

No ground for doomsday

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Forthcoming in *Inquiry: An Interdisciplinary Journal of Philosophy*

Penultimate draft: please refer to the published version

Abstract The ability of providing an adequate supervenience base for tensed truths may seem to be one of the main theoretical advantages of both the growing-block and the moving-spotlight theory of time over presentism. However, in this paper I will argue that some propositions appear to be as problematic for growing-block theorists as past-directed propositions are for presentists, namely propositions stating that nothing will be the case in the future. Furthermore, I will show that the moving-spotlight theory can adequately address all the main supervenience challenges that can be levelled against A-theories of time. I will, thus, conclude that, at least as far as the supervenience principle is concerned, the moving-spotlight theory should be preferred over both presentism and the growing-block theory.

Keywords Time; growing block; moving spotlight; grounding objection

1. Introduction

A-theories of time uphold the reality of temporal passage and therefore take time to have a certain ‘dynamic’ character. For the purpose of this paper I will assume that A-theories of time are best characterised by the adoption of primitive temporal operators (like ‘**it will be the case that**’ and ‘**it was the case that**’) thought of as irreducible to quantification over times.¹ According to this picture, A-theories all agree that there is some form of objective presentness in reality, but disagree on two main fundamental issues. The first concerns the existence of past and future entities (that is, entities that are, respectively, either earlier or later than present entities). The second concerns whether entities can either come into existence (and, thus, whether it can be **sometimes** true for some x that **it was the case that** [x doesn’t exist])² or go out of existence (and, thus, whether it can be **sometimes** true for some x that **it will be the case that** [x doesn’t exist]):³

¹ For a similar position on A-theories of time see, *inter alia*, Sider (2001: 14-5, 20; 2011: chapter 11), Deasy (2017) and Correia and Rosenkranz (2018: chapter 5).

² Square brackets are used for scope-disambiguation.

³ I assume here and in what follows that to exist is just to be identical to something (or, in other words, that: x exists =df $\exists y(x = y)$).

- (i) According to *presentists*, there are no entities that are either earlier or later than other entities (‘only present entities exist’), and (at least, typically)⁴ it is neither (necessarily) the case that everything **will always exist**, nor is it (necessarily) the case that everything **has always existed**.⁵
- (ii) According to *growing-block theorists* (henceforth: ‘GB-theorists’), past and present entities exist, yet future entities don’t. GB-theorists take the ‘sum total of existence [to be] always increasing’ (Broad 1923: 66) as time passes. For GB-theorists it is, thus, true that everything **will always exist**, although it is false that everything **has always existed**.
- (iii) Finally, according to *moving-spotlight theorists* (henceforth: ‘MS-theorists’), past, present and future entities exist, and **it is always the case both** that everything **always existed** *and* that everything **will always exist**. The only kind of ‘tensed change’⁶ for MS-theorists is change in the instantiation of a *sui generis* property of presentness, so that for them, **it is always the case that** one time (and one time only) is present and for every time t , if t is present, then t **was always** non-present and it **will always be** non-present (in what follows I will stop marking joint-carving temporal expressions with bold letters and let the context disambiguate).^{7,8}

⁴ What we may call, after Williamson (2013), ‘Williamsonian presentism’ (of which I regard Sullivan’s 2013 ‘Minimal A-theory’ as an instance) takes only present entities to exist and yet **always** everything to **always** exist.

⁵ In other words, I am taking here the core presentist tenet to be the thesis according to which, necessarily, **it is never the case that**, there is an x and a y , such that x is earlier than y . Alas, a proper defence of this definition must be left for another occasion (see, however, footnote 8).

⁶ By ‘tensed change’ I mean the following: tensed change occurs if and only if, for some p , [**it is sometimes the case that** p] and [**it is sometimes the case that** $\sim p$] (cfr. Correia and Rosenkranz 2018: 11).

⁷ I am here omitting, for simplicity’s sake, other constraints on A-theories, such as, for instance, the following constraint on the MS-theory: if **it is now the case that** time t instantiates presentness, then, if something **will be the case**, there is a time u that is later than time t and such that **it will be the case that** u is present (see section 3 for some discussion on similar principles).

⁸ Correia and Rosenkranz (2018) characterise presentism, the GB-theory and the MS-theory in a similar way (see chapter 5 and, for an overview, p. 168). Two differences with the present approach might be worth noticing: (i) Correia and Rosenkranz make use of an ‘At x ’ operator which (although they acknowledge that in principle ‘allows for the standard analysis in terms of ‘[x is a time] & Always, (x is present $\rightarrow \varphi$)’, p. 7) they take to be primitive; (ii) Correia and Rosenkranz characterise presentism as the theory according to which (**it is always the case that**) there exists only one time. Therefore, at least those who

Truth depends on reality. One way to articulate this idea is to say that for every true proposition p there is something, a *truthmaker*, in virtue of which p is true. However, *truthmaker maximalism* appears to come at a cost that not everybody may be willing to pay, such as, for instance, a commitment to entities like tropes, states of affairs, negative facts, or totality facts.⁹ A weaker way in which truths may be said to depend on reality is by *supervening* on reality. According to the ‘Supervenience Principle’, if a certain proposition p is true, then it couldn’t have been false without there being a *difference* in reality: either in the population of entities, or in the fundamental properties and relations they instantiate.¹⁰

Supervenience Principle: For any proposition p , if p is true, then it is necessarily the case that, if p is not true, then either (i) some things exist that don’t actually exist, (ii) some things that actually exist don’t exist, (iii) some things instantiate some fundamental properties or relations that they don’t actually instantiate, or (iv) some things don’t instantiate some fundamental properties or relations they actually instantiate.¹¹

The Supervenience Principle doesn’t seem to require the existence of controversial entities and properties. It only requires that a variation in truth always correspond to a certain variation in reality. Furthermore, since the Supervenience Principle concerns the difference in truth-value of a certain proposition (either across worlds or in time) it poses no problem whatsoever for necessary truths, as a necessary truth trivially complies with the Principle. In what follows I will assume that the idea that truth depends on reality is best expressed by means of the Supervenience Principle.

