Retro-Closure Principle and Omniscience

Ciro De Florio & Aldo Frigerio

Retro-Closure Principle and Omniscience

Ciro De Florio & Aldo Frigerio

Todd and Rabern (2021) have argued that if we assume that future contingents are untrue and if we accept the Retro-closure principle ($p \rightarrow \mathbf{PF}(p)$), then the existence of a temporal omniscient entity becomes metaphysically impossible. Since the truth of a metaphysical and theological theory should not be dependent on questions of temporal semantics, Todd and Rabern conclude that, if one wishes to maintain that future contingents are untrue, one must abandon the Retro-closure principle. The aim of this paper is to propose a temporal semantics system in which future contingents are untrue, the Retro-closure principle is valid, and the possibility of the existence of an omniscient and temporal being is guaranteed.

The future is uncertain. We do not know if it will rain tomorrow or if a drought will persist. Over centuries, philosophers have been wondering whether this uncertainty concerns only the epistemic dimension—and, therefore, it is only the result of our ignorance—or whether it is rooted in the ontological dimension, such that the world itself is at least partly indeterminate. Those who believe that the future is—at least to a certain extent—indeterminate should account for this intuition through an adequate semantics of future tense sentences. Let us assume that the actual state of the world and its natural laws do not determine the weather of tomorrow. According to many future tense semantics, "It will rain" is not true in this situation. However, suppose that time passes, and the following day, it rains. What would be the truth value of the proposition expressed yesterday by the sentence, "It will rain tomorrow," if considered from today's perspective, given that it rains today? Many may have the intuition that this proposition is true today. Following Todd and Rabern (2021), we call the content of this intuition the Retro-closure principle (RCP). In fact, several future tense semantics—though not all—account for this intuition.

Todd and Rabern (2021) have advanced an interesting argument against what they call Open-closurism (OC), which is the conjunction of two theses: 1) Open futurism (OF), following their terminology, which refers to the view that future contingents are untrue (i.e., false or neither true nor false); and 2) RCP. Theirs is an indirect argument: they do not argue against OC directly but instead show that OC is incompatible with the possibility of an omniscient temporal being. Even though we do not want to be committed to the existence of an omniscient temporal being, it is odd that semantic principles would determine a complex metaphysical question, such as the possibility of an omniscient entity. Todd and Rabern's conclusion is that we have to drop OC and, consequently, those OF semantics that validate RCP.

In this paper, we present a future tense semantics that accepts both OF and RCP without implying the impossibility of an omniscient temporal being. As a consequence, Todd and Rabern's objection fails within this semantics or semantics similar in kind. As we will see below, one of the main features of our semantics is the presence of two indices, the first of which indicates the time at which a formula is evaluated, while the second indicates the perspective from which it is evaluated.

The paper is structured as follows: In section 1, we put forward some considerations about the plausibility of RCP. In section 2, Todd and Rabern's objection is presented in detail. In section 3, the branching time semantics is introduced, and the difficulties of Thomason's supervaluationism in responding to Todd and Rabern's objection are considered. In section 4, a particular OC semantics is presented. It is shown that this semantics allows for the possibility of an omniscient temporal being, thus refuting Todd and Rabern's argument. Finally, section 5 contains some closing remarks.

1 Intuitions in Favour of RCP

As indicated above, OC is—at least prima facie—a plausible view. In this section, we would like to further elaborate on our intuitions about OC and show that OC appears to be quite natural when it is "referred," so to speak, to the past and present; the extension to the future case is quite natural, and, therefore, the sceptic about OC has much work to do.[1]

---

[1] In this paper, we will defend a particular version of OC for which future contingents are neither true nor false. There is another version of OC for which future contingents are false. The combination of this view with RCP seems to us much less plausible, so we will ignore this version of OC here.

Suppose today is December 9th, 2022, and the world is such that it is not determined whether it will rain tomorrow. However, it is determined that tomorrow, Paul will believe the proposition expressed by "It's raining today." In other words, the current state of the world and the laws of nature determine a particular configuration of the neurons of Paul's brain, such that on December 10th, 2022, Paul believes the proposition expressed by the indexical sentence "It's raining today." Is Paul's belief of tomorrow correct today? In other words, when Paul believes tomorrow that it is raining that day, will he have a correct belief? Intuitively, we can respond neither positively nor negatively to this question. The answer depends on how things will go: if it rains tomorrow, then Paul's belief will be correct; if it does not rain, it will be incorrect. However, since it is not determined today whether it will rain tomorrow, it is also not determined whether Paul's belief will be correct. Tomorrow, however, it will rain, or it will not rain, and Paul's belief will be either correct or not. Therefore, the correctness of Paul's belief in the proposition expressed by the sentence "It is raining today," uttered on December 10th, is determined by what happens on December 10th and cannot be determined before that date.

Let us now make a change to our initial scenario. Suppose that today is December 9th, but in this case, Paul is not determined to believe something tomorrow; rather, he believes something the day after tomorrow, on December 11th. In particular, he is determined to believe the proposition expressed by the sentence "It rained yesterday." Let us assume again that on December 9th, it is undetermined whether tomorrow, December 10th, it will rain or not. Once again, we can ask whether Paul's belief of December 11th that it had rained the day before would be correct. Once again, however, today, December 9th, we can neither say that it is correct nor that it is incorrect because it is not determined whether it will rain tomorrow on December 10th. Only tomorrow will the correctness of that belief be determined. Tomorrow, we will be able to say whether Paul's belief of the day after tomorrow will be correct or not. In fact, the correctness of Paul's belief on the day after tomorrow depends on what happens tomorrow. However, today, it is indeterminate what will happen tomorrow, and, therefore, it is also indeterminate whether Paul's belief will be correct. Nevertheless, time passes, and the world determines itself. Tomorrow, it will rain, or it will not rain. Consequently, from tomorrow's perspective, Paul's belief of December 11th, that it rained the day before, will be correct or incorrect. Therefore, the correctness of Paul's belief in the proposition expressed by the sentence "It rained yesterday," uttered on December 11th, is

determined by what happens on December 10th and cannot be determined before that date.

Now, suppose that Paul believes today, December 9th, that it will rain tomorrow. Again, it is not determined today whether it will rain tomorrow or not. Is Paul's belief correct or incorrect? By symmetry with the previous cases, we would say that from today's perspective, his belief is neither correct nor incorrect. The correctness of Paul's belief depends on what will happen tomorrow, but today, what will happen tomorrow is indeterminate; therefore, the correctness of Paul's belief is not determined either. However, the world moves forward and determines itself. Tomorrow, it will rain, or it will not rain. On the basis of what will happen tomorrow, it will be possible to say whether Paul's belief of December 9th was correct or not. If it rains, it was correct; otherwise, it was incorrect. Therefore, from tomorrow's perspective, Paul's belief will have been correct or incorrect. The correctness of Paul's belief in the proposition expressed by the sentence "It will rain tomorrow," uttered on December 9th, is determined by what happens on December 10th and cannot be determined before that date.

