

A new grounding problem for presentism

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Abstract

The presentist — if she wants her thesis to be consistent with venerable logical–semantic principles, namely, bivalence and excluded middle — must provide a convincing answer to the grounding problem. Given the idea — already present in classical antiquity — that truth supervenes on being, the grounding problem is used by the eternalist to accuse the presentist of not being in a position to offer an adequate ground for truths that concern the past or future. To address this problem, many thinkers evoke metaphysical doctrines regarding abstract object — a truth about Socrates does not include Socrates himself but only his essence or haecceity. Others seek present grounds for future or past truths — nomic presentism — while still others deny the semantic traditions in question or deny that truth supervenes on being. In this article, I present a new grounding problem to the presentist. Under the assumption that time is infinite, I claim that the presentist does not have at her disposal the foundations for truths that concern infinitely distant objects in the future. Moreover, I present a similar argument to refute 'temporalism', the thesis that at least some truths are temporally indexed. To conclude the argumentative phase, I evaluate the traditional presentist perspective that was advanced in some of the above responses to the typical versions of the problem. The objective is to show that the usual answers cannot address the

new grounding problem. Accordingly, I conclude that eternalism is better positioned to provide a ground for some truths if time is infinite.

Keywords: grounding, truth, presentism, temporalism, infinite.

1 Introduction: the grounding problem

The thesis that truth supervenes on being originates in classical antiquity. The expectation of finding a foundation for every true proposition is based on this idea. One of the ways to understand how truth supervenes on being is to say that truth supervenes on facts or states of affairs. The long tradition following Aristotle (1963) known as 'correspondentism' relates truth and being in such a way that the truth-bearers — the kinds of entities we consider liable to attribute the truth predicate — i.e., propositions, phrases, thoughts, representations, theories, etc., are true if and only if they correspond to reality. Recently, a principle of this nature has been defined as the *truthmaker* principle (cf. Armstrong 1997)¹. This is the principle that if ϕ is true, then there is an X such that: necessarily, if X exists, then ϕ is true.² This formulation of the principle makes it clear that the truth of ϕ requires an X and that this X , when it exists, requires that ϕ be true. It is here that the problem for the presentist appears. Presentism is a very parsimonious ontology because it admits only present objects, facts, events, times and present relationships into reality.³ Hence, the only facts on which a truth could supervene are those that exist now, in the present. Accordingly, we explore an argument against presentism below based on this idea:

¹ The term truthmaker can be defined as follows: a truthmaker is that by virtue of which something is true (Bigelow 1988: 125; Armstrong 1989: 88).

² Fox (1987) provides a similar definition, although in his version, he does not mention truth explicitly. The important point is to make it clear that according to this principle, every truth has a truthmaker.

³ There are many ways to define presentism and eternalism. Most authors seem to speak of objects or entities not present for eternalism, rejecting them in a presentistic context. I believe that is equally correct to include in the scope of our operators of existence things such as relationships, facts and non-present times as things that can be admitted in an eternalist ontology. Of course, those same things are rejected for the presentist.

(I) Presentism is true. (II) The world does not include future or past objects and events. However, (III) if the world does not include these, there is nothing in the world that can make a proposition about the past or future true. Thus, (IV) propositions about the past or future have no *truthmakers*. Therefore, (V) if the *truthmaker* principle is true, propositions about the past and the future are not. However, (VI) the *truthmaker* principle is true, and (VII) some propositions about the past or future are true. Therefore, (VIII) presentism should be considered false

(cf. Rea 2003: 21).⁴

The above argument is, in fact, an attempt to defeat presentism via a *reductio ad absurdum* since it is difficult to deny the existence of at least some truths about the past or future. The following three claims seem to be incompatible with each other: the *truthmaker* principle, presentism and the idea that there are truths about the past and future.⁵ Some examples of such truths include 'Socrates was the master of Plato', 'Aristotle was the teacher of Alexander the Great', 'There will be a white house in Alentejo next Christmas', and 'The first person born in 2023 will be born in January'. Notably, these are examples of contingent truths. Naturally, one could ask the same question about necessary non-present truths. However, if they are necessary by virtue of logic, it is debatable whether they need a foundation other than a logical one or, even, in the case of nomic necessity, that they require something more than a law of nature. Some examples of logical truths about the future include 'Either the actual president of the United States dies next year, or he does not die' and 'No one will be and will not be in Denmark on January 31, 2024'. Some examples of truths necessitated by the laws of nature include 'Every man is mortal' and 'There will be a visible solar eclipse in southern Spain in

⁴ The grounding problem in many versions has received attention from many authors. Among those who recognize the difficulty for the presentist are authors such as Sider (2001: 35–42), Armstrong (2004: 145–50), Keller (2004), Crisp (2007), Cameron (2011), Sanson & Caplan (2010), Markosian (2013), Tallant & Ingram (2015) and Emery (2020). For a more general approach to this problem, see Sanson & Caplan (2010).

