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# Nothing to Come in a Relativistic Setting

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**Abstract**
In the first part of the paper, we show that C&R's axioms generate the following dilemma. On the one hand, they could admit that truths about future contingents have no real ground in reality. To reject the requirement of grounding, however, goes against the intuitions of most philosophers concerning truth. On the other hand, C&R could give up bivalence for future contingents at the cost of making their temporal logic more complicated and presumably losing certain theorems. In the second part, we evaluate C&R's relativistic generalization of the growing block by discussing the various options that can be used to make relativity cohere with the growing block, and we illustrate the reasons why Stein's "pointy present" looks preferable to bow-tie presentism.

**Keywords**
bivalence; ground; growing block theory; permanentism; temporarysm

## 1 Introduction

The main metaphysical contrast illustrated in Correia and Rosenkranz's Nothing to Come is between what Williamson (2013) called *temporaryism—i.e.*, the view according to which **sometimes some things sometimes do not exist**—and *permanentism*, the view that **always everything always exists**.

The formulation of the two views needs three clarifications. First, the quantification involved in these existence claims is meant to be unrestricted, so that the dispute between them turns out to be (supposedly) genuine: the view that the future is unreal does not amount to the trivial claim that it is unreal (or does not exist) *now*, *i.e.*, that it is not *located* in the now. In what follows we will also assume unrestricted quantification for all (non-)existence statements.

Second, the 'sometimes' or 'always' repeated twice in the definition of the two views needs to be spelled out. If I claim that "Sometimes, some things sometimes do not exist", I am saying that there are times (for example, October 5$^{th}$ 2020) at which something (say, Donald Trump's coronavirus infection) exists, but sometimes (for example, at all times before September 2020) do (did) not exist. Analogous considerations hold for the definition of permanentism: "it is always the case that everything always exists" means that there is no time at which something exists which is *new* (did not exist before) (which is the claim of the growing block view), or at which something fails to exist which previously did exist (the claim of presentism). We must confess that we both found the definitions of the two contrasting views rather confusing at first, but the complicated formulations (which are taken *verbatim* from Williamson) are needed by the authors (C&R henceforth) in order to forestall some objections to temporaryism found in recent literature.

Finally, the conceptual strategy that C&R use to formulate their version of the growing block theory (GBT henceforth) is tensed logic (see first chapter). The logical apparatus developed in chapters 1-3 is complex but ultimately very clear and useful and constitutes a major contribution of this book of which future works should take advantage.

In order to get to the core of what we take to be C&R's extremely good addition to the literature, we begin our review with chapter 5. The main purpose of the chapter (and of the book) is to show that GBT is better than its critics have taken it to be. However, they do not attempt to show that GBT is the best temporal ontology in the market: even if they implicitly defend it in so far as they point out, in some places, problems that rival views face which GBT does not face, they do not cover *all* rival temporaryist ontologies, and they explicitly do not offer criticisms of static permanentism or eternalism.

Following and articulating a point made in Williamson (2013), they conclude their analysis by pointing out that the notion of being present is not robust enough to serve as a foundation for temporal ontologies, GBT included. Moreover, and fortunately, they show that the notion or property of being present is, for some surprising reason, not needed by temporaryists, because "logical constants, temporal operators, quantification, identity and the notion of being a time suffice" to capture perspicuously all the traditional views. (49)

The following two axioms are considered as the ground for their version of the GBT

$$\text{(P1) } \text{E!}x \rightarrow \text{GE!}x$$
$$\text{(P2) } \text{T}x \rightarrow \text{At } x, \text{H}\neg\text{E!}x$$

> (P1) means that if $x$ exists unrestrictedly, then it will always (*i.e.*, in the whole future) be true that $x$ exists unrestrictedly (existence does not get "lost" as in presentism) (P2) means that if $x$ is a Time (being a Time is an eternal feature, given the axiom A9, 7) then at that $x$, it has always been true in the past that x did not exist unrestrictedly. This means that at $x$, $x$ is (in terms of *times*) the new element added to the total sum of existence, or the growing "edge of being", so that what exists "grows".