Those who deny OC must deny that it is indeterminate today whether Paul's belief that it will rain tomorrow is correct or incorrect and that instead, from tomorrow's perspective, it can be said that it was correct or not. To deny this, they must either 1) deny that the correctness of Paul's beliefs is determined in the course of time or 2) deny the symmetry between the future case and the present and past cases. Let us consider these two possibilities in detail:

(1) One could reject that the correctness of Paul's belief in the proposition expressed by the sentence "It is raining today," uttered on December 10th, is determined only when the present is December 10th and cannot be determined before that date. This can be done in at least two ways: (i) Either it is claimed that it is already true today, December 9th, that such a belief is correct or incorrect; or (ii) it is denied that tomorrow, on December 10th, Paul's belief becomes correct or not. Since it is indeterminate today, on December 9th, whether it will rain tomorrow or not, (i) is only possible assuming that one of the possible futures is the true one. In other words, (i) is only possible when assuming a Thin Red Line semantics of the future. This means that OC must be abandoned. We will ignore this solution because our goal here is to defend the consistency of OC and, thus, the compatibility of OF with RCP, and not to argue for OF. Then, (ii) is completely implausible: suppose it rains

tomorrow, and that Paul believes it rains. How can we deny that Paul's belief is correct? Suppose that someone says to Paul, "It is true that you believe that it is raining today, and it is true that it is raining today, but your belief is not correct because it was uncertain yesterday whether it would rain today, and therefore it was also uncertain yesterday whether your belief would be correct or not." Paul, and we with him, would find this reasoning absurd. Paul would probably say, "Regardless of how things were yesterday, it is a fact that it is raining today and that I believe it is raining today. Therefore, my belief about today is correct *today*."

(2) More plausibly, the symmetry between past and present cases, on the one hand, and the future case, on the other hand, might be denied. It is true that the correctness of Paul's belief of December 10th, that it is raining that day, is determined on December 10th, and it is true that the correctness of Paul's belief of December 11th, that it rained the day before, is determined on December 10th. However, the correctness of Paul's belief of December 9th that it will rain the following day is not determined on December 10th. This amounts to saying that while the correctness of Paul's belief that it is raining today is determined by what happens today and that the correctness of Paul's belief that it rained yesterday is determined by what happened yesterday, the correctness of Paul's belief that it will rain tomorrow is not determined by what will happen tomorrow. However, it is hard to see why the case of the future should not be similar to the present and past cases.

The only plausible argument to deny the symmetry between these cases could be this: in the first two cases, the passage of time determines the correctness of a present or future belief; in the third case, the passage of time determines the correctness of a past belief. However, the past is fixed and unchangeable; therefore, the flow of time cannot determine something in the past. Nevertheless, as Todd and Rabern (2021, 106) point out, a change in the correctness of a belief is an extrinsic change (or a so-called "Cambridge change"), not an intrinsic one. When the past is said to be fixed, it is usually assumed that it is fixed with respect to intrinsic changes. However, extrinsic changes do not seem to be barred by the fixity of the past. For instance, World War I acquired the property of having ended 21 years before the outbreak of World War II in 1939. However, acquiring this property poses no problem for the fixity of the

past because it is an extrinsic property. Similarly, it is not a problem for the fixity of the past that a past belief becomes correct after the fact.[2]

A further argument can be advanced in favour of OC; something similar to this principle seems to be valid for other verb tenses as well, particularly for the progressive. Bonomi (1997) gives the following example. Suppose that Leo has just begun a journey in France. In the first stage, he drives from Milan to Dijon, where he arrives on July 14th at a quarter to three p.m. He does not stop there because he plans to spend his first night in France in one of the following cities: Besançon, Metz, or Paris. Actually, he must make a decision since three different routes correspond to these alternatives. However, at a quarter to three p.m., while driving around the Dijon ring road, he has not yet decided where to go; he is thinking it over because, for several reasons, all these cities attract him in exactly the same way. In this situation, the following propositions are arguably untrue if evaluated at a quarter to three p.m.:

(1) Leo is going to Besançon.
(2) Leo is going to Metz.
(3) Leo is going to Paris.

Since Leo has not yet decided where to go, none of these propositions is privileged with respect to the others. Suppose, however, that Leo ultimately decides to go to Besançon, where he arrives two hours later. Moreover, suppose that traffic police have photographed Leo on the Dijon ring road at a quarter to three p.m. The day after, someone asks, "What was Leo doing yesterday, at a quarter to three p.m., when the picture was taken?" Intuitively, the following answer seems to be correct:

(4) Leo was going to Besançon.

The analogy with OC is obvious: while from the perspective of July 14th at a quarter to three p.m., it is not true that Leo was going to Besançon at that time, from the perspective of July 15th, it was true that Leo was going to Besançon on July 14th at a quarter to three p.m. The progressive, moreover, has an obvious connection with the future. According to the standard semantics of the progressive (Landman 1992; Portner 1998), Prog(e) is true if a first

---

2 The correctness or incorrectness of past beliefs about the future are soft facts—that is, past facts that depend on future facts. For the distinction between soft and hard facts, cf. Hoffman and Rosenkrantz (1984), Todd (2013), and de Florio and Frigerio (2018).

stage of event *e* has occurred so far, and if all will go on normally without any unexpected interruptions, *e* will be completed in the future. Thus, our intuitions about the truth values of (1) to (4) provide further support for OC.

2 OC **and Omniscience**

Our intuitions in favour of OC are very strong; this means that our formal semantics should validate it. Otherwise, we would be in the presence of a conceptual tension; although the principle is intuitively valid, our logic fails to characterise it. Indeed, many of the major semantic frameworks for branching time account for OC. Specifically, it is valid in Thomason's supervaluationism (cf. Thomason 1970) because $p \rightarrow \mathbf{PF}p$ holds in all histories, and supervaluationism universally quantifies on all histories. It is also valid in MacFarlane's relativism (cf. MacFarlane 2003, 2014), which indeed seems to be designed to account for the intuition that $\mathbf{F}p$ is untrue with respect to yesterday's assessment context but true with respect to today's assessment context. However, OC is not valid in Peircean or Thin Red Line (TRL) semantics—in Peircean semantics, OF is valid, but RCP is not, whereas in TRL semantics, neither OF nor RCP are valid[3]—and this might be a problem for these semantics.

Todd and Rabern (2021) are not convinced by OC. For this reason, they construct an ingenious argument against it. Their strategy is indirect: if OC is supposed to be valid, then counterintuitive consequences regarding the logic of divine omniscience follow. In other words, the validity of OC is incompatible with the existence of an omniscient and temporal entity. Todd and Rabern are not committed to the actual existence of an omniscient entity, but—and this is their point of argument—it is very odd that a question concerning the semantics of future statements has metaphysical consequences for the existence of omniscient entities. Our intuition suggests that the conditions for the possibility of omniscient supernatural entities should not be related to the structure of the future and RCP. However, if Todd and Rabern are right, and if OC is accepted, there can be no omniscient temporal entity. Since this is a metaphysical thesis, it follows that OC is a suspicious doctrine. Incidentally, this is a point in favour of semantics that do not validate OC. In particular, if

---

3 For the invalidity of RCP in TRL semantics, cf. Belnap and Green (1994). It is possible to amend the TRL semantics in order to validate RCP. For instance, the TRL can be relativized to instants of time (cf. McKim and Davis 1976; Øhrstrøm 2009), or the TRL can be initialized at the post-semantic level rather than at the semantic level (cf. Iacona 2014; Wawer 2014; Wawer and Malpass 2020). We will ignore these issues here.

OF is supposed, this constitutes a point in favour of Peirceanism, which does not validate RCP.

Therefore, let us examine Todd and Rabern's argument in detail. We may, for ease of presentation, sometimes refer to the omniscient entity as "God"; we also assume a doxastic operator of belief (B), which we intend to always refer to the omniscient subject, whereby Bp indicates that God believes p. Todd and Rabern establish the principle of omni-accuracy as follows:

OMNI-ACCURACY. $p \leftrightarrow Bp$[4]

The OMNI-ACCURACY principle thus establishes a double implication between p and God's belief that p: every divine belief is true, and there is no truth that is not believed by God. Using OMNI-ACCURACY and RCP, we obtain the following:

(5) $p \rightarrow \mathbf{P}_1 B(\mathbf{F}_1 p)$[5]

As a result, if it is true that it is raining today, then yesterday, God believed it would rain today. However, suppose yesterday it was not determined whether it would rain today. Then yesterday, God could not believe that today it would rain. In fact, yesterday $\mathbf{F}_1 p$ was untrue because today's weather was indeterminate, and, therefore, God could not believe it.