⁵ A similar version of this argument, which, however, concerns only truths about the past, is given by Keller 2004: 85–87; Cameron 2011: 55–57; and Tallant & Ingram 2015: 355. Not all authors accept the idea that there are truths about the future, adopting the thesis of the 'open future'. This thesis, however, would be difficult to make compatible with the basic principles of classical logic.

2026'. For such truths, it is debatable that the grounding argument applies because we find its foundation in logical reasons or in laws of nature, and this may be enough.⁶

Nonetheless, the problem remains. Given the strength of logical principles such as bivalence, how can we avoid declaring that at least some truths about contingent futures exist now? Given the reasonableness of the truthmaker principle, how can one avoid concluding that the presentist is at a disadvantage, given that many present truths seem to lack present truthmakers? In what follows, I present a new version of the grounding problem (henceforth the NGP). The argument follows the structure of a *reductio*, similar to Rea's (2003). However, I rely on different assumptions and present a different problem for the presentist. Finally, I show that the presentist — if she wants to maintain bivalence and the idea that the truth supervenes on being — cannot accept that time is infinite or, at least, cannot accept that there are truths about futures infinitely distant from now.

2 A new dilemma of grounding.

Let us imagine, as many authors have already assumed (Aristotle 1957; Newton 2014, etc.) and only for the purpose of formulating an argument, that time is infinite. This can mean different things. It may mean that time does not have an end despite having a beginning — it is infinite from now on.⁷ It could also mean that time is infinite in the past but will end in the future, or that time has neither a beginning nor an end.⁸ It is moreover important to mention the known difference between potential and actual infinity, introduced in antiquity by Aristotle. The former designates a merely possible infinity and the latter an actual one — *latte potentis* and *latte actualis*. Beyond the historical debates on the existence of actual

⁶ Rea's argument (2006) relates to this point. According to Rea, the presentist who wants her thesis to be compatible with bivalence must bet on determinism as a means of establishing currently true propositions about the future (cf. Kierland 2013). In this case, presentism and bivalence are incompatible when in conjunction with future contingents.

⁷ *Temporal finitism* is the thesis that time is finite in the past, defended against Aristoteles by many authors, especially in the Middle Ages. The philosophers of religion William Lane Craig and James Sinclair presents some arguments in defence of finitism (cf. William Lane Craig and James Sinclair 2012). Finitism seems to be compatible with eternalism. Regarding the thesis that existing beings are not eternal but transient, we may call this transientism, i.e., there are things that start to exist and those that cease to exist (cf. Deasy 2015).

⁸ Maybe I can just frame it as the following: for any time t , there is an earlier/later time t' or both.

infinity, its possibility or the reasonableness of this concept, we can observe that time for the presentist can only be potentially infinite, i.e., for any moment it is possible that there be infinitely many further such moments in the future or past. However, there is no infinite and actual sequence of events or temporal instants. According to the Erlangen school⁹, one example of antirealism regarding the concept of infinity, only the potentially infinite can be a part of reality. Both concepts — actual and potentially infinite — refer, again, to Aristotle and his theory of actuality and potentiality. For Aristotle, the actual infinite must be timeless, and potential infinite occurs in mathematical operations of endless divisibility. It is impossible for potentially infinite to become actual (for example, for a potentially infinite object to acquire infinite extension). In his work 'Physics', Aristoteles lists some reasons supporting the theoretical relevance of the concept of infinity:

- 1 The nature of time — because it is infinite.
- 2 The division of magnitudes — in the mathematical use of the concept.
3. Because the limited finds a limit in something external, there is no absolute limit (the concept of absolute limit is contradictory).
4. Finally, above all other reasons, there is consideration of what is outside the heavens and mathematical magnitudes, which are never exhausted in our thoughts

(Aristotle 1957: 204a).

The Aristotelian concepts of potential and actual infinity are still influential today. They permeate fields such as philosophy of religion and mathematics, many times in accordance with Stagirite's conclusions. Although Aristotle declared the actual infinite impossible, some thinkers, such as Augustine of Hippo, left space for this concept in the figure of God, the only infinite and actual Being. Hence, as the concept 'infinite' is very rich and influential in many areas, it is not surprising that it could have some relevance to the metaphysics of time.

⁹ The Erlangen school provides a antirealist account of the infinite. The school assumes a constructivist model of mathematics. In this mode of thinking, mathematical objects exist when and only when they can be 'constructed'.