As noted above, we find C&R's logical apparatus to be clear and perspicuous, once one gets used to it, and their demonstration that both presentism and GBT can be clearly formulated without recourse to a primitive notion of presentness is an extremely valuable contribution to the literature. That said, in setting up their logic and their revised version of Broad's GBT (Broad 1923), C&R make some choices that may not be congenial to some philosophers antecedently attracted to Broad's GBT. C&R's logical axioms presuppose truth bivalence, even for statements concerning future contingents, and even if one presupposes indeterminism of the laws of nature. Thus, here and now, any statement you wish to make concerning future states of affairs (*e.g.*, Q: "In 2060 there are human outposts on Mars.") is determinately true, or determinately false.

This may seem to be in tension with some of their GBT's core claims. The events of Mars-outpost-building, for example, do not exist; but if the events that occur in 2060 do not exist (for us, here in 2020), what, in reality, can possibly ground the truth (or falsity) of Q? C&R tackle the issue of truth grounding head-on, proposing and defending a weakened grounding requirement (GR) that lets them maintain bivalence:

$$\text{(GR) For all } \Psi, \text{ Sometimes, } \exists X((\text{Now, } \Psi \text{ is true) because } X \text{ exist})$$

In other words, $\Psi$ is now groundedly true as long as sometime in the future, it will be the case that there exists something (an object, event, or whatever) that makes $\Psi$ true. In the case of $Q$, that would be the future human Mars outposts (which are not, now, part of reality—what exists—construed in the widest possible sense, though they one day will be).

This may seem unsatisfying, possibly even incoherent to some readers. What, after all, could make the embedded sentence "Sometimes, $\exists X$((Now, $Q$ is true) because $X$ exists)" true here and now (as it should be, if $Q$'s truth here and now is to be grounded)? Presumably, only the future human Mars outposts can do this job materially, so to speak, but they do not exist. C&R must intend, then, that the mere fact that in 2060 human outposts on Mars will exist serves as the ground of the truth of $Q$. But this looks awfully close to saying that the truth of $Q$ grounds itself.

To evade this appearance of circularity, one might try to "beef up" the ontological significance of facts, so that the fact that in 2060 human outposts on Mars will exist becomes something more robust and interesting than the mere truth of $Q$. In that case we would worry that this deflates the distinctive ontological claim of the GBT—that the future literally does not exist, is not part of reality construed as widely as can be—into something that may seem like a merely verbal twist on standard eternalism (or permanentism). We recall Wittgenstein's way of explicating what it is to be part of reality, of the World: "The World is everything that is the case." Bivalence implies that there is a full and complete panoply of statements that are the case regarding future times, objects and events, just as there is for past and present times, objects and events. To put it in other terms, all the facts about future events currently exist just as much as the facts about past and present events. From this perspective, one may question whether on C&R's account there is really "nothing to come"—instead, it may seem as though the only things "yet to come" are the events of future things and times earning the honorific label "exists". Eternalists may be tempted to claim that at bottom this GBT amounts to a worldview that is basically the same as their own, but with certain indexical notions (like: *exists now or to the past of now*) being presented as non-indexical (*exists full-stop*). The only escape that C&R seem to be left with is either to drop GR above for all statements (but this seems too high a price to pay), or to drop it just for events in the future of now, which entails that there is no truth of the matter about the human outposts on Mars. We therefore see a dilemma here for C&R. On the one hand, they could admit that truths about future contingents have no real ground in reality, and defend the claim that no (substantial) grounding requirement should be imposed on such truths. To reject the requirement of grounding, however, goes against the intuitions of most philosophers concerning truth. On the other hand, they could give up bivalence for future contingents and adopt some three(or more)-valued logic, at the cost of making their temporal logic more complicated and presumably losing certain theorems. C&R mention some of the disadvantages of giving up bivalence in chapter 7, but do not explore the matter in detail.

Having noted this concern, we should immediately add that, as far as we can see, most of the important contributions of the book are independent of the choice of maintaining bivalence for future contingents, so philosophers who choose to reject it can still profit immensely from it.

## 2 Relativist growing block

In the 8th and 9th chapters C&R tackle the difficult problem of squaring GBT with the two theories of relativity, in such a way that its reformulation in relativistic terms is coherent with relativity (that is, it does not "tinker" with the theory while taking it seriously). The other requirement is that a relativistic GBT (hereafter, RGBT) be a *generalization* of the classical ontological view that is faithful enough to the original. In other words, their aim is to reach a reflective equilibrium between the need to reformulate the classical theories in view of relativity and that of preserving the spirit of the original thesis, so that the resulting RGBT is worth wanting. Do they succeed in achieving this equilibrium?

