just two examples: counterfactual theories presuppose the existence of spacetime, because similarity between worlds is determined by facts about spacetime (Lewis 1979: 472); and process theories presuppose spacetime because the "mark" transmitted in causal processes is transmitted over a spacetime interval (Dowe 1992: 200). Baron, Miller, and Tallant respond by showing how such time-including theories of causation can be reformulated without spacetime. The basic strategy is to replace spacetime with *approximate* spacetime, which lacks many of the

⁶² See van Inwagen (1983: 202-204).

properties spacetime has in general relativity. I won't cover the details here, but the situation here looks much like the above in section 4.11. Granted, extant theories of causation presuppose that time (spacetime) exists, but upon further analysis this seems to be an accidental feature of the theories. It's not that they're plausible *because* they entail that time exists, rather, they're plausible for other reasons e.g. they rule in obvious cases of causation and rule out obvious cases of non-causation. So, the argument from theory provides little support for premise (3).

Let's move on to the second candidate thing which requires the existence of time - agency. On the face of it, if there is no future to plan for, and no past information to plan on the basis of, then no decision is prudentially better than any other. Similarly, if there is no time, then there is no past, and so no one did anything in the past, and thus no one can be morally responsible for anything they did in the past. Being able to plan in either of these ways is necessary for agency. If no one processes information, considers and weighs reasons for acting, or does anything for which they are morally responsible, then there is no agency. Baron, Miller, and Tallant's response to this argument is as follows. Agency requires deliberation, and deliberation requires holding somethings fixed, unchangeable, and others open and malleable. But this requires only causal structure, not time; so long as there are things causally down/upstream from us, then deliberation can get going.⁶³ Since causation doesn't require time - according to Baron, Miller, and Tallant - neither does agency. I've argued that there's modest evidence that causation requires time, and so it follows that there's at least some evidence that agency requires time. How much evidence? Less than or equal to the amount of evidence for causation requiring time, because the separation cases involving agency are a proper subset of all separation cases (e.g. a tree breaking a powerline doesn't involve agency).

Zooming out from the intuition and causation/agency arguments, let's move on to the second category of reasons for thinking that time exists – folk belief. The situation here is much the same as with times. Given only the results of the Sydney Time Studies, it's hard to tell whether the folk believe in time. At the very most, a majority of the folk think that *the C-*

⁶³ Cross-temporal relations are a much-discussed problem for presentism, and *prima facie* lots of causation is cross-temporal, so agency might cause problems for presentism. But this effects presentism wholesale, so this problem doesn't favour instantaneous or extended presentism over non-extensive presentism, and that's the only thing relevant here.

series is necessary for time (and even this may not be so), which, of course, doesn't tell us whether they think there is in fact time. Anecdotally, sometimes the folk say things like "time is a social construct", and mention time zones and different calendar systems in support of this. It's hard to tell from these statements whether the folk believe time is unreal, or real but social, or even whether it's a claim about something else entirely. At the very most, the folk do believe in time, and this is some reason to think that time exists. More probably, what the folk think about time is negligible evidence in favour of premise (3).

Where does this leave non-extensive presentism? I suspect that most presentists find (3) plausible (on some reading or other, anyway), and I've argued that there's at least modest inductive evidence in favour of it. By contrast, there's little reason to accept premise (2), which says that time is (composed of) all of the times. So, this objection provides little to no reason to reject non-extensive presentism.

4.12 Conclusion: Non-Extensive, Extended, and Instantaneous Presentism

To recap, I've argued that non-extensive presentism is preferable to both instantaneous and extended presentism relative to all the arguments and objections thus far, minus the indispensability arguments for times. Part II takes up the task of developing and responding to these arguments. It serves the dual purpose of vindicating non-extensive presentism against its principal objection, and a more general investigation into whether we (presentist or otherwise) should believe in times.

PART II

5. The Quantification-Reference Indispensability Argument for Times: Type-A Strategies

The final objection I'll consider to non-extensive presentism is the indispensability argument for the existence of times. Much of what we say and believe apparently commits us to thinking that times exist. Talk about times appears in several places: ordinary discourse, physics, and semantics. Moreover, it's natural to think that a lot of this discourse about times is true, and therefore that it carries ontologically committed to times. To my knowledge, no has explicitly developed this kind of argument for the existence of times. But some authors do claim that we should believe in times because the truth of ordinary talk or our best scientific theories require them. Meyer, for example, says that "to deny the existence of times altogether would be to reject a great number of our ordinary and scientific beliefs as either false or meaningless" (2011: 41). Banfi and Deasy make a weaker claim - that there is pressure from both physics and semantics to posit instants of time (2021: 728). Meyer gives no argument for his claim, whereas Banfi and Deasy do slightly better. They point out that some physical equations contain time-variables, which are naturally interpreted as taking times as their values, and that most semantic theories of tense feature times. A charitable interpretation of these claims suggests that these authors think there is a sound indispensability argument for the existence of times, akin to those in the philosophy of mathematics (Balaguer 2016; Field 2016).

Two types of indispensability argument can be distinguished. The first is a Quine-Putnam-style indispensability argument: some true sentences quantify over or refer to times, so we should believe in them. I will call this the Quantification-Reference argument. The second is an explanatory indispensability argument: times play an indispensable explanatory role in our best scientific theories, so we should believe in them. I will call this the Explanatory argument. In this chapter and the next, I'll formulate the Quantification-Reference argument and develop several anti-realist responses, divided into what I'll call "type-A" and "type-B" strategies. In chapter (7) I'll formulate the Explanatory argument and assess which of the previously developed versions of times anti-realism provides the most plausible response to the argument.

All of this is one aim of Part II of this thesis. To recap, the second aim is more general: to challenge a rarely questioned and assumption in metaphysics – realism about times.

Taking inspiration from other areas of metaphysics, versions of times anti-realism abound:

Fictionalism: time talk purports to be about times but is false because times don't exist. There is true non-time talk that does the job that time talk does.

Paraphrase: time talk can be translated in a way that shows the apparent ontological commitment to times to be merely apparent.

Figuralism: time talk is true but doesn't commit us to times because time talk is figurative, not literal.

Substitutional Quantification: quantificational time talk is true but ontologically non-committing, because time talk occurs in a logic where the quantifiers take substitution instances rather than ranging over a domain.

Neutralism: time talk is true but ontologically non-committing because all quantification and reference is ontologically non-committing, at least in the absence of a speaker's intention to be so committing.

Free Logic: singular terms which refer to times aren't in the domain of their corresponding quantifier, and so time talk involving singular terms is not ontologically committing.

Craneanism: quantification over times is ontologically non-committing. Time talk does not genuinely refer to times, though it is still *about* times, but this carries no ontological commitments.⁶⁴

I call the first three views "Type-A" strategies. These strategies play by Quinean meta-ontological rules: they accept (or at least don't reject) the view that the ontological

⁶⁴ There are other options I won't discuss: error theory, quasi-truth, neo-meinongianism, non-cognitivism. An error theory of times discourse is hard to assess without the relevant empirical information on the folk concept of times. Quasi-truth theories offer non-quasi true propositions that are similar in meaning to the quasi-true propositions. To my mind, these non-quasi true propositions are just the ones that the paraphraser endorses, and so it's not worth discussing quasi-truth in addition to paraphrase. Neo-meinongianism seems hard to motivate; it's hard to see how the non-extensive presentist retains their gain in parsimony if they hold that there are times (which don't exist). Finally, I don't know how non-cognitivism about times discourse could be motivated.

commitments of a sentence are all and only those things that it quantifies over or refers to. Thus, they *deny* that there are any true sentences that quantify over or refer to times. Instead, they offer some other account of our time talk. I call the last four views “Type B strategies”. These strategies reject the rules of the Quinean meta-ontological game: they deny that we are ontologically committed to what true sentences quantify over or refer to. While these views aren’t *committed* to accepting that there are in fact true sentences which quantify over or refer to times, they might as well accept this (otherwise they’d be combining type-A and -B strategies, which is unnecessary). In this chapter I’ll argue that non-extensive presentists inclined towards type-A strategies should adopt fictionalism for time talk in physics and semantics, and a paraphrase strategy for ordinary time talk. I’ll leave type-B strategies until chapter (6).

Here, then, is the Quantification-Reference argument:

- 1) If an existential sentence or simple sentence is literally true, then the objects it quantifies over or refers to exist.
- 2) There are literally true existential sentences or literally true simple sentences that quantify over or refer to times.
- 3) Times exist.⁶⁵

Premise (1) is what I will call the neo-Quinean criterion of ontological commitment. A simple sentence is one which includes a singular term, such as Fa or $a = a$. An existential sentence is one featuring an existential quantifier e.g. $\exists x Fx$. A sentence can be both existential and simple e.g. $\exists x x = a$. A sentence is literally true iff it’s literal and true, and it’s literal if it’s not metaphorical or figurative in any way. I won’t offer an analysis of literality or figurativeness, so just consider some examples of the latter: the bounce has gone from his bungee; rebellions are built on hope; I am the Bread of Life; great supine protoplasmic invertebrate jellies.⁶⁶

Adding “literally” to premise (1) is important, for otherwise it entails that “it’s raining cats and dogs” carries ontological commitment to the existence of domesticated furry organisms

⁶⁵ This general formulation, from Balaguer (2016), is modelled after the Quine-Putnam style indispensability argument.

⁶⁶ Respectively, these are from *Wallace & Gromit: the curse of the were-rabbit*, *Rogue One: A Star Wars Story*, *the Gospel of John* (6:35), and Boris Johnson, addressing members of the London Assembly in 2013.

accelerating towards the ground, which, intuitively, it doesn't. It only carries ontological commitment to rain, presumably lots of it. Premise (2) says that there are in fact literal and true sentences such as Fa , $a = a$, or $\exists x Fx$, where a is a time or \exists ranges over times. I'll consider the motivation for this premise in the following sections where I develop the responses to the argument.⁶⁷

5.1 The Difference Between Fictionalism and Paraphrase

The first two versions of times anti-realism are fictionalism and the paraphrase strategy. There are some similarities between these two views, but I'll take them to be different in the following way. Fictionalists about Fs think that talk about Fs (F-talk) is false on account of there being no Fs.⁶⁸ In place of F-talk they provide some other talk, G-talk, which is similar to the F-talk but true. Paraphrasers, meanwhile, think that F-talk *is* true but *not* ontologically committing to Fs. They attempt to show this lack of ontological commitment by offering translations of F-talk in terms of things other than Fs (Gs, Hs). So, the fictionalist and the paraphraser agree on one thing and disagree on another. They agree that G-talk is true and about Gs, but they disagree over how the F-talk and G-talk compare. The fictionalist says the F-talk doesn't mean the same thing as the G-talk, since only the former is false, whereas the paraphraser says that the F-talk and G-talk mean the same thing, and both are true (but lack ontological commitment to Fs).

5.2 Fictionalism

So, fictionalism about times is the view that time talk purports to be about times but is false, because times don't exist. Following the example of mathematical fictionalism, I'll apply fictionalism to time talk in physics and semantics. I'll leave my treatment of time talk in ordinary discourse until the section 5.3 on the paraphrase strategy.

⁶⁷ I won't consider every case where time talk appears. I'll ignore things like time talk in philosophy e.g. 'S is free with respect to ϕ at time t ', and time parameters in calculus e.g. dx/dt , which are used all over physics.

⁶⁸ I will assume that a sentence can be about something that doesn't exist, but this can be dispensed with by replacing "talk about Fs" with "*apparent* talk about Fs", e.g. maybe Jedi talk isn't really about Jedi because they don't exist, but Jedi talk is still apparently about Jedi.

As mentioned above, our best physical and semantic theories include times-laden concepts, such as time variables and quantifiers ranging over times. I will restrict my focus to four of our best physical theories: the general and special theories of relativity (GR, SR), quantum mechanics (QM), and quantum field theory (QFT). My approach to semantic theories will be different. I will consider only one semantic theory involving times, a Priorean tense logic, which, according to Fernando (2015), is an appropriate starting point for building other semantic theories of tense. This will serve to illustrate the general fictionalist approach to semantic theories.

5.2.1 The General Theory of Relativity

On the face of it, GR does not carry ontological commitment to times, since the orthodox physical interpretation implies that spacetime exists, which would seem to make redundant any postulation of times. As Callender explains, “the distance between events [in GR] are not spatial or temporal but spatiotemporal.” (2017: 43). If there are no temporal distances, then plausibly there are no temporal locations (times) either. You might think that spacetime coordinates, (x, y, z, t) , involve implicit quantification over times, with “ t ” taking times as its values, but this involves a mistake about how coordinates work. To illustrate, consider a Cartesian coordinate system. Coordinate pairs, (x, y) pick out points on a plane. But the x and y variables don’t pick out *different* points on the plane, as though there were two kinds of spatial points - x -points and y -points. Rather, they *jointly* pick out *one* point and pick out nothing on their own. Spacetime coordinates are much the same. It’s a mistake to think that each variable picks out its own point, as though there were, x -, y -, z -, and t -points. Rather, the variables *jointly* pick out *one* point in the manifold, a spacetime point, and pick out nothing on their own. This makes sense of Callender’s point that there are no temporal distances, and so no temporal locations, in GR. So, if the orthodox spacetime interpretation of GR is correct then it gives us no reason to think that times exist.

But not all of us think that spacetime exists, and those that don’t can’t respond to the indispensability argument in this way. Presentists are some such people. They should want to have their own and presentist-friendly version of GR. I won’t endeavour to show here that there is in fact an empirically adequate and theoretically virtuous presentist version of

GR. The relevant point here is simply whether times are indispensable to a presentist version of GR. Crisp (2008) develops such a theory, called PGR.⁶⁹ Like any physical theory, it has two parts: a theoretical structure and a set of theoretical hypotheses. The theoretical structure is a set of mathematical spacetime (or space and time) models. The theoretical hypotheses form the physical interpretation of the models. One of orthodox GR's theoretical hypotheses is that at least one spacetime model is isomorphic to our four-dimensional universe. Since this entails eternalism, PGR replaces this theoretical hypothesis with one that entails presentism:

PTH: At least one model of PGR represents the evolution of Space over time.

Crisp explains that Space is an enduring⁷⁰, three-dimensional object, in which all (other) physical things exist. Space evolves over time if, for some property F , Space has F but either didn't or will not have F (2008: 264-265). An informal gloss on this is: unrestrictedly, the things in space change. A model of PGR is a triple $\langle M, g, T \rangle$ where M is a point manifold, g a metric tensor, and T a theoretical structure.⁷¹ Crisp then explains that a model *represents* the evolution of Space over time iff the model can be foliated (partitioned) into a sequence, S , of hypersurfaces which stands in a one-to-one mapping with a history, H , of instantaneous states (2008: 265). This latter item – an instantaneous state – is important for our purposes, because if anything in PGR is a time then instantaneous states are.

Crisp defines an instantaneous state as a triple $\langle \Sigma, h_{ij}, \varphi \rangle$, where Σ is a three-dimensional point manifold, h_{ij} a metric, and φ a set of fields. But, crucially, he does not say that instantaneous states are times, nor that they have zero temporal extent.⁷² Elsewhere Crisp suggests that he wants to leave open whether presentists must believe in times, since his definition of presentism leaves open whether present things are at *zero* temporal distance from each another or *no temporal distance at all* from each other (2005: 212). If the former

⁶⁹ Crisp draws on work by Barbour (1994). Though he appears to depart somewhat from him. The latter's approach to relativity affirms the existence of instants whereas Crisp's does not, or so I will argue.

⁷⁰ Crisp does not say what he takes enduring to be, but it'll do no harm to simply take an enduring thing to be something that exists and either has or will exist and has no spatiotemporal parts. The apparent commitment to substantival space can be swapped out for a relationist alternative e.g. "the spatially related things...".

⁷¹ A point manifold is a locally flat but curved space (Gowers 2008: 244); a metric tensor is a function that defines distances between points in a space (Stover and Weisstein: 2023); and a theoretical structure is a set of theoretical hypotheses.

⁷² Barbour, on whose work Crisp draws, *does* say this explicitly: "I regard instants of time as real things, identifying them with possible instantaneous arrangements of all the things in the universe." (1999: 9).

disjunct is true then present things exist at the same *time*, and so either instantaneous or extended presentism is true. If the latter disjunct is true then present things do not stand in any temporal distance relations to each other, not even that of being at zero temporal distance from one another. This is the non-extensive presentist's view. So, Crisp's PGR makes room for anti-realists about times, such as the non-extensive presentist. The upshot of all this is that there's little reason to think that times are indispensable even to a non-spacetime version of GR.⁷³

5.2.2 The Special Theory of Relativity

The notion of simultaneity features in special relativity (SR).⁷⁴ Standardly defined, two events are simultaneous if they happen at the same *time* (Hartle 2014: 50). But whether this apparent commitment to times is genuine depends on the physical interpretation given for SR. The Minkowskian interpretation entails that spacetime exists and so, as above, it would seem redundant to postulate times in addition to spacetime points. Simultaneity would then be a matter of two events having the same value for the *t* variable in their spacetime coordinates. There are two other interpretations of SR: Einsteinian and neo-Lorentzian. The former agrees with the Minkowskian view that whether two events are simultaneous is relativised to reference frames, the latter denies this.⁷⁵ Importantly, both are so-called 3+1 theories, treating space and time as non-identical. Thus, two events' being simultaneous is *not* a matter of their spacetime coordinates agreeing on the value of *t*. Instead, simultaneity is, strictly and literally, a matter of occurring at the same time, which involves quantification over times. Given the neo-Quinean criterion of ontological commitment, this entails that 3+1 theories (the presentist-friendly ones) carry ontological commitment to times. How can the fictionalist respond? Here's one way to redefine simultaneity:

x and y exist.

⁷³ What about the time variable that appears in the Lorentz transformations? I'll deal with time variables generally below.

⁷⁴ Simultaneity is absent from GR, because GR is a theory of gravity, while SR is a theory of mechanics dealing only with inertial frames. This makes the former's name something of a misnomer.

⁷⁵ See Craig (2008) for an overview of these three interpretations.