Without further exegesis, it must be said that since the work of Cantor (1932), the actual infinite has been accepted. If it is correct that time for a presentist can only be infinite in potentiality — a thesis that I defend in this article —, perhaps actual infinity can be shown to be compatible with eternalism. However, there are some important distinctions to be made here. For example, eternalism may or may not be identified with permanentism (Williamson 2013). That is, we can conceive eternalism of permanent and nonpermanent worlds. Eternalism advocates the existence of non-present, past, and future entities. Permanentism, in turn, advocates that all entities exist *ad aeternum*.¹⁰ Both may subscribe to actual infinity; however, it is the difference between them that gains relevance in the last section of this article.

I argue that permanentism by definition requires the kind of infinity mentioned above: that which has neither a beginning nor an end. Conversely, eternalism does not necessarily have to be this way. That is, eternalism does not seem incompatible with the divine creation of the world, with temporal finitism. Now, if all existing things are *ad aeternum*, the concepts of creation and corruption are not accepted in the world, i.e., they are in contradiction with the very idea of a world with this prerogative. Therefore, while eternalism is compatible with temporal finitism and with the idea that the universe is finite in the past as well as in the future, permanentism is not.

We must, therefore, grasp that the infinite time the eternalist advocates is actual, compatible with finitism, although not necessarily finitist. When our model is eternalist and finitist, this can only mean that we are discussing something that is infinite in the future. The important point is to distinguish, for the purpose of the argument that I am constructing, a fact that should be well established: presentism is a doctrine in whereby there is only potentially infinite time, never actual.¹¹

¹⁰ Permanentism refers, according to Deasy, the thesis that “it is always the case that everything exists eternally” (Deasy 2015, 2074). Williamson (2013: 4) coined the term ‘permanentism’ in philosophical debates.

¹¹ The so-called ersatz presentism of authors such as Bourne (2006a, 2006b); Chisholm (1979); Crisp (2007); Davidson (2003, 2004); Markosian (2004); Prior and Fine (1977); and Zalta (1987) is compatible with actual infinity. However, this thesis makes infinite time abstract, similar to a set of propositions. The infinite thus conceived has a very strong Platonist flavour. Moreover, as Baron points out, it is confusing to use terminology that does not express a definition of the concept of time, i.e., that does not tell us what ‘times’ are, effectively. Baron’s opinion favours an interpretation of ‘time’ that can be used to properly define the concept, and the preference may be for ‘concrete entities’.

This facet of presentism is explored below to underscore the disadvantage of this theory amidst the possibility that time, as Aristotle, Newton and others defended it, is actually infinite. The long tradition of these authors carries an unfortunate consequence for the presentist, i.e., the difficulty of grounding some truths. On note before elaborating upon my argument, that the problem arises regarding infinite time in the future, i.e., it is related to the future that the problem arises, although the traditional versions of the grounding problem also apply to the past.

2.1 The argument from infinitely distant truths

This argument is structured as follows:

- a) For each time instant t , there is, potentially or actually, an infinite number of later instants t' , t'' , etc.
- b) If presentism is true, then time can be infinite only potentially.
- c) If time is only potentially infinite, truths about an infinitely distant future t^* take infinitely many moments of time to be grounded, from the perspective of t .
- d) If something will occur at a time infinitely distant from t , then, from the perspective of t , it will never occur.
- e) Something that will never occur relative to t can never count as a ground for truth in t .
- f) Therefore, if the presentism is true, then an infinitely distant truth of t has no ground in t .

The presentist claims that only the present exists. Thus, it is easy to conclude that the instant t that should have truthmakers for infinitely distant future truths is the present. Hence, this argument allows us to question presentism as follows: any infinitely distant future truth lacks ground both now and always.¹² The strength of the premise is that if

¹² Thus, for example, it is common to say that no object in acceleration can reach the speed of light since this requires an infinite energy source. As it accelerates, the object in question needs to use more energy, and thus infinitely so.

something is infinitely distant, then it can never be achieved. Notably, this argument offers novelties in relation to the previous argument (Rea 2003). In the traditional version, the presentist struggles to provide a ground for non-present truths. Now, the struggle is even greater: presentism must admit that if there are truths infinitely far away, they will never have a foundation. Similarly, proponents of the Kalam Cosmological Argument, such as William Lane Craig (Cf. Craig and Sinclair 2009), have argued that the past must be finite in duration. The reason is that, otherwise, reaching the present moment would have to involve some an impossible move – the ‘traversing’ of an actual infinite sequence of events (cf. Puryear 2014). With the NGP the same reason would apply, i.e., that which could count as an appropriate foundation is infinitely distant – something that cannot be actualized to sufficiently ground truth, since it must accomplish a ‘traversing’ of an infinite sequence of instants. If presentism is true and time is infinite, then there are future truths that lack a foundation both now and forever. Effectively, the situation is even worse: there are infinite truths now (if time is infinite and there is at least one truth for each point in time, then the number of truths is also infinite) that are not grounded in reality and never will be, since it is necessary to await their occurrence *ad infinitum*¹³. A different version of the above argument can be structured as follows:

- a) Presentism is not compatible with the thesis that time is actually infinite, but only in potentiality (potentially infinite).¹⁴
- b) There are now infinitely distant truths, i.e., temporally saying.
- c) True propositions now require an actual ground.
- d) Therefore, presentism offers no basis for at least some true propositions.

