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Themes from Prior

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The Metaphysics of Time

Logic and Philosophy of Time, Vol. 4

Per Hasle, David Jakobsen, and Peter Øhrstrøm (Eds.)

The Metaphysics of Time:

Themes from Prior

Edited by:

Per Hasle, David Jakobsen and

Peter Øhrstrøm

Logic and Philosophy of Time, Volume 4

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The Metaphysics of Time: Themes from Prior Logic and Philosophy of Time, Volume 4
Edited by Per Hasle, David Jakobsen & Peter Øhrstrøm

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Preface

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This is the fourth volume of the book series "Logic and the Philosophy of Time". As in earlier volumes, the main focus is on the beginnings as well as the further development of modern tense logic. However, in the present volume most of the papers also consider basic metaphysical questions related to time, logic, and modality.

In most cases, earlier versions of the papers in the volume have been presented at the conference "The Metaphysics of Time", at Aalborg University, Denmark, 19st-21st March 2019. Following that event, the authors have been given the chance to improve their papers based on the discussions at the conference and the suggestions in the peer reviews.

As Peter Øhrstrøm argues in his paper "From A-time to B-time: Prior's journey there and back again", A.N. Prior's life from his childhood to his death in 1969 can be conceived as a metaphysical journey. From the belief in free choice as a Methodist in his childhood, he as a teenager moved on to Calvinistic determinism and rejection of free-will, and at the age of 40 he introduced a brand new paradigm based

on free choice, indeterminism and a tensed view of time. As argued by Øhrstrøm, all the papers in the present volume can somehow be related to important topics and questions which Prior had to deal with on his life-long, metaphysical journey.

Prior was not only a highly qualified philosopher and an outstanding logician, but he also involved himself in a series of public debates as a public philosopher. In his essay "The Public Prior: A.N. Prior as (relocated 17th & 18th century) Public Intellectual 1945-1952", Mike Grimshaw argues that this activity can be viewed as a continuation of his public voice as religious journalist.

There can be no doubt that Prior's views on time, logic and modality over the years were closely related to his religious and existential views. In his paper "Dispelling the Freudian Specter: A.N. Prior's Discussion of Religion in 1943", David Jakobsen considers Prior's metaphysical world view and his correspondence with Karl Popper about relevant aspects of faith and unbelief. In their joint paper 'On Prior's "Logic of the Word of God", David Jakobsen and Hans Götzsche consider Prior's early paper 'The Analogy of Faith', seeking out productive insights which it offers into Prior's view on logic.

One of the things that made Prior so influential was his ability to cooperate with others. He maintained an extensive correspondence and was quick to realize the potential of ideas suggested by his fellow logicians and philosophers. In many cases he would develop such ideas much further, whilst carefully acknowledging their original authors. As argued in the paper "Early Prior on the Nature of Modality: Debates with Łukasiewicz" by Aneta Markoska-Cubrinovska and Zuzana Rybaříková, Prior adopted the formalism and proof theory of Jan Łukasiewicz, although Prior disagreed with Łukasiewicz' view on modality. In his development of so-called hybrid Prior was able to benefit from his cooperation with Carew Meredith, who introduced the notion of 'world propositions' in 1953. As pointed out in Per Hasle's paper "The Beginnings of Hybrid Logic: Meredith, Prior and the Contingent Constant n", Meredith's 1953 note laid the earliest (albeit rudimentary) foundation of hybrid logic, and Prior later decisively improved this early notion of world propositions.

Prior vigorously argued for a tensed view of time. However, he was not the first modern philosopher to do so. Other thinkers much earlier made similar points. As pointed out in Florian Fischer's paper "Prior

to Prior", Moritz Schlick made the case for indispensable A-sentences 25 years prior to Prior. Prior himself also referred to much earlier work (1908) by McTaggart, which in spite of imperfections contains important and fundamental observations in this respect. Such forerunners notwithstanding, Prior was the first philosopher to develop full-fledged logical systems based on the tensed view of time, and thus stands as the founder not only of modern tense-logic but also of so-called hybrid logic.

Prior found his tense-logical view of time challenged by relativistic physics. In her paper "Arthur Prior and Special Theory of Relativity: Two Standpoints from the Nachlass ", Julie Lundbak Kofod explores the evolution of Prior's views on the special theory of relativity. She compares and contrasts the views expressed in Prior's early reactions with his mature views, which were most fully expressed in *Past, Present and Future* (1967).