In order to try to fulfil their aim, they put to new use Strawson's well known distinction between a conservative and a revisionary strategy. The former consists in an attempt to rescue views requiring an absolute frame of simultaneity (presentism and the GBT) by adding such a frame to relativity by *fiat*, so to speak. The latter is the attempt defended by C&R to define a tensed logic relative to spacetime points rather than times, and to re-express GBT in this framework.

## 3 The conservative strategy

C&R briefly discuss Bourne and Zimmermann as representatives of the former strategy. They point out that not only various forms of presentism and GBT, but also the standard B theory, are in conflict with relativity, because these views presuppose an absolute and total temporal order (119). According to relativity theory, there is no such thing as "the universe at a time", but this is exactly what the meaning of 'always' (at all times) in permanentism requires. Relativity in fact raises the question "always relative to which inertial frame's time?" The main problem for Bourne and Zimmermann is that they try to claim that relativity is *incomplete*: that is, from the fact that there are features of reality that physics cannot express, we should not conclude that they are not real. The application of this incompleteness thesis to the aim of the "conservative" philosopher of physics is obvious.

C&R's main charge against the conservative strategy in Bourne's case is that it is not

capable of giving a "physically respectable characterization of the application conditions of absolute temporal notions or the notion of a privileged foliation" (125). The same holds also for Zimmermann's proposal: (i) distinguishing between an invariant structure of Minkowski spacetime and its content, and (ii) introducing a privileged foliation, are not inconsistent per se with special relativity. But the lack of an independent physical justification renders the moves ad hoc, insofar as they tinker with the geometrical structure of spacetime.

Our main remark about this claim is that finding a ground in a physical theory for a metaphysical theory is desirable, but probably too strong a requirement, and one by which C&R's revisionary strategy arguably also fails to abide (see our 'Conclusion' section below). Distinguishing between physically unintelligible and physically otiose structures seems to us an important conceptual point to make, and it is only the second charge that applies to Bourne and Zimmermann's strategy.

## 4 Spatiotemporaryism

C&R's revisionary strategy consists in using a "spacetime sensitive language", and in postulating that "what exists varies from spacetime-point to spacetime-point", rather than varying between different times. In particular, C&R defend a "bow-tie" RGBT according to which, at spacetime point *s*, what exists is the union of the causal past of *s* (back light-cone) and the absolute elsewhere of *s*. (This second component has a "bow-tie" shape in standard Minkowski diagrams and is an invariant structure. See Figure 1.) What does not exist as of s, according to this RGBT, is the causal future at s. The obvious competitor of bow-tie RGBT, a "pointy" RGBT (*i.e.*, the causal-past type of GBT (Stein 1991)), omits the absolute elsewhere as well as the absolute future from what exists at s. C&R argue that the bow-tie RGBT is superior to pointy RGBT; we come back to this question below. While either of these RGBTs is of course much more faithful to the spirit and the letter of relativity than a conservative approach, crucially, as C&R acknowledge, it remains to be seen whether they are not just compatible with relativity but also worth-having.

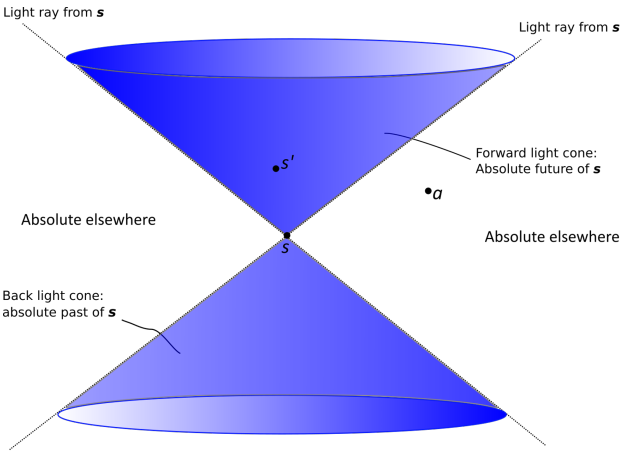


Рис. 1: Relativistic spatiotemporal structures

Before presenting and defending their RGBT, C&R first re-work the temporal logic of chapters 1–3 into a spatiotemporal logic adapted to relativistic spacetime. C&R reasonably extend the temporal operators defined earlier in the book by generalizing them to spatiotemporal operators, in such a way that they reduce to the former in prerelativistic spacetimes. (This reduction to the familiar temporal operators under appropriate conditions is a sign that the revisionary strategy is not straying too far from the original notions of temporal logic.)