Advocates of OC have two possibilities at this point:

(i) They can claim that yesterday it was not true that God believed $\mathbf{F}_1 p$, but that today it is true that God believed it. This is equivalent to stating that the past changes with the passage of time. This does not seem

---

4 An aspect of OMNI-ACCURACY seems to be problematic; if p is true, then it is true that God believes p; analogously, in the case in which it is false (and therefore $\neg p$ is true), we have that God does not believe p. If p is indeterminate, how does the principle behave? One might answer that it is indeterminate whether God believes p, but this seems strange; if p is an indeterminate proposition, then God should not believe it. However, the principle remains silent on this point. It could be argued that it is for this reason that Todd and Rabern introduce the principle of OMNI-CORRECTNESS (see below in the main text). However, this move does not seem to solve the problem of the indeterminacy of divine belief. Suppose that the truth value of p is undetermined. It would, therefore, be the case that $T(p)$ is also indeterminate (because of the Tarskian T-schema). However, through the OMNI-CORRECTNESS principle, we obtain that $B(p)$ is indeterminate, and, therefore, the point raised against OMNI-ACCURACY is reiterated.

5 $\mathbf{F}_1$ and $\mathbf{P}_1$ are metric temporal operators. Their semantics is straightforward: fixing the day as the unit of time, $\mathbf{P}_1 p$ means that yesterday, it was true that p; analogously, $\mathbf{F}_1 p$ means that tomorrow, it will be true that p.

acceptable. As mentioned earlier, we can assume that the correctness of beliefs changes over time because correctness concerns the relationships between beliefs and states of affairs in the world. Since changing these relationships does not imply any intrinsic change in beliefs, they do not appear to have any impact on the fixity of the past. However, the change that seems required here does not concern the correctness of beliefs. Rather, what is required here is an intrinsic change of the past: while at time t_1 it is true that God did not believe at t_0 that it would rain (where $t_0 < t_1$), at a later time t_2 it is true that God believed at t_0 that it would rain. This intrinsic change in the past is clearly in conflict with the fixity of the past.

(ii) They can deny OMNI-ACCURACY. This amounts to denying the very *possibility* of an omniscient being. However, it seems strange that a future semantic theory could imply the denial of such a possibility. As the authors observe, "In general, one could argue that a semantic theory—a theory concerned with the logic and compositional structure of the language—ought not to settle certain substantive non-semantic questions" (Todd and Rabern 2021, 116).

Therefore, it seems that OC must be denied. If we accept OF, RCP must be denied. Todd and Rabern discuss another possible defence by advocates of RCP. Instead of assuming OMNI-ACCURACY, the defender of RCP could assume Omni-correctness:

OMNI-CORRECTNESS. $\mathsf{T}p \leftrightarrow \mathsf{B}(p)$

where T is the truth predicate; in other words, an omniscient being believes that p iff p is true. They could then insist that yesterday, it was not true that $\mathbf{F}_1 p$. In other words, they could argue that today, $p \rightarrow \mathbf{P}_1\mathbf{F}_1 p$ holds, but $p \rightarrow \mathbf{P}_1\mathsf{T}\mathbf{F}_1 p$ does not hold. Since it was not true that it would rain yesterday, the principle of OMNI-CORRECTNESS is not violated. This seems to reconcile OC with the possibility of an omniscient being.[6]

Todd and Rabern do not find this solution convincing. In fact, they find it strange that it could be said that yesterday it was the case that it would rain today but that yesterday it was not true that it would rain today. In their view,

---

6 Notice that this notion of truth is not the one defended by Thomason (1970), who proposed a completely transparent treatment of T: $t \vDash \mathsf{T}p$ iff $t \vDash p$.

> Very plausibly, if one is moved by the backward-looking intuition
> that, given that a sea-battle has occurred, it was always going to
> occur, it seems that one should likewise be moved by the intuition
> that given that a sea-battle has occurred, it was always true—
> which is not to say determined!—that it was going to occur. (Todd
> and Rabern 2021, 114)[7]

Todd and Rabern also reject MacFarlane's relativism. According to MacFarlane, it is necessary to evaluate propositions on the basis of both the context of utterance and the context of assessment: a statement such as "It will rain tomorrow" uttered on December 9th has December 9th as its context of utterance. However, it can have different contexts for assessment. When evaluated with respect to December 9th, it is neither true nor false, but when evaluated with respect to December 10th, it is true or false. Todd and Rabern state that apart from the technicalities with which this relativistic intuition is implemented, it remains true that "insofar as the Open-closurist view has a notion of truth that vindicates the (updated) Retro-closure principle, they will have to accept the conclusion that *God was genuinely ignorant*. Something was *true* (in the relevant sense) that God didn't believe" (2021, 115). From the point of view of December 10th, it was true on December 9th that it would rain the following day, and since God did not believe on December 9th that it would rain on December 10th, there was something true that God did not believe.

We believe that the two-dimensional semantics we propose in this paper—inspired by MacFarlane's intuitions—has all the resources to demonstrate that from OC, it does not follow that God failed to know something true. It is possible to assume OC and still not deny the possibility of an omniscient being. We will show this in section 4. In the next section, we introduce the branching time semantics and illustrate the difficulties of traditional supervaluationism in responding to Todd and Rabern's objection.

3   Branching Time, Supervaluationism, and RCP

As we have seen above, Todd and Rabern are convinced that there is no way out for the OC adherent who accepts the possibility of the existence of an omniscient entity. Indeed, as we shall see, supervaluationists (*à la* Thomason)

---

7 Todd and Rabern do not explicitly mention the principle that would be abandoned if one embarked on this strategy. This would amount to denying the Tarskian T-scheme for which φ iff $T\varphi$. In our opinion, this move has unsustainable theoretical costs.

can formally accept the two conditions without contradiction. However, the theoretical cost that they have to pay is high; for this reason, we will develop an alternative semantics to supervaluationism that is able to account for our intuitions about omniscience and that validates OC. First, we present the key ingredients of a branching time semantics; then, we reconstruct the argument from a supervaluationist perspective and show that, although not inconsistent, the supervaluationist is nevertheless forced to accept very strange conclusions.

3.1 *Branching Time*

A branching time structure[8] is a couple consisting of a non-empty set of time instants and an order relation defined on them: $\mathcal{B} = \langle \mathbb{T}, < \rangle$. Intuitively, the instants are possible instantaneous states of the world, and $<$ is the relation of temporal precedence. This relation is, therefore, asymmetric and transitive and satisfies (at least) the conditions of Backward Linearity (BL) and Historical Connectedness (HC).

(BL) $\forall t \forall t_1 \forall t_2 ((t_1 < t \land t_2 < t) \rightarrow (t_1 = t_2 \lor t_1 < t_2 \lor t_2 < t_1))$

In words, two instants of the past of t are either identical or ordered by $<$; this implies that for every instant t, there is one and only one past history.

(HC) $\forall t_1 \forall t_2 \exists t (t \leq t_1 \land t \leq t_2)$

HC asserts that all the instants are connected in the past.

Maximal subsets of instants linearly ordered in t are referred to as histories (h)—the possible courses of events around the world. Ours is a propositional language that includes a possible infinite set of propositional variables (Var) and two temporal operators, **P** and **F**. It is useful, as we will see in a moment, to exploit metric temporal operators, such as $\mathbf{P}_n$ and $\mathbf{F}_n$. As indicated earlier, $\mathbf{P}_n$ means "n units of time before the instant of evaluation," and $\mathbf{F}_n$ means "n units of time after the instant of evaluation."

