Prior and Tichý's Concepts of Temporalism

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Abstract: At the beginning of modern logic, propositions were defined as unchangeable entities placed in a certain idealistic realm. These unchangeable propositions contain in themselves so-called indexical, i.e. the place, time and other circumstances of the utterance. This concept of the proposition, which is entitled eternalism, was and is still prevalent among analytic philosophers. Often even the term 'proposition' is identified with an idealistic entity located outside the real world. In my paper, I would like to focus on the concept of propositions of two logicians who deviated from the standard understanding of propositions, Arthur N. Prior and Pavel Tichý. They were both proponents of temporalism, i.e. the view that propositions could change their truth-value over time. The paper will discuss the reasons why they were proponents of temporalism and compare their views. It claims that in Prior's case, his metaphysical views were the main reasons he was a proponent of temporalism. In contrast, when Tichý presented his arguments for temporalism, he focused primarily on natural language.

Keywords: Temporalism; Eternalism; Arthur Norman Prior; Pavel Tichý; Time; Natural language.

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1. Introduction

In the analytic philosophy of language and logic, the concept of proposition played an important role from the very beginning. They are bearers of the truth-value, the meaning of sentences or objects of propositional attitudes such as beliefs, wishes or knowledge (see McGrath and Devin 2020). As Ciecierski (2022, 15–17) points out, propositions differ from sentences. A proposition stands for content that several sentences describe. For example, the sentence in Czech 'Linus je na rohožce', and the sentence in English 'Linus is on the mat' or the English question 'Is Linus on the mat?', represent the same state of affairs, i.e. my brother's kitten named Linus is placed on a certain piece of cloth.

The proposition 'Linus is on the mat' could be seen from two perspectives, with respect to philosophical tradition. The tradition that follows e.g. Bernard Bolzano and due to Frege is prevalent in analytic philosophy, would view any appearance of the proposition as unique. I could utter such a proposition that I saw my brother's kitten on its mat yesterday evening and also when I inform my brother today about a similar situation. According to the previously mentioned tradition, it would be understood as a unique proposition each time, as it contains indexicals in itself such as the date, place of utterance and the person who claimed it, however. Propositions, in the view of eternalism, are stable entities often placed in a certain kind of idealistic realm. An eminent representative of this approach is Frege's concept of propositions (see McGrath and Devin 2020). Consequently, when I say 'Linus is on the mat' now, it would mean 'Linus is on the mat at noon on 8 June 2022 by CET'.[1]

The other tradition would understand any utterance of 'Linus is on the mat' as the same proposition that could, however, change its truth-value in accordance with reality. The proposition could be true if Linus is on the mat and false if the kitten gets up to mischief somewhere else. The proponents of this view hold that propositions can change their truth-values over time. Representatives of the view were Aristotle, certain ancient and

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[1]   Central European Time (UTC+1).

medieval philosophers and also Arthur Norman Prior and Pavel Tichý[2] (see Brogaard 2012, 6; Tichý 1980b). The fact that the proponents of the latter tradition claim that certain propositions could change their truth-value over time does not mean that they argue that all propositions can change their truth-value. The proposition – 'World War Two started on 1 September 1939' is true, for example, since it was the beginning of World War Two and will be true until the end of time.[3] As Brogaard (2012, 14–16) points out, propositions that contain a certain specification of time in itself usually have a fixed truth-value.

The term 'proposition' has no fixed meaning in philosophy. One could argue that what Prior, Tichý and other representatives of temporalism refer to when they claimed that it could change its truth-value was not a proposition at all. Consequently, the bearers of the truth-value are different entities in their theory. Prior (1996b) even sometimes used the term 'statement' instead of 'proposition' when he referred to the bearer of the truth-value. The point is, however, that both were also logicians and when they addressed entities that could change their truth-values over time, they described entities that play the role of propositions in their systems of logic. Namely, propositional variables stand for these entities in Prior's (1958, 106) systems of logic, and the ascription of the truth-value with respect to time instant and possible worlds is a characteristic of propositions in Tichý's (1988, 194) Transparent Intensional Logic (further TIL).