Examples of spatiotemporal logical operators are, *e.g.*, $\triangleleft\varphi$ ('Somewhere in the elsewhere region, $\varphi$'), $^{\blacktriangle}\varphi$ ('Everywhere in causal past, $\varphi$'), $\varphi$ ('Somewhere in spacetime, $\varphi$'), ● ('everywhere in spacetime') and so on. With the new operators, C&R introduce doctrines that generalize classical permanentism and temporaryism: spatiotemporaryism and spatiopermanentism. Spatiopermanentism, for instance, is expressed with these operators thus: ●$\forall x$ ●E!$x$ ('Everywhere in spacetime, whatever exists also exists everywhere in spacetime.')

Analogous generalizations of the axioms already formulated in the first chapter are explicitly, precisely and beautifully written relatively to spacetime points. For instance, a necessary condition for a relativistic presentism or *spatiopresentism*, or a relativistic GBT, is that somewhere some truth *simpliciter* somewhere else fails to be a truth *simpliciter*.

At this point C&R use their technical machinery to formulate in a precise way two different forms of presentism, namely the view that for each spacetime point *s* *s* only that point exists and the view that for each spacetime point *s* only*s* plus the spacelike-related (or 'absolute elsewhere') region of *s* exists. It is important to note that these two forms of metaphysical presentism had been already expressed before in a less technical language, but

one should not oppose C&R's admirable precisification of those views.

Two remarks are in order, one for each kind of presentist view. (1) For here-now presentism (which is analogous to "hereism" in the spatial realm and solipsism in the mental realm), Stein (1991) had already remarked, in one passage, that the only equivalence relations in special relativity are the "trivial" relation (for every point only that point exists) and the universal relation (every point exists relative to any point). To the extent that a relation of existence-at (or existence-as-of) is required to be an equivalence relation, a denial that existence-at is a universal relation (*i.e.*, spatiopermanentism) implies an acceptance of a pointlike presentism. This is another way of explaining why, if they want to avoid permanentism, C&R must give up either transitivity or symmetry of the existence-at relation. Giving up symmetry is no cost at all, of course, since classical GBT rejects it already.

(2) Bow-tie presentism allows that other things can exist as of here-now, so it avoids solipsism. But arguably, it has *too much* existing as of here-now, or "now" as we would colloquially say. If we go far away from our here-now s, for example to the Andromeda galaxy, then entire civilizations may turn out to rise, flourish and fall entirely within our now or "present". But the corresponding RGBT can evade this awkwardness. The surface of the *future* light-cone at *s* constitutes the edge of existence, so if we consider that surface as defining the "present" or "now" as of s, only momentary events happen now-elsewhere, as in classical views. (The observations of this paragraph are ours, not C&R's). However, as Savitt (2000) had already noted, it is counterintuitive to claim that the set of points that count as present is not achronal.

A key advantage of the bow-tie choice over a "pointy" RGBT, according to C&R, lies in the fact that "whenever I here-now perceive my limbs to have been located at points in the causal past of here-now, there exist, here-now, several spacetime-points in the causal future of those points" (152). This fact guarantees persistence of my limbs, which can thus be said to "still exist" now. But in pointy RGBT, "at no point in my causal past are there sufficiently many points in order for all my different limbs to be located, not even if we think of each of my limbs as a mereological fusion of residents of spacetime" (151–2).

We find this argument unconvincing. Why should a defender of pointy RGBT not simply ostend the places on the surface of the past light cone where one's limbs are seen to exist and say "There is where my limbs are now!" One's limbs only exist up to the edge of existence and not further, but this seems perfectly acceptable to any GBT view.