¹³ This is related to the reason why many authors, Aristoteles included, reject the possibility of something infinite being actual. It is pointless to expect something infinite to happen, e.g., waiting for a payment that could only be received in infinite milliseconds.

¹⁴ The ersatz presentism is, of course, an exception. But one could not try to answer the NGP by suggesting that ersatz presentism is true since there is no actual relationship grounding a truth and, according to our argument, will never be. I will consider ersatzism carefully in the third section of this paper.

Presentists expect to obtain a ground for certain propositions as part of what will one day be the present. However, can this expectation be maintained in terms of infinitely distant truths? I believe that we can put the presentist already accustomed to responding to standardized versions of the argument on the ropes again with the NGP. That is, the generally advanced responses do not refute the version explained here. This is the main subject of this work in the following sections. However, before moving on, I explore the strength of this argument by challenging the thesis known as 'temporalism'. This thesis, as I define it here, suggests that something that is true at one time may be false at another, and vice versa. Temporalism, as we know, has been the most accepted thesis on how we should understand conditions for the truth of statements about future contingents since Aristotle. I argue in this article that temporalism is inevitably weakened when we consider, by the NGP, that presentism is a proposal that cannot accommodate infinitely distant truths.

2.2 Damage to temporalism.

Temporalism¹⁵ is the thesis that at least some truths are temporal, i.e., there are temporally indexed truths. This was a prevalent thesis in the history of philosophy, recently challenged via the emergence of semantics associated with mathematical logic. This challenge comes from the Fregean thesis that the truth value of tensed sentences is *ad aeternum*. Frege's thesis, in turn, refers to the precursors to mathematical logic that stimulated a novel conception in the seventeenth century, e.g., that of Leibniz. Some truths seem to be time-sensitive due to their incompleteness. Thus, the phrase 'it will rain tomorrow in Alentejo' is the unfinished expression of a complete thought expressing that 'it will rain in Alentejo on September 30, 2022'. The latter is always true or false at any instant in the past, present or future. Throughout most of the 20th century, philosophical orthodoxy embraced the Fregean thesis that truths are eternal. Dissonant voices with respect to this orthodoxy have been those of Prior (Prior 1967a: 16), Geach (1955), Kaplan (1989) and others, for whom the conception of Aristotle, of the Stoics and of the medievals, that is, temporalism, is the correct alternative.

¹⁵ What I refers to as 'temporalism' is the same theory that Prior called 'the tensed theory of time' (cf. Prior 1957). In any case, it is not unusual to refer to this theory as temporalism nowadays. To a similar use of 'Temporalism', see for instance Brogaard (2012).

The debate can then be characterized as concerned with the following two questions:

- 1 – Are there temporal truths?
- 2 – Are tensed sentences incomplete?

A typical temporalist will respond negatively to the second and positively to the first. Prior, in his summary of the imbrications of logic and time, describes temporalism as the conjunction of the following ideas: a) distinctions among verbal tenses are related to logical reflection and; b) what is true at one time may eventually be false at another, and vice versa (Cf. Prior 1957: 104).

Now that we understand temporalism in more detail, we can ask ourselves: what might the conception of time as potentially infinity imply for this thesis, if anything? I argue that if we are presentists, temporalism also becomes difficult to justify. To understand the argument that I will provide, let's consider first the following sentence (*M*): there will be a space battle in ϕ – an instant of time infinite distant from now. The argument, taking (*M*), could be like this:

- 1) For each time instant t , there is, potentially or actually, an infinite number of later instants t' , t'' , etc.
- 2) If presentism is true, then time can only be potentially infinite.
- 3) If time is only potentially infinite, truths that concern an infinitely distant future t^* take infinite moments of time to be grounded from the perspective of t .
- 4) If something will occur at a time infinitely distant from t , then, from the perspective of t , this something will never occur.
- 5) Something that will never occur can never be a ground for truth.
- 6) Temporalism demands that phrases like (*M*) become true at the appropriate time.
- 7) There are no truths without a truthmaker.

8) Therefore, if presentism is true and time is potentially infinity, temporalism is false.