As among in all probability all competing theories in philosophy, a discussion has developed between proponents of eternalism and temporalism on the priority of their theories. However, this paper will not argue for any side of the discussion. Its aim is to present two concepts of temporalism, Prior and Tichý's ones. The reasons for such a presentation are two. First, temporalism is less common in analytic philosophy than eternalism, and therefore the

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[2]   There were more proponents of temporalism in modern analytic philosophy, e.g. Richard Montague or David Kaplan (see Richard 1981, 1–2).

[3]   One could distinguish between several possible worlds in which the proposition will not be true as World War Two began there at some other time or there was no World War Two at all. This would be Tichý's approach (see e.g. Tichý 1980a, 348–352). Prior (1968) was more modest concerning the ontological commitments of his theories, as will be discussed further.

position has to be more elaborate than the position which is mainstream in analytic philosophy. Second, Prior and Tichý provided different reasons for temporalism; for the sake of metaphysics in the case of Prior, or for the sake of natural language in the case of Tichý. As such, they represented two reasons for temporalism identified by Brogaard (2012, 8). Since Tichý presented his position later than Prior and to some extent developed Prior's views, Prior's concept of temporalism will be presented first and Tichý's later.

2. Prior's concept of temporalism

Prior (1996b, 47–48) referred to his concept of propositions as a view of ancient and medieval authors. He claimed that this concept of propositions is more fundamental than the concept of tenseless propositions of eternalism. Proposition whose truth-value remains the same as the previously mentioned proposition 'World War Two started on 1 September 1939' is merely a proposition that is always true by chance (or always false as the proposition 'World War Two started on 1 September 1938'). Prior's reasons for temporalism vary in four different areas. The most important were the reasons based on metaphysics. He claimed, however, that temporalism is also advantageous from the perspective of natural language, philosophy of mind, or specific use in computer science.

2.1. Metaphysics

Metaphysical reasons for favouring temporalism appear to be the most important for Prior. He strived to vindicate free will for a considerable part of his life. It was also his main motivation for introducing and developing his system of temporal logic (see Copeland 2022). Temporalism contributed to this endeavour. His choice of temporalism was, however, also motivated by his nominalism. In Prior's work, three reasons that favour temporalism can be identified; the ontological concept of propositions, the fact that eternalism implies a tapestry view of time and the view that there is a real difference between the past and future.

Frege (1956, 301–302) placed propositions in his renowned 'The Thought' in the third realm. In his view, propositions are neither part of

the physical nor of the psychological world. They cannot be experienced and are not just parts of our consciousness. Prior as a nominalist held a different concept of propositions. He argued that propositions are only logical constructions (see Prior 1971, 12–13). He denied that they are eternal objects placed in a certain kind of Platonistic realm. However, there were also proponents of eternalism, e.g. Willard Van Orman Quine (1968, 3–8), whose concept does not require Frege's third realm. Consequently, if nominalism were only Prior's reason for reintroducing the medieval concept of propositions, the proposal does not seem convincing. Despite the fact that the placement of propositions into the Platonistic realm is an important part of Frege's (and also Bolzano's) concept of propositions, it does not seem essential to eternalism. However, Prior had several other reasons for favouring temporalism.

Another metaphysical reason consists in Prior's concept of time. According to Prior (1996b, 47–48), time is dynamic. Any state of affairs that was once expected in the future is in one unique moment present and then shifts to the past. He (1996a, 45) also pointed out that time is not an object, but all entities that exist, exist in time. This view is in opposition to the tapestry view of time. The tapestry view of time is the concept in which a time-line is observed from the position of God. In this concept, all events as well as all entities that existed in the past, exist at present or will exist in the future possess a certain kind of existence (see Prior 1996b, 47–48).