In their joint paper "Letters between Mary and Arthur Prior in 1954: Topics on Metaphysics and Time", David Jakobsen, Peter Øhrstrøm and Martin Prior discuss correspondence between Mary and Arthur Prior and between Arthur Prior and J.J.C. Smart from 1954 on five topics: freedom, abstract entities, modal logic, religion and theology and finally the logic of time. The paper argues that the logic of time was formulated in the context of reflections on the first four of these.

Clearly, Prior's tensed view of time can still be analysed in a metaphysical and also religious manner. In his paper "Time, tense, and eternity", W.L. Craig argues that if we are to understand divine eternity, we must first settle the question of the tenseless vs. tensed theory of time. In his other paper in the volume "Legal pardon, tensed time, and the expiation of guilt", Craig deals with topics at the intersection of theology, philosophy of law, and philosophy of time. In particular, he explores the relation between legal pardon, tensed time, and the expiation of guilt.

The following three papers all deal with conceptions of presentism. In his paper "Future Bias and Presentism", Sayid R. Bnefsi has suggested an account of what some call "future bias", according to which there is a preference for certain tensed truths properly relativized to the present. Furthermore, Bnefsi has demonstrated the compatibility of this notion with presentism.

In his "Fatalism for Presentists", David P. Hunt considers Prior's

view that presentism offers some obvious grounds for denying divine foreknowledge of future contingents. Hunt argues that this view is not tenable, or in the very least not cogent. On the other hand, he finds that the recent foreknowledge debate has shown that Prior was right in insisting that the idea of future contingent truth can well be challenged.

In his paper "A defence of presentism against the Rietdijk-Putnam-Penrose argument", Atle Søvik considers the problems arising from the theories of relativity with regard to presentism and touches upon the block universe perspective. Søvik offers a defence of presentism against such a line of argumentation.

Elton Marques in his paper "Eternalism, hybrid models and strong change" argues that eternalism in the block universe conception is compatible with change. In fact, Marques shows that what he calls 'strong change' can in principle be introduced in an eternalistic model.

The following three papers in the volume deal with problems related to the open future and branching time. In her paper "Living in a World of Possibilities: Real Possibility, Possible Worlds, and Branching Time", Antje Rumberg introduces a notion of so-called real possibility. She argues that real possibilities—as temporal alternatives for actuality—are most adequately represented in Prior's theory of branching time.

In their paper "Perspectival Semantics and the Open Future", Ciro De Florio and Aldo Frigerio offer a perspectival temporal semantics, in which propositions are evaluated with respect to two indexes: the time of evaluation and the time of the perspective. It turns out that this suggestion is very promising in relation to the foreknowledge problem.

In his paper "History relativism as extreme assessment relativism: A note on Prior's Ockhamism", Jacek Wawer introduces a doomsday extension of a branching model, and he proves that history-relative truth in any given model is equivalent to doomsday-relative truth in the extended model. It turns out that this equivalence holds in general only if the end of time is also, in a sense, beyond time.

In their paper, "Some Remarks on Hybrid Modal Logic with Propositional Quantifiers", Patrick Blackburn, Torben Braüner and Julie Lundbak Kofod have offered an conceptual and formal analysis of Prior's instant-propositions as well as other nominals in modern hybrid logic. They have shown that the two intuitions of instants suggested by Prior, the index view and the content view, correspond to two different interpretations of propositional quantifiers.

In his paper "Modeling Decision in a Temporal Context: Analysis of a Famous Example Suggested by Blaise Pascal", Ola Hössjer offers a study of the temporal aspects of the decision between two mutually exclusive alternatives available for an unknown period of time. The primary example is taken from Pascal, but Hössjer's model is in fact a general approach to decision making in a temporal context.

In his paper "Counterfactuals and Irrelevant Semifactuals", Lars Gundersen offers an analysis of some basic problems regarding the semantics of counterfactuals in terms of a notion of relevance. However, Gundersen shows that when we try to handle the notion of relevance formally, we can easily get into trouble because of some very counterintuitive consequences. This calls for further research in order to come up with a satisfactory notion of relevance.

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From A-time to B-time: Prior's journey there and back again

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Abstract

A.N. Prior developed his famous tense-logical paradigm during a period of 15 years (1954-1969). However, it turns out that this work was done under the influence of a long struggle with scientific, philosophical and theological problems regarding time and reality. During his childhood, it was generally taken for granted that we can to some extent make free choices. However, when Prior was16 years old he wrote three booklets in which he rejected free-will and defended a kind of determinism related to the Calvinistic doctrine of predestination. He held on to this view for almost two decades, although he went through periods of doubt during which he felt that his world-view was challenged. In 1954 he finally left determinism and embraced a tense-logical account of indeterminism, presentism and change. In terms of McTaggart's A- and B-series this means that Prior as a teenager left the A-theoretical approach to time and reality which had dominated his childhood, and furthermore that after several years as a B-theorist he returned to a logically elaborated A-theory of time and reality. Prior's long metaphysical journey made it possible for him to suggest a tense-logical paradigm that reaches far beyond his own models and theories.