This works for presentists, since there are no past or future events and so *a fortiori* no simultaneous past or future events.⁷⁶ Crucially, it doesn't quantify over or refer to times. So, we can have simultaneity without times. Thus, there's no reason to think that times are indispensable to a presentist-friendly version of SR.

5.2.3 Quantum Mechanics

The closest thing to quantification over or reference to times in quantum mechanics (QM) appears in the wave function:

$$\Psi(x, t)$$

which describes the state of a physical system at a given time and is obtained by solving the Schrodinger equation (Griffiths and Schroeter 2018: 3). The variables x and t are naturally and often taken as having spatial points and times as their values. For example, Griffiths and Schroeter: " $|\Psi(x, t)|^2$ gives the *probability* of finding the particle at point x , at time t " (2018: 4); and Mandl (1992: 2-3), " $\Psi = \Psi(\mathbf{r}, t)$ species the state of the system at time t ." The theory is rarely if ever spelled out using an existential quantifier ranging over a domain of times, but that the time variable takes times as its values is reason enough to think that QM carries commitment to times, at least standardly understood.

But we needn't formulate QM in this way. The fictionalist replace the time variable with two temporal operators:

$$n \text{ seconds ago } \Psi(x)$$

$$n \text{ seconds hence } \Psi(x)^{77}$$

The fictionalist holds that these are genuine, irreducible operators, which are not analysable in terms of quantification over times.⁷⁸ These are similar to some Priorian operators. Prior

⁷⁶ What if we want to say that two things were (or will be) simultaneous? The presentist can use irreducible, composite temporal operators, which I explain below.

⁷⁷ Of course, it *looks* a bit weird to have natural language words next to physics, but this is just an artefact of how I'm presenting them. Imagine appropriate symbols in their place if you wish.

⁷⁸ I won't *directly* argue that they cannot be analysed in terms of quantification over times. Rather, I'm simply introducing the view that they can't, and will argue in section 5.2.6 that the fictionalist theories involving them are just as plausible as the standard, times-involving theories. This functions as an indirect argument against analysing them using quantifiers.

introduces “dyadic statement-forming” operators and combines them with variables and propositions to form expressions like “ Pnp ”, “it was the case n days ago that p .” (1957: 11). This appears to be the fictionalist’s proposal, but Prior says that these “interval-variables”, like the n above, are bound by a quantifier (1968: 88). Thus, the quantifier ranges over intervals, in which case they carry ontological commitment to times, at least assuming the premise (1) of the indispensability argument. Prior himself denied this premise:

“quantifications of this sort do not imply that intervals are entities.” (1967: 96). A Priorian approach to reformulating our best physical theories without ontological commitment to times would therefore deny premise (1). Since I am modelling times fictionalism after mathematical fictionalism, it should offer a response to the indispensability argument *without* denying this neo-Quinean criterion of ontological commitment. So, the fictionalist’s composite temporal operators are not the same as Prior’s. The latter’s implicitly quantify over times while the former’s do not.⁷⁹ The fictionalist’s operators are more like Crisp’s (2005: 16), “it was (will be) the case n units of time ago (hence)”. Crisp isn’t explicit that these *aren’t* analysable in terms of times, rather he just leaves this option open.

It’s worth noting that exactly how many seconds ago p was the case changes over time. This makes the operator approach impractical to use in physics, because by the time you’ve uttered the fictionalist sentence it will already be false. But impracticality is no guide to truth; the fictionalist aims to report the sober metaphysical truth of the matter, not advise on the practice of physics. And it’s part and parcel of this kind of dynamic approach that what’s true (unrestrictedly) changes over time. So, with the time variable dispensed with in favour of operators, any ontological commitment to times in QM disappears.

5.2.4 Quantum Field Theory

The final candidate reason for thinking that times are indispensable to our best physical theories comes from (an interpretation of) quantum field theory (QFT). Very roughly, QFT is an extension of QM that covers systems with fields and many more particles. Little more can

⁷⁹ The fictionalist’s operators are also different from Brogaard’s “composite tense operators” (2012: 91), which combine “basic” tense operators (e.g. “it was the case that”) and time adverbials (e.g. at 11:00 a.m. on April 11, 2023).

be said about QFT without going into great detail, since there is no canonical definition of the theory (Meinard 2023). According to some physicists and philosophers, the most plausible interpretation of QFT treats particles as bundles of energy or excitation properties of fields (Weinberg 1987: 78-79, d’Espagnat 1983: 84). Since particles are objects, and objects aren’t properties, I take it that what these authors (should) mean is that there aren’t really such *things* as electrons and photons, instead there are fields which are (crudely speaking) electron-ish, or photon-ish. Since fields are naturally taken to be states of spacetime (Norton 2004, Schaffer 2009), QFT implies there are spacetime points, given by quadruples (x, y, z, t) .

As with GR, if QFT carries commitment to spacetime points then it probably doesn’t also carry commitment to times. So we need to consider what presentists will say in response, since they treat space and time as non-identical rather than part of some other thing called spacetime, and so it remains open whether a presentist QFT will postulate times. A non-spacetime version of QFT will agree with the above characterisation of the theory except that it will treat fields as states of space (rather than spacetime), given by triples (x, y, z) .⁸⁰ Without the time variable, the theory needs some other way of expressing when things happen. As before, we can do this by using temporal operators:

n seconds ago (hence) (x, y, z) .

In general, it’s hard to see how this fictionalist alternative couldn’t be deployed for all quantification and reference over times in our best physical theories. There is, then, little reason to think that physics supports premise (2) of the Quantification-Reference argument.

5.2.5 Semantics of Tense

Moving on from physics, many semantic theories involve quantification over times. These include theories of tense (Fernando 2015), when-clauses (Hall and Caponigro 2010), and

⁸⁰ There is probably a lot of work to be done to formulate a non-spacetime, presentist-friendly version of QFT. But this thesis is a defence of non-extensive presentism against instantaneous and extended presentism. Thus, objections to presentisms as such are irrelevant, because they don’t help decide between the three versions.

when-questions (Larson and Cooper 1982). Unlike physics, however, there is no generally accepted, single best semantic theory of tense, and so it's hard to draw an exact parallel here to other indispensability arguments. Banfi and Deasy claim that such semantic theories are our “most successful” theories (2021: 728), though they don't explain why. But an overview of the literature (Fernando 2015) does suggest that most, if not all, semantic theories of tense utilise quantification over times, and so *a fortiori* our best ones do too. I can't give the fictionalist treatment of *every* semantic theory on offer, but I can give fictionalist treatments of a handful of sentences often analysed in terms of times. This will serve as good evidence that our best semantic theories can be so fictionalised.

Let's start by looking at a Priorean tense logic, which Fernando (2015) takes to be an appropriate starting point for building other semantic theories of tense. This semantics features a satisfaction relation, $\models_{\mathcal{M}}$, defined relative to a model, \mathcal{M} , which contains an earlier-than relation, $<$, on a set, $T_{\mathcal{M}}$, of times. Take a tensed sentence like

Josh was in Nottingham.

The Priorean semantics yields the following analysis:

$$t \models \text{PAST}(\text{Josh was in Nottingham}) \leftrightarrow \exists t' < t \ t' \models \text{Josh is in Nottingham.}$$

t is the time that satisfies the sentence, that is, the time at which the sentence is true, and t' is the time (earlier than t) at which Josh arrived in Nottingham and thus satisfies the present tense sentence. Fernando doesn't explicitly mention this, but I take it that the “PAST” operator is there only to illustrate the reduction (or perhaps elimination) of tense operators in favour of quantification over times, that is, it's not intended as a piece of primitive ideology. This is strange, though; if the “PAST” operator is meaningful, why not simply use it to analyse tensed sentences and drop quantification over times? This is almost exactly what the fictionalist proposes:

“Josh was in Nottingham” is true iff WAS (Josh is in Nottingham).⁸¹

⁸¹ You might find this analysis frustratingly simple and think that the quantifier approach is better because it gives a deeper analysis. But it's hard to see what we gain from analysing temporal operators like “PAST” or “WAS” in terms of quantification over times. Not more understanding, anyway, as Prior reminds us:

I take “WAS” to have the same meaning as “it was the case that”. It takes you backwards in time by a certain amount. In fact, we can analyse this operator in terms of the operators introduced in section 5.2.3:

WAS p iff *n* seconds ago *p*.

You might object that the simple “WAS” operator is expressive in a way that the composite operator isn’t. The simple operator allows us to express that something was the case *at some time or other*, without having to specify exactly which time. Utterances of this sort are common, as in “Josh was (at some point, relatively recently) in Nottingham”. I think we can account for these unspecific past tense truths by leaving the value of *n* unspecified. This captures the intuitive idea that something was the case at some point or other. A consequence of this is that the following sentences can both be true when the value of *n* is unspecified:

n seconds ago (Josh is in Nottingham)

n seconds ago ¬(Josh is in Nottingham).

The same is not true of the slice operator “WAS”, since it takes you backwards in time by a fixed amount. Thus, the following are contradictories:

WAS (Josh is in Nottingham)

WAS ¬(Josh is in Nottingham).

Other sentences are harder to give a fictionalist treatment of. Tallant and Ingram (2020: 201) point out that sentences such as

There have been two queens (of England) named Elizabeth

cannot be analysed using a single slice operator

WAS (there are two queens named Elizabeth)

I think I know what I mean when I say 'Some things are not the case but merely have been or will be the case', better than I know what I mean when I say 'Some things are not the case at this instant but only at earlier or later ones' (1977: 56).

The only thing we gain from a quantificational analysis is more ontology.

because the latter (but not the former) sentence falsely asserts that England once had co-ruling queens. There are two options for the fictionalist here. The first is to introduce *span* operators (Brogaard 2007), where “there have been two queens named Elizabeth” is analysed as

HAS (there are two queens of England).

There is some debate about whether these span operators can do the job requested of them (Lewis 2004; Brogaard 2007). The second option, which Tallant and Ingram deploy, is to use nests of slice operators:

WAS (there is a queen named Elizabeth and *WAS* (there is another queen named Elizabeth)).

This says that there have been two queen Elizabeths while ruling out that they shared their rule. This proposal can easily be extended for sentences of the form “there have been n Fs”, where the Fs don’t all exist together but instead are spread across history (like the Elizabeths), using first-order logic plus identity in place of natural numbers (2020: 202-203). This is easiest when n is a finite, countable number. When n is countable but infinite, as in “there have been \aleph_0 electrons” the paraphrase can *begin* to be written out but will never be completed (just try it).

The uncountable case, as in “there have been \aleph_1 electrons [not all at once, but spread across every point in the past]” is complicated. Suppose that time is continuous, so that regardless of the value of n ($\in \mathbb{R}$), something was the case n seconds ago.⁸² The translation must contain a conjunct for every n , that is, the conjuncts and numbers must stand in a one-one mapping with each other. This corresponds to each of the uncountable electrons existing at a different time. The first conjunct of such a translation can be written out, but after that it becomes impossible not only to *complete* (there isn’t enough time in one’s life) but to *continue*, for which conjunct do you write next? The answer is “none”, for assuming that time is continuous, there is no immediately next past proposition and thus no immediately next conjunct.⁸³ This should be no problem for the times fictionalist, however.

⁸² Ignoring values of n that take you either earlier than the beginning of time if either exist

⁸³ You could start by writing out the *countable* infinite conjunction and then hope to “fill-in” the rest in between each adjacent pair, but this process would also never be completed.

As Melia (1995: 228), and Tallant and Ingram (2020: 205-206) point out, there's no reason to think that we should be able to state every translation. It's enough that there is one, even if it's practically impossible to write out.

A final test case for the fictionalist is sentences which say that one thing happened before (after) another. For example:

World War I began before World War II.

Fictionalists can't interpret "before" as expressing a relation between temporally separated times. They have three options. First, they can use the variable operators defined above, and state that the number of seconds ago that the earlier event ended is greater than the number of seconds ago the later event began:

n seconds ago (World War II began) and, m seconds ago (World War I ended), such that $n < m$.

The second option is to use nests of operators:

WAS (World War II has begun and n seconds ago World War I ended).

The third option is to define "WAS" such that it takes us backwards in time by the minimal physically meaningful amount of time, say, a Planck second. For things that happened one second ago, the number of "WAS" operators needed is 10^{43} (subscripts could be used as shorthand e.g. $WAS_{10^{43}}$).

There are two drawbacks to the third option. First, it requires that there be a minimal temporal extent.⁸⁴ For if there isn't, then some events will be impossible to speak about (what happens between Planck seconds?), and thus the resulting fictionalist semantic theory will not be expressively equivalent to the standard quantification-over-times theory. The second drawback is that it makes us unable to express that something happened some amount of time ago or other without specifying exactly how long ago, which is exactly what sentences like

Josh was in Nottingham

⁸⁴ I argued in chapter (4) that non-extensive presentists should reject this.

seem to say. For these reasons, the first two options are preferable; either does the job, and all without quantifying over or referring to times. The upshot of all this is that the fictionalist has ample resources to reformulate our best semantic theories without quantification over times. There is, then, little reason to think that semantics supports premise (2) of the Quantification-Reference argument.

5.2.6 Fictionalism Vs the Standard View

We've seen that the above theories can be given a fictionalist treatment by using primitive temporal operators. But are these reformulated theories as plausible as the standard, times-ridden, theories? Yes, because i) they're empirically equivalent, ii) they're just as expressive, and iii) they're no less ontologically or ideologically parsimonious. I'll take these in turn. And if they are (at least) equally as plausible as the standard theories then premise (2) of the indispensability argument garners no support from physics.

First, there doesn't seem to be empirical evidence from physics for the existence of times. It's hard to prove this directly, but consider an example to illustrate the point. Suppose I drank coffee this morning. Is there any empirical evidence favouring

At t , I drink coffee

over

n seconds ago, I drink coffee?

I can't think of any. Second, the fictionalist theories are just as expressive as the standard theories, in the following sense: if there were times then, for every t , there would be some n such that t is located n seconds earlier/later than now. It follows from this that for each sentence of the form "at t , p ", there is a sentence of the form " n seconds ago/hence, p ". Thus, no past or future event is beyond the expressive capabilities of the fictionalist's language.

Third, the fictionalist theories are no less parsimonious. In comparing the parsimony of the fictionalist and standard theories, I'll consider them as package deals of all four physical theories e.g. fictionalist GR, SR, QM, and QFT vs standard GR, SR, QM, an QFT, rather than

considering each individual fictionalist theory with each individual standard theory.⁸⁵ A consequence of this is that one package deal might be more parsimonious overall, even if one of its members is less parsimonious than its counterpart. There are four kinds of parsimony, distinguished along two dimensions: ontological and ideological, and quantitative and qualitative.⁸⁶ I don't assume that any of these are or aren't theoretical virtues. But regardless of which you pick, fictionalism is no less parsimonious.⁸⁷

The fictionalist theories are more quantitatively ontologically parsimonious because operators carry no ontological commitments, whereas time variables do. Exactly how much more parsimonious depends on the theory of times on offer. A theory that says there are instants has continuum many more things, which is at least \aleph_1 .⁸⁸ If instead there are non-zero intervals, say, Planck length intervals, then there are approximately $10^{43}(4.1 \cdot 10^{17})$ more, not including future seconds.⁸⁹ Either way, the fictionalist makes gains in quantitative ontological parsimony. The fictionalist theories are more qualitatively ontologically parsimonious, because the fictionalist postulates one less kind of thing, namely, times.

You might object that the fictionalist's composite operators carry an extra commitment not had by the standard view, namely, numbers. This isn't a problem for the fictionalist. If number talk is interpreted along mathematical realist lines in both the fictionalist and standard theories, then both theories have numbers in their ontology. If not, then neither have numbers in their ontology. Neither option leaves fictionalism less parsimonious than the standard view. Moving on to ideology, the fictionalist theories are no less quantitatively ideologically parsimonious, since the fictionalist has two operators and two variables, whereas the standard theories have four variables (x , y , z , and t). Finally, they're no less

⁸⁵ I leave out the semantic theories because my treatment of them is deliberately incomplete, as explained above. In generally, however, I can't see the need for anything more than composite temporal operators to account for all tensed sentences in English, which makes the fictionalist's semantic package deal highly ontologically parsimonious and fairly ideologically parsimonious (both quantitatively and qualitatively).

⁸⁶ Roughly, the ideology of a theory is the set of things used to state the theory. I won't take a stand on whether these are linguistic items (predicates and names), intensional entities (meanings, concepts), or worldly things (things that the theory refers to).

⁸⁷ See Nolan (1997), Baker (2003), and Jansson and Tallant (2017) for a defence of quantitative ontological parsimony as a theoretical virtue. See Finocchiaro (2020) and Cowling (2013) for a defence of quantitative and qualitative ideological parsimony as a theoretical virtue (respectively).

⁸⁸ If the continuum hypothesis is true then it's exactly \aleph_1 many, if it's false then it's more than that many.

⁸⁹ This number is obtained by taking the product of the number of Planck seconds in a second and the age of the universe (13.8 billion years) in seconds.

qualitatively ideologically parsimonious, since each has two ideological kinds: operators and variables, and variables and quantifiers. So, the fictionalist makes some gain in ontological parsimony, and no overall loss in ideological parsimony.⁹⁰

5.2.7 Is Fictionalism at Odds with Science?

The times fictionalist must deny all the above physical and semantic theories because they carry commitment to times. But isn't it just implausible that the physicists and semanticists have got this all wrong? I don't think so: their theories are good in many respects - they successfully predict and explain various things - they're just wrong about times. The fictionalist needn't think that physicists and semanticists have the physics and semantics wrong. What they've got wrong is metaphysics, but it's not implausible to suppose that non-metaphysicians have got their metaphysics wrong. Consider an analogous case to illustrate the point. The standard model of particle physics entails that there are quarks and baryons, and, no doubt, sometimes physicists say that baryons are *composed of* quarks. But the mereological nihilist shouldn't fear conflict with physics, for what the physical evidence supports is that there are quarks arranged baryon-wise, not that quarks compose baryons.⁹¹

The lesson to draw from this example is that physicists and semanticists, *qua* physicists and semanticists, do their job perfectly well. Their theories are right about time dilation, superpositions, and past tense sentences being true if PAST(p). But this is no reason to think that they get the metaphysics of time right. The fictionalist might be at odds with the physical and semantic theories as stated,⁹² but we should agree with them only to the extent that the evidence supports what they say, and sometimes theories go beyond what the evidence supports. I've argued that the evidence doesn't support the standard

⁹⁰ You might want to know what the fictionalist's truth-makers are for sentences of the form "WAS p", if not times. Options abound in the truth-making literature, but whichever truth-makers the fictionalist chooses (if they choose any) they will not incur more ontological commitments than the standard view incurs by being committed to times, because they will only postulate as many truth-makers as there are truths, which is no more than anyone else, and so fictionalism will come out as no less parsimonious than the standard view, all things considered.