Consider some contingent truth about the past like

(C) Caesar crossed the Rubicon

think that ‘presentists should deny that there is anything at all [...] that is the present time’ (Merricks 2007: 124-5) may have some reason to prefer the characterisation of presentism offered in this paper.

⁹ This problem is more acute when truthmaker maximalism is combined with *truthmaker necessitarianism* (according to which, if x makes p true, then necessarily, if x exists, p is true). Notice, however, that even forms of truthmaker contingentism seem to suffer from this problem. Just as a way of an example, Parsons (1999) takes truths to simply supervene upon the intrinsic nature of their truthmakers. As he himself seems to acknowledge (1999: 334) it is at least not obvious that his account is sufficient to eliminate the need for either negative facts or totality facts.

¹⁰ Two *loci classici* for the first and the second approach are Armstrong (2004) and Lewis (2001), respectively.

¹¹ See Lewis (2001: 612) for a statement of the principle in terms of possible worlds.

According to MS-theorists and GB-theorists, (C)’s truth-value supervenes on the way the past block of reality is. For them, in fact, Caesar exists, is temporally located in the past, and is crossing the Rubicon on 49BC. If (C) was false, then the world would be different in at least one of these respects. Instead, according to presentists, neither Caesar nor his crossing the Rubicon exist anymore. Therefore, it seems that presentists must say in this case that the truth of (C) *doesn’t* supervene on reality. This, in a nutshell, is the so-called grounding objection to presentism^{12,13}

All the proposed responses to the grounding objection to presentism appear to fall into two main groups whose members we can call (following Tallant and Ingram 2015) ‘upstanding’ and ‘nefarious’ presentists, respectively. *Upstanding presentists* accept the grounding challenge and consequently provide *sui generis* grounds for truths about the past. Although many upstanding presentist theories have been proposed in the literature, the following three appear to be among the most representative ones:

- (i) Bigelow (1996) takes past-directed truths to be truth-made by the fact that the world instantiates ‘Lucretian properties’ such as ‘being such that once Caesar crossed the Rubicon’.
- (ii) Cameron (2010, 2015) invokes both ‘temporal distributional properties’ (saying how a thing is across time) and ‘age-properties’ (saying how old a thing is) and claims that ‘it is in virtue of things having these properties *now* [...] that the bearers of these properties *were* such-and-such a way’ (Cameron 2015: 362).
- (iii) Bourne (2006) and Crisp (2007) resort instead to *ersatz* B-theoretical histories constructed out of *ersatz* times (consisting in sets of propositions) and an *ersatz* earlier-later relation. For them, what makes ‘it was the case that *p*’ true is the fact that *p* belongs to an *ersatz* time that is *ersatz*-earlier than the present *ersatz* time.

Instead, *nefarious presentists* (like Tallant and Ingram 2015) reject the unrestricted validity of the Supervenience Principle and accept that some truths about the past do indeed float on the void and have no present ground. ‘Socrates drank hemlock’

¹² See Caplan and Sanson (2011) and Davidson (2013) for an introduction to the grounding problem for presentists.

¹³ Notice that grounding objection isn’t normally thought of as targeting future-directed truths like

(M) There will be a human colony on the Moon in 2077

In fact, many accept that if nothing makes (M) either true or false, then (M) is indeed neither true nor false (or, alternatively, neither *determinately* true nor *determinately* false; see Barnes and Cameron 2009, 2011). More on this below (section 2).

is true because Socrates drank hemlock. However, the latter fact has no further ontological ground and is, thus a fundamental aspect of reality, or so the nefarious thought seems to go.¹⁴

The grounding objection seems to draw a wedge between presentism on the one hand and non-presentist A-theories of time like the GB-theory and the MS-theory on the other hand. However, as I will argue in this paper, there appears to be at least one class of statements that are as problematic for GB-theorists as past-directed statements are for presentists, namely ‘this is doomsday’ statements saying that nothing will be the case in the future. On the contrary, as I will show, the MS-theory is perfectly in position to meet not only the ‘doomsday challenge’ to A-theories of time (as I will call it) but also all the other supervenience challenges that may be levelled against it. I will, thus, conclude that the Supervenience Principle appears to give us good reasons to prefer the MS-theory over both presentism and the GB-theory.

2. The doomsday challenge

As is well-known, temporal operators can be used to express many topological features of time, such as its being linear, dense, discrete, and endowed with a first or a last moment.¹⁵ In particular, A-theorists can take the last moment of time (‘doomsday’) to be the moment at which *nothing*— not even metaphysical or logical truths—*will be* the case and, thus, at which the following ‘this is doomsday’ statement is true (in what follows ‘*F*’ stands for the tense-operator ‘it will be the case that’):

$$(D) \sim \exists p Fp$$

It is not the case that, for some *p*, it will be the case that *p*¹⁶

Suppose, then, that the A-theory of time is true and that it is indeed doomsday. What does the truth of (D) supervene on? Let’s call this the ‘doomsday challenge’ to A-theories of time.