Eternalism is linked to the tapestry view of time, as the propositions in this concept are stable and static, similar to the static time-line seen from the perspective of God. If my utterance: 'Linus is on the mat' is understood as 'Linus is on the mat at noon on 8 June 2022 by CET', the proposition is static and timeless. On the contrary, propositions such as 'Linus is on the mat' can dynamically change their truth-value with respect to the current position of the kitten in temporalism. Unlike eternalism and the tapestry view of time, temporalism take time seriously.

Denying the tapestry view of time, Prior also used another metaphysical position, namely logical realism.[4] Logical realism is the view that logic concerns reality. As Prior (1996a, 45) claimed in the introductory sentence of

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[4]   The view also impacted the formulation of Prior's temporal logic as Jakobsen (2020) argued in his paper.

his paper 'A Statement of Temporal Realism': "Philosophy, including Logic, is not primarily about language, but about the real world." As was already mentioned Prior (1996a, 45–46) argued everything that exists, exists in time. Therefore, if time is dynamic and logic could concern reality, it is more natural to describe reality from the perspective of presentism when once present event became far and far past, and temporalism where propositions are at a certain time true and then false.

Temporalism plays a role in another feature of time important to Prior. Prior believed that there is a genuine distinction between the past and the future. The distinction is essential for the cornerstone of Prior's metaphysics, his vindication of free will. While what happened in the past is already settled, the future is partially open, according to Prior. He (1996b, 48) argued:

> This belief, or prejudice of mine, is bound up with a belief in real freedom. One of the big differences between the past and the future is that once something has become past, it is, as it were, out of our reach - once a thing has happened, nothing we can do can make it not to have happened. But the future is to some extent, even though it is only to a very small extent, something we can make for ourselves. And this is a distinction which a tenseless logic is unable to express.

This openness is crucial for contingency in the future and consequently enables free will. As Prior argued in the quoted fragment, this difference cannot be stated in the tenseless language of eternalism.

As was already mentioned, the question of free will was central to Prior's philosophy and logic. There were, however, different stages of its reception by Prior. Copeland (2022) stressed that Prior began as an opponent of free will for the sake of religion. He switched his position entirely, however, in his mature work. First, he introduced temporal logic as a tool for formulating arguments against determinism. Second, Prior argued that God's omniscience problematizes the existence of free will. This could have contributed to Prior's distancing from the Presbyterian Church (see Øhrstrøm, Hasle and Jakobsen 2022).

2.2. Natural language

When Prior argued that certain metaphysical views cannot be expressed in the tenseless language of eternalism, he overlapped with the second area that is mentioned in the debates between temporalism and eternalism, natural language. Although natural language was not as important to Prior as was the metaphysics of time, he (1959) included one of these issues in the title of one of his papers: 'Thank Goodness That's Over'.

In the paper, Prior (1959, 17) argued against eternalism pointing out that supposing time indexicals appear paradoxical in certain propositions. Namely, the proposition 'Thank goodness that's over' is perfectly clear without the addition of any indexical. On the contrary, the addition of the appropriate indexical causes its paradoxicality, since it would be either 'Thank goodness the date of the conclusion of that thing is Wednesday, 8 June 8 2022' or 'Thank goodness the latest part of that is earlier than this utterance' (see Prior 1996b, 50).

2.3. Other reasons for temporalism

Apart from metaphysics and natural language, Prior also mentioned reasons for supporting temporalism from the philosophy of mind and practical use. First, Prior (1959, 17) claimed that adding a precise date to a proposition could be troublesome, as people are not always aware of the time when they assert something. However, this does not affect the soundness of their utterance. Second, Prior assumed that temporalism might be useful in computer science. He (1996a, 46) argued:

> There are practical gains to be had from this study too, for example in the representation of time-delay in computer circuits, but the greatest gain that a logic of tenses brings is the accurate philosophical description of the reality of the passage of time.

3. Tichý's concept of temporalism

In his concept of temporalism, Tichý was undoubtedly affected by Prior and the Priorean tradition. Tichý (1980b, 167) described his position as the

concept of ancient and medieval logicians similarly to Prior, and quoted his works, discussing temporalism. He (1980b, 174–177) also critically addressed the analysis of 'now' developed by Prior and his colleagues.