Now, let us see how to define formula evaluations in our semantics. Here, we will use an Ockhamist framework in which a formula φ is evaluated with respect to a time t and a history h. For the formal feature of the order relation among instants, any instant in the structure has only one past history but

---

8 For a classical presentation of branching time, see Belnap, Perloff and Xu (2001). Readers familiar with this literature can go directly to section 3.2.

one or more future histories, depending on whether there is branching in the future of that instant.

The use of histories becomes crucial in the case of the evaluation of statements in the future. Suppose there are two histories branching off from instant t_0, namely, h_1 and h_2. In h_1, certain things happen, and therefore certain formulas are true, while in h_2, things go differently and, consequently, other formulas are true. How can we interpret the proposition "It will rain" ($\mathbf{F}\varphi$) evaluated at t_0 if in one history it rains the following day and in the other history it does not? A very natural solution might be to relativise truth conditions to histories, as in Ockhamist semantics. Therefore, today, it is true that in the future, it will rain in history, say, h_1, while it is false that in the future, it will rain in history h_2:

$$\mathcal{M}, t/h_1 \vDash^{\text{ock}} \mathbf{F}\varphi \quad \text{iff} \quad \exists t' > t, \mathcal{M}, t'/h_1 \vDash^{\text{ock}} \varphi$$
$$\mathcal{M}, t/h_1 \nvDash^{\text{ock}} \mathbf{F}\varphi \quad \text{iff} \quad \neg\exists t' > t, \mathcal{M}, t'/h_1 \vDash^{\text{ock}} \varphi$$

On the Ockhamist semantics, only if a future branch is specified can a truth value be ascribed to a formula. The intuitive problem with this theory consists in the fact that there is no trace of such specification of possible branches in our everyday talk about the future, which we would like to model (Wawer 2014, 366).

In the literature, there are two large families of answers to this problem. The first, the *Open Futurist* semantics, denies that future contingents can be true. Most Open Futurist semantics state that the truth value of a future tense statement depends (in a sense to be specified) on what happens in all the histories that stem from a certain instant. In the second family of views, on the contrary, future contingents can be true. Usually, those who embrace this thesis assume *linearist* semantics—that is, they believe that there is somehow a privileged history and that the truth conditions of a future tense statement concern only what happens in that history.

As is widely known, Open Futurists can be roughly divided into *Peirceans* and *Aristotelians*: for the former, greatly simplifying, future contingents are all false since a future tense statement is true if and only if it is true in all future histories, and by definition, a future contingent is true in some future histories and false in others. Aristotelians, on the other hand, maintain that future contingents are neither true nor false.

It is not the purpose of this paper to precisely characterise the options on the table nor to argue in favour of one solution or another (for this, we refer,

among many others, to Thomason 1970; Todd 2021). Our aim here is only to demonstrate that Open Futurism and RCP are not in conflict with the possibility of an omniscient being.

3.2 *Supervaluationism and* RCP

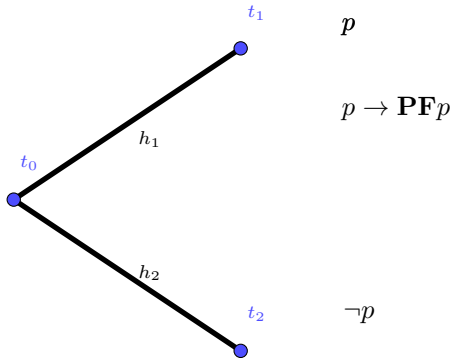Now, let us reconstruct Todd and Rabern's argument from a supervaluationist standpoint.

t_1

p

$p \rightarrow \mathbf{PF}p$

h_1

t_0

h_2

t_2 $\neg p$

Figure 1: caption

Supervaluationism distinguishes truth from super-truth. Formulas are evaluated with respect to instant/history pairs; they are then supervaluated with respect to instants only. The idea can be described as follows: Formula φ is super-true at t if and only if φ is linearly true in every history that passes through t; formula φ is super-false at t if and only if φ is linearly false in every history that passes through t; finally, φ is indeterminate if and only if it is neither super-true nor super-false.

Figure 1 represents a fork made up of two histories (h_1 and h_2). Within the first, p is true; within the second, it is not true. Since p is true at t_1, in

accordance with RCP, it was true at t_0 that p would be true because, for every history that passes through t_1 (that is, h_1), $\textbf{PF}p$ is true at t_1. Now, $t_0 \nvDash^{\text{sup}} \textbf{F}p$ holds because future contingents are never super-true. By Omni-Accuracy and logic, we have that $t_0 \nvDash^{\text{sup}} \text{B}(\textbf{F}p)$—that is, it is not (super)true that God believes at t_0 that it will rain.[9] Therefore, supervaluationists who endorse Omni-Accuracy are forced to accept both of the following semantic statements:

(i) $t_0 \nvDash^{\text{sup}} \text{B}(\textbf{F}p)$
(ii) $t_0/h_1 \vDash^{\text{ock}} \text{B}(\textbf{F}p)$

Although (i) and (ii) are not contradictory and do not violate Omni-Accuracy, this is a weird situation for supervaluationists. They must claim that at a given instant of time, it is not (super)true that God believes that tomorrow it will rain, but it is true with respect to some history that God believes that it will rain tomorrow. It is not straightforward how the advocate of this view could account for these results in a coherent, general picture.

In addition, there is a more general problem concerning the adequacy of supervaluationist semantics in characterising epistemic predicates, such as belief. It is well known that supervaluationism has been developed to rigorously account for the semantics of vague predicates (cf., for instance, Fine 1975). Now, it is not clear how this could apply to belief operator B. If a subject is *agnostic* about p, then it seems natural to claim not only that it is not true that she believes p (and that she believes $\neg p$) but also that it is *false* that she believes p. However, this entails that $\neg\text{B}(p)$ is true. The export of negation from the metatheory to the theory—that is, the passage from the metatheoretical general claim $\mathcal{M} \nvDash \varphi$ to $\mathcal{M} \vDash \neg\varphi$—is invalid within the supervaluationist semantics: from the fact that it is not (super)true that there will be a sea-battle tomorrow, it does not follow that it is (super)true that there will be no sea-battle. However, for the doxastic operator B, things look different. Supposing that Emma is agnostic about the presence of beer in the fridge, the supervaluationist semantics would force the following reading: it is not (super)true that Emma believes that there is any beer in the fridge, but, from that, it does not follow that it is false that Emma believes that there is any beer in the fridge. Given our pre-theoretical stances about the semantics

---

9 MacFarlane (forthcoming) correctly notices that supervaluationism and Omni-Accuracy imply $t_0 \nvDash^{\text{sup}} \text{B}(\textbf{F}p)$ and not $t_0 \vDash^{\text{sup}} \neg\text{B}(\textbf{F}p)$, as Todd and Rabern seem to suppose. However, we find supervaluationism still problematic for the reasons given in the main text.

of the verb *believe*, this seems to be rather odd. To solve this problem, perhaps supervaluationists might postulate that if φ is indeterminate, then $\neg B(\varphi)$ is true.