⁹¹ Of course, there might be other evidence that quarks compose baryons: maybe all pluralities compose something, or maybe folk intuitions plus facts established by physics give us reason to believe that quarks compose baryons. The point is that the existence of composites is not a deliverance of physics,

⁹² It's probably an open question whether fictionalism is at odds with physicists and semanticists themselves, for while their theories (as stated) carry commitment to times, they themselves may not believe in them.

formulation of our best physical and semantic theories over the fictionalist formulation. The fictionalist is in no substantial conflict with science.

To sum up, then, I've argued that fictionalist reformulations of our best physical and semantics are no less theoretically virtuous as the original times-ridden theories, because they're empirically equivalent, equally expressive, and no less (ontologically or ideologically) parsimonious. Fictionalism is a plausible type-A strategy for non-extensive presentists to adopt in response to the Quantification-Reference argument.

5.3 Paraphrase

The second version of times anti-realism is the paraphrase strategy. I take a paraphrase strategy to do two main things. First, it identifies sentences of a discourse which appear to carry ontological commitment to unwanted entities. Second, it provides meaning-preserving translations of those sentences such that the apparent ontological commitments are revealed to be *merely* apparent. This is what I will mean by paraphrasing, or a paraphrase strategy, unless otherwise stated. Keller calls such paraphrases "reconciling" paraphrases, since they attempt to *reconcile* the original, apparently problematic sentence with some folk, scientific, or philosophical belief (2015: 90), rather than revise them. He also notes another, "revisionary" type of paraphrase, where the original unparaphrased sentence is rejected as untrue, and replaced with a sentence with a similar, but true, meaning.

I will mostly consider reconciling paraphrases, because providing revisionary paraphrases is too similar to the fictionalist project already undertaken above. In what follows I will offer reconciling paraphrases of many different types of ordinary time talk. I won't paraphrase all time talk, since there is simply not the space to. But I will paraphrase enough to shift the burden of proof onto the view that time talk cannot be paraphrased.⁹³ Call the paraphrase of any sentence, *s*, *P(s)*.

⁹³ I won't consider predicates like "is past/present/future". These can be analysed as primitive operators as we saw above.

5.3.1 Conditional When-Clauses

Conditional *when*-clauses say that one thing happens *when* another thing happens:

- a. When it's cold I wear a hat.
- b. Introverts are happy when they're alone.

Following Farkas and Sugioka (1983), we can paraphrase a and b as:

P(a). If it's cold, then I wear a hat.

P(b). If introverts are alone then they are happy.

5.3.2 Adverbials

Adverbials can be distinguished along two different dimensions: indexical or non-indexical, and framing or durative. Adverbials like "this evening" and "yesterday" are indexical, while "at 2 PM" and "in 2005" are not.⁹⁴ Frame adverbials specify *when* something happened, e.g. "this evening", "yesterday", whereas durative adverbials specify *for how long* something happened/will happen, e.g. "for three hours", "from tomorrow".

Here is one example of each of the four adverbial types:

- c. The meeting is next Tuesday.
- d. Dinner is at 14:00.
- e. She will be here from tomorrow.
- f. She read for three hours.

The general strategy here is to paraphrase time talk in terms of talk about the arrangement of the Earth and Sun. This information, if you were to list it all out, would be quite lengthy, and so the full paraphrase is quite messy. Since this isn't an astrophysics thesis, it'll be helpful to have a short-hand way of expressing this information. Let's borrow a trick from the mereological nihilist: at 2:00 (PM GMT), the sun and earth stand in a particular

⁹⁴ These are technically still indexical until we make explicit information such as the time zone (GMT) and calendar (Gregorian).

arrangement with each other. Some of the earth's surface is facing the sun, some of it isn't. Let's say, then, that if the clock reads 2:00, then the sun and earth are arranged 2:00-wise.⁹⁵

Here are the paraphrases:

P(c). *WILL* (the Sun and Earth are arranged next-Tuesday-wise and the meeting happens).

P(d). *WILL* (the Sun and Earth are arranged 14:00-wise and we have dinner).

Sentences (e) and (f) are more complicated. The former is relatively unspecific; no particular time is specified. It's most naturally read as saying something like: she'll arrive at some time or other tomorrow, a time which is contextually appropriate. In ordinary circumstances, an appropriate time is neither very early nor very late. Here is the paraphrase:

P(e). *n* seconds hence (the Sun and Earth are arranged tomorrow-wise and she arrives here).

As mentioned in the fictionalism section, the value of *n* is left deliberately unspecified to express the fact that she will arrive *at some point or other*. For the same reason, "tomorrow-wise" is also unspecific.

Sentence (f) doesn't require the Sun-Earth shorthand, since it doesn't specify any particular temporal location. The strategy here is to use the fictionalist's variable operators to capture what is meant by an event lasting for a certain amount of time:

P(f). *WAS* (*n* hours ago, she is beginning to read, and, *m* hours ago, she is finishing reading), and $m - n \approx 3$.

The slice operator puts us in the past, and then the difference in values of the variables tell us how long she read for. The use of hours rather than seconds is merely accidental; we could equally use seconds instead. The *approximately equal to* relation is a better choice than *equal to*, since it's true that I read for three hours even if I read for, say, two hours, fifty-nine minutes, and fifty-nine seconds. So, the paraphraser has plausible reconciling paraphrases for sentences involving time adverbials.

⁹⁵ Prior suggests something like this (1967: 106).

5.3.3 Amount-Clauses

Amount-clauses mention amounts of time e.g. two second, ten minutes, thirty years:

- g. I've got ten minutes until I have to be at church.
- h. He spent an hour getting ready.
- i. We have plenty of time.

Here are the first two paraphrases:

P(g). If I want to be at church in less than or equal to n minutes, then I have to leave in m minutes or less.

P(h). *WAS* (n seconds ago, he is beginning to get ready, and, m seconds ago, he is finishing getting ready), and $m - n \approx 1$.

As with time adverbials above, the values of n and m depend on when the sentence is uttered, and so which sentence is the correct paraphrase changes over time.

Paraphrasing (i) is more complex, because its meaning is largely context dependent. If, for example, we have plenty of time to go shopping before catching our train, then the paraphrase will look much like P(d) e.g. if we want to be on the train, then we will need to be at the station in a certain number of seconds, where this number is large, relative to the context (maybe the station is a ten minute walk and we have two hours). So, the paraphraser has plausible reconciling paraphrases of amount clauses, too.

5.3.4 Temporally Embedded When-Clauses

Temporally embedded *when*-clauses (TWs) cannot be paraphrased as conditionals. For example:

- j. Erik wondered when (it was that) Jade arrived

can't be paraphrased as a conditional *when*-clause e.g. "if Erik wondered then Jade arrived", since (j) can be true even if Jade, but not Erik, arrived. Hall and Caponigro (2010: 545) note that TWs can be paraphrased using another *wh*-clause:

P(j). Erik wondered at *what time* Jade arrived.

They then proceed to treat “when” as a set restrictor - it takes a set of entities and outputs a time or event (2010: 548). In sentence (j), “when” restricts the set of things that bear a certain relation to Jade’s arriving to the subset of those times or events when Jade arrived. Hall and Caponigro point out that the word “time” can be used to refer to either times or events. For example, the sentence “they arrived at the time we agreed on” (*prima facie*) refers to a time, and “I was tired that time we went on holiday” refers to an event, despite the use of the word “time”. The paraphraser could therefore take P(j) to be equivalent to

Erik wondered which event had Jade’s arriving as a constituent.

The paraphraser might not be out of the woods yet, however. Events have beginnings and endings, which are naturally construed as temporally separated temporal parts, which the non-extensive presentist can’t believe in. One way to avoid ontological commitment to events is to opt again for a temporal operator:

P(j’). Erik wondered how many seconds ago, n , it was that Jade arrived.

The difficulty here is that P(j’) doesn’t have the same meaning as (j) (“Erik arrived when Jade did”). Sentence (j), once true, is always true. But P(j’) is true only briefly; it’s false once the value of n changes, and then a new sentence with a different value for n is true instead. P(j’) is therefore not a reconciling paraphrase. By extension, then, no TWs can be given reconciling paraphrases. At best, the paraphraser can take P(j’) to be a revisionary paraphrase: it’s true, and has a similar meaning to (j), but (j) is false.

The upshot of this is that the paraphraser must utilise both reconciling and revisionary paraphrases to give a plausible anti-realist account of time talk. This lack of uniformity counts as a small cost to the view. Moreover, paraphrasers ought to have an explanation of why it is that sentences with temporally embedded *when*-clauses seem true when, (according to paraphrasers) they aren’t. I’ll explore one such candidate explanation below.

5.3.5 Explaining Away Temporally Embedded *when*-Clauses

I think paraphrasers should explain away the apparent truth of TWs by appealing to quasi-truth. The explanation I’ll develop takes inspiration from Markosian’s discussion of quasi-

truth and truth-conditions. I'll explain his use of it to help illustrate the paraphraser's explanation.

On Markosian's view, presentism implies that the sentence

k. Socrates was a philosopher

is false, since there is no Socrates, because he isn't present (2004: 68-69). Markosian accepts that most (English speaking) people regard (k) as true and attempts to explain why despite its falsity (given presentism). He gives three explanations, but only the second and third are relevant here. The second explanation involves quasi-truth. A sentence is quasi-true if it's false, but only in virtue of certain philosophical facts. It *would* be true except for some rather pedantic, philosophical reason (2004: 69). For example, you might think that "chairs exist" is quasi-true; it's true enough, it would be genuinely true except for the pedantic, philosophical reason that composite objects don't really exist.

So, for a given quasi-true proposition, p, quasi-truthers will identify another proposition, q, which is in the neighbourhood of p, but (genuinely) true. Quasi-truth strategies aim to soften the blow of denying a given proposition. It is somewhat surprising that p is false, but q is all we really want to say, and so a theory which entails the falsity of p suffers little.

Markosian's third explanation of why people are regard (k) as true is that they confuse two different candidate sets of truth-conditions for it (which I have renamed and reformatted):

Grabby) "Socrates was a philosopher" is true iff $\exists x$ (x is the referent of "Socrates" \wedge WAS(x is a philosopher))

Searchy) "Socrates was a philosopher" is true iff WAS $\exists x$ (x is the referent of "Socrates" \wedge x is a philosopher).

The difference, Markosian explains, is that Grabby implies that *there exists* something which *was* a philosopher called Socrates, whereas Searchy implies that *it was the case that there exists* something which is a philosopher called Socrates. The former implies that there is right now something which was named "Socrates" about two-thousand years ago, which seems unlikely. The latter implies only that there *was* such a thing (2004: 70). Markosian thinks that people regard (k) as true because they implicitly think that Searchy is the correct truth-condition, when in fact Grabby is. So, Markosian's explanation of why people regard

(k) as true has two parts: (k) is at least quasi-true, and we usually don't pay attention to the philosophical facts that make propositions only quasi-true; and the folk think (k) has the searchy truth-condition, when in fact it has the grabby truth condition.

Let's turn back to paraphrasing. Following Markosian, the paraphraser's explanation for the merely apparent truth of TWs has two parts. The first part says that TWs are only quasi-true; they *would* be true except for the rather pedantic philosophical fact that times don't exist. Since the folk usually pay no mind to whether times exist, it's no surprise that they say these quasi-true things. The second part offers two sets of truth conditions for TWs. Let's use sentence (j) as an example ("Erik wondered when Jade arrived"), and angle brackets to refer to events:

Event) "Erik wondered when Jade arrived" is true iff there was the event <Erik's wondering which event it was that Jade's arriving was a constituent of>.

Operator) "Erik wondered when Jade arrived" is true iff *n* seconds ago, Erik wondered how many seconds ago it was that Jade arrived.

The paraphraser concedes that Event is the correct truth-condition for (j), that is, that TWs have event truth-conditions, and therefore that (j) is false (because the antecedent is sometimes true when the consequent is false). But they propose that the folk implicitly think that Operator is true, and that's why they're inclined to believe and assert (j).

So, that's how the paraphraser should explain away the apparent truth of temporally embedded *when*-clauses. By combining this with the paraphrastic strategies deployed for sentences (a)-(i), they have an account of time talk, and all without quantifying over or referring to times. I now turn to objections to the paraphrase strategy.

5.3.6 Genuine Paraphrases?

A worry about paraphrase strategies is that the proffered paraphrases often do not look much like the original sentences, in at least two ways. First, the original and paraphrase sentences seem to be *about* different things – the former are about times, the latter about seconds. And, plausibly, if two sentences are about different things, then they have different meanings, and so neither is a genuine paraphrase of the other. Second, their

syntactic structure is quite different e.g. sentences (a) and (b) don't look like conditionals (they don't contain "if" or "then"), yet the paraphraser says they're equivalent to conditionals.

Take the aboutness worry first. We should not expect paraphrases to *seem* to be about the same thing as the original sentence. For example, "my car is parked next to the office" is clearly a genuine paraphrase of "I'm parked next to the office" even though the latter, but not the former, seems to be about the speaker rather than their car. In any case, the only sentence from the above that seems (to me, at least) to be about something else is (j), which I already conceded was not a genuine, reconciling paraphrase. Second, I don't think syntactical differences are good evidence that the paraphrase is not genuine. In fact, we should expect syntactic differences to arise in the paraphrase. As Melia (1992: 42) explains, paraphrases are supposed to reveal that the apparent ontological commitments of the original sentence are merely apparent, and they do this by revealing the true logical form of the proposition. For example, "there's one cat (over there)" is correctly paraphrased as "there is an x , such that x is a cat, and for every y , such that y is a cat, y is identical to x ". How's that for a syntactical difference? It should come as no surprise, then, that P(a)-P(i) are syntactically unlike like their original sentences, since the logical form is different. This is what we should expect of genuine paraphrases.

5.3.7 Paraphrase and Ignorance

You might object to my paraphrases of time adverbial sentences, (c)-(f), on the grounds that people can truly and sincerely utter such sentences despite not knowing much of anything about the relevant arrangements of the Sun and Earth. This is especially so if we go sufficiently far back in human history, where facts about the positions of the Sun and Earth were presumably mostly unknown (of course, if they weren't, then there's no problem here for the paraphrase strategy). Nonetheless, people said things like "the harvest starts at six", despite being mostly in the dark about the relevant astronomical facts. How, then, can they be uttering a sentence synonymous with "if the Sun and Earth are arranged six-o'clock-wise then we start harvesting"? Doesn't their ignorance concerning the relevant astronomical facts mean that they do not express the proposition expressed by the proffered paraphrase,

and therefore that it is not a genuine paraphrase? I think not. Consider that the folk know the sentence “there are two earthen hemispheres”, even if they don’t know “ $\exists x \exists y (Hx \wedge Hy \wedge x \neq y) \wedge \forall z Hz \rightarrow z = x \vee z = y$ ” (where “H” is equivalent to “is an earthen hemisphere”). The folk don’t know the latter because they don’t know about first-order logic. Nonetheless, they understand the proposition it expresses, namely, *that there are two earthen hemispheres*. Thus, they would answer “no” (or rather “huh?”) if asked whether the first-order sentence is what they mean by “there are two earthen hemispheres”. But clearly the first-order sentence is still a genuine paraphrase of the English sentence. Similarly, then, ignorance of astronomy doesn’t show that the proffered paraphrases are not genuine.

5.3.8 What are the Ontological Commitments of the Paraphrases?

You might want to know just what the ontological commitments of (a)-(j) are, if not times. They must have some ontological commitments, so what are they? This is a difficult question, because it spans many different areas of metaphysics. If I hold that the ontological commitments of (a)-(j) are things like myself, hats, the sun, and the earth, then I take a stand on the question of whether there are composite objects. If I hold that the commitments of (a)-(j) are coldness, happiness, being late, and so on, then I take a stand on whether there are properties (*mutatis mutandis* for events and states of affairs). The existence of any of these things is disputed by someone or other. But, importantly, the existence of any of these things is not a problem for non-extensive presentism, and so it does not really matter what the ontological commitments of (a)-(j) are, so long as none of them are times.

A familiar problem for paraphrase strategies raises its head here: if the paraphrases have the same meaning as the original sentences, why not think that the things referred to and quantified over in the paraphrases are times? That is, why not think that the Sun and Earth arrangements are times? The best response here is to say that the burden of proof is on the realist to show that times are indispensable to the truth of ordinary time talk. After all, if the paraphrases preserve meaning, then why not accept the more parsimonious ontology? Why go further and postulate that Sun and Earth arrangements are times? I can’t see any reason to do so.

5.3.9 The Lack of Scientific Evidence Objection

I now come to the final objection to the paraphrase strategy. Some object wholesale to paraphrastic strategies because they lack linguistic or scientific evidence for their central claim that the proffered paraphrases are genuine. For example, Burgess and Rosen think that there is a “total lack of scientific evidence in favour of any such reconstrual as a theory of what ordinary [...] assertions mean” (2005: 525), where such “reconstruals” are the body of paraphrases offered to avoid some unwanted ontological commitments. Korman also raises this objection against mereological essentialists who endorse a semantic hypothesis that the folk speak loosely when they say that things change their parts. He argues that there is no linguistic evidence for the hypothesis that the proffered paraphrases are genuine (2009: 260). Since no such evidence is forthcoming, we should reject such paraphrase strategies. Keller (2015) offers three responses to this objection. I’ll take each in order and examine whether the times paraphraser can make a similar reply.