Presentists can answer the doomsday challenge in the very same upstanding or nefarious way in which they attempt to rebut the grounding objection. They can either claim that (D) is a brute, ungrounded truth or claim that (D) possesses some *sui generis* supervenience base. As I will argue in section 3, MS-theorists appear to

¹⁴ Other nefarious presentists appear to include Baia (2012), Sanson and Caplan (2010), and Tallant (2009, 2010).

¹⁵ See Burgess (1984).

¹⁶ See Goranko and Galton (2015: §3.6.1) for similar principles expressing the idea that time has no beginning and no end.

be perfectly in position to meet the doomsday challenge *without* resorting to any of the presentist strategies. Instead, things appear to be more problematic for GB-theorists. Clearly, in fact, for GB-theorists the truth of (D) cannot depend on the fact that future entities are not part of the ontological inventory. For GB-theorists it is *always* true that future entities don't exist, and therefore, even at moments at which (D) is *false*. It is, thus, not the lack of future ontology that can make a difference to the truth-value of (D). Can (D) supervene only on the present and the past, and thus on what present and past entities exist and what properties and relations they instantiate? Although the hypothesis doesn't seem to be inconsistent, it is at least *prima facie* hard to see *how* for GB-theorists a situation in which (D) is false could differ from a situation in which (D) is true. In order to better understand this point, consider the classical case of how negative existentials supervene on reality. In order for the truth-value of 'There are no arctic penguins' to supervene on reality it isn't necessary to postulate a *sui generis* entity making 'There are no arctic penguins' true, like the *absence* of arctic penguins. 'There are no arctic penguins' supervenes on reality simply because a world in which 'There are no arctic penguins' is false would be different from the actual world, namely, by containing arctic penguins. In other words, it is by deciding whether to create arctic penguins or not that God can determine whether 'There are no arctic penguins' is true or false. Return, then, to (D). *What* can God decide to create in order to determine whether (D) is true or false? What kind of entities or the instantiation of what kind of properties and relations could possibly make a difference for the truth or falsity of (D)?

One option might appear to be that of saying that (D) is grounded in the laws of nature (plus the current state of the world). As Briggs and Forbes (2012) claim, '[t]ruth should supervene [...] on the concrete things that [...] exist, the properties and relations those things instantiate, and the laws of nature' (Briggs and Forbes 2012: 296).¹⁷ However, this answer excludes the possibility that (D) may be a nomologically contingent truth. But why shouldn't it be possible for doomsday to occur also without being deterministically determined by the laws of nature? In the same way in which we accept that in nomologically indeterministic worlds some events can occur (or not occur) even if their occurring (or not occurring) is not required by the laws of nature, it seems that—at least absent further considerations—we also ought to accept the possibility that no event whatsoever will occur, even when the laws of nature are silent about this. GB-theorists offering this kind of reply would at least owe us some independent motivation of why doomsday can only come about as a matter of nomological necessity.

¹⁷ See Markosian (2013) on presentism and the idea of grounding tensed truths in the laws on nature.

A second option may seem to be that of accepting both that (i) doomsday is indeed a possibility and that (ii) nothing can ever ground either the truth or falsity of (D), so that (iii) on doomsday (D) should be thought of as being *neither true nor false*. The reasoning behind (iii) appears to be the same that animates ‘Aristotelian’ approaches to the open future, according to which future-contingent statements are neither true nor false:

- (i) truth and falsity depend on reality;
- (ii) if there is nothing that makes a certain statement true and nothing that makes it false, then the statement in question is neither true nor false;
- (iii) there is nothing making (D) either true or false;
- (iv) therefore, (D) is neither true nor false.¹⁸

However, it is difficult to understand how this solution could be consistently defended. In order to appreciate this point, notice that there is an important difference for GB-theorists between the problem concerning the ‘this is doomsday’ statement (D) and the familiar problem of future-contingent statements. In fact, although the idea that future-contingent statements lack a (determinate) truth-value is not completely uncontroversial,¹⁹ it has the *prima facie* ring of intuitiveness to it: ‘The future does not exist. Therefore, there is nothing in reality capable of making future-contingent statements either true or false. However, *once enough time has passed*, reality will make the corresponding (appropriately ‘truth-value linked’)²⁰ present-tense statement true, thus ‘resolving’ the past unsettledness of the future-contingent statement in question, so to speak’. In the case of doomsday, however, things appear to be significantly different. In fact, if it *is* doomsday, and so *it is the case* that, for no *p*, it will be the case that *p*, how can it *not* be *true* that for no *p*, it will be the case that *p*? How can the world be ending *right now* if (i) it is currently

¹⁸ Not every GB-theorist endorses this ‘gappist’ treatment of future-contingent statements. Correia and Rosenkranz (2018), for instance, take future-contingent statements to be ‘grounded in the future’, so to speak, in the sense that if ‘*n* time units in the future it will be the case that *p*’ is a true future-contingent statement, there will be some fact, *n* time units in the future, grounding the fact that it is now the case that *p* (see Correia and Rosenkranz 2018: 109-110). Notice that this strategy is clearly not applicable in the case of (D) since on doomsday there is *no* future in which (D) can be grounded. Correia and Rosenkranz endorse the (‘nefarious’) idea that ‘[if] time will not go on for at least *n* units of time, then one can hold that for some *m*, with $0 \leq m < n$, [...] *m* time-units from the present, time has come to an end, and add that *m* time-units from the present, it is a *brute fact* that time has come to an end’ (Correia and Rosenkranz 2018: 111; my italics).