There is a more serious problem for supervaluationists: the question arises as to the truth value of formula $\mathbf{P}(B(\mathbf{F}p))$ evaluated at t_1. Supervaluationists have two possibilities: either $t_1 \nvDash^{sup} \mathbf{P}(B(\mathbf{F}p))$ or $t_1 \vDash^{sup} \mathbf{P}(B(\mathbf{F}p))$. However, both seem to be problematic. If the former holds, then a fact of the past (i.e., a divine belief) is indeterminate. This is against the intuition according to which past facts are metaphysically determined. Therefore, the second possibility must hold. However, in this case, Todd and Rabern's objection seems cogent: yesterday, it was indeterminate (or false) that God believed $\mathbf{F}p$ since $\mathbf{F}p$ is a future contingent, lacking a (super)truth value, but today, it is determinate that yesterday God believed $\mathbf{F}p$. Therefore, endorsing this view is quite implausible because it implies an intrinsic change in past facts.[10] Therefore, we agree with Todd and Rabern's claim that supervaluationism is in trouble with OC and the possibility of the existence of an omniscient entity (Todd and Rabern 2021, 110–111). Now, the following question arises: Is it possible to develop an OC semantics compatible with the existence of an omniscient entity?

4 Retro-Believing and Retro-Truth

4.1 *Double-Indices Semantics*

In the following, we develop an OC double-indices semantics. Our system is, in a sense, inspired by intuitions surrounding MacFarlane's relativist semantics; however, unlike MacFarlane's system, our semantics considers both

---

10 MacFarlane (forthcoming) claims that Todd and Rabern's argument presupposes a substantive metaphysical claim: past and present beliefs are settled. However, it is difficult to see why past and present beliefs should not be fixed as any other past or present fact. MacFarlane appeals to Jackman (1999) to support the idea that past and present beliefs are not settled. However, Jackman believes that a past belief is not settled when it involves indeterminate meanings that are determined over time. Future uses ultimately determine past uses of a word. By Jackman's own admission, these cases might be quite rare. However, this would not be the case with divine past beliefs about future contingents, which should always be determined by what happens in the future, even when dealing with wholly determinate meanings.

MacFarlane's contexts of evaluation and of assessment as semantic indices.[11] A formula is evaluated at a particular time and with respect to a perspective; the perspective indicates the present time within the structure. We call this framework *perspectival semantics*. From a formal point of view, this means that a formula is evaluated with respect to an instant and any history that is included between that instant and the particular instant that is the present, or the "now." Therefore, we evaluate the truth value of a formula at a certain instant *when* another instant has the property of being now. In other words, the second index is the perspective from which we "see" the structure.[12] This parameter is essential, as we will see soon, since it cuts off the histories against which a formula is evaluated. In fact, the advancement of the world determines the future; time flows, and the bundle of possible available histories is reduced. Today (t), it is indeterminate whether it will rain or not tomorrow, but tomorrow, when day $t + 1$ will be now, the weather will no longer be indeterminate.

To clarify, let us take the above example: today, December 10th, it rains. Assuming that today's rain is a contingent feature of the world, is it indeterminate on December 9th whether it will rain the next day? The answer would be that it depends on the *perspective* from which we locate ourselves. If we place the now on December 9th or at an instant preceding December 9th, then the rain of the following day is an indeterminate event. The world has arrived—so to speak—at just a certain point, and the future is open. But if we place the now at an instant following December 9th, such as December 10th, the world has been determined, and some histories are no longer available; in particular, the possibility of a December 10th with no rain has expired. Therefore, *from the perspective of December 10th*, it is determined on December 9th that it will rain the following day.

Why adopt a two-indices semantics? The grounding idea is that the advancement of the present prunes certain histories and leaves others open. This feature is crucial when we evaluate the truth value of sentences that are future-tensed but evaluated at a *past* instant. Since time has passed, some

---

11 We use this semantics since we believe that it makes our argument clearer. However, we assume that our argument could be formulated in any semantics or post-semantics that involves two evaluation indices.

12 One might wonder what the intended interpretation of perspectival semantics is and whether it favours an A-theoretic construal. Although we have argued elsewhere that perspectival semantics is an adequate framework for advocates of the A-theory, it is nevertheless wholly compatible with a purely indexical reading of the now.

histories are no longer available; they were open *before*, but not now because things went a certain way. As said before, our framework explicitly ffavours no specific metaphysics of time; consequently, we do not take a stance towards the phenomenon of pruning. But let us consider that our linguistic practices often refer both to available and no longer available histories. In other terms, we evaluate the formula ψ at an instant t from a perspective t'. Sometimes, the instant of evaluation is connected to the perspective, that is, it lies in its past or future; sometimes not. In the first case, we have a *factual* situation; in the second, a *counterfactual* one. The two-indices semantics seems to be a promising conceptual tool in order to characterise these scenarios.[13]

From a formal point of view, our semantics accounts for this possibility by using two temporal indices: the first is the evaluation instant, and the second is the present. Therefore, let us consider the following expression:

(a) $\mathcal{M}, t_i, t_j \vDash^{\mathrm{prs}} \varphi$

(a) should be read as follows: φ is true at t_i when the present is t_j. The former index (t_i) refers to the instant at which the formula is evaluated. The latter index (t_j) refers to the position of the present within the structure.

The two instants can coincide. This would be a case in which we would evaluate, say, φ at t when the world has arrived at t. In any case, the evaluation instant (e.g., t) and the present (e.g., t') must be *connected*; in other words, one of the following conditions must hold: $t < t'$ or $t \approx t'$ or $t' < t$.[14] The truth clause for atomic formulas is as follows:

(b) $\mathcal{M}, t_i, t_j \vDash^{\mathrm{prs}} \varphi \quad \Leftrightarrow \quad \forall h \in (\mathcal{H}_{t_i} \cap \mathcal{H}_{t_j}), t_i/h \vDash^{\mathrm{ock}} \varphi$

where $\mathcal{H}_{t_i}$ is the set of histories that pass through the instant t_i ($\mathcal{H}_{t_i} = \{h|t_i \in h\}$); therefore, ($\mathcal{H}_{t_i} \cap \mathcal{H}_{t_j}$) is the intersection between the two sets of histories. Here, we assume that the satisfiability operator is not bivalent in perspective semantics. Therefore, we have the following:

(c) $\mathcal{M}, t_i, t_j \nvDash^{\mathrm{prs}} \varphi \quad \Leftrightarrow \quad \neg \forall h \in (\mathcal{H}_{t_i} \cap \mathcal{H}_{t_j}), t_i/h \vDash^{\mathrm{ock}} \varphi$

---

13 For a more extensive defence and articulated exposition of this two-indices framework, cf. de Florio and Frigerio (2020).

14 A perspectival semantics in which the instant of evaluation and the now need not be connected has been exploited to provide a counterfactual semantics in de Florio and Frigerio (2020). We thank you, an anonymous referee, for this point.

(d) $\mathcal{M}, t_i, t_j \dashv^{\text{prs}} \varphi \quad \Leftrightarrow \quad \forall h \in (\mathcal{H}_{t_i} \cap \mathcal{H}_{t_j}), t_i/h \not\models^{\text{ock}} \varphi$

The following truth clauses are straightforward:

$\mathcal{M}, t_i, t_j \models^{\text{prs}} \neg\varphi \quad \Leftrightarrow \quad \forall h \in (\mathcal{H}_{t_i} \cap \mathcal{H}_{t_j}), t_i/h \not\models^{\text{ock}} \varphi$

$\mathcal{M}, t_i, t_j \models^{\text{prs}} \varphi \wedge \psi \quad \Leftrightarrow \quad \forall h \in (\mathcal{H}_{t_i} \cap \mathcal{H}_{t_j}), t_i/h \models^{\text{ock}} \varphi$
$\qquad\qquad\qquad\qquad\qquad$ and $\forall h \in (\mathcal{H}_{t_i} \cap \mathcal{H}_{t_j}), t_i/h \models^{\text{ock}} \psi$

$\mathcal{M}, t_i, t_j \models^{\text{prs}} \mathbf{P}\varphi \quad \Leftrightarrow \quad \forall h \in (\mathcal{H}_{t_i} \cap \mathcal{H}_{t_j}), \exists t' < t_i, t'/h \models^{\text{ock}} \varphi$