First, proponents of such evidence-lacking paraphrases may (and perhaps should) accept that their proffered paraphrases are revisionary rather than reconciling. But, Keller says, paraphrasers can hold that they are revisionary only with respect to what speakers *say*, not what they *believe* (2015: 97). And if the paraphrase strategy is revisionary only with respect to what is said, then it does not entail that our ordinary view of the world is mistaken, and so the general motivation for paraphrase strategies – to preserve our ordinary beliefs – is left intact. Keller illustrates this kind of response as follows. Suppose a Cartesian dualist takes the sentence “I’m at the train station” to have the paraphrase “my body is at the train station”. It would be a mistake to think that they’re offering a revisionary account of first-person indexicals; they aren’t saying that we were wrong to believe that “I” refers to the speaker and not (only) the speaker’s body. Rather, they are revisionary about what we *say*; we speak incorrectly when we say that *we* are in the train station, for no one is literally anywhere, given Cartesian dualism. But they might still hold that what we *believe* is true, namely, that bodies are sometimes at train stations. And it’s not very surprising that we don’t always say what we believe. So, the Cartesian needn’t revise the folk conception of reality (Keller 2015: 96-97), *even if* their paraphrases are revisionary with respect to what

we say. Turning back to times, then, do we really say that there are times while not actually believing that there are any? Frankly, it's hard to say, because it's hard to determine whether time talk is true but paraphrasable, or false but true enough for practical purposes. So, it looks like the paraphrase can't give a version of Keller's first response to this objection.

Second, Keller notes that popular views in semantics and metasemantics entail that the semantic facts (e.g. which propositions are expressed by which sentences, which things are referred to by which words) are partially determined by metaphysical facts (2015: 102-103). Given that, say, gold has an atomic number of 79, it follows that "gold" refers to something with atomic number 79. This is a clear case of a metaphysical or non-linguistic fact (about gold) determining a semantic fact (about "gold"). Thus, while linguistic evidence is clearly relevant to what sentences mean, so is non-linguistic evidence. A lack of linguistic evidence needn't be a mark against a paraphrase strategy, so long as there is other evidence for its central claim about the semantic equivalence of a sentence and its paraphrase.

Now, it's not as easy to see how this extends to cases where the non-linguistic evidence isn't from natural science (such as gold and chemistry). Keller's example is from mereology. He thinks that if there are no composite objects, then we probably didn't introduce words like "chair" in an attempt to talk about composites. The metaphysical fact (the non-existence of composites) determines the semantic fact that nothing in our language (except "composite") even purports to refer to composite objects, because there are none (2015: 104-105) Thus, our chair talk comes out true, because what it purports to refer to does in fact exist, namely, simples arranged chair-wise.

So, is there non-linguistic evidence for thinking that the original times-involving sentences have the same meaning as the paraphrases? As I argued above, there's little reason from physics or semantics to think that times exist, and a theory that replaces quantification and reference to times with primitive temporal operators is ontologically and ideologically more parsimonious, and so we should think that times don't exist. So the paraphrase strategy has some non-linguistic evidence in its favour, which makes up for its lack of linguistic evidence.

Moreover, let's apply Keller's mereology example to times. On the face of it, we introduced timely concepts and words ("day", "year", etc.) to help organise ourselves and get things done. We needed to know when to plant and harvest crops, and when to hold some cultural

or religious festival or celebration. Let us say, then, that the intended function of time concepts is *practical*. For all we know, this is the main or primary intended function; whatever else time concepts and words might do, this is the thing we introduced them for and the main thing they continue to do. This contrasts with other concepts like *electron*, which were introduced for decidedly theoretical purposes; our intention in introducing the concept was to pick out some existing thing, and this gives us a more true and complete view of reality. Now, if times exist, then our time talk and concepts probably serve some theoretical purpose (in physics and semantics, say). If times *don't* exist, then they don't in fact serve any theoretical purpose. And given that their primary intended purpose is practical rather than theoretical, they plausibly don't *attempt* to pick out anything in the world, and so time talk comes out as true even in the absence of times. So, it's *easy* for time talk to come out as true, it takes very little for it to be true, because its purpose is practical rather than theoretical. If true, this is good news for the paraphraser. Thus, paraphrasers can give a response along the lines of Keller's second response.

Third, Keller argues that successful paraphrases need only have the same truth-conditions of the original sentence, not the same semantic content. Why think that sameness of truth-conditions is enough for a successful paraphrase? What the paraphraser aims to do is to show that their philosophical view (whether it be nominalism, mereological nihilism, or whatever) is consistent with the ordinary folk view of the world. If the proffered paraphrase, *S'*, is true under all and only the same circumstances as the original sentence, *S*, and *S'* is consistent with the paraphraser's philosophical view, *p*, then *S* is consistent with *p*, thereby vindicating the paraphrase strategy, despite *S* and *S'* having different semantic content (2015: 109-111). Keller's third objection applies perfectly generally, and so it applies to time talk too. Paraphrases of time talk, even if not reconciling (expressing the same proposition) are successful if their truth-conditions are the same as the original sentences. So, paraphrasers can give replies along the lines of the second and third replies that Keller gives.

That's the last of the objections to the paraphrase strategy. To sum up: I've argued that genuine or reconciling paraphrases can be given for all time talk except temporally embedded *when*-clauses. I then offered a candidate explanation of why TWs appear to be true despite being false, namely, the folk confuse the Event and Operator truth-conditions for them. I then argued that surface-level differences between the original sentences and

their paraphrases don't show the paraphrases to be non-reconciling, and that the Lack of Scientific Evidence objection can be successfully answered by appealing to non-linguistic evidence, such as the dispensability of times to physics and semantics. In conclusion, then, the paraphrase strategy for time talk proves to be a plausible anti-realist account of ordinary time talk.

5.4 Figuralism

Figuralism about a discourse is the view that claims in the discourse are figurative (metaphorical, non-literal) so that the truth of such claims does not ontologically commit us to the things they (seem to) quantify over or refer to (Yablo 2001, 2005). We have already seen an example of a figurative sentence which doesn't wear its ontological commitments on its sleeve: "it's raining cats and dogs" commits us to rain, not cats and dogs. Let us say that "it's raining heavily" is the *literal translation* of "it's raining cats and dogs", and the proposition <it's raining heavily> the *literal content* of the sentence. For our purposes, a translation of a sentence is another sentence that expresses the same proposition.⁹⁶

Figuralism about times, then, is the view that time talk is true but figurative, and so we're not committed to times. We need to know, then, what the literal translations of figurative time talk are. Take "four o'clock is teatime". A literal translation of it might be "if the Earth and sun are arranged four-o'clock-wise, then we drink tea", and the literal content is the proposition that if the Earth and Sun are arranged four-o'clock-wise then we drink tea.

It's not enough for the figuralist to provide literal translations, however. For the central figuralist claim is that the sentences they translate are *figurative*. The sentence "four o'clock is teatime" is not quite so obviously figurative as "it's raining cats and dogs" is. So why think that time talk is figurative? Following Yablo, we can attempt to show that time talk is figurative by showing that times share many features with what Yablo calls make-believe

⁹⁶ This is much more restrictive than the notion of translation used in language studies, where, for example, "pleased to meet you" is a translation of "よろしくお願ひします", even though they don't have the same meaning. You can't say "pleased to meet you" to someone you've already met, but you can say "よろしくお願ひします" if, for example, you start working on a project together. What makes one a translation of the other is the fact that they are used in similar contexts.

objects (MBOs), objects which are paradigm examples of things that don't exist. He lists eleven such features (the examples in brackets are my own):

Paraphrasability: MBOs can be paraphrased without loss of subject matter (“it’s raining cats and dogs” and “it’s raining heavily” are about the same thing).

Impatience: We are generally indifferent or impatient when someone says we should be worried that an MBO doesn't really exist e.g. “I didn't mean that domesticated organisms were accelerating towards the ground”.

Translucency: when someone uses an MBO we “see through” the figure of speech and take them as asserting the literal content (we look past the imagery and understand that she's had a low mood for a while).

Insubstantiality: there's little to say about what any given MBO is like apart from what our talk says about it, they have no “hidden substantial nature” (there is nothing substantive to say about what the dump is like).

Indeterminacy: there's no fact of the matter whether any given MBO is identical to another (the blues she had last winter aren't determinately (non)identical to the blues she had this winter).

Silliness: taking MBO talk literally invites silly questions (“how cute are the raining cats and dogs?”).

Expressiveness: Using MBOs helps us express things which are otherwise difficult to express (“she's caught between a rock and a hard place.”).

Irrelevance: MBOs are thought to explain facts which would still obtain in the absence of the MBO (the pavement would still be wet even if there were no domesticated organisms accelerating towards the ground).

Disconnectedness: MBOs don't do anything except help us express facts – they don't really cause or explain things (the rock and hard place don't cause or explain anything, all they do it help us express something).

Availability: it's not clear how we could have epistemic access to MBOs unless they were (crudely) created rather than discovered (it would be difficult to explain how we know

about the rock and hard place if there really were such things, for no one has seen them).

Necessity and A Priori: that something exists is the paradigm case of a contingent, a posteriori fact. Mathematical statements, by contrast, are necessary and a priori, which is evidence that their apparent ontological commitments e.g. “there are infinitely many primes” are merely apparent.

The more of these features something has, the more likely it is that it’s an MBO. Before looking at how many of these features times have, I want to comment on three of them. First, though impatience is about, well, impatience, Yablo’s definition involves the notion of indifference too. The rough idea here, I take it, is that we’re indifferent to the suggestion that an MBO doesn’t exist because this in no way troubles us, it doesn’t make us revise our beliefs or attitudes. Sometimes, though, we’re indifferent to the suggestion that something might not exist for another reason, namely, we’re completely convinced that it exists. For example, the suggestion that we might not be morally responsible for anything doesn’t trouble me, because it’s completely obvious to me that we are sometimes morally responsible for the things we do. My indifference to the suggestion that no one is ever morally responsible is evidence of my high credence in moral responsibility, not a belief that it’s an object of make-belief. This isn’t the case for many MBOs, like the cats and dogs raining from the sky. Whether there are or aren’t any domesticated organisms accelerating towards the ground changes nothing. If it’s raining, I’ll wear a coat. I’ll wear a coat regardless of the presence or absence of downwardly accelerating domesticated organisms. So that’s the kind of indifference relevant to whether something is an MBO. Indifference will count as evidence that MBOs don’t exist only if the indifference is present for reasons other than that we’re convinced that MBOs exist.

Moving on, irrelevance and disconnectedness are connected – if something has Irrelevance then it has Disconnectedness. If something does nothing other than expressive work then it doesn’t cause or explain anything either. This makes figuring out which things exhibit which features easier. It also means that something’s having disconnectedness is no extra evidence of something’s being an MBO over and above it’s having Irrelevance.

So, let’s consider each of Yablo’s MBO features to see whether times have them.

Paraphrasability: I argued above that times have paraphrasability, that is, that sentences about times have genuine paraphrases.

Impatience: Suppose someone informs me that the meeting is at two and I say “Well, actually, there aren’t any times, and so *ipso facto* there is no fact of the matter as to when the meeting is”. My (unlucky) conversation partner will likely become impatient with me. They will also be indifferent - they’ll still go to the meeting on time. But *why* will they be indifferent? Is it because nothing - including the meeting and reason for attending it - hangs on the existence of times, or simply because they are utterly convinced that times exist? I’m willing to bet the former. I don’t think the folk are convinced that times are part of the ontological inventory of the world. So, times probably have impatience.

Translucency: it’s unclear whether times have translucency, partly because Yablo’s definition of translucency has two parts. First, when I say that the time is two o’clock, do the folk “see-through” my statement, which is apparently about times, to what I really mean? It’s hard to say. I think I “see through”, but only when I’m thinking about paraphrasing time talk. I don’t think the folk do this. At least, they would probably struggle to articulate the literal content behind time talk (assuming it’s figurative). But, second, the folk probably don’t notice that, *taken literally*, this commits us to times. Thus they do not, in Yablo’s words, “register the as-if reference” to times (2001: 89).

Insubstantiality: there doesn’t seem to be more to four o’clock than what our concept of it requires, which is just that it’s *when things happen* e.g. tea drinking. This makes it thin or insubstantial. However, unlike other MBOs (the dumps she’s down in, the apple which doesn’t fall far from the tree) there *are* metaphysical accounts of times (see Meyer 2011). And this gives some credence to thinking that times do have a substantial nature. So, it seems that insubstantiality is a matter of degree: the ordinary concept of times is relatively insubstantial, but questions about their hidden nature aren’t silly in the way that questions about the dumps or the apple and tree are. So times have a little insubstantiality.

Indeterminacy: times don’t have *Indeterminacy:* the year 2025 is determinately non-identical to the year 2000 (different events happened in them); the present hour is determinately non-identical to the previous one (I wasn’t typing then, I am now).

Silliness: taking time talk literally does invite silly questions e.g. “you said you had ten minutes until you need to leave, where were you keeping those ten minutes?”, or “Can I take a moment of your time?” answered with “Sorry, I left my moments at home.”⁹⁷ To be clear, it’s not merely the ability to ask silly questions about Fs that’s evidence of them being MBOs. Clearly, we can ask silly questions about things that obviously exist (do chairs like music?). The point is that taking chair talk literally doesn’t *invite* such questions; you already have to be in a silly mood to ask them. The fact that you take chair talk literally (the chair is real, and it really is brown) doesn’t itself make you ask silly questions. So, times do have silliness.

Expressiveness: the sentence “there’s plenty of time” helps us express a more complex sentence about in how many seconds we ought to be somewhere or do something. Moreover, if the paraphrases I offered above are genuine, then mention of times helps us express complex information about the relative positions and orientations of the Sun and Earth. So times have expressiveness.

Irrelevance: whether times have irrelevance depends on whether times are indispensable to good explanations of anything. In the previous section I argued that quantification over and reference to times is dispensable to our best scientific theories, which is some evidence for the claim that they’re dispensable to scientific explanations either.

Disconnectedness: as above, whether times have this feature depends on the success of fictionalism and the paraphrase strategy. I’ve argued that there’s no reason to postulate times in our philosophical, physical, or semantic theories, which is just to argue that times have this property. But the figuralist has no independent argument for this, and so figuralism doesn’t gain any advantage here over fictionalism or the paraphrase strategy.

Availability: how would we know about times if they existed? This of course depends on what times would be like if there were any. If they would be abstract, then times realism faces the same problem that mathematical platonism does. If times would be maximal spaces, or collections of events, or sentences, then it’s not nearly so hard to see how we

⁹⁷ Thanks to Jonathan Tallant for bringing this to my attention.

could come to know about them, because they'd be concrete. It's hard to say, then, whether times have *availability*.

Let's round these features up. Times very likely have *Impatience* and *Silliness*. They also probably have *Paraphrasability*, *Insubstantiality*, *Expressiveness*, *Irrelevance*, *Disconnectedness*. However, the arguments for thinking this are effectively the arguments given in earlier sections: that time talk can be paraphrased, and that times fictionalism (at least about physical and semantic theories) is true. It's unclear whether times have *Translucency* or *Availability*. Finally, times don't have *Indeterminacy*. So, times definitely have two of Yablo's MBO properties, and might have seven if fictionalism and/or the paraphrase strategy are plausible. In conclusion, then, it's hard to motivate times figuralism independently from fictionalism and the paraphrase strategy. There's little reason to favour it over alternatives.

5.6 Which Type-A Strategy?

To recap, type-A strategies accept premise (1) of the argument, the neo-Quinean criterion of ontological commitment, according to which we're ontologically committed to whatever a true and literal sentence quantifies over or refers to. Which type-A strategy should the non-extensive presentist adopt? This is hard to evaluate for one main reason. There are two subcategories of type-A strategies: those which deny that there are any *true* sentences quantifying over or referring to times, and those which accept that some such sentences are *true* but deny that they're literal. The fictionalist (and quasi-truther) deny the truth of the sentences, whereas the paraphraser accepts their truth and denies their literality. How should we choose between these options? Is time talk false but true enough, or genuinely true but not entirely literal? My suggestion here is the following. We should expect time talk in theoretical discourse to be literal. Physical and semantic time talk is not a figure of speech. For physics and semantics, then, the most plausible type-A strategy is fictionalism. By contrast, we should have a general presumption that the things the folk ordinarily say are true; we don't adopt a general attitude of scepticism about ordinary discourse. But we should also expect that much folk discourse is not entirely literal. So, the most plausible type-A strategy for ordinary time talk is the paraphrase strategy, coupled with the quasi-

truth account of temporally embedded *when*-clauses. In conclusion, then, non-extensive presentists attracted to type-A strategies should adopt fictionalism for physical and semantic time talk, and the paraphrase strategy (plus quasi-truth) for ordinary time talk.

6. The Quantification-Reference Indispensability Arguments for Times: Type-B Strategies

In this chapter I'll develop four type-B strategies in response to the Quantification Reference indispensability argument. To recap, type-B strategies deny premise (1), the neo-Quinean criterion of ontological commitment, according to which we are ontologically committed to whatever true and literal sentences quantify over or refer to. They can thereby allow that sentences that quantify over or refer to times are both literal and true and yet deny that we are thereby ontologically committed to times. I'll argue that non-extensive presentists inclined towards type-B strategies should adopt a free logic for referential time talk, and a Craneian view of quantification for quantificational time talk.

6.1 Substitutional Quantification

The first type-B strategy is substitutional quantification, an alternative semantics for first order quantifiers. It has been defended as a plausible account of quantificational talk in various discourses on the grounds that it allows us to avoid unwanted ontological commitments (Barcan Marcus 1972; Gottlieb 1980). Standardly, first-order quantifiers have an objectual semantics:

$\mathcal{M} \models \forall x Fx$ iff for all objects, x , in the domain, D , Fx

$\mathcal{M} \models \exists x Fx$ iff for at least one object, x , in the domain, D , Fx .