¹⁹ MacFarlane (2003) is a good starting point on the recent debate on future-contingents.

²⁰ See Dummett (1968) on the notion of ‘truth-value link’.

neither true nor false that it is the end of the world and (ii) it will never be even retrospectively true that it is now doomsday?^{21,22} In the case of future-contingent statements the unsettledness of a statement about the future is thought of as something that the future *will resolve*. The sentence ‘It will be sunny tomorrow’ is neither true nor false *now*, yet tomorrow the sentence ‘It is sunny today’ *will be* either true or false. We have, thus, in this case *two* different sets of possible futures: the set containing the futures in which it is sunny tomorrow and the set containing the futures in which it is not sunny tomorrow. In the case of (D), instead, there is only *one* set of possible *futures*: the set containing the futures in which (D) is *false*. Therefore, the only way in which *what happens in the future* may ‘resolve’ the unsettledness of (D) is by showing its (retrospective) falsity. If, instead, today were doomsday, as (D) says, then (D) could never be even retrospectively true. In this case we would have, thus, the paradoxical situation in which the world ends by leaving it open and unsettled whether the world is ending.

Some GB-theorists may perhaps reply that within the framework of an Aristotelian approach to the open future doomsday should not be thought of as the moment at which (D) is true, but rather as the moment at which (D*) or, alternatively, (D**) is the case (depending on whether one takes the lack of truth- and false-makers to give rise to *truth-value* gaps or just *determinacy* gaps; in what follows ‘**T**’, ‘**F**’, and ‘**Δ**’ stand for ‘it is true that’, ‘it is false that’, and ‘it is determinately the case that’):

$$\begin{aligned} (D^*) & \quad \sim \mathbf{T}\exists pFp \wedge \sim \mathbf{F}\exists pFp \\ (D^{**}) & \quad \sim \mathbf{\Delta}\sim\exists pFp \wedge \sim \mathbf{\Delta}\exists pFp \end{aligned}$$

However, the problem with this strategy is that in this kind of framework we have, on the one hand, that (D*) and (D**) entail that it is now-possible for the future to continue,²³ and on the other hand, that (D*) and (D**) are true also when the future

²¹ On future-contingents and the idea of ‘retrospective truth’ see, among many others, MacFarlane (2003) and Barnes and Cameron (2009).

²² Similarly, if it is assumed that future-contingent statements, although either true or false, are neither *determinately* true, nor *determinately* false (Barnes and Cameron 2009, 2011), the same kind of reasoning would entail that it cannot ever be *determinately* the case that the world is ending. But how could the world *determinately* end if it is neither (i) determinately true that it is the end of the world, nor (ii) it will be ever the case that it was true that it is the end of the world?

²³ Within this kind of framework truth-value/determinacy gaps arise from the existence of a plurality of possible futures so that a proposition *p* is ‘gappy’ if and only if it is now-possible that *p* and now-possible that not-*p* (see Thomason 1970, and Barnes and Cameron 2009).

is open as to whether it is doomsday or not. Consider, then, the scenario in which it is open and unsettled whether it is doomsday *and then* time keeps on passing for a little bit longer. If that was the case, it would follow from this account that it is true to say that *it was doomsday some time ago*, which of course, cannot be the case.

As a third option, GB-theorists may consider the possibility of simply biting the bullet and taking doomsday to be *impossible*. However, this option strikes one as too costly. Not only does the end of time seem to be a clear metaphysical possibility, but it is even something that contemporary physics doesn't appear to be in position to rule out about the *actual* world.²⁴ Furthermore, recall that here we are considering whether GB-theorists are really better off than presentists when it comes to the challenges posed by the Supervenience Principle. According to this option, the price that GB-theorists have to pay is to commit themselves to a certain substantial thesis concerning the topology of time. However, it is not at all clear that such a commitment should be preferable to either the position of *sui generis* truthmakers or the rejection of the unrestricted validity of the Supervenience Principle.

As I have argued, invoking (i) laws of nature, (ii) truth-value (or determinacy) gaps, or (iii) the impossibility of doomsday don't seem to be live options for GB-theorists. It seems, thus, that the only remaining option is that of following presentists and employing one of their responses to the grounding objection. *Upstanding GB-theorists* may, for instance, invoke *ersatz* histories and claim that (D) is made true by the fact that in the actual *ersatz* history the *ersatz* present is not 'followed' by any other time.²⁵ Or, alternatively, they might resort to other kinds of *sui generis* truthmakers for (D) like *future-directed* Lucretian properties (like 'being such that for every p, it will not be the case that p') or, perhaps, 'countdown-properties' instantiated by the world and thought of as the

²⁴ In the context of the theory of general relativity the so-called 'closed Friedmann models' feature both a 'big bang' and a 'big crunch' singularity so that, according to them, 'time is finite in the past, and [...] also in the future' (Earman 1995: 19-20).

²⁵ *Ersatzist* GB-theorists include Briggs and Forbes (2012) (although they don't qualify as *upstanding* GB-theorists: 'The Growing-Block theory does better. Which timeline is actualized is determined by which concrete things tenselessly exist, the properties and relations those concrete things instantiate, and the laws of nature': 296). They call *ersatz* histories 'timelines' (Briggs and Forbes, 2012: 260) and 'semi-complete timelines' those timelines that 'the laws of nature permit, but do not require, to extend into the future' (Briggs and Forbes, 2012: 269). They leave open the question as to whether there are semi-complete timelines (*Ibid.*).

future-directed counterparts of Cameron's (2010, 2015) age-properties.²⁶ Instead, *nefarious GB-theorists* (like Correia and Rosenkranz 2018: 111) can claim that, although the idea that 'truth doesn't float on the void' is in many cases plausible and intuitive, 'this is doomsday' propositions are indeed propositions that can be true without being grounded in reality. Both options appear to be open to GB-theorists, at least *prima facie*. It is clear, however, that in both cases the GB-theory doesn't seem to fare substantially better than presentism when it comes to providing a *general* account of how tensed truths supervene on reality.