The intuitive price paid by bow-tie RGBT compared to the pointy alternative was already captured in the quoted phrase at the beginning of this section: "what exists at a

spacetime-point existing at *s* may not exist at *s* itself". In other words, existence-as-of is not transitive. Again, consider the elsewhere region of any point *s*, and take a point *a* in the elsewhere of *s*. What exists as of *a* is the causal past *and* absolute elsewhere of *a*; but this will in general include points *s′* that are in the causal future of *s* and hence do not exist as of *s* (See Figure 1 for illustration of this scenario). Therefore, transitivity of existence-as-of must be given up on pain of contradiction. Giving up the transitivity of being may be thought to be too high an intuitive price to pay, since 'existence' seems transitive as a matter of meaning; we leave this problem to the reader to judge.[1] But it is worth noting that the need to reject transitivity of being re-introduces, in a sense, the solipsism that bow-tie RGBT seemed able to avoid. Although plenty of other things, places and events exist in my absolute elsewhere, their existence is second-class: I cannot accept that all the things my compatriots (*e.g.*, at *a*) say exist, really do exist. My compatriots are real as of me here-now, but not as decisive as me in determining what exists in reality: the resulting notion of reality is perspectival or relational, as in some versions of quantum mechanics. By contrast, defenders of pointy RGBT can at least preserve transitivity of being, because the relation "in the causal past of" is indeed transitive in relativistic spacetimes. I, here-now, am still at the pinnacle of becoming and hence special compared to my spatially distant compatriots, but at least I can agree with them whenever they say that something exists. No matter what form of RGBT one chooses, it seems, it is lonely at the top!

## 5 Conclusion

The main message of RGBT is therefore summarizable thus: "at *s*, *s* is 'new' on any particle's trajectory passing through *s*, while it continues to exist on this trajectory even after the latter has passed through *s*" (149). However, if the growth of the block becomes local and worldline dependent as the spirit of relativity requires, the universal classical worldwide tide of coming into being is fragmented into a "crisscrossing of uncorrelated narrow creeks" (Dorato 1995: 185). The question then becomes whether this relativistic, coherent but highly revisionary GBT provides a metaphysical view that followers of classical GBT can judge as worth having. (One could reply, of course, that given the conceptual novelties of relativity, one cannot have more.) We will not take a stand on this, although we suspect that if forced

[1] Kurt Gödel clearly stated that "The concept of existence … cannot be relativized without destroying its meaning completely" (1949: 558).

to choose an RGBT, we would prefer the pointy over the bow-tie version. But in terms of meshing with our classical intuitions, it is clear that any relativistic presentism *or* GBT fares poorly compared to a conservative strategy that singles out a privileged frame time for all of reality. This makes it understandable—though not one bit more naturalistically respectable—that some philosophers prefer to take the conservative line and pray that one day future physics will restore some meaningful sense of absolute simultaneity. Independent indications from Bohmian mechanics may provide some hope.

On a more general philosophical level, one may baulk at widespread projects of building metaphysical models of time without paying attention to a possible explanatory link with time as it is used in physical theories.[2] In GBT, which seems closer to common sense, the notion of coming into being of course should be taken to be ontologically fundamental (one could call it "the arrow of becoming"). However, ideally one might wish to have an explanatory link between this "grounding ontological arrow" and the other physical arrows of time that feature prominently in our description of the universe, for example the entropic arrow, the radiation arrow, or possibly the expansion of the universe. Without such connections, one may fairly comment that RGBTs are *not* "grounded" in physical theories, which is similar to the complaint made against Bourne and Zimmerman's conservative strategies. And it is only fair to note that all temporaryist ontologies have this feature in common, wheareas C&R's RGBT at least has the extremely valuable virtue of not postulating any spatiotemporal *structure that is not already found in physical theory*.

It is important to establish which of the various metaphysical views of time *coheres* with empirically well-established theory, and which of them is more naturally hospitable to new theories, even if the latter question never dictates the choice of a metaphysical theory among many.[3] Correia and Rosenkranz's *Nothing to Come* makes important strides in this project by clearly extending temporal logic into a relativity-friendly spatiotemporal logic and showing that there are ways to develop GBT into an ontology that coheres with relativity theories

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[2] This criticism can also be addressed to Maudlin (2007).

[3] One cannot expect that physical theories *not* underdetermine metaphysical theories, given that also the latter are undetetermined by *observational* data.

perfectly well, while retaining most of the distinctive content of classical GBT.[4]

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