Clauses without temporal operators are a natural extension of the Ockhamist linearist evaluation. As for the past case, the second index is vacuous. In the past of the instant of evaluation, there is just one history, and, therefore, the evaluation is linear. Things become more interesting in the future case because the second index plays a significant role.
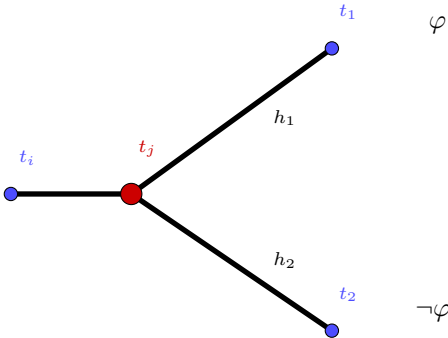

Figure 2: caption

In figure 2, the instant of evaluation is t_i, while the now is at t_j; the truth conditions of $\mathbf{F}\varphi$ at t_i are the following:

$$\mathcal{M}, t_i, t_j \vDash^{\mathrm{prs}} \mathbf{F}\varphi \quad \Leftrightarrow \quad \forall h \in (\mathcal{H}_{t_i} \cap \mathcal{H}_{t_j}), \exists t' > t_i, t'/h \vDash^{\mathrm{ock}} \varphi$$

We now have two cases (see the figures below): the case in which the present coincides (or precedes) the instant of evaluation, and the case in which the present follows that instant:
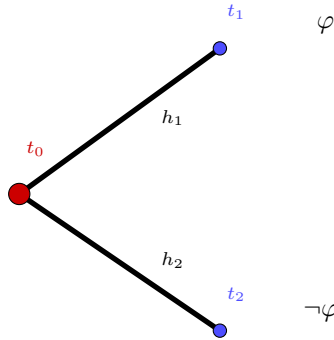

Figure 3: I Case

(I Case). In this case, the now (t_0) coincides with the point of evaluation. Since $\mathcal{H}_{t_0} \cap \mathcal{H}_{t_0} = \mathcal{H}_{t_0}$, both branches (the φ-branch and the $\neg\varphi$-branch) are available. Therefore, $\mathcal{M}, t_0, t_0 \nvDash^{\mathrm{prs}} \mathbf{F}\varphi$.
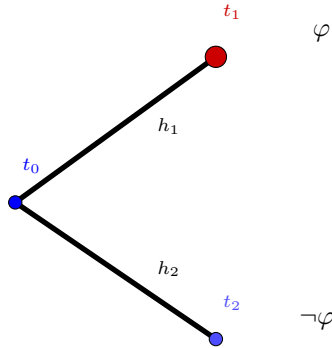
Figure 4: II Case

(II Case). Here, the now is at t_1 and follows the instant of evaluation (t_0). The history in which $\neg\phi$ is true is no longer available because $h_2 \notin \mathcal{H}_{t_0} \cap \mathcal{H}_{t_1}$. Consequently, $\mathcal{M}, t_0, t_1 \vDash^{\text{prs}} \mathbf{F}\varphi$.

In the double-indices framework, the truth values of propositions change with the flow of time. This accounts for RCP and the intuitions reviewed in section 1.[15]

4.2 *The Possibility of Omniscience*

Is our perspectival semantics able to answer Todd and Rabern's challenge? We think so, and in order to show this, we must elaborate on a further important point. The belief operator is usually characterised through Kripkean semantics using doxastically possible worlds—namely, possible cognitive representations of the subject. It is debatable whether this approach is ade-

---

15 Our two-dimensional semantics has some similarity with the two-dimensional possibility framework proposed by Cariani (2024), even though in a rather different context. In his framework, too, the evaluations of formulas depend on two different possibilities, which correspond to moments in branching time semantics.

quate to model divine beliefs; in fact, God has just one representation of the world—the correct one. This fact is correctly grasped by Todd and Rabern's Omni-Accuracy principle. However, there is another interesting point here. The concept of belief is clearly representational: a subject believes that *p* in that she has a representation of the (actual) world as a world in which *p* is true. This holds true both for human subjects and for omniscient entities. Believing that tomorrow *p* will be true has to do with the representation of the future actual world.

These reflections may seem to be trivial, but they are of a certain interest if we take into account the double-indices analysis we provided. Since the concept of belief is representational, it is natural to *centre* it on the now, where we represent the present structure of the world. This does not mean that the belief cannot concern the future or the past; we can believe that it will rain tomorrow or that it rained yesterday, but we do so from the actual (present) perspective, whereby if Emma believes (now) that it will rain (tomorrow), this means that it is from the perspective of today that Emma believes that it will rain tomorrow. Analogously, if Emma believed yesterday that it would rain today, it is from the perspective of yesterday that Emma represented the following day.

This peculiar feature could be formally presented through a particular semantic clause about the belief operator B; in a nutshell, when one construes, at instant *t* and from the perspective *t'*, a formula in which the B operator occurs, then one has to reformulate that interpretation, *moving* the now to the instant of evaluation of the formula. The justification for this manoeuvre follows from the fact that the belief operator must be fixed to the now. In other words, we represent the world based on the information available at the moment of the representation.

This means that we cannot rightly construe a past doxastic state if we locate the epistemic subject at a time different from that at which she represents the world. When we look back and wonder what we believed in the past, we must *backdate* the now, bringing back the perspective to the one that is contemporaneous with the instant of evaluation.

Formally, all of this can be characterised through the following *belief semantic norm*:

(bsn) $\mathcal{M}, t_i, t_j \vDash^{\mathrm{prs}} \mathrm{B}(\varphi) \Rightarrow \mathcal{M}, t_i, t_i \vDash^{\mathrm{prs}} \mathrm{B}(\varphi)$

where φ can have any logical complexity. A formula that describes a belief attitude of any complexity must be evaluated from a perspective that coincides with the instant evaluation of the formula. Therefore, (bsn) moves the index of the perspective from t_j to t_i.[16]

This point is important, and it deserves some clarification.[17] (bsn) is a principle that is not derived from other semantical axioms. On the contrary, it is assumed as a formal counterpart of a conceptual reflection about the very notion of belief. Let us consider an ascription of a doxastic state, such as $B(x, \psi)$, whose intended meaning is: the doxastic agent x believes that ψ is true. Well, ψ could have any complexity; in particular, it can be a future or past tense sentence. So far, so good. But let us also consider x, that is, the doxastic agent. In a temporal framework, x is located (so to speak) somewhere; she believes something at a given time. Then, the perspective from which to evaluate $B(x, \psi)$ must be centred on the actual temporal position of the doxastic agent.

As a consequence, the Omni-Accuracy principle $\varphi \Leftrightarrow B(\varphi)$ becomes the following:

(Omn-prs) For every t, $\mathcal{M}, t, t \vDash^{\mathrm{prs}} \varphi \leftrightarrow B(\varphi)$

For every perspective, God believes what is true at the instant of that perspective. For example, if $\mathrm{now}(t_0)$, God believes every proposition that is true at t_0 from the perspective of t_0. Notice that since φ can have any logical complexity, it can contain any number of temporal operators. Therefore, at t_0 from the perspective of t_0, God believes what is true at the other points of the structure from the perspective of t_0. For instance, if φ is true at t_{-1} when $\mathrm{now}(t_0)$, then God believes at t_0 from the perspective of t_0 that $\mathbf{P}_1\varphi$. In symbols:

$$\mathcal{M}, t_0, t_0 \vDash^{\mathrm{prs}} \mathbf{P}_1\varphi \leftrightarrow B(\mathbf{P}_1\varphi)$$

Therefore, God believes at any instant what is true at any point in the structure from the perspective of that instant.[18]

---

16 In the following, we also exploit the (bsn) principle for cases of dis-beliefs; this is reasonable, however, since they are representational attitudes toward the world. The idea is that if a proposition is untrue (perhaps because its truth value is indeterminate), then an omniscient entity does not believe it is true.