3. The MS-theory and its supervenience challenges

In order to understand how MS-theorists can successfully address the doomsday challenge it may be useful to also consider what appear to be the two other main supervenience objections that can be levelled against the MS-theory: (i) the objection concerning the 'Distinguishability Thesis' (Miller 2017, 2018a) and (ii) the objection focussing on truths about the 'A-past' such as 'time T was once present'.

The idea that non-presentist A-theories of time fare better than presentism when it comes to the grounding objection has been recently questioned in relation to the so-called 'epistemic challenge' to non-presentist A-theories. Take Caesar, for instance. According to pastist A-theories of time, Caesar exists and is located in the past. Caesar thinks he is in the present, yet he is wrong. However, Caesar seems to have the same kind of evidence we have when we claim that we are in the present. So, how can *we* know that we are in the present?²⁷ Miller (2017, 2018a) has argued that the only way non-presentist A-theorists can address the epistemic challenge is by endorsing the 'Distinguishability Thesis' (henceforth 'DT'):

Distinguishability Thesis: There is a respect, *R*, in which any time, *t*, when *t* is objectively present, is distinguishable from *t*, when *t* is objectively non-present. (Miller 2017: 187)

However, as Miller argues, once DT is accepted, pastist A-theorists appear to be in the same boat as presentists when it comes to truth-grounding. Simplifying a bit, Miller's main line of reasoning may be summed up as follows. Suppose that time T

²⁶ 'Count-down properties' are meant here to be properties that say how much time the world has left, so to speak. When the world instantiates a countdown property saying that its time is over, *that* makes (D) true.

²⁷ On the epistemic challenge to non-presentist A-theories of time (also known as 'present problem') see, among others, Bourne (2002), Merricks (2006), and Braddon-Mitchell (2004, 2013).

was present and let R be the respect in which T *qua* present is distinguishable from T *qua* non-present. T was R in the past. However, T is past now, and so it is not R anymore. In other words, *T's being R* is not a part of reality anymore, given that T is not present. Therefore, the truth of 'T was R' appears to point beyond reality in the same problematic way in which truths like 'Socrates drank the hemlock' do for presentists. If DT is true, also the GB-theory and the MS-theory fall prey to the grounding objection.²⁸ Let us call this the 'distinguishability challenge'.

In a similar vein, (what we may call) the 'A-past challenge' focuses on truths about the past position of the moving spotlight. For instance, MS-theorists claim that although 2014 *is* past, it *was* present. However, 2014 doesn't currently instantiate the property of being present. '2014 was present' seems, thus, to be a truth that, quite like 'T was R', points beyond how reality currently is (and what entities exist and what properties and relations are instantiated), thus engendering a grounding problem.

The doomsday challenge to the MS-theory appears to belong the same group as the distinguishability challenge and the A-past challenge. In fact, while in the latter case the truths in question point beyond reality by saying how things are beyond the present reality *in the past*, (D) points beyond reality by claiming that *nothing* is the case beyond the present reality *in the future*. It may seem, therefore, that the MS-theory is also destined to succumb to supervenience problems. As I will argue in what follows, appearances prove to be deceptive in this case.

Recall that the grounding principle at stake here is the Supervenience Principle. Therefore, in all these cases MS-theorists can simply retort that all the relevant truths *do* in fact supervene on reality since:

- (i) *necessarily*, if 'T was R' is false, either T *doesn't* exist or it is *not* earlier than the time that is currently present;
- (ii) *necessarily*, if '2014 was present' is false, the spotlight is *not* illuminating a time that is later than 2014;
- (iii) *necessarily*, if (D) is false, the spotlight is *not* illuminating the latest moment in time.

In fact, MS-theorists can continue, (i)-(iii) follow from the fact that (MS1)-(MS3) are all metaphysically necessary principles within the framework of the MS-theory:²⁹

²⁸ A similar line of reasoning seems to be offered by Heathwood (2005) in connection with the 'Dead Past Hypothesis' (Forrest 2004). See Cameron (2015) for an alternative response to the epistemic challenge.

²⁹ In what follows '*P*' stands for tense-operator 'it was the case that', '<' for the earlier-later relation, and ' $\pi(t)$ ' for '*t* is present'. '*t*', '*u*' and '*v*' are thought of as ranging over

(MS1) $\forall t(\mathbf{PR}(t) \leftrightarrow \exists u(\pi(u) \wedge t < u))$

For every time t , it was the case that t was R if and only if some time u is present and t is earlier than u

(MS2) $\forall t(P\pi(t) \leftrightarrow \exists u(\pi(u) \wedge t < u))$

For every time t , it was the case that t was present if and only if some time u is present and t is earlier than u

(MS3) $\exists pFp \leftrightarrow \exists t\exists u(\pi(t) \wedge t < u)$

It will be the case that p , for some p , if and only if there is some time t and some time u such that t is present and t is earlier than u