Keywords: A-time; B-time; determinism; free choice; Prior; Einstein; Bergson.

1 Introduction

A.N. Prior (1914-69) contributed significantly to the development of the modern philosophy of time. In fact, his focus on the importance of the tenses has given rise to a new and powerful paradigm for the study of time. Prior insisted on the reality of the distinction between past, present, and future, and he demonstrated how the temporal aspects of reality can be treated formally in terms of tense-logic. He showed how ideas of presentism, branching time and instant propositions can be treated in terms of formal logic. Prior developed this famous tense-logical paradigm during a period of about 15 years (1954-69). However, recent research into the unpublished works of A.N. Prior makes it clear that his remarkable tense-logical approach should be understood in the light of a much longer struggle with scientific, metaphysical and theological questions concerning time and reality. Actually, this struggle began when he was a teenager!

Prior was brought up in a Methodist home in which the importance of free choice was emphasized. It was believed that the individual has to make significant decisions for himself. The most crucial decision in life, of course, would have to do with conversion and becoming a Christian believer. In the Methodist Church, young people were strongly encouraged to make this crucial decision as a personal step into the Christian belief. Prior presented his father as an Arminian, i.e., a defender of the view going back to the Dutch theologian Jacobus Arminius (1560–1609), according to whom man's free-will is compatible with the doctrine of God's sovereignty. According to this view a person can actually decide freely to become a Christian. In this way, a conversion should be seen as a result of a free choice.

Much later Mary Prior noted, looking back, that Arthur never had any experience of a conversion of that kind and probably did not find that he needed one (in personal communication). Anthony Kenny has made a similar point in his account of Prior's rejection of his earlier denomination:

> He became dissatisfied with Methodism, finding its theology too unsystematic, and disliking its stress on the felt experience of conversion. (Kenny, p. 322)

2 Rejection of the reality of free-will and becoming

As a teenager Prior became a Calvinist and rejected that there could ever be any free decisions at all. It has recently been discovered that Prior wrote three booklets during September and October in 1931 when he was just 16 years old. In these booklets he rejected his earlier beliefs in free-will and in becoming as a fundamental aspect of reality. Instead, he defended the view that the world is fixed and determined — a view Prior related to the Calvinistic doctrine of predestination.

With his booklets Prior apparently wanted to formulate an account of his new world-view. At that time, he was preparing for his final exam from Wairarapa High School in Masterton. He based his presentation on the knowledge he had obtained from literature, religion and science. This led him to writing the three booklets: *Essays Literary*, *Essays Religious*, and *Essays Scientific*. The first is in private possession in New Zealand, whereas the latter two have been donated to the Bodleian Library in Oxford as part of the Ann Prior Collection. Prior's Essays have recently been edited and published in (Jakobsen et al. 2020).

In his essays Prior clearly tried to integrate religious and theological thought with current scientific and philosophical ideas. As noted by Jack Copeland (2020) Prior, in his *Essays Literary*, even wanted to name "the greatest thinkers the world has known". A project of this kind is obviously difficult, but Prior stated: "I have no hesitation in placing JESUS OF NAZARETH at the top of this list" (Jakobsen et al. 2020, p. 49). This clearly indicates that in the integration he was inclined to give theological and religious thinking a key role.

Prior found that in integrating religious, philosophical and scientific he thought the questions regarding the concept of time should be seen as very important. There are various notes and addenda attached to the Essays, and one of them is in fact entitled "Father Time". In this note, dated 1.8.31, Prior wrote:

> Who shall contend with Time?" wrote Henry Kirke White in 1805, and to anyone with a pretence of education it must be obvious that the answer he intended was "Mach, Einstein, Jeans, Whitehead and Bergson.
>
> ("Father Time", Prior's Nachlass)

Later in the same note Prior wrote:

> In my young days, when I was green in judgement, I used to style myself a Bergsonian, but now, philosophically speaking, I prefer Einstein's view, and try to paint on the tableau of my mind his picture of Space-Time as a vast void wreathed into the strange and shadowy shapes of stars and atoms and life and humankind.
>
> ("Father Time", Prior's Nachlass)

According to the young Prior there are two important views of the temporal reality: one based on change and tense (Bergson) and one referring to a fixed structure of Space-Time (Einstein). It should be mentioned that the two positions correspond to McTaggart's A- and B-series, although Prior did not use this reference before P.T. Geach convinced him that he should do so; see (Prior 1967, p. vi).