17 We want to thank an anonymous referee for having prompted these considerations.

18 As previously noted, the Omni-Accuracy principle is silent about cases in which the truth value of the formula at play is indeterminate. We think it is plausible and in agreement with our intuitions about an omniscient entity (but, in general, this should be valid for any epistemic

The fundamental ingredients of our semantics can be summarised as follows: propositions are true at an instant of evaluation and with respect to a perspective. This entails that, in some cases, the truth value of a proposition, evaluated at instant t_i, is indeterminate from a certain perspective, while from another perspective, it is true. Divine beliefs always track the truth from the perspective of the evaluation because they are representations of the world at a certain instant from the perspective of that instant.

Let us now see how our perspectival semantics, enhanced with (bsn), is able to answer Todd and Rabern's objection. First, let us resume, in a semi-formal fashion, Todd and Rabern's argument. For convenience, we use metric temporal operators. Consider figure 5.[19] Since $t_1 \vDash \varphi$ and since, by hypothesis, RCP holds, we have that $t_1 \vDash \mathbf{P}_1 \mathbf{F}_1 \varphi$. However, $\mathbf{F}_1 \varphi$ is not true at t_0 because it is future contingent. It follows that $t_0 \vDash \neg B(\mathbf{F}_1 \varphi)$ (cf. footnote 12) because God does not believe what is untrue, but since it is true at t_1 that at t_0 φ would be true the following day, God should have believed that. Instead, $t_1 \vDash \mathbf{P}_1(\mathbf{F}_1 \varphi \wedge \neg B(\mathbf{F}_1 \varphi))$. In other words, let us locate ourselves at t_1 (when φ is true). In this case, two things were true yesterday: on the one hand, φ would be true the next day, and on the other hand, God did not believe that φ would be true the next day. However, this means that God is ignorant about the future truth of φ.

It is easy to realise that, within our framework, we get two theoretically interesting results. First, the framework allows us to distinguish the case of the "genuine" future from the case of the retrospective future (i.e., the future in the past). At the same time, Todd and Rabern's argument is no longer reproducible. Let us see why.

---

subject) that the following condition must be satisfied: if a proposition is indeterminate with respect to its truth value, then the omniscient entity does not believe it (as true). We translate this indeterminacy situation via the following meta-theoretical conditional:

(ind-bel) If $\mathcal{M}, t_0, t_0 \nvDash^{\mathrm{prs}} \varphi$, then $\mathcal{M}, t_0, t_0 \vDash^{\mathrm{prs}} \neg B\varphi$

(Omn-prs) and (ind-bel) describe, therefore, the relationships between propositions and their truth values from one side and God's beliefs on the other side.

19 Todd and Rabern never specify the semantic system in which they carry out their arguments. For this reason, we assume that their satisfaction relation ($\vDash$) involves a quantification on times.
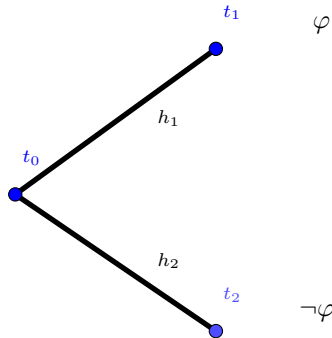
Figure 5: Figure 3

From $\mathcal{M}, t_1, t_1 \vDash^{\mathrm{prs}} \mathbf{P}_1(\mathbf{F}_1\varphi \wedge \neg B(\mathbf{F}_1\varphi))$, it follows that $\mathcal{M}, t_1, t_1 \vDash^{\mathrm{prs}} \mathbf{P}_1\mathbf{F}_1\varphi \wedge \mathbf{P}_1\neg B(\mathbf{F}_1\varphi)$ and then that $\mathcal{M}, t_1, t_1 \vDash^{\mathrm{prs}} \mathbf{P}_1\mathbf{F}_1\varphi$. We also have that $\mathcal{M}, t_1, t_1 \vDash^{\mathrm{prs}} \mathbf{P}_1\neg B(\mathbf{F}_1\varphi)$, whose meaning is: from today's perspective, it was true that yesterday, God did not believe that φ would be true. From this, it follows that $\mathcal{M}, t_0, t_1 \vDash^{\mathrm{prs}} \neg B(\mathbf{F}_1\varphi)$—that is, again, from today's perspective, yesterday, God did not believe that φ would be true. Is this sufficient to claim that God was ignorant? No. God appears to be ignorant only because we see the world from a metaphysically privileged standpoint, and we look at the world from the perspective of how things actually happened.

If we really want to locate ourselves at t_0, we must also backdate the now; we must, in other terms, rewind the tape of history. This is precisely what (bsn) does: $\mathcal{M}, t_0, t_1 \vDash^{\mathrm{prs}} \neg B(\mathbf{F}_1\varphi)$ becomes $\mathcal{M}, t_0, t_0 \vDash^{\mathrm{prs}} \neg B(\mathbf{F}_1\varphi)$. Thus, when the present was yesterday, God did not believe that φ would happen. However, $\mathcal{M}, t_0, t_0 \nvDash^{\mathrm{prs}} \mathbf{F}_1\varphi$ also holds because $\mathbf{F}_1\varphi$ is a future contingent. Therefore, assuming the present version of OF, φ is neither true nor false at t_0. However,

the fact that an omniscient entity does not believe what is not (yet) true is not a problem for that entity's omniscience.[20]

Todd and Rabern's argument hinges on a theoretical passage that retrogrades the truth and charges an omniscient being with the alleged failure to grasp that truth. However, it is precisely a retrograded truth: it is a truth only because the world has moved forward, and what was indeterminate is now determinate. If we place ourselves at the temporal perspective of the omniscient entity at t_0 (i.e., if we move the now to t_0), we naturally get that the omniscient entity does not believe that φ would be the case since, from t_0's perspective, it is not true that φ will be the case.

At the same time, from t_1's perspective, it was true that φ would be true: RCP entails $\mathcal{M}, t_0, t_1 \vDash^{\mathrm{prs}} \mathbf{F}_1 \varphi$. However, this is not a problem for the possibility of omniscience because Todd and Rabern suppose that the belief of the omniscient entity occurs when the present is t_0, not when it is t_1.

In addition, we have that $\mathcal{M}, t_1, t_1 \vDash^{\mathrm{prs}} \mathbf{P}_1\mathbf{F}_1\varphi \wedge \mathrm{B}(\mathbf{P}_1\mathbf{F}_1\varphi)$, from which it follows that $\mathcal{M}, t_1, t_1 \vDash^{\mathrm{prs}} \mathrm{B}(\mathbf{P}_1\mathbf{F}_1\varphi)$. In other words, from today's perspective, God believes that yesterday, it was true that it would rain today. Actually, as we have seen, it is true from today's perspective that yesterday, it was true that it would rain today.

To sum up, when now(t_0), God does not believe that $\mathbf{F}_1\varphi$ because she sees the world from t_0's perspective, from which $\mathbf{F}_1\varphi$ is untrue. When now(t_1), God believes that $\mathbf{F}_1\varphi$ was true the previous day because she sees the world from t_1's perspective, from which the previous day it was true that φ would be true the next day. Therefore, God's beliefs always track the truth. Time flows, and with its advancing, the truth values of propositions change; an omniscient God always believes at a time t what is true from the perspective of that time. Put differently, God's beliefs are changing in the same way that the truth values of propositions change due to the flowing of time. However, this is what is reasonable to demand of an omniscient entity.