One may worry that MS-theorists are not in position to simply declare (MS1)-(MS3) to be metaphysically necessary and the corresponding problematic worlds to be impossible.³⁰ Yet, why couldn't they? Nothing seems to debar MS-theorists from upholding, for instance, that (i) (MS1)-(MS3) must be thought of as 'metaphysical axioms' ('laws of metaphysics')—or as 'metaphysical theorems' following from such axioms—and that, in general, (ii) laws of metaphysics are metaphysically necessary truths that don't possess any further ground (see Sider 2011: §12.5). Similarly, nothing seems to prevent MS-theorists from claiming that (i) it lies in the (either constitutive or consequentialist)³¹ essence of R-ness and presentness that (MS1)-(MS3) are the case and that (ii) essentialist facts are fundamental, ungrounded facts (or facts that are not-apt to be grounded: see Dasgupta 2014). In this case, in fact, MS-theorists could employ the essentialist operator 'it lies in the (either constitutive or consequentialist) essence of x that' (' \Box_x ') and embrace the following 'generic' (Correia 2006) essentialist facts:

(ES1) $\Box_R \forall t(\mathbf{PR}(t) \leftrightarrow \exists u(\pi(u) \wedge t < u))$

(ES2) $\Box_\pi \forall t(P\pi(t) \leftrightarrow \exists u(\pi(u) \wedge t < u))$

(ES3) $\Box_\pi (\exists pFp \leftrightarrow \exists t\exists u(\pi(t) \wedge t < u))$ ³²

times, and ' \mathbf{R} ' stands for '[the] respect [...] in which any time, t , when t is objectively present, is distinguishable from t , when t is objectively non-present' (Miller 2017: 187).

³⁰ A similar move is deemed to be problematic by Miller (2018: 246-49) discussing Forrest (2006).

³¹ See Fine (1995: 276ff) on the distinction between constitutive and consequentialist essence. I employ here a disjunctive notion of essence (i.e. either constitutive or consequentialist) only for the ease of exposition.

³² *Mutatis mutandis* (ES2)-(ES3) appear to express something close to what Cameron (2015, 2017) claims concerning change and the essence of his age properties: '[...] the very *essence* of ages involves change [...] facts about change are a genuine feature of reality on

Notice, furthermore, that GB-theorists and presentists *cannot* appeal to laws of metaphysics and essentialist facts in order to avoid (all) their grounding problems. Upstanding GB-theorists and presentists can indeed claim (like Cameron 2015, 2017 does) that it lies in the nature of the *sui generis* truthmakers they invoke that the relevant tensed propositions are true. However, the question here is precisely whether one can address the challenges to A-theories of time without either positing the existence of *sui generis* truthmakers, and thus, taking the upstanding path, or rejecting the Supervenience Principle, and thus, embracing the nefarious side. Similarly, although GB-theorists do appear in position to invoke principles like (MS1) and (MS2) to meet both the Distinguishability and the A-past challenge, there appears to be no principle corresponding to (MS3) that may help GB-theorists with the doomsday challenge. In fact, it seems that such a principle could help GB-theorists only by making doomsday something that can only happen *by necessity* once the block has grown in a certain way. It is, however, difficult to see what these necessitating circumstances may be.

Miller (2017, 2018) claims that any non-presentist A-theorists aiming at doing better than presentists when it comes to truthmaking should comply with the following two theses:

Unified Truthmaker Thesis 1 (UTT1): ‘the sorts of truthmakers [...] for *present*-tensed propositions are the same as the sorts of truthmakers [...] for *past*-tensed propositions’ (Miller 2018: 235; my italics)

Unified Truthmaker Thesis 2 (UTT2): ‘Whatever kind of thing actually makes true *some* past-tensed truth, P, is the kind of thing that makes true *every* actual past-tensed truth.’ (Miller 2017: 190; my italics)

However, the MS-theory appears to have no problems concerning (UTT1) and (UTT2) (understood in terms of supervenience) once the notion of ‘tensed truth’ is disambiguated. In fact, MS-theorists (as defined in this paper) can distinguish between *two* kinds of tenses:³³ one that is reducible to quantification over times and

my view [...] The difference between my view and the Stuck Spotlight view is that temporal passage results from the *natures* of things.’ Cameron (2017: 819; italics mine).

³³ According to Sider (2001), they *must*: ‘the defender of the growing block universe must accept *two* senses of the tenses. One sense is given an eternalist-style analysis in terms of the manifold; the other captures the *growth* in the manifold. (The defender of the moving spotlight must also accept two senses of the tenses, one reducible to B-facts, the other expressing the movement of the spotlight.) The latter seems not to be reducible to the former, for if it were, the actual growing block universe—a dynamic four-dimensional manifold whose crest is in 2000—could not be distinguished from a B-theoretic world in which time comes to an end in 2000.’ (Sider 2001: 22).

one that is not. Let's call them 'weak' and 'strong' tense.³⁴ Strong tense is essential to the MS-theory as presented in this paper, so that MS-theorists are committed to claiming that there are some strongly-tensed truths. For what concerns weak tense, MS-theorists appear to have a choice concerning ordinary English past-tensed statements like 'Socrates drank the Hemlock'. They can either claim that

- (i) ordinary past-tensed statements like 'Socrates drank the Hemlock' must be understood as strongly-tensed and, thus, be parsed by means of fundamental tense operators ('**It was the case that:** Socrates drinks the Hemlock'), or that
- (ii) ordinary past-tensed statements are best parsed as (something along the lines of) 'There is a time T that is earlier than the time that is currently present and such that Socrates drinks Hemlock at T'.