It is obvious that Prior when writing in 1931 still found Bergson's views interesting:

> Even more importance is attached to Time by the great French philosopher, Henri Louis Bergson, who holds that to argue about the nature of Time is futile, for Time is the only thing which exists, and Matter, Mind and Spirit are alike but aspects of it. Time, according to Bergson, is not just a sort of abstract background against which events take place, but is rather the one living Reality of which we are all but parts and aspects. For Bergson we are all like ripples and eddies on the stream of Time, a stream of "unceasing becoming, which preserves the past and creates the future."
>
> ("Father Time", Prior's Nachlass)

Here Prior quotes from H. Wildon Carr's book on Bergson's philosophy of time (Carr 1911, p. 15). According to this view, the proper understanding of time depends on change and becoming. It is not just "a sort of abstract background against which events take place", but time is essential for life and reality as such. This also means that the tenses should be taken into account. Prior presented his discussion of Bergson's conception of time in *Essays Religious*, in which he made the criticism that Bergson fails to understand the importance of the permanent basis of everything:

> Reason teaches us that, though changes occur, they occur according to principles which do not change — that for all the ever-changing appearances there must be some basis that is permanent. But Bergson maintains that nothing is permanent, and indeed that Change is one name for the fundamental Reality. Another name for this Reality is Duration, or Time [...] (Jakobsen et al. 2020, p. 216)

However, it seems that Prior's main criticism of Bergson's philosophy of time has to do with the notion of free will. Whereas Bergson insisted on some degree of human freedom as crucial feature of man, Prior simply rejected this idea as being against the fundamental assumptions of causality and determinism:

> This belief [...] has been revived in recent years by Henri Louis Bergson, who applies the enticing term 'creative' to actions performed independent of any guiding motive or reason. What a lot of irresponsible maniacs we must be, to be sure, if these people are right!
> (Jakobsen et al. 2020, p. 216)

Prior's earlier belief in human freedom probably has to do with his religious upbringing in Methodism and Arminianism. In *Essays Religious* he strongly argued against Arminianism. In fact, he wrote the following dedication in the beginning of this booklet: "Dedicated to my Father and other Arminians who will not agree with it."

According to Prior modern Arminians may be divided into two schools (Øhrstrøm et al. 2000, p. 210):

1. Those who hold that God's control of the Universe is imperfect, and that Change plays a considerable part in Nature's workings.

2. Those who hold either that God does not exist or He is perpetually changing, or even that He is Himself Perpetual Change, and believe in what they call "creative freedom".

Prior mentioned Bergson as a representative of School 2, and in the booklet Prior consequently rejected the Bergsonian beliefs in free-will and in change as a fundamental aspect of reality. However, it seems

that his main reason for this was religious. He pointed out that "if Bergson and his followers are right in saying that the fundamental Reality is Change, the unchangeableness of God is also challenged" (Øhrstrøm et al. 2000, p. 218). Prior certainly had to oppose that view.

Having rejected the Bergsonian and Arminian view of time, Prior argued in favour of scientific determinism quoting the following claim from Einstein:

> Everything is determined, the beginning as well as the end, by forces over which we have no control. It is determined for the insect as well as the star. Human beings, vegetables and cosmic dust, we all dance to a mysterious tune intoned in the distance by an Invisible Piper.
>
> (Øhrstrøm et al. 2000, p. 200)

Furthermore, Prior pointed out that according to Einstein events "do not happen — we simply come across them" (Øhrstrøm et al. 2000, p. 240). In his note dated 1.8.1931 and entitled "Father Time" Prior maintained that Einstein was a follower of Ernst Mach, who had "reduced the concept of Time to a kind of meaningless figment of the imagination based on the observed succession of events".