The above argument is similar to the previous one with differences from the sixth premise onwards. It is unreasonable to expect infinitely distant ground for any sentence, even a temporal one. Of course, the reader may object that sentences about infinitely distant events, like (M), cannot be true since they lack a truthmaker. So temporalism does not demand (M) to be true, weakening the argument. However, this seems arbitrary. After all, what is the relevant difference between (M) and true phrases about the near future, i.e., the objects in the traditional argument (Rea 2003)?¹⁶ Given the thesis that the future is infinite in conjunction with the principle of bivalence, it does not seem reasonable, without additional justifications, to make exceptions for sentences that concern an infinitely distant future. The problem, when so posed, thus remains.

The conscientious reader will observe that the above arguments do not apply to eternalism. If we adopt an eternalist ontology, premise five in the last argument becomes false. Grounding, in eternalism, is cross-temporal; thus, in *t*, something that is true finds its grounding in things that exist later. As the eternalist ontology accommodates all events, objects, relations and non-present facts, all can be considered a ground for any proposition at any time.

How can the presentist object to this consequence of the NGP? In the next step, I explore how the new version of the problem behaves in regard to the advanced responses against the traditional version of Rea (2003) and others.

3. Presentist responses to the grounding problem

Naturally, as a much discussed problem in the literature, we cannot explore all possible answers to the grounding problem. However, we can consider the main presentist strategies adopted. In the context of this analysis, what is relevant is a discussion of how something fundamental is lacking in any attempt to refute the NGP. Specifically, for the presentist,

¹⁶ Many authors reject the relevance of the grounding problem regarding the future. If we can reject the idea that there are true phrases or propositions about the future, we can reject the grounding problem in any version (cf. Ingthorsson 2017), including the NGP. Regardless, it is not consensual that we can simply run out of bivalence for the future to avoid the ground problem or whatever the reason for that move.

the future event that is true now will occur. Without this fundamental premise, at least some traditional arguments cease to function.

Before exploring some of the main presentist strategies, it is appropriate to exclude those whose challenge is to reject the truthmaker principle or the logical principles for assigning a truth value — true or false — to any assertoric proposition, whether in the past, present, or future. In fact, the grounding argument, whatever its version, presupposes bivalence, the excluded middle and the truthmaker principle. For this reason, throughout this article, I assume a certain orthodoxy regarding the topic of truth, without which no version of the grounding argument can function. That said, we can now consider the traditional responses of the presentist to the classic versions of the grounding argument.

A popular solution is *Ersatzism*. This doctrine, Ersatz presentism, provides abstract entities that represent objects (facts, events, etc.) present, past or future, i.e., objects that exist, have existed or will exist. These abstract grounds compose a maximally consistent set of propositions (in some versions), which we can call 'times'. Times are, according to these theorists, abstract entities of this type that represent objects that do not yet exist (future) or no longer exist (past). Proponents of a version of this doctrine include Bourne (2006a, 2006b), Chisholm (1979), Crisp (2007), Davidson (2003, 2004), Markosian (2004), Prior and Fine (1977), and Zalta (1987). Accordingly, armed with these propositions, we can analyse the strength of this strategy in the face of the NGP.

How can we identify a relationship between abstract entities and entities that will only occur after infinite instants of time? For all purposes, the events that could form the ground of this relationship are, if presentism is the correct doctrine, only 'potential grounds'. The idea here is that the potentially infinite cannot become actual, as Aristotle said. In fact, it seems that the thesis that time can only be infinite in potentiality also includes a presentist premise — time cannot be infinite in actuality once it passes, as there is an arrow of time moves from the past to the present and from the present to the future. Without this premise, it becomes perfectly legitimate to speak of time as an infinite and actual

continuum. However, the Aristotelian thesis that the potentially infinite cannot become actual seems to be correct, interdicting this solution.¹⁷

The attentive reader will notice that all the strategies that evoke a relationship between abstract and non-present entities fail for the same reason. Thus, for example, the strategy of attributing to the essence of Socrates the role of substantiating non-present truths about the philosopher also fails. This is a known strategy in the literature (cf. Markosian 2004). However, I believe that current truths about objects that are infinitely distant fail to establish any relationship with these. That there may be a relationship of representation between a future entity, e.g., 'Ted, the greatest philosopher of the twenty-first century' and the essence of Ted, as strange as it may be, is something plausible. This is because Ted will be a present object sometime in the coming century. However, given that presentism and the passage of time are not compatible with the thesis that time is actually infinite, what about the application of the same strategy, now referring to abstract entities, e.g., the haecceity of Mark, the greatest philosopher of the ϕ century, i.e., where ϕ represents a century infinitely distant from now? It does not seem to me that Mark's haecceity can represent things that will never be actualized. Thus, the strategy of haecceities cannot be used to refute the NGP.