A universal sentence is true if all the objects in the domain have the property, and the existential sentence is true if at least one object the quantifier ranges over has the property. A substitutional semantics differs as follows:

$\mathcal{M} \models \forall x Fx$ iff all substitution instances of "F..." are true

$\mathcal{M} \models \exists x Fx$ iff at least one substitution instance of "F..." is true.

Here the variables are taken as dummy letters to be swapped out with substitution instances, that is, constants or singular terms. Thus, "there is a cat" is true iff there is a singular term such that subbing it into the expression yields a true sentence: "Ava is a cat".

The substitutional semantics is usually taken to give only the truth-conditions for quantificational sentences, not their meaning (Craig 2014: 554). Taken objecturally, first-order quantifiers are often thought to carry ontological commitment to the things they range over because the right-hand side of the biconditionals refer to a domain of *objects*. The semantics says, in effect, that such-and-such sentences are true only if there are some things. Given a substitutional semantics, however, first-order quantifiers are usually thought not to carry ontological commitment, since there is no domain, and hence no *things*, mentioned in the right-hand side of the biconditional. As far as I can see, the main motivation for the substitutional semantics here is simply ontological parsimony.

6.1.1 Not Enough Substitution Instances

The principal objection to substitutional quantification is that it can't account for truths about unnamed things. There are many individual things, like electrons that no one has observed, which have no names. Still, many things are true of them. But since the truth conditions for substitutional quantificational sentences require that there be the relevant substitution instance, no such sentences about unnamed things can be true, because to lack a name is to lack a substitution instance. Both Sellars and Craig think this problem can be solved by stating the truth conditions for substitutional quantification relative to a language in which everything is named. Sellars calls this the language of omniscience (1948: 604-605).⁹⁸

Craig postulates that God may have such a language (2017: 227), quoting the Psalmist, who declares God to have named every star (Psalm 147:4, *New Revised Standard Version* 2017). There are three problems with this response. First, this response is not available to non-Jews and non-Christians. Second, the Psalmist only says that God names stars, and most things aren't stars. Third, while I'm happy to grant the general reliability of the Hebrew Bible to tell us about God's activities, the Psalms are *songs*, and we should be careful about taking songs literally. In fact, stars are often metaphors for the descendants of Abram (Gen 15:5,

⁹⁸ Though, to be omniscient is not to have named everything. If God knows propositions without having to formulate them in a sentence of a divine language, then being omniscient needn't involve naming anything at all.

22:17, 26:4, 32:13; Deut 1:10, 10:22, 28:62; 1 Chr 27:23; Neh 9:23). Of course, Hebrew Bible references to stars are sometimes literal (Job 9:7, 22:12; Ps 8:3), but looking at the context of Psalm 147:4 makes the metaphorical use more likely:

Praise the LORD! How good it is to sing praises to our God, for he is gracious, and a song of praise is fitting. ²The LORD builds up Jerusalem; he gathers the outcasts of Israel. ³He heals the brokenhearted and binds up their wounds. ⁴He determines the number of the stars; he gives to all of them their names. ⁵Great is our Lord and abundant in power; his understanding is beyond measure. ⁶The LORD lifts up the downtrodden; he casts the wicked to the ground. (Ps 147: 1-6).

Plausibly, the Psalmist imagines God to have named all Israel, His chosen people, not stars. But even this is something of a metaphor, for clearly people are named by their parents, not God. Plausibly, the idea of naming people conveys that God is personal and loving, that He is deeply invested in the people with whom He has made a covenant. Exegesis aside, clearly God *can* name anything He likes, but for Craig's response to succeed, God actually needs to have done this. The truth conditions for substitutional quantification don't say that a quantificational sentence is true if it *could* have a substitution instance, they require that there actually be one. And we simply have no idea whether God has named everything. Does He need to? Probably not. Does He want to? I don't know.⁹⁹ Even if God has named everything (or everything is its own name), it remains the case that English speakers have not, and so a substitutional interpretation of English quantifiers entails that English speakers cannot quantify over unnamed things. This is surely false: simply by using a phrase like "absolutely everything whatsoever" I quantify over things which are unnamed, and therefore don't have a substitution instance, in English. If English speakers can do this, and it seems they can, then we should reject a substitutional semantics for natural language quantification.¹⁰⁰ The basic problem remains: truth is one thing, having a name is another.

⁹⁹ If the entire Lewisian array of possible worlds exists then God, or one of his counterparts, has named everything, because it's possible He has. But I suspect that the conjunction of theism and Lewisian modal realism isn't plausible by most people's lights, including theists and Lewisian modal realists.

¹⁰⁰ This objection stands even if there is a Lagadonian language, in which everything is named because everything is its own name (Lewis 1986: 145). And it stands even if we allow merely possible substitution instances to make quantificational sentences true (Williamson 2013: 256).

We should reject a substitutional semantics as an analysis of natural language quantifiers for this reason.

6.1.2 Not So Parsimonious

The second problem with substitutional semantics as a response to the indispensability argument is that it doesn't seem so ontologically parsimonious after all. The reason for thinking that objectual quantificational sentences carry ontological commitment is that their semantics *mentions some stuff*, namely, objects in a domain. But, by parity of reasoning, the substitutional quantifiers should also carry ontological commitment, not to things in a domain, but to *substitution instances*, because the semantics mentions them (van Inwagen 2004; Lehman 1979). Why would proponents of substitutional semantics think otherwise? Perhaps we are misled by the familiar distinction between language and the world, which encourages us to imagine that worldly things count as ontological commitments, but linguistic things don't. But are linguistic things not out there in the world? If they aren't, we should at least want an argument for thinking this, and I can't think of one.

You might object that ontological commitment to substitution instances occurs only if the metalanguage quantifiers e.g. "at least one substitution instance" are devices of ontological commitment. I'm willing to grant that the metalanguage quantifiers don't carry ontological commitments. But this move runs the risk of undercutting the motivation for substitutional semantics, for why can't we say the same about the objectual semantics? That is, if the language in which the objectual semantics is stated has ontologically neutral quantifiers e.g. "for at least one object", then objectual semantics won't saddle us with ontological commitments (Azzouni 2004: 55). The upshot of this is that substitutional quantification is ontologically non-committing iff objectual quantification is also non-committing. If both are so committing, then we've simply traded one ontological kind for another: times for substitution instances. non-extensive presentists would do better to hold on to their gain in ontological parsimony and hence reject any substitution instances in their ontology.

So, this type-B strategy faces a dilemma: accept substitution instances into one's ontology, thereby undercutting the non-extensive presentist's gain in ontological parsimony, or reject

that the metalanguage will incur ontological commitment, thereby undercutting the motivation for accepting the semantics in the first place to times. Moreover, the basic problem with substitutional quantification remains: truths need not be about named things. non-extensive presentists should look elsewhere for a type-B strategy in response to the indispensability argument.

6.2 Neutralism

The second type-B strategy is neutralism, the view that quantifiers and singular terms aren't simply by virtue of their meaning ontologically committing, that is, the meaning of a sentence underdetermines its ontological commitments. Strictly speaking, neutralism is neutral with respect to typical metaphysical questions of the form "are there Fs?", but it's natural for anti-realists about Fs to be neutralists more so than realists. Since neutralism is a perfectly general thesis, it entails that time talk is not ontologically non-committing (or at least it's not ontologically committing in virtue of its meaning alone). In what follows, I'll look the main motivations for neutralism and discuss three objections to neutralism.

Why be a neutralist? Azzouni's answer is that there's evidence from ordinary language that much of what we say is ontologically non-committing. Azzouni's examples include sentences with nouns, proper nouns, and quantificational phrases, which intuitively do not pick out any real objects (2010: 77-84). Here are some of Azzouni's own examples (renumbered):

- i. No mouse—not Mickey Mouse, not Minnie Mouse—has ever been depicted in movies as a plumber, although there are several that have been depicted as pirates.
- ii. Most gods are depicted in mythology as having superhuman powers.
- iii. There are many ways of getting around this.
- iv. Every attempt has been futile.

According to Azzouni, when people say these things they "help themselves to grammatical resources" (2010: 78), including referring terms and quantifiers, without meaning to commit themselves to the existence of the things referred to or quantified over – Mickey Mouse, gods, ways, and attempts. I don't know what to say about examples like (iii) and (iv) – do the

folk believe in ways and attempts? It's not exactly easy to find out. Suppose you and a friend are trying to fit a new sofa through a door, and you ask them "is there a way to do this?". All going well, they'll respond affirmatively. If, however, you ask them "is there really such a *thing* as a way to do this, like, an entity that really exists?", what will they say? I, for one, am not sure. Anecdotally speaking, when you ask the folk these things, they tend to be unsure. They sometimes try to clarify e.g. "what do you mean by 'exist'?". But they don't confidently assert that talk about ways and attempts is a mere manner of speech. So, I think Azzouni's judgement here is too hasty – we don't know whether the folk genuinely believe in ways or attempts.

Examples (i) and (ii) are clearer. Presumably, the folk do not believe in Mickey Mouse or the gods of *every* mythology. Azzouni takes these at face value: they genuinely refer and quantify over things (the apparent reference and quantification is not merely a misleading surface-level feature of the grammar). This doesn't yet count as evidence for neutralism, however. If (i)-(iv) aren't literal, if they're figurative in any way, then they support figuralism, not neutralism. Now, perhaps there's some grounds for thinking that talk about ways and attempts is non-literal: it's paraphrasable, and so not causally or explanatorily indispensable, and it invites silly questions ("where in space is the way to do this?").

Examples (i) and (ii) seem more clearly literal. After all, the occurrence of "mouse" in (i) isn't a metaphor for anything, it's not a stand in for some other thing. The word is being used in its ordinary sense. Similarly, the word "god" is not being used as a metaphor (for an impressive human, or the weather) it's being used in its ordinary sense to talk about powerful supernatural beings. So, sentences (i) and (ii) seem to be both true and literal yet not ontologically committing. Thus, there is some evidence for neutralism.

Craig gives a similar argument for neutralism. He thinks that it would be "fantastic" (in the sense of "fantastical") to think that all true descriptions carry ontological commitment to the things they're about (2017: 449). Consider some ordinary language examples:

- A lack of respect for the elderly
- A shorter train journey from Nottingham to London
- A hope that people will come to the Church service
- The tension in the room

- The sense that someone is watching you
- Her honesty
- His love of *Star Wars*
- Their sake

The neutralist takes the grammatical form of such expressions at face value: they really do quantify over and refer to hopes, lacks, tensions, and sakes, but since there plausibly aren't such things, quantification and reference must (sometimes) be ontological non-committing. Other philosophers, who haven't explicitly endorsed neutralism make similar remarks. Dummett argues similarly (1991: 231), quoting a passage from an issue of the *London Daily* to illustrate that a great many singular terms in ordinary language do not really have any things or objects as their referents:

Margaret Thatcher yesterday gave her starkest warning yet about the dangers of global warming caused by air pollution. But she did not announce any new policy to combat climate change and sea level rises, apart from a qualified commitment that Britain would stabilize its emissions of carbon dioxide—the most important 'greenhouse' gas altering the climate—by the year 2005. Britain would only fulfill that commitment if other, unspecified nations promised similar restraint.

Dummett thinks that the only nouns or noun phrases in this passage which pick out some really existing thing in the world are "Margaret Thatcher", "air", and "sea", and yet the passage is not shot-through with falsehood (at least not on account of theories of ontological commitment).

What should we make of these arguments? Of course, the type-A theorist (who accepts premise (1), the neo-Quinean criterion of ontological commitment) can deny there are hopes, lacks, ways, and gods, by paraphrasing them away. The problem with this, as the neutralist sees it, is that neo-Quineans will have to provide a general procedure for paraphrasing problematic sentences which eliminates all quantification over and reference to the relevant entities (Craig 2017: 427). Van Inwagen, a neo-Quinean, says that he cannot do this, but thinks that it should be at least possible (1990: 108). Isn't this all the neo-Quinean needs? Like van Inwagen, they can make it seem plausible that there are paraphrases of *all* the relevant sentences by offering *some*, and, perhaps, by arguing that

none of the sentences which have yet to be paraphrased are relevantly different with respect to their being able to be paraphrased, so that even paraphrasing only a small number of such sentences will be good evidence that all such sentences have paraphrases. Neo-Quineans needn't fill journals and books with paraphrases to convince us that they aren't committed to apparently fantastical things. I won't dive into the paraphrastic weeds again, but suffice to say that it's unclear whether the neutralist has the best way to avoid ontological commitment to problematical entities like hopes, lacks, tensions, ways, attempts, and fictional characters. The upshot of this is that Azzouni, Craig (and Dummett's) arguments give us only modest reason to adopt neutralism.

6.2.1 How do Neutralists Commit to Anything?

Neutralists don't deny that ontological commitment *sometimes* occurs. And rightly so, for much of what we say is obviously ontologically committing. Not just in the ontology room, when we deliberately commit ourselves (for better or worse) to properties, numbers, and the like, but also outside, when we say, "there's food in the fridge" or "my phone's not working". So, under what conditions does ontological commitment happen, according to the neutralist? Azzouni gives three answers: when the speaker uses a certain tone of voice; when they add words like "really"; and by contrastive use of "there is/are" and "exist" (Azzouni 2007: 214; 2010: 82-83). Craig calls these "rhetorical indicators" (Craig 2017: 427).

Consider two examples to illustrate how these rhetorical indicators work. First, if you were to explain to a non-philosopher the view that fictional entities exist you might say something like "some philosophers think that there *really are* fictional entities" (imagine the emphasis as reflected in the tone of voice). The emphasis of tone on "really are" helps to indicate to the philosophically uninitiated that you're not making the obvious and mundane claim that there are stories with characters in them, but rather the controversial metaphysical thesis that fictional entities exist.¹⁰¹ Second, another way of explaining the same view, and distinguishing it from the obvious and mundane claim that people make up characters, is to use "exist" at the end of the sentence rather than "there is/are" at the

¹⁰¹ Of course, some think that these sentences express the same proposition - that the apparently mundane claim entails the controversial metaphysical thesis - but the neutralist doesn't.

beginning or middle as in “some philosophers think that fictional entities exist”. Azzouni adds, however, that the context in which such sentences are said is relevant to whether they are ontologically committing (2010: 90), and so none of the above rhetorical infallibly indicate ontological commitment. This can be seen in the above two examples. In the first, the context of utterance for such sentences is a philosophical conversation, and so listeners are primed to interpret the sentence as a controversial thesis about metaphysics, rather than the obvious claim that people make up characters for stories. With the second example, some conversational contexts can prime listeners to interpret an emphasis on “really” as indicating the speaker’s *sincerity*, rather than as a device of ontological commitment, e.g. “there *really are* Jedi with yellow lightsabers, I’m not making it up” (imagine a heated debate about the canon of *Star Wars*). In this context, the speaker doesn’t mean to commit themselves to Jedi realism. All they wish to convey is that some Jedi have yellow lightsabers in *Star Wars*. So, the neutralist accepts that we do sometimes ontologically commit ourselves to things, but only by indicating this in one way or another, rather than by the semantic meanings of the words we utter.

So far so good, but the above rhetorical indications of ontological commitment aren’t always present in ordinary speech, even in cases which seem involve ontological commitment.¹⁰² If, in ordinary circumstances, I sincerely utter the true sentence

(S) my cat Ava is in the garden

Then I’m ontologically commitment to a cat and a garden. This remains the case even if I don’t say something like “there *really is* a cat in the garden out there *in reality!*”. So, S (when true and uttered in that context) carries ontological commitments even in the absence of the neutralist’s rhetorical indicators. Why? Without giving a full theory of ontological commitment, the following things plausibly partially explain why S has ontological commitments:

(i) S is uttered in a non-pretense context (I’m not roleplaying),

and

(ii) “Ava” and “the garden” refer to Ava (my cat) and a garden.

¹⁰² Asay (2010: 307) also notes this.

Condition (i) explains why S is ontologically committing – if I *was* engaged in pretense when uttering S, then I *would not* be committed to there being a cat in the garden, any more than I’m committed to Jedi when I talk about *Star Wars*. Condition (ii) explains why S is ontologically committing to *Ava* and *a garden* in particular. I’m not just ontologically committed to any old thing when I utter S, I’m ontologically committed to the referents of the singular terms.

As it stands, then, Azzouni’s account of when ontological commitment occurs – only in the presence of rhetorical indicators – is mistaken. Are conditions (i) and (ii) consistent with neutralism as such, apart from Azzouni’s account? I think not. If (ii) explains why S has the ontological commitments it has, then, at least sometimes, facts about what words refer to partially fix the ontological commitments of sentences containing those referring words. In cases where the meaning of a singular term is its referent (and it’s plausible that the meaning of “Ava” is simply Ava), it follows that singular terms are ontologically committing *partially* in virtue of their meaning - this is precisely what the neutralist denies.

An amended version of neutralism might say that singular terms (and quantification) are ontologically committing only when either the conversational context is not pretense or when rhetorical indicators are present. This, however, collapses neutralism into pretense theory, according to which sentences of a discourse are false but are to be imagined as true (Walton 1990: 39). Pretense theory is a type-A strategy; we avoid ontological commitment to the problematic entities only by denying the literal truth of the sentences in question. non-extensive presentists are better-off not having to mix type-A and -B strategies; the more diverse strategies you pull on to respond to the objection, the more *ad hoc* your response.

6.2.2 Existing and Really Existing

The next objection is due to Asay (2010), who argues that neutralism makes ordinary existential statements unintelligible. The objection is targeted at neutralism plus another of

Azzouni's views - that ontological commitments come about by use of an existence predicate - but the objection is largely independent of this matter. I will present the objection omitting this detail.