Prior found a similar account of determinism (and maybe even some kind of Predestination) in the works of Shelley. Prior quoted Shelley:

> We live and move and think; but we are not the arbiters of every motion of our own complicated nature; we are not the masters of our own imagination and moods of mental being. There is a Power by which we are surrounded, like the atmosphere in which some motionless lyre is suspended, which visits with its breath our silent chords at will.
>
> (Øhrstrøm et al. 2000, p. 137)

In this way Prior pointed out that both Shelley and Einstein – as well as many others – have spoken convincingly in favour of a determinism fully consistent with Calvinistic predestination. Such accounts leave no room for human freedom. Furthermore, this view means that time should be conceived as something fixed. It means that time is in fact an "abstract background against which events take place" (to use the expression Bergson strongly opposed). On this Einsteinian view

the "passage of time" is not something real, but "just one of our many delusive sense-impressions" and the distinction between past and future is a mere "convention based on light-signals." (Øhrstrøm et al. 2000, p. 241).

In his essays from 1931 Prior argued in favour of such an Einsteinian view of time and reality. In his opinion Einsteinian determinism and Calvinistic predestination should be understood as two approaches to the same world-view according which time is an eternal structure that leaves no room neither for free choice nor for becoming and change. It is evident from his letters to Ursula Bethell (Grimshaw 2018), that he remained dedicated to Calvinistic predestination and determinism during the 1930s. Apparently, he even kept supporting this view most of the time during the 1940s. However, his world-view was challenged several times during the 1940's. As Mary Prior remembered there was something about his view that did not please him:

> [...] it is true that Arthur was preoccupied by the problem of free will. At first he saw it in a semi-theological context. I have never felt quite sure how seriously Arthur really took the Calvinism which intellectually attracted him. It was rigorous and logical, unlike the Methodism of his childhood. But its God lacked humanity. I think sometimes he entertained Calvinism in its various forms rather than quite believing it. He was very aware of the dilemmas it posed. Perhaps his failure to resolve them was a reason why despite so much preparation the book on Scottish Theology never came to anything. In his later work I think he was prepared to go where logic led him, but the idea of the future as open to choice, where the past and present were not, may also have had deeper emotional attractions. But here I speculate.
>
> (Mary Prior, 1997; quoted form (Prior 2003, pp. 301-302))

3 Return to a belief in the reality of tenses and free choice

Prior's metaphysical journey eventually resulted in the precise formulation of his tense-logical views presented for the very first time at the Second Philosophical Congress, held at Victoria University Wellington,

New Zealand, on the 27th August, 1954. It is not clear what made him change his mind. However, his interest in ethics and deontic logic might have made him rethink his view on free choice and reality, see (Jakobsen et al.; in this volume).

Prior was not the first to formulate a logic of time. As mentioned in (Øhrstrøm and Hasle 2019) an account of a logic of time had earlier suggested by Jerzy Łoś, which was in fact recognized by Prior himself. Even the emphasis on the importance of tenses had been defended by Moritz Schlick two decades before Prior's findings; see (Fischer; in this volume). However, as pointed out by Fischer Prior's and Schlick's contexts differed a lot. Prior saw his tense-logic as a re-discovery of medieval logic, and his approach was very systematical and general. Furthermore, his ideas were presented in terms of a very powerful formalism. This still makes it reasonable to present Prior as the father of modern tense-logic.

There can be no doubt that Prior in first presentation found a lot of inspiration from modal logic and his studies of Polish Logic; see (Markoska-Cubrinovska; Rybaříková; this volume). In his further development of tense-logic he was clearly able to benefit from the close co-operation with a number of fellow logicians, such as Carew Meredith; see (Hasle; this volume).

Prior formulated his new tense-logical position in an undated paper, "Some Free Thinking about Time", which he never published:

> So far, then, as I have anything that you could call a philosophical creed, its first article is this: I believe in the reality of the distinction between past, present, and future. I believe that what we see as a progress of events is a progress of events, a coming to pass of one thing after another, and not just a timeless tapestry with everything stuck there for good and all [...]
>
> 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 tensless logic is unable to express.
("Some Free Thinking about Time", Prior's Nachlass)

Prior's long metaphysical journey took him from seeing time and reality in the light of Bergsonian Arminianism to understanding it in terms of a world-view based on Einsteinian determinism and Space-Time Theory. Finally, his journey took him back again to the A-camp. Like Bilbo in Tolkien's Hobbit (1937), Prior returns from his journey there and back again as a changed person. Like Bilbo, Prior comes back with a much wider outlook. He returned to the A-theoretical camp with a revised world-view mainly established through formal logic, which he learned to use on his way as a great tool for anyone who wants to understand reality better. Clearly, his approach to time and reality obtained on the long journey is consistent with essential parts of Bergson's philosophy of time. However, Prior did not return to his earlier Bergsonian position, but to a rather different view. The difference is mainly that whereas Bergson's own philosophy remained rather informal and tentative, Prior formulated his philosophy of time in terms of formal logic. With his tense-logic Prior was able to offer a formal account the basic flux and flow of things which Bergson referred to in his philosophy of time. In his printed papers and books Prior did not refer to Bergson, since wanted to support an A-theoretical approach very different from Bergson's. In an unpublished note Prior wrote:

> Perhaps you could call my logic a mixture of Frege and Kołakowski. — I want to join the formal rigorism of the one with the vitalism of the other. Perhaps you regard this as a bastard mixture — a mésalliance. — I think it is a higher synthesis. And I think it important that people who care for rigorism and formalism should not leave the basic flux and flow of things in the hands of existentialists and Bergsonians and others who love darkness rather than light, but we should enter this realm of life and time, not to destroy it, but to master it with our techniques.
> ("A wants me to relativize my tenses to dates", Unpublished note, Prior's Nachlass)

Prior ended up rejecting Calvinism as his personal view. In particular, he rejected Calvinistic Predestination and determinism. On the

other hand, it is obvious that he was able to benefit from religious studies even after he had left active Church life; see (Jakobsen; Jakobsen and Götzsche; in this volume).

The way Prior handled what he conceived as Einstein's determinism was rather complicated. His paper, "Some Free Thinking about Time", contains some critical remarks on the view of time that follows from Einstein's theory of relativity. This criticism is apparently rather early and unfinished. This may have been Prior's reason for choosing not to publish the paper. On the other hand, he knew that he had to discuss the relations between tense-logic and relativity, and in his most important book, *Past, Present and Future* (1967, p. 203-205), there is a much more mature account of the relativity in terms of tense-logic. It should be added that the topic of relativistic physics seen in the light of time and tense is still being discussed; see (Søvik; Kofod; in this volume).

Prior's metaphysical journey shows that the tense-logic he suggested is not just a nice and practical formalism. Prior showed that tense-logic provides a rather strong argument demonstrating that it is possible to defend a view of time and reality based on indeterminism in a formal and precise manner. In fact, it is even possible to model free-choice and decision-making within a general temporal framework; see e.g. (Hössjer; in this volume). Obviously, according to such a model our present beliefs and expectation regarding the future are seen as very different from our present relations to past experiences. When he became an indeterminist, Prior insisted that this asymmetry between the past and the future is essential for a proper understanding of reality. Clearly, this means seeing tenses as something real. This approach turns out to be extremely relevant within the modern philosophy of time in general. Even in modern analytic theology it is possible to benefit from the tense-logical approach to time and reality; see e.g. (Craig; in this volume).

The tense-logical approach also makes it evident that there are several ways to carry out a project of this kind. The very precise tense-logical formalism suggested by Prior makes it possible to specify a variety of different models of the temporal world. For this reason, it would be fair to say that the tense-logical approach is a paradigm of investigation rather than just a single theory; see for instance (Hunt; Marques; Bnefsi; Florio & Frigerio; Wawer, Rumberg, Gundersen; in this volume). Actually, Prior himself presented four "grades of tense-logical involvement" (Prior 2003, p. 117 ff). Personally, he preferred the fourth grade.

However, he was very much aware of the fact that fellow logicians might see some of the other possibilities within branching time semantics as more attractive. In Prior's opinion, the choice between the various possibilities has to be made on the basis of what he called 'the choice of the soul'. In his own words:

> In doing metaphysics there is still no substitute for 'the choice of the soul'; or, if you like, prejudice. (Prior 2003, p. 284)

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The Public Prior: A.N. Prior as (relocated 17th & 18th century) Public Intellectual 1945-1952

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Abstract

This essay considers an eight-year period when Prior was involved in a series of public debates as a public philosopher. I argue this can be viewed as a continuation of his public voice as religious journalist. What is interesting is Prior's choice of the medium of public periodicals to express and develop the transition in his thought to the wider, educated general public of New Zealand. This was carried out in three main journals, all published in New Zealand: the *Student* Christian Movement's *Student*; *Landfall*, a quarterly of literature, the arts and culture; and the *New Zealand Listener*, the weekly magazine modelled on the British title of the same name. As Mary Prior notes, in post-war New Zealand not only was 'everyone catching up on lost years', but also the limited resources of tertiary education at the time meant Prior 'lived isolated from other philosophers, save by letter'(Hasle et al. 1997/2003, p. 294, 295).

Keywords: Public intellectual, religious education, ethics, Karl Popper, C.S. Lewis, moral philosophy.