If MS-theorists take every tensed-statement to be strongly tensed, then tensed statements are indeed made true in an uniform way, since every tensed truth is partly made true by what kind of ordinary properties and relations entities instantiate along the block *plus* the position of the spotlight of presentness. Instead, if MS-theorists acknowledge the existence of both strongly and weakly tensed statements, then it would seem natural to reformulate (UTT1) and (UTT2) as demanding unification only when the *same* kind of tense is concerned. Why should statements whose logical form involves only quantification over times be truth-made in the same way as statements whose logical form involves a fundamental temporal operator? However, it is easy to see that in this case there is also no uniformity problem for MS-theorists. In fact, weakly-tensed truths all supervene on the way the block is (independently of the position of the spotlight), while all the strongly-tensed truths supervene on the way the block is *plus* the position of the spotlight.

It seems, thus, possible to conclude that, contrary to both presentism and the GB-theory, the MS-theory appears to be in position to meet all the main supervenience challenges to the A-theories of time and should, thus, be preferred over both presentism and the GB-theory.

³⁴ Deasy (2015) considers an *operator reductionist* version of the MS-theory according to which tensed statements can be reduced to quantification over times and the property of being present. The kind of MS-theory featuring in this paper is (by definition) not an operator reductionist one. However, what I am saying here about strong and weak tense seems to hold—*mutatis mutandis*—also for Deasy's 'moderate tense' (as we may call it).

4. Past record and Neutrality

In the previous section I have argued that the metaphysical axioms of the MS-theory shape the space of metaphysical possibility in a way that puts MS-theorists in position to address all the supervenience challenges reviewed in this paper. However, even those who agree with what has been said thus far may still be worried by the fact that MS-theorists must reject Past Record (Cameron 2015: 64):

Past Record: If something *was* the case, then it *is* the case in the past

In fact, even if 2014 was present, it is not part of the past block of reality that 2014 is present. Similarly, T was R. However, T is now part of the past block of reality *without* being R. According to Miller (2017, 2018), the rejection of Past Record is intimately related to the truthmaking problems of non-presentists. However, if what I have argued in the previous section is on the right track, the failure of Past Record doesn't appear to engender any supervenience objection to the MS-theory, as it doesn't prevent tensed truths from supervening on reality (and in a way that conforms with Miller's unification principles). The only potential problem for MS-theorists that may hide behind the failure of Past Record appears to concern the issue of whether the MS-theory adequately captures the reality of temporal passage.

Kit Fine (2005) famously distinguishes between *standard* and *non-standard* versions of tense-realism. He calls 'presentism' the standard version of realism. However, this label seems to be potentially misleading given that GB-theorists and MS-theorists also appear to be in position to endorse Fine's 'presentism'.³⁵ To avoid confusion I will use 'Fine-presentism' to refer to standard realism about tense in Fine's sense. Fine-presentism is characterised by the rejection of the Neutrality principle:

Neutrality: No time is privileged, the tensed facts that constitute reality are not oriented towards one time as opposed to another. (Fine 2005: 271)

Leaving aside Fine's reference to tensed facts,³⁶ a plausible way to understand the meaning of Neutrality appears to be the following. Those who uphold the reality of temporal passage embrace the idea that a certain kind of *change* occurs in reality: presentists think that entities begin and cease to exist and change their properties and relations; GB-theorists think that the block of reality grows; MS-theorists think that the spotlight of the present 'moves' along the block. At every 'stage' of

³⁵ See Loss (2017: 219-20).

³⁶ Fine (2005) explicitly takes tense-realists not to be committed to the existence of entities like tensed facts. See Loss (2018) for some discussion.

temporal passage reality is in a certain way: for presentists, such that only certain entities exist and instantiate only certain properties and relations; for GB-theorists, such that a certain moment is the latest moment on the block; for MS-theorists, such that the spotlight of presentness illuminates a certain specific time. Fine-presentists appear, thus, to be best understood as theorists who take reality to be always exhausted by a *single stage* of temporal passage, so to speak.³⁷ For instance, for MS-theorists endorsing Fine-presentism, from the fact that it is now part of the current stage of temporal passage that 2019 is present it follows that it is indeed part of reality that 2019 is present. However, from the fact that 2014 was present at a past stage of temporal passage it doesn't follow that it is part of reality that 2014 is present. The presentness of 2014 is not part of reality anymore. What is part of reality is that 2014 *was present*. It seems, therefore, that Neutrality can be better reformulated as follows:

Neutrality*: No stage of temporal passage is privileged. Reality is not oriented towards one stage of temporal passage as opposed to another.

Non-standard realists embrace Neutrality* and claim, thus, that *every* stage of temporal passage is part of reality. However, they endorse a different *conception* of reality. *External relativists* embrace the view that the most fundamental notion of reality is not absolute but always irreducibly relative to a certain temporal standpoint. Therefore, they claim that the presentness of 2014 is indeed real *but only relative to a certain perspectival standpoint*. Instead, *fragmentalists* think that every stage of temporal passage is real *simpliciter*, but deny that chunks of reality 'agglomerate', so to speak, so that not every two chunks of reality can be seen as both parts of a single, larger chunk of reality. According to them, it is part of reality that 2014 is present and it is part of reality that 2014 is past, but it is not part of reality that 2014 is *both present and past*.³⁸

³⁷ I speak of 'stages' of temporal passage only for the ease of expression. Whether entities like 'stages' exist will depend (among other considerations) on the version of tense-realism in place (for instance, *fragmentalists*—see below—may identify stages with their 'fragments of reality').