A third strategy, often referred to, consists of trying to find present truthmakers for non-present truths. A popular version of this approach is 'nomic presentism' (cf. Kierland 2013). This entails suggesting the present truths together with the laws of nature suffice to determine the truth values of all past and future truths. As Ingthorsson (2017: 94) has already mentioned, this strategy is only possible given the truth of causal determinism. Without determinism, we cannot guarantee the transitivity of information from a distant past to the present day or, still, from the present day to the future. However, can nomic presentism act as an escape route with respect to the NGP? The answer is no. The causal chain extending to infinity is plausible, given that antecedent events communicate a certain amount of information for what happens to it. What is doubtful in this strategy is the idea that the transitivity of information ensures the transitivity of the grounding relationship. Again, the problem is that infinitely distant truths will never be actualized — it takes infinite time intervals for them to become actual. Thus, the causal

¹⁷ I'm accepting the possibility of actual infinity here. All problems I will present in this article only force us to reject the idea of traversing an infinite interval of time. I would like to thank the anonymous reviewers for helping me clarify that point.

signal communicates to later events specificities about how they should be, given causal determinism, but cannot currently communicate anything about an infinitely distant future truth. Causal relations between time instants, if presentism is true, are only potentially infinite. This particularity of presentism is also associated with the thesis that the potentially infinite cannot become actual. Therefore, the most we can obtain within a presentist ontology is a potential foundation for infinitely distant truths. However, we want more than potential grounds for future truths, no matter how distant they are. We want actual foundations for every truth.

What ultimately acts as a ground in the strategy of nomic presentism? The laws of nature plus a certain state of affairs. They are, collectively, incompatible with indeterminacy. Are they incompatible with infinitely future indeterminacy? Yes, one could argue. However, from this, it does not follow that if determinism is the case, we have the appropriate ground for any truth at any instant of time. Such is the case if time is actually infinite, since otherwise we must be able 'traverse' an actual infinite to have an actual ground for any infinitely distant truth. However, once the presentist can only accept merely potentially infinite time, some transitive relevant properties transit only potentially; that is, for each property that transits a unit of time, another passable unit can be added, and so on, ad infinitum.¹⁸

4. Some objections to the NGP

The most obvious objection to address has already been mentioned in this article (section 2.2): there are no infinitely distant truths. Here, however, we analyse this objection carefully and decisively. As our argument assumes at least the plausibility of the thesis that there are truths of this kind and since without this premise the NGP does not arise, we must endeavour to affirm it.

Are there truly infinitely distant truths? Evidently, we cannot prove their existence. Nevertheless, we can consider their plausibility. What is required to establish the plausibility of this thesis? If time is infinite, given the thesis of bivalence, we can easily think of phrases that concern infinitely distant truths, such as 'there will be an intergalactic battle in ϕ ', where ϕ refers to an instant of time infinitely distant from 'now'. Our response must therefore address the plausibility that time itself is infinite.

¹⁸ For other criticisms of nomic presentism in the context of the classical grounding problem, see Kierland (2013) and Ingthorsson (2017).

Why would anyone reject the plausibility of this thesis? Historically, there has always been great distrust about the existence of an actual infinite. For example, in the Middle Ages, it was argued that 'infinite' is a syncategomatic concept¹⁹ without reference — *infinitum actum non datur*. Nonetheless, as it is applied today, particularly based on the works of Cantor (1887), actual infinity is an important mathematical quantity. Nevertheless, this might only mean that mathematicians have learned to construct algebraic statements using this concept without any ontological or metaphysical consequences. The relevant question then becomes, does mathematical infinity, with which we construct algebraic expressions, within the scope, for example, of set theory, have any ontological consequences? The answer is yes. Cantor suggests that the actual infinite exists in nature as something 'transfinite' (*infinitum creatum sive transfinitum*). The concept refers to a set of numbers, as we know, but it also refers to the works created by God, which are infinite and actual and could multiply, becoming a greater set of things. Transfinite infinity can thus infinitely increase in size. Cantor himself explains the difference between the two concepts of infinite, transfinite, and absolute. Both are ways of understanding the actual infinite, and both have an ontological purpose in the work of Cantor:

Another frequent confusion occurs with the two forms of the Actual Infinite, in that namely the Transfinite is mixed up with the Absolute, while however these concepts are strictly separated, insofar as the former is to be conceived as an indeed Infinite, but nevertheless a yet increasable, the latter however essentially as unincreasable and therefore mathematically indeterminable; we encounter this mistake, for example, in pantheism, and it constitutes the Achilles' heel of Spinoza's Ethics, about which, of course, F.H. Jacobi has maintained that it could not be refuted with rational arguments'

(Cantor 1886: 370-376)

With the expression 'infinite absolute' (*infinitum aeternum sive absolute*), Cantor also suggests that infinite greatness could be complete. This greatness is identified with God (Cantor 1932), and its character of

¹⁹ Syncategomatics' are those linguistic expressions whose meaning is contextual. These concern linguistic symbols that are 'syncategorema' (from Greek *synkatēgorēma*), i.e., devoid of their own or a precise meaning, whose function is only to relate significant terms.

completeness reveals the perfect facet of the creator, which nothing could complement.