Asay asks us to consider two sentences:

R: there really is no phlogiston

R': there is no phlogiston.¹⁰³

R contains one of the neutralist's rhetorical indicators. Imagine giving a philosophy of science lecture in which you inform the students that there *really is* [tone emphasis] no phlogiston. By emphasising "really is" you signal a negative ontological commitment. Sentence R', however, has no rhetorical indicator. It's supposed to be ontologically neutral, in line with the neutralist's claim that reference is not (generally) ontologically committing. Asay's objection is this: what does R' say, if not that phlogiston isn't part of the ontological inventory of the world? How is its meaning different to R? He brings out this difficulty by asking us to imagine what the world would have to be like in order for each sentence to be true. It's easy to imagine R being false – imagine that there is no fiery substance released during combustion. It's easy to imagine, at least if you have some rudimentary understanding of heat as kinetic energy. By contrast, it's less clear what the world would have to be like for R' to be true. Asay confesses that he cannot imagine what this would be like (2010: 307).

I agree that, initially, I find it harder to imagine a world in which R' is the case. The source of Asay's difficulty, it seems, is that two worlds which differ only in whether R' is true do not differ in which things exist in them. Asay spells this out as a worry about truth's supervenience on being (TSB). I don't think neutralists should be moved by violating TSB. They reject the general Quinean meta-ontological spirit, they reject the general pattern of argument according to which various sentences can't be true because nothing in the world accounts for their truth. That's just not how the neutralist sees things. The more pressing issue is to explain what it would be for R' to be true, and how that's different from R being true. My suggestion to the neutralist is as follows: a world in which R' is true is a world in

¹⁰³ This is a simplified presentation of Asay's exact argument. Nothing hangs on this.

which phlogiston is not a topic of conversation or object of thought. For example, before humans created cars, not only were there not any cars, they weren't even a topic of conversation, nor objects of our thoughts (of course, there was a small period of time when they were objects of thought but none had been made). For there to be cars in the ontologically neutral sense is just for cars to be something we can talk and think about. Back to phlogiston, then, a world in which R' is true is one in which no one has even so much as postulated phlogiston. Our world was like that prior to the 18th century. So, sentences like R' are intelligible, and can be true. It's therefore not the case, then, that neutralism makes ordinary existential statements unintelligible.

6.2.3 A Neutralist Contradiction

The final objection to neutralism is as follows. Neutralists accept the truth of sentences like

iii. There are Jedi

when the quantifier is intended to be ontologically *non*-committing. They also accept sentences like

iv. There aren't Jedi

when the quantifier *is* intended to be ontologically committing. But,

v. There are Jedi and there aren't Jedi

follows from (iii) and (iv) and is false. Thus, neutralism entails a contradiction.¹⁰⁴

I can think of two responses on behalf of the neutralist. First response: the first occurrence of "there are" in (v) is ontologically committing, but the second occurrence isn't. This, however, does nothing to block the inference to a contradiction. If each occurrence of "there are" has the same meaning, then (v) is a contradiction. The second response: quantifiers are ambiguous between two meanings. On one meaning, "there are/is" isn't

¹⁰⁴ Schaffer mentions this in passing, charging neutralists with being committed to an "unfathomable conjunction", namely, "numbers do not exist, and there are numbers" (2009: 358). If he means that it's unfathomable because a contradiction, then he is assuming that neutralism entails that "there is/are" and "exist" have the same meaning, a thesis Azzouni never explicitly endorses.

ontologically committing, which is the meaning expressed in (iii). On the other meaning, “there are/is” is ontologically committing, which is the meaning expressed in (iv) (though (iv) isn’t ontologically committing, because it’s a negative existential). The problem with this second response is that the claim that quantifiers have more than one meaning is no part of the neutralist’s view, at least as Azzouni has it. In fact, he apparently denies it; he calls the view that quantifiers are ambiguous “semantic underspecification” and sets his view up in contrast to it (2007: 206). Moreover, semantic underspecification conflicts with the neutralist’s claim that no expression carries ontological commitment merely in virtue of its meaning. If, on one meaning, “there are/is” is ontologically committing, then it looks like meaning fixes ontological commitments, but neutralism says that no expression is ontologically committing simply by virtue of its meaning. So, wholly apart from presentism-related reasons, neutralism is not a plausible version of times anti-realism, because it entails a contradiction.

To sum up this section: I’ve argued that the motivation for neutralism is weak, since there’s no reason to think that putatively ontologically non-committing sentences (about lacks, sakes, and gods) can’t be given a paraphrase treatment. I’ve also argued that neutralism faces two strong objections: it’s incompatible with the plausible thesis that the meanings of words sometimes partially fix ontological commitment, and it entails a contradiction. non-extensive presentists attracted to type-B strategies should look elsewhere for an anti-realist account of time talk.

6.3 Free Logic

The third type-B strategy is to adopt a free semantics for discourses in which time talk occurs. The semantics of a logic is free if some singular terms of the model don’t refer to anything in the domain. There are two ways for a singular term to do this: refer to something *outside* the domain, or not refer to anything at all. A key consequence of free semantics is that the inference rules existential generalisation

$$A \vdash \exists x A(t/x)$$

and universal instantiation

$$\forall xA \vdash A(t//x)$$

are not unrestrictedly valid. (A is a formula, and $A(t/x)$ is a formula where every occurrence of x is replaced by constant t , the $//$ signifies another such formula, distinct from $A(t/x)$.) Thus, in a free logic, “ x is a time” does not entail “there is a time”. In what follows I’ll mostly be concerned only with existential generalisation.

Free logics can have one of three different semantics: negative, positive, and neutral (Nolt 2021).¹⁰⁵ I will restrict my discussion to positive free semantics because it’s a more natural fit with the view that time talk involving singular terms is true but ontologically non-committing. Positive semantics come in two types. Some require each singular term to either denote something in the domain or else nothing at all. Dual domain semantics allow singular terms to denote (and predicates to be satisfied by) things, even if they aren’t members of the domain (Nolt 2021). These things are instead members of an outer domain. In what follows, I will restrict my discussion to dual-domain semantics because they are simpler. Drawing these together, a positive, dual-domain semantics for a language L , is a triple $\langle D, D_o, I \rangle$, where D is an ‘inner’ domain, D_o a non-empty outer domain, and I an interpretation function which assigns constants of L to D_o . D may be treated as a subset of D_o or as disjoint from it. Members of D and D_o are often distinguished by use of an existence predicate, “ $E!$ ”, the purpose of which is to express ontological commitment. Everything whatsoever is a member of both domains, but only objects in the inner domain satisfy the predicate. In other words, inner domain things *exist!*, but mere outer domain dwellers don’t. This predicate allows us to restore weaker, restricted versions of existential generalisation and universal instantiation (respectively):

$$A, E!t \vdash \exists xA(t/x)$$

$$\forall xA, E!t \vdash A(t//x).$$

Hence, if x is a time, and x *exists!*, then there is a time.

¹⁰⁵ In a negative semantics all atomic formulas containing empty singular terms are false, and neutral semantics requires that all empty-termed formulas not of a certain form be truth-valueless. In a positive semantics empty-termed atomic formulas can be true. Negative semantics is a natural fit with fictionalism and quasi-truth, since all of these views deny that time talk is true.

6.3.1 Free Logic and Natural Language

A free semantics is, of course, a semantics for a formal language. Some of the time talk considered thus far occurs in a formal language, whether mathematical (in physics) or logical (semantics), but other time talk occurs in natural language. How, then, does free logic provide us with an account of this natural language time talk? I'll sketch a picture of how the formal, free logical language and natural language relate to each other, in order to show how this can be deployed as a times anti-realist account of time talk. The basic idea is this: sentences of a natural language containing quantification over or reference to times can be regimented into a first-order logical language with a positive, dual domain free semantics. In particular, the referential expressions in natural language are regimented as singular terms, which refer only to things in the outer domain, and therefore don't *exist!*, thereby avoiding any ontological commitment to them. For example, the natural language sentence

Dinner is at 18:00

gets regimented as

$\exists x \exists y (Dx \wedge y = t \wedge Rxt)$.

In semi-formal English: there is a dinner, and a particular time, 18:00, such that the dinner is at 18:00. The sentence doesn't imply that 18:00 doesn't *exist!*, it just doesn't imply that it does. The domain of the second quantifier is the *outer* domain, and since the free semantics is a positive one, both the first-order and natural language sentence can be true. That should be enough to illustrate the general free logic strategy.

In the following sections, I'll argue that presentists (of any stripe) have independent reasons to adopt a positive, dual-domain semantics for any logic used for regimenting natural language, for two reasons. This makes an appeal to free logic in response to the indispensability argument independently plausible in a way not common to other responses to the indispensability argument.

6.3.2 Escaping Contingentism

The first reason presentists should adopt free semantics is that it's the best response to Williamson's argument for necessitism, which presentists should reject. Presentists, like everyone else, should think that things change. Given that only present things exist, it follows that what exists/is present changes. This implies:

Contingentism: sometimes, something is sometimes nothing.

Williamson (2013: 39) argues that contingentists should adopt a free semantics, since this is the most plausible response to his argument for the negation of Contingentism:

Necessitism: Necessarily, everything is necessarily something.

The proof of necessitism requires the validity of the converse Barcan formula, and so contingentists, and hence presentists, must reject a step of Barcan Marcus' (1946) proof of the formula. Here is Williamson's proof of necessitism, with the premises renamed (2013: 37-38):

CBF) $\exists x \Diamond A \rightarrow \Diamond \exists x A$

- 1) $\exists x \Diamond \neg \exists y x=y \rightarrow \Diamond \exists x \neg \exists y x=y$
- 2) $\neg \Diamond \exists x \neg \exists y x=y$
- 3) $\neg \exists x \Diamond \neg \exists y x=y$
- 4) $\forall x \Box \exists y x=y$

NNE) $\Box \forall x \Box \exists y x=y$

The conclusion, NNE, is the necessary necessity of being i.e. the necessitist's claim that necessarily everything is necessarily something. CBF is the converse Barcan formula, and Premise (1) is an instance of CBF. Premise (2) is the negation of the consequent of (1), and so (3) follows by modus tollens. Premise (4) follows from (3) by the interdefinability of quantifiers and modal operators.

So, contingentists (and presentists) must reject either CBF or premise (2). The latter option is not plausible. Premise (2) effectively says: the following is not possible: there is a thing such that there is nothing with which it is identical. In other words: it is impossible that there is something which is nothing. This seems to be true. So contingentists are better off rejecting a step of Barcan Marcus' (1946a) proof of CBF. As Williamson notes, her proof

includes the claim that $\neg\exists y x=y$ strictly implies $\exists x \neg\exists y x=y$. Williamson takes this claim as an implicit universal generalisation:

$$5) \forall x \Box(\neg\exists y x=y \rightarrow \exists x \neg\exists y x=y).$$

In English: everything is such that, necessarily, if there isn't something identical to it, then there is something such that nothing is identical to it. But contingentists will reject (5) because they will reject many of its instances e.g. if Tokyo tower hadn't existed, there would *not* have been something such that nothing is identical to it. Rather, there simply wouldn't have been Tokyo tower, end of story. This commits the contingentist to rejecting either $\Box(\neg\exists y x=y \rightarrow \exists x \neg\exists y x=y)$ or $\neg\exists y x=y \rightarrow \exists x \neg\exists y x=y$. To reject the former is to reject the necessitation rule:

$$\text{Necessitation: if } \vdash A \text{ then } \vdash \Box A.$$

To reject the latter is to reject an instance of, and hence the validity of, existential generalisation:

$$\text{Existential Generalisation: } A \rightarrow \exists x A$$

Let's consider these in order. Rejecting necessitation requires excluding proper names from the logic (which in ours and Williamson's case is S5) which is problematical for two reasons. First, it makes for an impoverished logic. This wouldn't be so bad all by itself, for, as explained above, the presentist should want to preserve the truth of *natural* language sentences about the past (and perhaps future). But the project of showing that such sentences are consistent with presentism involves analysing them in a (semi-)formal language, as evidenced by the literature on presentism and its many objections (Sider 1999, Crisp 2007, Markosian 2004), and the most natural way to render proper names in a formal language is with singular terms. Thus, excluding proper names from the relevant logic commits us to denying the truth of all natural language sentences containing proper names for non-present things, such as "Zeno was a philosopher" - this is theoretically costly.

Secondly, it's hard to see how something could fail to be necessary given that it's a theorem of the correct logic. Theorems are provable from no (non-logical) assumptions, in which case the truth of any (non-logical) proposition cannot change the fact that it can be proved, and since provable things are true, no truth of any (non-logical) proposition can change the fact

that it's true, which is just to say that it's a necessary truth. So, contingentists should reject that $\neg\exists y x=y$ implies $\exists x \neg\exists y x=y$ and therefore reject the validity of Existential generalisation. This commits contingentists, and therefore presentists, to a free semantics for the logic in which natural language time talk is regimented.

6.3.3 Escaping Permanentism

The second reason presentists should adopt free logic is that they must reject the temporal version(s) of the Barcan formula, and the best response to the proof of the temporal Barcan formula(s) is, again, one which involves a free semantics for the logic in question. Here's why presentists must reject the temporal version(s) of the Barcan formula. Some presentists (Crisp 2004) take sentences of the form "x was F" to express the *de dicto* proposition:

di) It was the case that: for some x , x is the Second Temple

rather than the *de re* proposition

re) for some x , x is the Second Temple and is not present

because the former, but not the latter, doesn't (immediately or obviously) carry ontological commitment to the Second Temple, since the existential quantifier occurs within the scope of the (non-truth-functional) operator. Unfortunately for this response, however, these *de re* propositions are derivable from the *de dicto* propositions in the minimal temporal logic K_t plus the temporal versions of the converse Barcan formula (Jakobsen, Øhrstrom, and Schärfe 2011: 118-130):

Past BF: $P(\exists x A) \rightarrow \exists x (PA)$

Future BF: $F(\exists x A) \rightarrow \exists x (FA)$.¹⁰⁶

Sentence (*re*), and the consequents of Past BF and Future BF, are incompatible with presentism. So presentists must either deny that K_t is a suitable temporal logic for translating the relevant natural language sentences or deny both Past BF and Future BF.

¹⁰⁶ P is a past operator meaning "it was the case that".

F : "it will be the case that".

H : it has always been the case that.

G : it is always going to be the case that.

Prior showed that once one adds a universal and existential quantifier to K_t , Future BF can be proved, and Past BF can similarly be proved (2011: 122-123). Let's run through the details. K_t is an extension of classical propositional logic with the following four axioms (Jakobsen *et al.* 2011):

$$A2: G(\varphi \rightarrow \psi) \rightarrow (G\varphi \rightarrow G\psi)$$

$$A3: H(\varphi \rightarrow \psi) \rightarrow (H\varphi \rightarrow H\psi)$$

$$A4: PG\varphi \rightarrow \varphi^{107}$$

$$A5: \varphi \rightarrow GP\varphi$$

Prior's proof of Future BF uses five rules of inference and a theorem of K_t . The first pair of inference rules are the temporal analogues of Necessitation:

$$GN: \text{If } \vdash p \text{ then } \vdash Gp$$

$$HN: \text{If } \vdash p \text{ then } \vdash Hp$$

The second pair govern the universal quantifier:

$$\Pi 1: \text{If } \vdash \varphi(x) \rightarrow A, \text{ then } \vdash \forall x \varphi(x) \rightarrow A$$

$$\Pi 2: \text{If } \vdash B \rightarrow \varphi(x), \text{ then } \vdash B \rightarrow \forall x \varphi(x), \text{ for } x \text{ not free in } B.$$

The final rule is modus ponens:

$$MP: \text{If } \vdash \varphi \text{ and } \vdash \varphi \rightarrow \psi, \text{ then } \vdash \psi.$$

The theorem ("T6" in Jakonsen et al., 2011) is:

$$T: H(p \rightarrow q) \rightarrow (Pp \rightarrow Pq)$$

Here is Prior's proof of Future BF (as it appears in Jakobsen et al., 2011):

- 1) $Gq \rightarrow Gq$
- 2) $\forall x(Gq \rightarrow Gq)$ (1 and $\Pi 1$)
- 3) $H(\forall x(Gq \rightarrow Gq))$ (2 and HN)
- 4) $P\forall x(Gq \rightarrow PGq)$ (3, MP and T)

¹⁰⁷ Valentin and Rumberg's K_t system replaces $PG\varphi \rightarrow \varphi$ with $\varphi \rightarrow HF\varphi$ (2023).

- 5) $P\forall x(Gq \rightarrow q)$ (4 and A4)
- 6) $P\forall x Gq \rightarrow \forall x q$ (5 and $\Pi 2$)
- 7) $G(P\forall x Gq \rightarrow \forall x q)$ (6 and GN)
- 8) $GP\forall x Gq \rightarrow G\forall x q$ (7, MP, and A2)
- 9) $\forall x Gq \rightarrow G\forall x q$ (8 and A5)
- 10) $F\exists x q \rightarrow \exists x Fq$ (9).¹⁰⁸

The proof of Past BF (which Prior doesn't lay out) uses both temporal necessitation rules and a different pair of rules governing the existential quantifier:

$\Sigma 1$: If $\vdash \phi(x) \rightarrow A$, then $\vdash \exists x \phi(x) \rightarrow A$, for x not free in A

$\Sigma 2$: If $\vdash B \rightarrow \phi(x)$, then $\vdash B \rightarrow \exists x \phi(x)$.

As far as I can see, there are two general strategies presentists can take in response to these proofs of Past and Future BF, which I will call "metametaphysical" and "logical". A metametaphysical response is one which accepts the conclusion of the proofs, namely, the validity of Past and Future BF, but denies that this entails the falsity of presentism, because the quantifiers in the logic do not express "heavyweight" existence, the kind of ontologically committing existence that metaphysicians are interested in. A logical response is one that rejects the truth of some axiom or theorem, or the validity of an inference rule (I don't mean to imply that logical responses don't have metaphysical implications, they might). In what follows, I'll consider each response in turn, and argue that presentists should give a logical response, namely, a free logical one.