1 Introduction

Arthur Prior was a man of varied interests, and, it could be said, varied careers. As is well documented, Prior originally attended the University

of Otago in Dunedin as a medical student but soon changed his studies to Philosophy and Psychology (gaining a BA). In 1935 he enrolled as a Theological student, training for the ministry of the Presbyterian Church. The common tale is that Professor J.N. Findlay's influence lured Prior from theology and training for the ministry to the world of Philosophy. Yet the reality is not so clear. As has been noted (Grimshaw 2002; Grimshaw 2018), Prior's transition was not so smooth — nor as influenced by Findlay as he and others would later claim. The influence of J.M. Bates, the Presbyterian clergyman, theologian and in the 1930's, co-founder of *The New Zealand Journal of Theology* (1931-35) for whom Prior wrote was, it can be argued, just as formative. Bates not only provided (with the Calvin scholar and clergyman) J.M. Steele an outlet for local theological thinking, he was also the acting head of Philosophy at Otago University in 1933 and so provided a model for Prior that straddled both theology and philosophy. Likewise, Prior did not just abandon theological study and immerse himself into philosophy; nor does it seem that it was a matter of disbelieving in theology and now believing in philosophy (Hasle 1997b). Until the early years of World War II, Prior strongly considered a career as a religious journalist writing widely on theology and contemporary Christianity, especially when travelling and living on the Continent and in England with his first wife Clare (Grimshaw 2018).

When in 1946 Prior did take up a position teaching philosophy at Canterbury University College, Christchurch, he continued to write on religious issues. In fact, it could be argued that the decisive turns were the loss of books and notes in two house fires — the second in 1949 damaging a manuscript (or rather notes) on a history of Scottish theology[1] and destroying further material – and the publication in that same year of his first text *Logic and the Basis of Ethics* (1949a) (Hasle et al. 1997/2003, p. 295).

The circumstances of Prior's move from theological study into firstly religious journalism and then philosophy, has tended to be read as if embodying a modernist sense of inevitability and scientific enlightenment. Yet there exists a document that challenges this history of either a smooth transition or a sudden turn to philosophy via what is set out

[1]The first section of the 'ms' comprised notes that were used in Prior's "Adam Gib and the Philosophers", *Australasian Journal of Psychology and Philosophy*, vol. 26 (1948b), pp. 73-93.

the 1942 'crisis of faith' diary entry (Jakobsen 2016). In August 1936 Prior wrote to the Convenor of the Theological Hall committee asking for his name to be 'definitely' crossed off the list of Theological Hall students. What makes this letter important for revising common histories of Prior is the statement: 'The course of my personal life has brought me to a crisis in the past few months.' This is his meeting and falling in love with the journalist Clare Hunter (around June 1936); by the end of the second term of 1936 he had moved out of Knox College, where he had lived since 1932, and married Clare on 27 August 1936 (two weeks after sending his letter to the Hall Convenor) (Grimshaw 2018, pp. 19-20, 23, 93). As a result Prior has:

> [...] come to doubt very seriously my vocation to the ministry. Neither my desire to serve the Church nor my interest in theology has dimmed this year, but I have become more and more convinced that I am not cut out for the work and the life of *the regular ministry*. (Prior 1936 [italics added])

Theology students had to gain the approval of the Theological Hall Committee to marry, and there was little chance that the politically and socially radical Clare Hunter would have been considered a suitable minister's wife — nor that she would wish to take on such a role.

However, we also need to understand this letter to the Hall Convenor in the light of the letter Prior wrote to the poet Ursula Bethell concerning his marriage and future plans. In late July 1936, Prior not only informs Bethell that he and Clare "are going to get quietly married" by the end of the year but that they aim to "depart for England to earn our living as best we may by free-lance writing of various kinds." While the outcomes of this are increasingly well-known to Prior scholars, it is the following statement that helps us understand his transition: "[...] instead of my theologizing from pulpit or lecture-hall, I shall do it, like Coleridge, on paper and in conversation"; and he adds a footnote comment "I have hopes of ending up eventually as the editor of a religious periodical" (Grimshaw 2018, p. 93).