The scientific work of Cantor, despite this philosophical-theological frame, was to prove that there are actual infinities. Transfinite sets are those we can not put into 1-1 correspondence with the set of natural numbers. The great mathematician also shows the existence of different orders of infinity, which was indeed his major achievement. The set of natural numbers, for Cantor, is actually infinite, but the fact that there are larger sets seems to rule out a purely negative conception of infinity. It is the case because there would be no way to distinguish Aleph-0 from Aleph-1 if the infinite were merely infinite in potentiality.

So, what is the relevant lesson we can take from Cantor? I believe that the task we could take couldn't be more clear: actual infinity can be part of the world when instantiated, for example, by time.²⁰ Thus, given the value that the concept of infinity assumes in set theory, considering its metaphysical meaning — ensured since the works of Cantor — it is relatively straightforward to exploit these results to attest to the plausibility of the thesis that time is infinite.

However, our hypothetical objector, still not content, may also say that it is not enough to guarantee the plausibility of the thesis that time is infinite. We must also guarantee the plausibility of the thesis that the world is infinite. By the expression 'world infinite' I signify that it is always the case that something is happening in the world, in all instants of time, i.e., what presupposes, indeed, the existence of the world. Because of it, we can have true propositions about each of these facts. What our objector may be thinking is that if the world cannot exist in each of the infinite current moments of time, there can be no future truth, since truths must concern something factual. Fortunately, this objection does not add anything important to the previous one. Our objector wants to prevent us from having a foundation for infinitely distant truths, since the world is not temporally infinite, i.e., if there are no facts in an infinitely distant future, there can be no truths, even if there is, in some relevant sense, time. However, if the world is finite in time and will end in hundreds of thousands of years, we can still have true propositions, even in the absence of the world. Here, we can evaluate the following

²⁰ I am not claiming that Cantor shows that the set of all temporal instants is infinite. What he shows is just that there are actual infinities. That only undermines an argument against actually infinite time based on the claim that there are no actual infinities at all, and this is my use here of Cantor's thesis.

sentence: 'at time $T\phi$, infinitely distant from $T1$ (now), there will be no living being'. Naturally, the previous sentence is true; it is based on the hypothetical scenario that time is infinite, even if the world is not. In this case, this statement is grounded on all time instants after 'Armageddon', whether via a collapse or the 'Big Crunch', as long as it is a finite event and concludes at a certain instant of time, considering eternalism.²¹

Our objector could also argue that it is important to show not only the plausibility of the thesis that time is infinite but also its probability. If the thesis that time is infinite has a very low probability, the NGP is irrelevant. However, what could our objector be suggesting? Since classical antiquity, time has been considered infinite. Perhaps our objector could use cosmological theses to substantiate her objection. For example, Olbers' paradox (1823), also called the enigma of the dark night, imposes difficulties on those who imagine an infinite universe. Basically, the finitude of the universe can explain why the night sky is not filled with distant star-light in all directions. That is, however distant 'fixed stars' are (to use Mach's expression²²), their light, at least in the majority, should completely fill the night sky.

We must thus consider this objection that standard cosmology suggests a finite universe, starting with an analysis of Olbers' paradox. What exactly is infinite in this scenario, and what role does the notion of infinity play in the conclusion that the sky should not have the nocturnal aspect that we observe? Suppose that the stars are uniformly distributed across infinite space and time. For any observer anywhere, the volume of a sphere's increases from the center with the square of the radius of that sphere ($dV = 4\pi R^2 dr$). Therefore, as our observer looks deeper, she sees several stars that grow with the square of a given distance. As a result, her field of vision intercepts a star in any direction she looks at the sky from, which in this case cannot be nocturnal.

The above paradox highlights a contradiction between the night sky and the hypothesis that the world is infinite. If the sky is nocturnal at

²¹ Usually, in relevant cosmological theses, the expression 'infinite time' is used as a synonym for the expression 'infinite world'. In the standard cosmological model, for example, the universe as we know it today arises from a singularity in the space-time itself. But why we should think that time would continue after the "big crunch" or whatever? If many physicists think time began with the big bang, why suppose it will continue after space has collapsed? Anyway, we can also imagine a scenario in which the end of the universe is a 'heat death' storyline, in which it is an infinitely diffuse sea of photons (effectively at absolute zero everywhere). In that case, there would not be much of a world, but time would still pass.