³⁸ Simon (2018) distinguishes three versions of fragmentalism: (i) *dialectic fragmentalism* (Loss 2017) 'revises our logic itself, allowing for true (first-order) logical contradictions to obtain without *quodlibet*'; (ii) *jagged fragmentalism* (Fine 2005, Lipman 2015, 2018) 'allows that fragments may fail to cohere with one another, in the sense that there is some notion of obtaining-in-a-fragment such that P can obtain in one fragment while ~P obtains in another, but this does not engender genuine contradiction'; (iii) *smooth fragmentalism* (tentatively endorsed by Simon himself) 'denies that there is any genuine incoherence [...]. On this approach, logic remains classical [and] reality is coherent [...]. Instead we focus

One of the most interesting arguments for Neutrality* and non-standard forms of tense-realism is nicely summed up by Lipman (2018):³⁹

The closest that a standard A-theory comes to capturing the passage of time is in the constant rewriting of its description of the world. It states that the world is (now) *this* way. And then we wait. And then it states that the world is (now) *this* way. But the crucial bit is in the waiting, this is where time passes, and the passing itself isn't captured in any of the descriptions that the theory offers us. [...] What an A-theory really offers us, across time, are the still snapshots of that which passes away *if and when time passes* and not a picture of that very passing itself. A passing picture isn't a picture of passage. (Lipman 2018: 97)

2014 was *first* present, *and then* past. It *passed from* being present *to* being past. However, the metaphysical reality of temporal passage appears to require the reality of *both* stages of the passage. A world-block featuring only a present 2014 would appear to be as static as a world-block without any present time, no matter how many 'tensed truths' one adds to the picture. Neutrality* appears to entail Past Record. If reality is not oriented towards the present stage of temporal passage, then what *was* the case must be the case *simpliciter* (even if in the 'past part' of reality). Therefore, if what has been said in this section is on the right track, it can be concluded that the failure of Past Record ought to be seen as problematic only by those theorists that feel the pull of this kind of arguments and take the reality of temporal passage to require reality *not* to be oriented towards the present stage of temporal passage. Notice, however, that MS-theorists who find the rejection of Past Record problematic do have the option of embracing some *non-standard* form of tense realism. For instance, they may endorse a *fragmentalist* version of the MS-theory according to which each fragment of reality features the same block of the world but with the spotlight of presentness in a different position.⁴⁰ It seems, thus, possible to conclude that the failure of Past Record is in any case not a fatal problem for the MS-theory.

exclusively on those cases of metaphysical incompatibility that do not generate logical incompatibility—i.e. distinct determinates of a common determinable, like being scarlet (all over) and being crimson (all over)' (Simon 2018: 128-9).

³⁹ See also Fine's (2005: 286-88) 'argument from passage'.

⁴⁰ This fragmentalist version of the MS-theory is different from the theory Iaquinto (2018: 5) says that may be labelled 'Fragmentalist Moving Spotlight' (but which he takes to be a form of presentism, as it seems to be indeed more plausible). According to Iaquinto's FMS every fragment contains only present entities, whereas according to this version of the MS-theory each fragment contains past, present, and future entities (see below).

One may retort that presentists and GB-theorists also have the option of embracing Neutrality* and of choosing a non-standard form of tense-realism like fragmentalism. For instance, presentists may take fragments of reality to contain only present entities (Iaquinto 2018), while GB-theorists may take them to contain only past and future entities. However, in this case the supervenience problems of GB-theorists and presentists may appear to vanish, at least insofar as supervenience on *über-reality*—thought of as the ‘collection’ of the plurality of realities in which the fragments consist (Fine, 2005: 281-3)—is taken to be sufficient to meet the grounding challenge. Suppose, for instance, that (D) is true with respect to a certain fragment of reality *f*.⁴¹ Then, even assuming that there may be a fragment of reality *g* featuring the same fundamental entities instantiating the same pattern of fundamental properties and relations and such that (D) is false at *g* (thus violating *reality/fragment-supervenience*), it is indeed the case that, if (D) was false, then there would have to be a fragment of reality *f** in the future of *g* such that something *is* the case at *f** (thus complying with *über-reality-supervenience*). Even assuming that this line of reasoning can be successfully pursued (and, thus, that the notion of *über-reality-supervenience* is sufficient to articulate the intuition that ‘truth depends on reality’) the MS-theory still appears to fare better than its fellow A-theories. In fact, contrary to presentists and GB-theorists—MS-theorists are *not* forced to endorse Neutrality* in order to cope with the supervenience challenge. Therefore, even in this case, the MS-theory should be preferred at least by those who have a taste for standard tense-realist landscapes.

5. Conclusion

In this paper I have argued that there is at least a class of propositions that appear to be as problematic for the GB-theory as truths about the past are for presentists. Furthermore, I have also argued that (at least insofar as Neutrality* is rejected) the MS-theory is the only A-theory capable of addressing all the supervenience challenges threatening the A-theoretic idea that time is, somehow, dynamic in nature.

I conclude, thus, that the Supervenience Principle gives A-theorists of time good reasons to prefer the MS-theory over both presentism and the GB-theory.⁴²

⁴¹ Among friends of fragmentalism it is controversial what is the relation between the notion of truth-at-a-fragment and the notion of truth *simpliciter*. According to Loss (2017: 227), truth-at-a-fragment entails truth *simpliciter*, while for Lipman (2015: 3129; 2018: 113), formulas of the form ‘ $\sim A$ ’ (like (D)) can be true-at-a-fragment without being true *simpliciter*.

⁴² I am very grateful to an anonymous referee for this Journal for useful comments.

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