Obviously, our argument can be opposed by objecting (bsn). However, this does not seem to be a plausible objection if we assume that God is temporal, as Todd and Rabern do. Such a God is temporally located, and He, therefore,

---

20 An anonymous referee suggests that Todd and Rabern's argument shows the incompatibility between the Retro-closure principle and the idea of *permanent omniscience*. The idea is as follows: in our framework, we have cases in which an omniscient being realises—so to speak—that in the past, there were true propositions not known. However, this does not happen in our framework since the omniscient being realises that in the past, He did not believe φ, but, nevertheless, φ was indeterminate from yesterday's perspective. Only from today's perspective, φ was true.

knows the world from the perspective of the present. If we embrace the Open theism view, His beliefs evolve when tracking the evolution of the world. If this concept of God is assumed, it is quite natural to endorse (bsn): God is an entity located within the present who, therefore, knows the world from the present's perspective, like human beings.

Of course, we could have different theistic views. We could hypothesise that God is timeless and that He knows the evolution of the world from an eternal perspective. Within these views, (bsn) can be safely discharged. However, if these views are presupposed, Todd and Rabern's argument is no longer valid: being timeless, God neither remembers nor anticipates anything. Rather, He sees the whole unfolding of the world from His eternal standpoint, and thus, He knows all that happens at every instant. If God is timeless, it is meaningless to wonder whether $t_0 \vDash^{\text{prs}} \mathbf{P}(\text{B}(\mathbf{F}p))$ holds since the belief operator B cannot be within the scope of the temporal operators and, in general, cannot be evaluated with respect to an instant.[21]

Therefore, either one assumes that God is temporal, and then Todd and Rabern's argument does not succeed since it is reasonable to claim that (bsn) holds, or one assumes that God is timeless, and then (bsn) does not hold. In the latter case, however, Todd and Rabern's argument cannot even be formulated since their argument presupposes a God located within time.

5 Conclusions

In our semantic framework, there is no instant at which a formula is true, and the omniscient entity does not believe it to be true. The theoretical cost we have to pay is the acceptability of (bsn); specifically, the principle according to which the ascription of belief to a subject at an instant is constrained by the state of the universe at that time and cannot be legitimately forward dated. We think this is a highly affordable cost based on a reasonable theoretical proposal. We conclude that Todd and Rabern's argument fails to show that

---

21 It is reasonable to require that a timeless God knows the truth values of propositions relatively at every instant of time and every temporal perspective, that is, from any "now." For this omni-perspective view of God's knowledge, see de Florio and Frigerio (2019, chap. 6). This view seems to be naturally connected with a B-theoretic metaphysics of time, where all the "presents" exist on a par. If one wants to keep together a timeless God and an A-theoretic metaphysics, one needs to appeal to non-standard A-theories, like Fragmentalism. On this, again, see de Florio and Frigerio (2019, chap. 6).

OF is incompatible with the possibility of an omniscient entity. OF, therefore, remains a viable alternative in the tense semantics market.*

Ciro De Florio
0000-0002-5503-7463
Università Cattolica of Milan, Italy
ciro.deflorio@unicatt.it

Aldo Frigerio
0000-0003-4698-2110
Università Cattolica of Milan, Italy
aldo.frigerio@unicatt.it

References

Belnap, Nuel D., Jr. and Green, Mitchell S. 1994. "Indeterminism and the Thin Red Line." in *Philosophical Perspectives 8: Logic and Language*, edited by James E. Tomberlin, pp. 365–388. Oxford: Basil Blackwell Publishers, doi:10.2307/2214178.

Belnap, Nuel D., Jr., Perloff, Michael N. and Xu, Ming. 2001. *Facing the Future: Agents and Choices in Our Indeterminist World*. Oxford: Oxford University Press, doi:10.1093/oso/9780195138788.001.0001.

Bonomi, Andrea. 1997. "The Progressive and the Structure of Events." *Journal of Semantics* 14(2): 173–205, doi:10.1093/jos/14.2.173.

Cariani, Fabrizio. 2024. "Modeling Future Indeterminacy in Possibility Semantics." Unpublished manuscript, draft of March 21, 2024, https://philpapers.org/archive/CARMFI.pdf.

de Florio, Ciro and Frigerio, Aldo. 2018. "Two Kinds of Soft Facts." *Grazer Philosophische Studien* 95(1): 34–53, doi:10.1163/18756735-000031.

—. 2019. *Divine Omniscience and Human Free Will. A Logical and Metaphysical Analysis*. London: Palgrave Macmillan, doi:10.1007/978-3-030-31300-5.

—. 2020. "The Thin Red Line, Molinism, and the Flow of Time." *Journal of Logic, Language, and Information* 29(3): 307–329, doi:10.1007/s10849-019-09304-4.

Fine, Kit. 1975. "Vagueness, Truth, and Logic." *Synthese* 30(3-4): 265–300, doi:10.1007/bf00485047.

Hoffman, Joshua and Rosenkrantz, Gary S. 1984. "Hard and Soft Facts." *The Philosophical Review* 93(3): 419–434, doi:10.2307/2184544.

Iacona, Andrea. 2014. "Ockhamism Without Thin Red Lines." *Synthese* 191(12): 2633–2652, doi:10.1007/s11229-014-0405-6.

Jackman, Henry. 1999. "We Live Forwards but Understand Backwards: Linguistic Practices and Future Behavior." *Pacific Philosophical Quarterly* 80(2): 157–177, doi:10.1111/1468-0114.00078.

Landman, Fred. 1992. "The Progressive." *Natural Language Semantics* 1(1): 1–32, doi:10.1007/BF02342615.

MacFarlane, John. 2003. "Future Contingents and Relative Truth." *The Philosophical Quarterly* 53(212): 321–336, doi:10.1111/1467-9213.00315.

—. 2014. *Assessment Sensitivity: Relative Truth and Its Applications*. Oxford: Oxford University Press, doi:10.1093/acprof:oso/9780199682751.001.0001.

—. forthcoming. "Why Future Contingents Are Not All False." *Analytic Philosophy*, doi:10.1111/phib.12334.

McKim, Vaughan R. and Davis, Charles C. 1976. "Temporal Modalities and the Future." *Notre Dame Journal of Formal Logic* 17(2): 233–238, doi:10.1305/ndjfl/1093887526.

Øhrstrøm, Peter. 2009. "In Defence of the Thin Red Line: A Case for Ockhamism." *Humana.Mente* 3(8): 17–32, https://www.humanamente.eu/index.php/HM/issue/view/8.

Portner, Paul H. 1998. "The Progressive in Modal Semantics." *Language* 74(4): 760–787, doi:10.2307/417002.

Thomason, Richmond H. 1970. "Indeterminist Time and Truth-Value Gaps." *Theoria* 36(3): 246–281, doi:10.1111/j.1755-2567.1970.tb00427.x.

Todd, Patrick. 2013. "Soft Facts and Ontological Dependence." *Philosophical Studies* 164(3): 829–844, doi:10.1007/s11098-012-9917-4.

—. 2021. *The Open Future: Why Future Contingents are All False*. Oxford: Oxford University Press, doi:10.1093/oso/9780192897916.001.0001.

Todd, Patrick and Rabern, Brian. 2021. "Future Contingents and the Logic of Temporal Omniscience." *Noûs* 55(1): 102–127, doi:10.1111/nous.12294.

Wawer, Jacek. 2014. "The Truth About the Future." *Erkenntnis* 79(suppl., 3): 365–401, doi:10.1007/s10670-013-9454-3.

Wawer, Jacek and Malpass, Alex. 2020. "Back to the Actual Future." *Synthese* 197(5): 2193–2213, doi:10.1007/s11229-018-1802-z.