²² This refers to Ernest Mach (1960).

night, the world is more probably finite due to this contradiction. The solution is associated with the standard cosmological model, which finds appreciable support in Hubble's Law.²³ If the world and so time are finite, as suggested by our standard model, then the light of some distant stars cannot reach the eyes of any observer, since this light has not yet reached a position in the sky allowing it to be seen. Notably, given that this argument is addressed to cosmology, the expression 'infinite time' should be part of any identification between time and the world, i.e., time is infinite if the world itself is. However, can we even find in Olbers' paradox a counterexample to refute the hypothesis that time is infinite? I argue that the night sky is compatible with this hypothesis. Nevertheless, whatever my response is, it must include an explanation that supports the thesis that time is infinite and renders its conjunction with the darkness of the night sky plausible.

We can certainly, for example, reject the premise that stars uniformly inhabit infinite space. This would suffice to support the night sky if the problem is that when we look in any direction, we do not see a star that we should see. For example, if, in the universe, there were intervals of sets of stars and galaxies distributed across infinity, i.e., intervals that infinitely separate the aforementioned sets of stars, the night sky would seem uniform to us on all sides, as far as we could see; however, this uniformity would only be apparent, due to our limited field of view.

Accordingly, the above hypothesis is at once *ad hoc* and contradicts what we have deduced from studying the universe in the stage in which we know it. If we seek an answer that considers the actions of astronomers, we must first consider the cosmological models that propose infinite and open worlds. What is needed, more specifically, is to accommodate the theoretical hypothesis known as the 'cosmological principle', i.e., the universe is homogeneous and isotropic in all directions.²⁴ The cosmological principle acts as a simplifying factor in

²³ As part of the solution for the paradox, we mention the evidence of the redshifted caused by the expansion of the space. But we can say much more. For instance, the electromagnetic radiation is really there, in all parts of the sky, but it is redshifted beyond the visible range. It is also true that, in the standard model, some light cannot possibly reach us: space is effectively expanding faster than the speed of light.

<https://www.forbes.com/sites/startswithabang/2020/06/12/ask-ethan-how-does-the-fabric-of-spacetime-expand-faster-than-the-speed-of-light/>

²⁴ The cosmological principle says that, when evaluated from a certain moment on, the universe is the same everywhere, i.e., in relation to the distribution of matter through space-time.

universe models and is fully compatible with open and infinite universes. Although it may seem that this principle compels us again, to address Olbers' paradox, the solution that makes observation compatible with the cosmological principle and our hypothesis is quite simple: the universe must have an origin, i.e., it must be finite, in time, regard to the past. Some solutions to the field equations of general relativity, such as those of Friedmann (1922), describe the evolution of an expanding world as an open universe and, therefore, one that is infinite in the future. In fact, the NGP is not committed to an infinite past. This highlights the importance of what we mention above — whether eternalism is compatible with an instant of creation, i.e., the non-permanentist hypothesis.²⁵ Any theorist who wants to address Olbers' paradox, whether eternalist or not, should consider cosmological hypotheses of open but finitist worlds. However, if our argument is correct, only the eternalist can ground truths in such worlds. Critically, we must conceive of infinite alternatives that are compatible with temporal finitism, i.e., worlds open in relation to the future but finite in relation to the past. There is nothing to indicate the impossibility of this idea. Therefore, according to the best available science, there seems to be no problem with the probability of the hypothesis that time can be infinite in the future, affirming the utility of questions concerning the NGP.

Conclusion

The thesis that time is infinite does not have any insurmountable barrier, either in empirical or a priori considerations. It also seems true that the theoretical apparatus of Cantor (1874) helps us to understand the concept of infinity and apply it to the idea that time is actual infinite. This provides it with the requisite prevalence for explaining the viability of the premises that articulate my argument. According to it, presentism and temporalism are unable to ground current truths on infinitely distant facts. The main reason for this is that it does not seem reasonable to establish a grounding relationship between things that exist now and others in an infinitely distant future. Of course, it does not follow that there cannot be any relationship. Our argument instead shows that there is not a relationship, i.e., a relationship of grounding. Thus, the presentist who accepts the truthmaker principle finds herself in a quandary if time can be considered infinite. Now, something true cannot be eternally

²⁵ This is the hypothesis that God created a four-dimensional but infinite world, i.e., an infinite world in which entities have temporal parts.

waiting for its foundation. An eternalist can easily say, 'this is a foundation in the eternal for a truth now', or even, 'this truth is grounded now by something infinitely distant, in the future'. Basing an argument on my theory concerning the infinity of time, therefore, offers the eternalist an appreciable advantage.

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