Despite Tichý's main focus differing from that of Prior, temporalism also plays a key-role in his concept of propositions. It is included in the concept of propositions in his system of logic TIL. TIL is typed calculus. The four basic types are:

o - the class of truth-values (truth and falsehood)
ι - the universe of discourse, which is the class of individuals
ω - logical space, which is the class of possible worlds
τ - time-scale, which is the class of moments of time

Propositions are defined in TIL as (oτ)ω, i.e. they obtain truth-value with respect to a specific moment of time *t* and the possible world *w*. However, not every proposition has to have a truth-value. It could be the case (for instance, if Linus does not exist at a specific moment in time or possible world*)* that the proposition 'Linus is on the mat' will obtain no truth-value, i.e. there will be a truth-value gap (see Tichý 1980a, 348–349). The proposition 'Linus is on the mat' is true in all possible worlds and moments of time where the state of affairs (Linus is on the mat) is actualised. The proposition consequently changes its truth-value over time (and across possible worlds) (see Tichý 1980b, 166).

Natural language was at the centre of Tichý's interest. TIL is a precise tool that could grasp many subtleties of it (see e.g. Tichý 1980a). Natural language also occupies a prominent position in his arguments for temporalism. Although metaphysics and philosophy of mind are also mentioned, the most elaborate arguments are based on the aspects of natural language. Natural language will therefore be introduced in the former part of this section and the other arguments for temporalism in the latter.

3.1. Natural language

Tichý (1980b, 167) pointed out that, unlike previous centuries in analytic philosophy, "[t]ruth has been declared timeless, permanent, eternal" and argued against this view. He wondered whether the approach that was for centuries evident to logicians and philosophers of language really called

for denial only for the sake of logical convenience, especially, if everyday usage of natural language supports temporalism. He listed several examples that support his claims.

First, Tichý pointed out that in our daily communication people behave as if referring to the same proposition changes its truth-value. If my brother asks me: 'Is Linus on the mat?', I could answer 'Yes' or 'No', but my answer could also be more elaborate. If the kitten has recently changed its position, it is quite common to answer: '*It* was true a minute ago but *it* is no longer true.' Such sentences suggest that the pronoun 'it' stands for a proposition in the temporalists' understanding of the term. It is once true and then false. The proponent of eternalism would not use this sentence, as the pronoun 'it' would refer to two different propositions 'Linus is on the mat at 12:00 on 8 June 2022 by CET' and 'Linus is on the mat at 12:01 on 8 June 2022 by CET', in their view.

Second, people often have contrafactual wishes. For example, I could wish that Linus was on the mat at the moment when it was actually nibbling my laptop on the table. As propositions are also objects of propositional attitudes, the object of my wish is the proposition 'Linus is on the mat', which is false in the given situation. However, I could express my dissatisfaction with Linus' behaviour and it could go to its mat. Then my wish would come true and so the proposition 'Linus is on the mat'. Tichý (1980b, 168) argued that in situations like this, one could assume that there are not two propositions involved, but just one that changed its truth-value.

Third, Tichý (1988, 189–191) claimed in eternalism that it is difficult to express time-telling propositions, if every proposition should contain indexicals. The proposition 'It is noon' would then be 'It is noon at noon on 8 June 2022 by CET' in eternalism, which is absurd. Tichý (1980b, 167–169) stressed that eternalism was motivated by logical convenience, but sacrifices linguistic and epistemology for this sake. He (1980b, 169) argued: "If we do not want to trade time-telling for logical convenience we should see Russell's approach as inadequate."

Finally, Tichý (1980b, 178–179) claimed that the proponents of eternalism differentiated between the two uses of the verb 'is'. In the proposition 'Linus is on the mat', 'is' is *tensed*, as it means 'is now', while in the proposition 'Linus is on the mat at noon on 8 June 2022 by CET', 'is' is

'tenseless', i.e. eternally true. Tichý argued that there is a lack of sufficient arguments for postulation of such a distinction. He maintained that 'is' is always tensed, i.e. true at a certain time, even though in special cases, such as mathematical equations, it means being true at every moment of time.