6.3.4 Metametaphysical Responses

The metametaphysical response I'll consider here is one which says that the existential quantifier in the relevant logic does not express any so-called "heavyweight" notion of existence that's of significance to metaphysics, only a lightweight or merely semantic notion

¹⁰⁸ I've reformatted the bracketed inferences using my names for the inference rules.

of existence. It's hard to give a reductive analysis of lightweight existence, but by way of illustration, consider the different senses in which there surely are, and surely aren't, fictional characters. Clearly, there are dragons in stories, but are there really dragons? No (alas). Thus, a presentist may accept the truth of Future and Past BF but deny that either $\exists x (PA)$ or $\exists x (FA)$ are incompatible with presentism, because their truth doesn't incur ontological commitment to any past or future thing.¹⁰⁹ The problem with this response is that we can re-run the proof of the Barcan formula with an existential quantifier that's *stipulated* to express "heavyweight" existence, such that any existential sentence is one which carries ontological commitment to whatever it quantifies over or refers to. The presentist will then have to give one of the logical responses, because the metametaphysical one is ruled out.

You might have two objections to this. First, you might think that heavyweight quantifiers have a different meaning to lightweight quantifiers, so that even though the syntax of the premises is the same as before, the semantics is different, and different in such a way that the argument is no longer valid.¹¹⁰ My response is twofold: this objection is not available to *neutralists* about quantification (Azzouni 2009), since they think that the meaning of quantifiers, whether heavy or lightweight, is the same, and so the proof featuring the heavyweight quantifiers will still be valid. This is relevant, since neutralism is one candidate for a view on which there are lightweight quantifiers. The second response: even if the proof with the heavyweight quantifiers is invalid, it can be made valid by adding extra premises, and once it's valid, and the quantifiers are heavyweight, the only kind of response left will be a logical one.

The second objection involves denying that there is *any* meaningful existential-like quantifier which is a heavyweight device of ontological commitment. This is more radical than holding that ordinary natural languages quantifiers, or quantifiers with a substitutional interpretation, aren't ontologically committing. It is effectively to deny that there could be anything like Ontologese (Dorr 2005; Sider 2009) or Tarskian (van Inwagen 2014), that is, a

¹⁰⁹ Jakobsen *et al.* (2011) consider a different response defended by Cocchiarella, according to which the existential quantifier expresses "possible existence" rather than "actual existence". I can't see how this works. A future (past), possible thing is just as non-present as a future actual thing, and so no more compatible with presentism.

¹¹⁰ Thanks to Jonathan Tallant for raising this objection.

language containing a quantifier with which to state our ontological commitments. This is not a good move for presentists to make. Presumably, the claim that everything is present should be interpreted in such a way that the ontological commitments of every true sentence are only present things, which is tantamount to saying that “everything” is to be read in a heavyweight, ontologically committing way. If “everything” (and its corresponding “something”) were neutral in this way, then presentism would be obviously false, because - in an ontologically neutral sense - Socrates exists, and so not everything is present. If you cannot express heavyweight existence then you cannot express presentism, at least if presentism is a claim about the sober metaphysical state of the world. Tallant (in personal communication) suggests that *existence presentists* – those who think that existence is (identical to) presence - might be able to get out of this problem, since their thesis does not (explicitly) involve quantification, and so apparently does not have need of a heavyweight quantifier. I don’t think this response will work. Either existence presentism says that the *properties* existence and presence are identical, or that the *categories* are identical. In each case, such properties or categories are presumably things over which we can quantify, and if existence presentism is to be a thesis about the sober metaphysical state of the world, then there must be a heavyweight quantifier over which existence and presence (whether properties or categories) ranges. The upshot of this is that the metametaphysical response to the proofs of Past and Future BF (which are incompatible with presentism) is not plausible.

6.3.5 Logical Responses

There are three logical responses: reject one of the axioms of K_t used in the proof; deny the validity of *G*- and *H*-Necessitation; or reject $\Pi 1$, $\Pi 2$, $\Sigma 1$, and $\Sigma 2$ (call the conjunction of these four “ $\Pi\Sigma$ ”), which commits one to a free semantics for the logic in question. I’ll take these in order. First: reject one (or more) of the axioms of K_t . This isn’t plausible because it’s hard to imagine counterexamples to any of the axioms. Take A3: if it’s always been the case that (say) John wears a coat when it’s cold, it’s surely also true that if it was (at some point) cold then John (at some point) wore a coat (*mutatis mutandis* for the future version, A2). Take A4: if at some point it was the case that electrons will always exist then surely they must

(now) exist. Take A5: if I'm now typing then it will forever onwards be true that I was typing. To suppose otherwise is to suppose that the past can be changed, but not even time travellers can do this (contrary to much science fiction).¹¹¹ The second logical response: reject either temporal necessitation rule. This is also implausible: if p is now provable from no assumptions, then why should it have not been so yesterday, or in twenty years' time? It's implausible enough that theorem-hood be a property held only contingently, and so even more implausible that it be a property held only temporarily.

The third logical response has none of the above problems, and I'll argue that objections to it can be met. It involves rejecting the inference rules governing the quantifiers. If $\Pi 1$ and $\Pi 2$ are false, then universal generalisation is false. If $\Sigma 1$ and $\Sigma 2$ are false, then existential generalisation is false. Rejecting both commits one to a free semantics for the relevant logic. There are three alleged costs of adopting a positive free semantics: ontological extravagance, substitutivity failures, and inexpressibility of existence conditions. I'll take each in turn.

The first alleged cost is specific to positive, dual-domain semantics. This objection has two parts. The first is that the outer domain and its associated quantifier must express some kind of meinongian sense of existence or being, which is extravagant (Nolt 2021; Frost-Arnold 2025). The second part is that the idea of non-existent objects (in the outer domain) cannot be understood. Some claim that dual-domain semantics is ontologically extravagant, spooky, or otherwise intelligible (Bencivenga 1990: 15). In response to both parts: I deny that the outer domain quantifier must express some kind of lesser existence or meinongian sense of being. I'll argue in section 6.4 that Crane's (2013) view of quantification should be adopted for the outer domain, and that this is perfectly intelligible without recourse to meinongianism.¹¹² Briefly, Crane thinks that lots of natural language quantification is ontologically neutral, especially sentences containing the phrase "some". This can plausibly be taken as one reading of the existential quantifier. I'll argue that non-extensive presentists

¹¹¹ You might think that the past can be hyper-changed e.g. later moments of hyper-time have a different past to earlier moments of hypertime. This seems coherent, but it would be extraordinary to suppose that all presently true sentences are such that their future perfect counterparts are false in hyper-time, as though the universe or God were conspiring to prevent A5 from being true.

¹¹² Without an account of quantification, Sylvan is right that free logic is an "unsatisfactory halfway house" on the way to avoiding unwanted ontological commitments. (2019: 79).

attracted to type-B strategies should take the outer domain existential quantifier to express “some”.

The second alleged cost is the failure of substitutivity. In classical predicate logic, co-extensive open formulas can be substituted with each other without changing their truth value. This is not the case in most free logics, including those with positive semantics. For example: the formulas $x = x$ and $(x = x \wedge E!x)$ are co-extensive in a positive semantics, since they're satisfied by all members of the domain (everything in the domain *exists!*). Yet, if t is empty, then $t = t$ is true while $(t = t \wedge E!t)$ is false (Nolt 2021; Lambert 1974). Since truth is usually defined relative to a language, it follows that substitution *salva veritate* fails in a positive dual-domain semantics. (I'll grant for the sake of argument that substitutivity is a desirable feature of a logic – if it isn't, then that's good news for free semantics). In response, the free logician should introduce new quantifiers for the outer domain, so that each domain has its own pair of first-order quantifiers. Once this is done, a weaker principle of substitutivity is still true, namely, that formulas coextensive *with respect to the inner domain* are substitutable *salva veritate*. That is, if we restrict our focus to only the inner domain, t will be non-empty, and thus *both* $t = t$ and $(t = t \wedge E!t)$ are true, thereby preserving substitutivity.

The third alleged cost is the inexpressibility of existence conditions (Nolt 2021). Seemingly valid arguments come out as false in a free logic e.g. I think, therefore I exist, because existential generalisation is invalid. To the extent that our intuitive judgement is that these types of arguments are valid, we should reject free semantics. We can, however, accommodate this intuition in a free semantics. A weaker form of existential generalisation is valid in free logic: if we restrict ourselves to the inner domain, it *is* the case that “I think” entails “I exist”, since every constant to which “think(s)” may be applied has an *existing!* referent.

Let's sum up this section on free semantics. I've argued that presentists have independent reason to endorse a free semantics, namely, as a response to arguments for necessitism and permanentism. This makes the appeal to free semantics as a response to the indispensability argument independently plausible, rather than *ad hoc*. The main drawback of a free logic approach is that it doesn't by itself provide an anti-realist account of *quantification* over times. The upshot of this is that non-extensive presentists inclined

towards this free logical approach should supplement it with an account of quantification over times. I'll argue below that Crane's (2013) view of quantification affords exactly this.

6.4 Craneanism

The final type-B strategy I'll consider is an application of Crane's view of quantification and reference. Crane holds that we can think and talk truly about non-existent objects even though they do not have any kind of being at all. Such non-existent objects are so-called not because they have some lesser, Meinongian-esque kind of being, or some lower degree or grade of existence; rather, there simply are no such things at all (2013: 3). Nonetheless, non-existent objects can be *objects of thought* or *intensional objects*, that is, things that we can and do think about. On Crane's view, intensional objects can be anything at all: physical, non-physical, concrete, abstract, and non-existent (2013: 4). Unless you are in the grip of Quinean thinking this shouldn't be mysterious.

Crane's view differs from neutralism, both with respect to quantification and reference. The neutralist holds that quantifiers have one meaning, and that this meaning (even in cases of true and literal sentences) does not incur any ontological commitments, except in the presence of rhetorical indicators. In effect, the neutralist severs the existential from the ontological. Crane, by contrast, takes the existential to be ontological. He accepts that there is a reading of the first-order existential quantifier which is "existential or ontological" (2013: 54), but contrasts this with another meaning, expressed by "some". He claims that this latter meaning is operative in much ordinary discourse. Since existence is not what natural language quantification expresses, natural language quantifiers are not ontologically committing (2013: 51). The neutralist takes reference to be ontologically non-committing.¹¹³ Crane, however, does. He takes reference to be a relation between a word, or thought, and something in the *world*. Thus, "Pegasus" does not refer to anything, though Crane still holds that it is genuinely *about* Pegasus (2013: 9).

¹¹³ Azzouni himself distinguishes reference_R and reference_E. The former is the ontologically inflationary relation between word and object, and the latter is what empty singular terms do, and it ontologically neutral. Craig rejects this dual conception of reference and simply takes reference simpliciter to be ontologically neutral (2016: 134-137), adopting Båve's deflationary theory of reference (2009).

A Cranean view of times holds that times are non-existent intensional objects; there are no times, they do not exist in any way, but they can be objects of our thoughts. Referential time talk like “the meeting is at 2:15” does not refer to times, since reference is a relation between language and the world, and times are not in the world. But time talk is genuinely *about* times, and so it can be true. Quantificational time talk, like “there are two times available in my diary”, is true, even though there are no times, since natural language quantification doesn’t express existence. Not all simple and existential sentences about times will be true, however. For example, though Crane holds that “Pegasus is a mythical horse” is true, he thinks that “Pegasus is a horse” is false (2013: 68). A Cranean view of times will naturally hold something similar e.g. the simple sentence “the time 2:15 is a member of the true and complete ontology” and the existential sentence “there are times in the true and complete ontology” are both false by Cranean lights.

6.4.1 Motivating Cranean Quantification

Crane’s view is independently plausible because it, but not (some of) its rivals, is compatible with various truisms:

Whenever someone thinks, they think about something. Or in other words:
whenever someone thinks, there is something they think about. Some of the things they think about exist, and some of them do not. There are truths and falsehoods about the non-existent things they think about. And yet the entire world—the real world, reality, being, the universe, call it what you like—does not contain more than what exists. (2013: 3-4)

These do seem (to me, anyway) to be truisms, but neo-Quineans can’t accept them. The neo-Quinean denies that some of the things we think about don’t exist. They treat “some” and “exist” as synonymous with “ $\exists x$ ”, and therefore the translation of the above sentence reveals it to be a contradiction: $\exists x (Tx \wedge \exists x x = x)$ (there is something such that we think about it and there is no such thing). Moreover, non-Craneans who accept some of the other truisms thereby commit themselves to implausible views. For suppose that a neo-Quinean accepts that whenever someone thinks, there is something they think about. Since we can think about things like Obi wan Kenobi, and my merely possible younger sibling, the neo-

Quinean finds themselves in the awkward position of thinking that both these things exist, despite the apparently obvious fact that they don't.

6.4.2 Combining Cranean Quantification and Free Semantics

In the Free Logic section, I argued that presentists (and therefore non-extensive presentists) should adopt a free semantics for logics in which natural language time talk is regimented. The semantics proposed was a positive dual-domain semantics, featuring two pairs of quantifiers: one for the inner domain and one for the outer domain. This outer domain collects all the things which do *not* fall under the extension of the predicate $E!$, such that nothing outside the inner domain *exists!*. One objection to outer-domain-specific quantifiers is that they're ontologically extravagant or spooky. What are these non-existent objects, of which many things are true? Crane's account of quantification offers a plausible response to this objection. Recall that, on Crane's view, natural language quantification, "some x ", does not express existence, and so is ontologically neutral. The objects that these quantifiers range over are intensional objects, objects of thought, which do not have any kind of shadowy, meinongian being. These intensional objects aren't extravagant or spooky. In fact, they're entirely familiar to us.¹¹⁴

Crane himself adopts a positive free logic, it's worth quoting him in full:

It seems to me that what is indisputably correct about free logic is this: if there is to be such a thing as a realistic logic of our language at all, then this logic cannot require every significant name to have a referent. For our language contains genuine names which lack referents. For this reason alone, then, if there are any logical rules which govern the use of names, then they cannot be [universal instantiation] and [existential generalisation], with ' $\exists x$ ' understood in the ontological way. An adequate logic of our language must therefore replace or modify these rules. [...] Nonetheless,

¹¹⁴ Crane's account avoids the problems that beset alternative views, like (neo-)meinongianism and many-ways-of-being-ism. These problems include: explaining what it is for something to have being without existing; explaining how things which don't exist but have being don't count as any kind of ontological or theoretical cost; articulating how many ways of existing/being there are in a way that doesn't imply that in fact there is only one way to exist/be (Merricks 2019).

I reject negative free logic, since there are too many sentences for which it does not give the intuitively correct truth-values.” (2013: 54-55)

Crane doesn't discuss dual-domain semantics, but it's somewhat clear that he *isn't* adopting it; the most natural way of reading Crane is that he thinks that empty terms do not pick out anything in any domain of the logic in question. Not so with dual-domain semantics, of course, since terms with no inner domain referent nonetheless have an outer domain referent.¹¹⁵ However, I don't think Crane would object particularly to a dual-domain semantics. Since he stipulates that reference is a relation between word (or thought) and an object in the world, his statement that natural language contains “genuine names which lack referents” is probably not in conflict with the view that they have *outer* domain referents, since this outer domain sense of “reference” is *not* a relation between word and worldly object, but rather a relation between word and intensional object.

In sum, then, Crane's view is a plausible account of natural language quantification, accommodating truisms about what exists and what we can and do think truly about. It also fills a gap in the free logical response developed in the previous section by providing an ontologically neutral account of quantification. I conclude that non-extensive presentists attracted to type-B strategies should adopt a Cranean view of quantification.

6.5 Type-B Strategies

Type-B strategies respond to the Quantification-Reference indispensability argument by denying premise (1), the neo-Quinean criterion of ontological commitment, according to which we are ontologically committed to anything that a true and literal sentence quantifies over or refers to. I've argued that substitutional quantification and neutralism are not plausible versions of times anti-realism, whether by presentist lights or more generally. Non-

¹¹⁵ Ironically, then, dual domain semantics is in some sense not a free semantics: every singular term has a referent in some domain or other. But in another sense, it is free: some terms do not refer to anything in the 'original', inner domain, the domain you start with in a classical semantics before making it free.

extensive presentists who favour type-B strategies should adopt a combined response to the indispensability argument: a positive, dual domain semantics for the logic(s) in which natural language time talk is regimented, where the outer domain existential quantifier is equivalent to the ontologically neutral “some”, which is frequently operative in natural language and ontologically neutral.

6.6 Conclusion: The Quantification-Reference Indispensability Argument

Non-extensive presentists deny the existence of times, and therefore face the Quantification-Reference Indispensability argument. I’ve defended two types of responses to this argument: type-A strategies, which deny that there are any such literal and true sentences; and type-B strategies, which deny that we’re ontologically committed to anything a true and literal sentence quantifies over or refers to. I argued that the most plausible type-A response was a combination of fictionalism for physical and semantic time talk and paraphrase (and quasi-truth) for ordinary time talk. I then argued that the most plausible type-B strategy was a free logic with a positive, dual-domain semantics, where the outer domain quantifiers are read in the ontologically neutral way proposed by Crane. I take no stand on whether non-extensive presentists should be of type-A or type-B. Suffice to say, however, that non-extensive presentists have plausible responses at their disposal to respond to the Quantification-Reference Indispensability argument.

7. The Explanatory Indispensability Argument for Times

Explanatory indispensability arguments attempt to show that some kinds of objects (numbers, times, etc.) play an explanatory role in our best scientific theories and so we should believe in them. One influential explanatory indispensability argument is due to Baker (2005, 2009). He argues that numbers play a genuine, indispensable role in the explanation of periodical cicadas' life-cycles. I'll use Baker's argument as a template for constructing an explanatory indispensability argument for times. To get a handle on just how explanatory indispensability arguments work it will be worth looking at Baker's argument (2009: 613):

- 1) We ought rationally to believe in the existence of any entity that plays an indispensable explanatory role in our best scientific theories.
- 2) Mathematical objects play an indispensable explanatory role in science.
- 3) Hence, we ought rationally to believe in the existence of mathematical objects.¹¹⁶

Examples abound in support of premise (1): the heart pumps blood around the body, atoms explain the macroscopic properties of gases, and the sun exerts a gravitational force on the earth. The heart, atoms, and gravity all play an indispensable role in these theories, unless we postulate them the explanation is not a good one. Premise (2) is the most contentious. For it to be true mathematical objects can't merely be quantified over or referred to, they must do some of the explanatory work, where no equally plausible nominalist-friendly explanation is available. To illustrate the difference, consider that "there are two prime numbers between 1 and 4" quantifiers over prime numbers, but doesn't (obviously) give them any explanatory role. In what follows I'll explain Baker's argument that prime numbers play an explanatory role in the explanation of the length of Cicadas' life-cycles. This will help illustrate how explanatory indispensability arguments work and give us a general recipe for constructing an explanatory indispensability argument for the existence of times.