3.2. Other Reasons for Temporalism

Similarly to Prior, Tichý also pointed out reasons for temporalism from metaphysics and philosophy of mind. Both are connected, however, with issues of natural language. First, when Tichý argued against the tenseless understanding of 'is', he also pointed out that it implies the tapestry view of time and that this concept of time is wrong. He (1980b, 179) claimed:

> Natural language is meant for time-bound speakers, not for atem-
> poral gods. Accordingly, it knows only one "is" of predication,
> the one which is redundantly called "tensed". And there are, in-
> cidentally, no atemporal gods: an alleged being that is not at any
> particular time is not at all.

Second, Tichý (1988, 191) also acknowledged that people sometimes know when something will happen, but do not know that the time is now or vice versa. Tichý used Robinson Crusoe's case as an example. If Robinson Crusoe was oblivious as to what the date is and possessed astronomy books, he could deduce from them that there would be an eclipse of the moon on 1 January 1987 at 10 p.m., i.e. that the proposition (i) 'The moon is eclipsed on 1 January 1987 at 10 p.m' will be true. However, if the sky was overcast that day, he might not have noticed that the proposition (ii) 'The moon is eclipsed' is true, although he would know that (i) is true. On the other hand, if Robinson Crusoe had no astronomy books and the sky was clear, he could see that the proposition (ii) is true without knowing that (i) is also true. In this case, the propositions (i) and (ii) would be different propositions.

4. Tichý's Criticism of Prior's Approach

As was already mentioned, Tichý knew and quoted Prior's work. The evidence is based on inter alia on Tichý's critique of the analysis of complex

time reference that occurred in Prior's work and the work of his colleagues. Tichý (1980b, 174–177) criticised a position entitled 'double indexing'. This consists of adding an operator 'N' for 'now' in the formalisation of propositions containing complex depictions of time including 'now'.[5] Namely, he argued that the propositions as 'It will be the case that Linus is on the mat now' are formalised as:

F(N(p))

in the work of Prior and his colleagues. The operator 'N' stands in the formalisation for 'now' the operator 'F' stands for 'it will be the case' and the propositional variable for the proposition 'Linus is on the mat'.

The formalisation means that the truth-value of the proposition is evaluated with respect to two time instants 'now' and the future one. This analysis violates Tichý's concept of propositions understood as functions whose input is the respective time and a possible world and the output is a truth-value as there are two times that have to be considered.

Tichý claimed that propositions such as 'It will be the case that Linus is on the mat now' make sense only if it is already known what time 'now' is, e.g. noon on 8 June 2022 by CET. Therefore, the proposition 'It will be the case that Linus is on the mat now' represents the proposition 'It will be the case that Linus is on the mat at noon on 8 June 2022 by CET' which does not require double indexing.

Tichý also challenged the view that there could be a difference between the truth-values of p and $N(p)$. Despite the proponents of double indexing vindicating this difference, Tichý argued that it would be difficult to find a proposition in which this could be the case.[6] It would not be the propositions 'Linus is on the mat' and 'Linus is on the mat now' as the former would be true at any time the latter is and vice versa. Consequently, double indexing is superfluous, according to Tichý, and since it also violates his concept of propositions, he denied it.

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[5]   In Prior's (2003, 178) paper, the operator 'J' is used for 'it is now the case'. This might be caused by the fact that Prior used Polish notation and 'N' stands for negation in this notation.

[6]   As will be demonstrated further, it is not the case in Prior's system of temporal logic.

Prior (2003, 171, 174) claimed that his temporal logic originally lacked the operator for 'now' as he viewed the present tense as redundant. Hans Kamp, however, pointed out to Prior the importance of this operator. Prior (2003, 175–176) argued that in cases when the time reference is complicated, the addition of the operator for 'it is now the case', could be useful. Prior does not have in mind simple propositions such as 'It will be the case that Linus is on the mat now', but a more complex pair such as:

'It is now the case that I will later be glad that I am writing the paper now.'

and

'It is now the case that I will later be glad that I am writing the paper then.'

where the use of the operator for the present could help to grasp the difference between these two propositions. The former proposition concerns my current work on the paper, but the latter concerns my work on the paper in the future.

The propositions that Tichý proposed and their formalisation in temporal logic cannot express the difference as Prior's (2003, 178–179) system contains as theorems:

$$p \leftrightarrow N(p)$$
$$F(p) \leftrightarrow F(N(p))$$

Prior (2003, 176) admits that although there are cases, in which 'now' is not redundant, the propositions in which it appears could be reformulated to such a form that 'now' becomes redundant. He views the operator 'now', however, as an enrichment of his system of temporal logic.

As was already mentioned, Prior had a different concept of proposition than Tichý. Propositions are logical constructions, according to him (see Prior 1971, 11–13). True propositions could be replaced by facts, i.e. 'Linus is on the mat is a true proposition' could be replaced by 'Linus is on the mat is a fact'. However, both propositions mean the same since the proposition 'Linus is on the mat'. No proposition is an abstract entity placed in the third realm. The proposition 'Linus is on the mat is a true proposition' is not about an abstract object but also about the position of the kitten.

In addition, Prior denied the existence of possible worlds and time instants. In his view, there are only world-propositions and instant-propositions. Prior defined world-propositions as follows:

> … a "world" proposition is a *maximum* proposition; if we conjoin with it the least thing that it does not imply we shall have a contradiction, since among the things it does imply will be the negation of the added item. (see Meredith and Prior 1965, 102)

Similarly to instant-propositions, in their case the conjunct at a specific time is taken into account. From the distinction between world-proposition and instant-proposition, it is also obvious that Prior considered only one parameter in his systems of logic. In temporal systems of logic, it is just respective time or times, but not possible worlds.

Therefore, he could have considered the introduction of the operator for 'now' as an interesting enrichment to his system without causing any problem to his concept of proposition. He would agree with Tichý that the use of the operator is not indispensable. However, Tichý's criticism does not entirely address Prior's aim since the introduction of the operator for 'now' was driven by more complex propositions than those presented by Tichý.

5. Conclusion

Temporalism was for centuries a prevalent view in philosophy. On the contrary, in analytic philosophy, the authors have preferred eternalism from its beginning. Certain analytic philosophers still provide, however, arguments for temporalism. The paper focused on two of them – Arthur N. Prior and Pavel Tichý and argued that Prior was driven more by metaphysics, i.e. the unacceptable metaphysical implications of eternalism, and Tichý was driven more by reasons of natural language. However, 'more' is an important word here. Prior also discussed the negative impact on natural language and Tichý on metaphysics, but these were secondary for them. Both logicians also introduced arguments from the philosophy of mind, and Prior pointed out that temporalism might have been used in certain applications in computer science.

However, their divergent concepts of temporalism also reflect Tichý's criticism of double indexing. While double-indexing opposed Tichý's concept of propositions, it does not cause any issue in Prior's one. Although it is not inevitable in Prior's systems of temporal logic, he viewed it and the operator 'N' that caused it as an enrichment of his system of logic.

The difference between Prior and Tichý is important from the point of view of evaluating of arguments for temporalism. Prior's temporalism is open to the same criticism, as is his dynamic concept of time and his vindication of free will. On the contrary, Tichý's concept has to face primarily criticism from the philosophy of language, where, for instance, Richard (1981, 2–6) pointed out that temporalism could also imply serious paradoxes. However, as Tichý's concept was considerably less known than that of Prior, the most of the criticism from the point of view of language was also addressed to Prior. Consequently, the last aim of my paper is to point out that Tichý is another unknown proponent of temporalism (if one intends to support this view) or another target of criticism (if one decides to question this position).

Acknowledgement

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