¹¹⁶ This is word-for-word Baker's argument, but I'll treat (2) as saying that mathematical objects play an indispensable explanatory role *in one of our best scientific theories*, which is not exactly what (2) says.

7.1 Periodical Cicadas

Among the *Magicalada* genus, three species of cicadas have a life cycle lasting a prime number of years, either 13 or 17. Biologists have identified five features of these life cycles, each of which requires explanation:

- i. The great duration of the cicada life-cycle.
- ii. The presence of two separate life-cycle durations (within each cicada species) in different regions.
- iii. The periodic emergence of adult cicadas.
- iv. The synchronized emergence of adult cicadas.
- v. The prime-numbered-year cicada life-cycle lengths

The last of these is Baker's focus. Why are the life-cycle periods a *prime* number of years, what's the evolutionary advantage? Two explanations have been offered by biologists, which Baker calls the predation and hybridization explanations. The predation explanation is due to Goles, Schulz, and Markus (2001). They propose that prime life-cycle periods minimise the frequency with which cicadas emerge from the soil at the same time as their predators. Suppose the cicadas' life-cycles were 12 years long. Predators have small life-cycle periods – 2, 3, 4 years – and so cicadas would emerge from the soil at the same time as their predators, because 2, 3, and 4 are multiples of 12, and hence they wouldn't survive nearly as easily. Prime numbered life-cycles prevent this kind of overlap with predators and therefore aid survival. On a 13-year life-cycle, predators are born either after or before the cicadas (e.g. six 2s are 12, but seven 2s are 14 – either side of 13), thereby maximising the chances of survival. The hybridization explanation is due to Cox and Carlton (1988, 1998), and Yoshimura (1997). They propose that prime life-cycles minimise the frequency with which periodical cicadas mate with other cicada species which have a different life-cycle period. If two cicada species had life-cycle periods of 5 and 10 years, then their offspring would have a period of some number of years between 5 or 10. Their offspring would then be out of sync with the 5- or 10-year cycles. This would result in fewer potential mates, which is evolutionarily disadvantageous.

Baker (2005: 454-5) shows that both explanations share an underlying structure:¹¹⁷

- 4) Having a life-cycle period which minimizes intersection with other (nearby / lower) periods is evolutionarily advantageous. [biological 'law']
- 5) Prime periods minimize intersection (compared to non-prime periods). [number theoretic theorem]
- 6) Hence organisms with periodic life-cycles are likely to evolve periods that are prime. ['mixed' biological / mathematical law]

When the law expressed in (6) is combined with

- 7) Cicadas in ecosystem-type, E, are limited by biological constraints to periods from 14 to 18 years. [ecological constraint]

it yields the specific prediction

- 8) Hence cicadas in ecosystem-type, E, are likely to evolve 17-year periods.

Baker calls (5) the “purely mathematical” component of the argument (2005: 454), and he claims that it *explains* why prime life-cycles are evolutionarily advantageous. And, crucially, he claims that the truth of (5) *essential* to the explanation. By essential I take it that Baker means that the evolutionary advantage of prime lifecycles couldn't (or wouldn't) be explained if (5) were false. There are a few more steps from here to the second premise of the indispensability argument, namely, that mathematical objects play an indispensable explanatory role in our best scientific theories. To get to (2), the mathematical component of the explanation must be explanatory in its own right, rather than merely serving to describing or represent something in the explanation. To illustrate this difference, consider two examples: atoms explain the behaviour of gases; and a body accelerates to 5 ms^{-1} because the force exerted on it is 20 newtons. In the first case, the atoms themselves are explanatory - *they* (and their behaviour) are responsible for the behaviour of the gases. In the second, even if the force being 20 newtons is indispensable to the explanation, *the number 20* is not thereby explanatory in its own right. As Melia says, when numbers appear like this, they merely serve to pick out the force or describe it (Melia 2002: 76). What's genuinely explanatory is the *magnitude* of the force, not the number 20. It's important,

¹¹⁷ The premises are renumbered compared to Baker 2005 but match the numbering in Baker 2009.

then, to check whether the mathematical component of (5) is explanatory in its own right. This requires some understanding of what explanation is. Baker runs the cicada example through each of the three main accounts of explanation (causal, deductive-nomological account, and pragmatic) to check which of them counts (5) as explanatory. I'll take each account in turn.

7.2 Cicadas and Accounts of Explanation

The causal account says that to explain x is to list and describe x 's causes. This account entails that premise (2) of the explanatory indispensability argument is false because Baker's proposed explanation is plausibly non-causal. The deductive-nomological account says that x is explained if there is a sound argument such that the premises include some laws of nature and the conclusion is (or entails) that x occurs. Baker (2005: 235) notes that a broadening of the notion of laws of nature would allow (5) to be explanatory in its own right and would thereby suffice for the truth of premise (2). But this is just to say that *as it stands* the deductive-nomological account is incompatible with genuinely mathematical explanations (of physical phenomena), since mathematical laws are not laws of nature. The platonist needs some reason in favour of broadening the notion of laws of nature as to include mathematical laws. And it's hard to see what this could be; instances of genuine mathematical explanation would be such a reason, but that there are any such instances is precisely the thing under debate. Instead, we could simply *replace* the notion of laws of nature with a more general sense of laws which includes mathematical laws. Such a modified deductive account of explanation would say that x is explained if there is a sound argument whose premises are laws of any kind, whether natural, metaphysical, or mathematical, and whose conclusion is (entails) that x occurs. This broader account of explanation counts (5) as genuinely explanatory for the same reason it counts the other premises as genuinely explanatory, namely, they are premises which entail that the phenomenon occurs. Finally, the pragmatic account says that x is explained if there is an answer to a *why*-question which shows (or makes it the case) that x is more likely to occur than y . The intuitive idea here is that explanations are, or can be translated into, answers to questions of the form "why does x happen?" Baker says that the pragmatic account counts

(5) as explanatory: “Why do periodical cicadas have prime periods? Because prime numbers minimize their frequency of intersection with other period lengths.” (2005: 235). I think this is a mistake. The phrase “with other period lengths” suggests that it is not the *numbers* that minimise the frequency of intersection but rather the *lengths*. This is just Melia’s point mentioned above: at most, the *properties* (such as length and force) are genuinely explanatory, and the mention of numbers merely serves to pick out or describe property in question e.g. the magnitude of the force is 20 newtons, the length of the life cycle is prime. In both cases the numbers may be indispensable to the explanation, but they are not themselves explanatory.

Out of the three accounts Baker surveys, only the pragmatic account counts (5) as explanatory. Though we have discovered a neighbour of the deductive-nomological account, the deductive account, which also counts (5) as explanatory. But we are still not yet at the conclusion of the argument, (3), that we should believe in mathematical objects. To see how we get there, let us concede for the moment that the correct account of explanation does count (5) as explanatory. Now, explanation is plausibly *existence-entailing*: if x explains y , then x exists. Atoms and their properties explain the macroscopic properties of gases, and this explanation can only be a good and true explanation if atoms exist. It follows, then, that anything essential and explanatory in (5) exists. Assuming that prime numbers are genuinely explanatory, it follows that they exist.

Now that we have a solid grasp of how one explanatory indispensability argument works, we can proceed with abstracting the details of the mathematical case in order to arrive at a general, abstract structure or recipe for building explanatory indispensability arguments. This will help us construct an explanatory indispensability argument for times, in particular.

7.3 The Structure of Explanatory Indispensability Arguments

To get at the underlying structure of explanatory indispensability arguments we need to eliminate references to specific biological or mathematical facts. The expressions in square brackets in Baker’s premises are helpful here, since they specify what the premise is an instance of, so to speak. We can use these to extract the underlying structure from Baker’s argument:

- [Natural law]
- [Mathematical theorem]
- [Mixed natural/mathematical law]
- [Natural fact]
- [Conclusion] (mixed natural/mathematical fact)

So, a natural law, natural fact, and mathematical law jointly entail a conclusion which is part natural and part mathematical fact. Since the conclusion is explanatory, its mathematical part carries ontological commitment to the explanans. The conclusion of Baker's argument, (5), does not have an accompanying expression in square brackets, but given that it's supposed to be a scientific explanation which makes indispensable use of mathematical results, it seems correct (at least by Baker's lights) to call it a mixed natural/mathematical fact. One additional step layer of abstraction will be useful before constructing an explanatory argument for times. The above argument is the general structure of explanatory indispensability arguments for *mathematical* objects in particular. Since *mathematical* is a kind, we can use so we can swap out "mathematical fact" for "fact about Ks", where the existence of Ks is the conclusion of the explanatory argument for Ks:

- [Natural law]
- [law, theorem, or fact about Ks]
- [Mixed law, theorem, or fact, part natural, part K] (4, 5)
- [Natural fact]
- [Conclusion] (mixed natural/Ks fact) (6, 7)

This is the final result of abstracting away from all the specifics of the explanatory argument for platonism. We can use it to construct an explanatory argument for times.

7.4 The Explanatory Indispensability Argument for Times

Before de-abstrating the above argument template, let's state the three-premise explanatory indispensability argument for times:

- 1*) We ought rationally to believe in the existence of any entity that plays an indispensable explanatory role in our best scientific theories.

2*) Times play an indispensable explanatory role in our best scientific theories.

3*) We ought rationally to believe in the existence of times.

While (3*) doesn't say that times exist and therefore doesn't entail that non-extensive presentism is *false*, it is obvious that no non-extensive presentist will accept (3). Premise (1*) is just premise (1), and so the crucial premise to defend is (2*). Using the above abstract argument structure, we can begin to construct an argument for times as follows:

- [Natural law]
- [fact about times]
- [Mixed natural law/times fact] (4, 5)
- [Natural fact]
- [Conclusion] (mixed natural/times fact) (6, 7)

The next step in constructing the argument is to fill-in the square brackets with particular laws/facts. In fact, periodical cicadas work well here: Saatsi's (2011) response to Baker contains a (probably unintentional) indispensability argument for times. Saatsi's aim is to offer an alternative argument-explanation which makes no appeal primeness or prime numbers. In doing so, however, he constructs an argument for times:

4*) Having a life-cycle period which minimizes intersection with other (nearby/lower) periods is evolutionarily advantageous. [biological law]

5*) There is a unique intersection minimizing period T_x for periods in the range $[T_1, \dots, T_2]$ years. [fact (?) about time]

6*) Cicadas in ecosystem-type E are limited by biological constraints to periods from T_1 to T_2 years, [ecological constraint]

7*) Cicadas in ecosystem-type E are likely to evolve T_x -year periods (Saatsi 2011: 152; premises renumbered)

Premises (4*) and (6*) are identical to Baker's (4) and (6). The question mark that appears in (5*) suggests that Saatsi is unsure whether this is an indispensability argument for times. He doesn't explicitly say so, but some of his other remarks suggest it. He says that (5*) states a fact about time; and he says that the role of mathematics in his argument-explanation is merely "knowledge-conferring role", and serves only to represent the relevant features of time (2011: 152), which presumably include the fact that there are times. Other nominalists

make similar claims. In response to Baker, Daly and Langford think that the prime numbered units only serve to “index the *durations* measured, which, together with evolutionary pressures, provide the genuine explanation” (2009: 657; emphasis mine). The durations of the life-cycle periods, or at least the periods themselves, play a genuine explanatory role, according to Daly and Langford. Thus, they inadvertently give an explanatory argument for temporally extended things, which entails that there are times. This is also the most natural way of reading Saatsi’s argument-explanation. Duration is just temporal extension, and temporal extension presupposes times. On the face of it, then, there’s some support for premise (2*), which says that times play an indispensable explanatory role in our best scientific theories. In what follows I’ll show how non-extensive presentists can construct an argument-explanation which doesn’t give times (or numbers) any explanatory role.

7.5 The Inapplicability of Type-B Strategies

Before considering how non-extensive presentists should respond to this argument, it’s worth noting that type-B strategies uniformly fail with respect to explanatory arguments. Recall that they all deny the first premise of the Quantification-Reference argument (the neo-Quinean criterion of ontological commitment). But *explanatory* indispensability arguments don’t assume such a premise. Instead, all they assume is that explanation is existence-entailing: if x explains y , then x exists, and not just in a neutral or lightweight sense of existence. For example, atoms and their properties explain the macroscopic properties of gases, this explanation can only be a good one if atoms really exist. Or: suppose you think that God explains the fine-tuning of the laws and constants but remain an atheist. This would be confused- because explanation is existence-entailing. An explanation in terms of neutrally existing entities is no good. Thus, type-B strategies are inapplicable to explanatory indispensability arguments. We are therefore left with the type-A strategies.

7.6 Paraphrase and Figuralism

A paraphrase response to the explanatory indispensability argument is not plausible, for the following reason. Recall that a paraphrase strategy says that the original, to-be-paraphrased

sentences are true, but ontologically non-committing. This is plausible for sentences whose logical structure is obscured in some way by its grammar. But in the case of the above argument-explanations, every effort is made to make the logical structure clear, and so there's little room to claim that the ontological commitments are an illusion generated by natural language grammar. A figuralist response to the explanatory indispensability argument is implausible for a similar reason. While scientists may sometimes state their theories in figurative (or otherwise less than perfectly literal) language, it's clear that Saatsi and Baker have avoided figurative language. They are trying to analyse and unpack the explanations offered by biologists to reveal their ontological commitments, and so it's just implausible to read them as even partially figurative. So, non-extensive presentists should not adopt a paraphrase or figuralist response to the explanatory indispensability argument.

7.7 Fictionalism

Fictionalism comes out as the only version of times anti-realism that can really get off the ground in response to the explanatory argument. The fictionalist needs an argument-explanation which eliminates times (and numbers). Here is one such fictionalist alternative:

- 4**) Having a low frequency of co-existence with members of another species is evolutionarily advantageous.
- 5**) If members of a species were born x years ago/ and died y years ago, then the frequency of co-existence with members of another species is minimised, and $x, y \in \{a, \dots, b\}$.
- 6**) Cicadas in ecosystem-type E are limited by biological constraints to being born a years ago and dying b years ago.
- 7**) Hence, cicadas in ecosystem-type E are likely to evolve such that they are born x years ago and die y years ago.

This argument-explanation doesn't quantify over or refer to time periods or durations, and so *a fortiori* it doesn't give them an explanatory role. You might think, as with Baker and Saatsi's argument-explanations, that the second step is a fact about *something*, where that something plays an explanatory role. Hence, if (5**) is not a fact about numbers or times, what is it a fact about? I suggest that it's simply a general fact about species existing or not

existing with other species, depending on when they're born. Of course, numerals and time variables are useful for expressing this fact succinctly, but that's as far as it goes, the general fact about members of a species existing/not existing with other species does all the explanatory work.

The fictionalist's alternative is no less preferable to Saatsi or Baker's. It's no less general, since different numbers can take the values of the pair variables (and the tenses and operators can be changed for the future), and thus the explanation can be adapted for other cases with other species.¹¹⁸ And while it doesn't explain why the difference between x and y is prime, it needn't, for the same reasons Saatsi gives: it's unclear what biologists mean when they say that prime numbered life-cycles are part of the explanation, and if they intend this in the way Baker mean it, then it's the job of philosophers, not biologists, to figure out whether this is true or not.

To conclude, I've argued that non-extensive presentists should adopt fictionalism in response to the explanatory indispensability argument for times, for two reasons. First, no other version of times anti-realism can get off the ground as a response to this argument. And second, the fictionalist's alternative argument-explanation is no less theoretically virtuous than Saatsi or Baker's. Thus, non-extensive presentism has a plausible response to the explanatory indispensability argument.

¹¹⁸ Strictly speaking, which explanation is correct changes, since the values of the variables increase as time passes. This was also the case in section [Quantum Mechanics], and the same response can be given: the no-times operator approach is impractical to use in biology, but impracticality is not a guide to truth. It's part and parcel of this kind of 'dynamic' approach that the way things are (unrestrictedly) changes over time.

8. Conclusion

In this thesis, I've examined three versions of presentism, each of them an answer to the question(s) "is there a present time, and if so, what is its duration?". Instantaneous presentism was the first option. I argued that presentists should reject it primarily because it has an implausible account of persistence. Extended presentism was the second option. I argued that presentists should reject it for four main reasons: it has an implausible account of persistence; it implausibly sets no maximum limit on the duration of the present; it suffers from a McTaggart-style problem and a Boundary Points problem. I then argued that presentists should reject a key assumption of these versions of presentism: that there are times, including a present time, and that there is duration/temporal extension. The version of presentism that results from this rejection is non-extensive presentism: everything is present, nothing is a time, and so duration/temporal extension doesn't apply to anything. I argued that non-extensive presentism is preferable to its rivals because it's more qualitatively and quantitatively ontologically parsimonious, and it's no worse off with respect to the objections raised against its rivals. I then responded to two smaller objections: that time is intuitively space-like, and that it implausibly entails that time doesn't exist. Then I devoted my attention to the biggest objection: talk about times appears to true across several domains: ordinary language, physics, and semantics. The first version of this objection was the Quantification-Reference indispensability argument. I argued that presentists should adopt fictionalism for time talk in physics and semantics, and a paraphrase strategy (plus quasi-truth) for ordinary time talk. The second version of the indispensability argument was the Explanatory argument. I argued that fictionalism was the most plausible response to this argument. The conclusion of Part II was that non-extensive presentists have a number of plausible anti-realist accounts of time talk, and that the presumption of the existence of times is unmotivated. Finally, then, when all is said and done, presentists should deny that there are any times, durations, or temporal extensions, that is, they should adopt non-extensive presentism.

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