The reply from the Convenor is sympathetic, noting the Committee's acceptance 'with regret.' While this is a stock phrase and can be excused as niceties, the Rev. David Herron's further comments also signal a wider understanding that Prior's move from study for the ministry was not a move from the wider work of the church and theology:

> However, if you feel that this is not the life work to which you have been called you are wise to withdraw at this stage. No man could be more unhappy than one in the ministry who felt it was not his vocation. I trust that you will find your right niche and that you will be able, *without actually being in the ministry*, to make a valuable contribution to the work of Christ and His Church. (Herron 1936 [italics added])

These two letters[2] are important not only for revising the current view of Prior's transition from Religion to Philosophy, but they also help us understand why he seemed to undergo what, in Jack Copeland's phrase, is his 'bohemian wanderings' in Europe (Copeland 1996, 2020). Both Prior and Herron (and by implication the Theological Hall Committee) seem aware of the fact that Prior, whilst removing himself from clerical activity, will continue to act within a type of Christian world and activity. Prior continued to be an active member of the Student Christian Movement, writing regularly for its publication the *Student*; he also attended St Andrew's Presbyterian Church in Dunedin after his withdrawal from the Theological Hall. Therefore, the change from Theology to Philosophy is not one of doubts of faith and intellectual questioning (the most common reasons to withdraw) but rather one occasioned by personal circumstances. It could be argued that a statement in 1936 has little relevance for what Prior began to undertake in public life almost a decade later; furthermore, during these years he divorced, remarried, gave up his pacifism, joined the air force and served overseas, went through a period of atheism and returned to Christianity, and then transitioned into the university. Yet throughout this time, the one constant in Prior's life was his writing, for publication, on theological and religious matters. Prior may have read a great deal of philosophy, but until he began teaching at Canterbury he wrote a great deal on theology. We also need to remember that the Minister in the Presbyterian church is also 'a teaching elder'; the sermon, not a mass or eucharist is the centre of the Sunday worship. Prior's "right niche [...] without actually being in the ministry" would appear to have been as type of public intellectual teaching elder "theologizing [...] on paper and in conversa-

[2]My thanks to Jane Bloore of PCANZ archives, Knox College, Dunedin for finding these letters when I contacted the archives for information on Prior's writings in church journals.

tion." As a further example of what is being claimed here, it has also just recently come to light that for some time from the late 1940s to the early 1950s Prior was also writing a column in the New Zealand Presbyterian weekly the *Outlook* under the pseudonym 'Napthali' (one of the Tribes of Israel). This is described as "a column of answers to questions on theological or ecclesiastical matters which were purported to have been sent in by readers" (McEldowney 1966, p. 38).[3] So here is Prior, undertaking another type of public intellectual sermonizing, using the *Outlook* as one of his pulpits.

This preamble is important for contextualizing Prior's later burst as a public intellectual, not only because much of the content revolves around religious issues, but also because his involvement, in this period, arises from a time when he is teaching philosophy at Canterbury University College. Prior's public face is exercised in what, it can be argued, is a last attempt at a form of public, non-ordained ministry, that both predates and follows his period of atheism as expressed in his diary entry of 1942 (Jakobsen 2016).

This attitude of being a public intellectual who is also a public theologian can be discerned in an article Prior wrote for the *Outlook*, in 1941, having returned to New Zealand in November 1940. Entitled "Some Mail Gone Missing" (Prior 1941) Prior addresses the issue of how the Church could implement a social voice by ensuring the "ecclesiastical machinery" of the Church could get the effects of decisions made "down to our congregations and parishes, to the people it really concerns, and getting it pressed on this man and that?" (Prior 1941, p. 10). Taking as his example a letter written to the London *Times* by various church leaders in England, "solemnly renouncing, in the name of the Christian Church, the evil of racial discrimination and the colour bar"[4], Prior asks if such a process is really the most successful or appropriate? (Prior 1941, p. 10). Does it, he asks, change the attitudes of those in London "refusing to have Negro air wardens" or Christchurch (New Zealand) landladies knitting for missions "but refusing to let Chinese visit their tenants" or those soldiers on the streets in Wellington "shouting insults

[3]For a discussion of this column; see Grimshaw, "Prior as 'Napthali'" (forthcoming).

[4]In February 1939, in a letter to Bethell, Prior had expressed his distaste ("it's hard to stomach to say the least") of expressions of "this abominable race prejudice" he and Clare noted while in Britain (Grimshaw 2018, pp. 202-203).

at a white woman for being seen there with her Chinese husband,[5] and to legislators responsible for immigration regulations?" (Prior 1941, p. 10). The problem is what could be termed a lapse in logic, in that the letter's signatories intended the public letter to be also a personal one to each of these individuals "just as if it had his name and address on it" but "the letter hasn't been delivered to him (at all events, its delivery is improbable)" (Prior 1941, p. 10). Prior's solution, arising out of his interest in the Scottish reformers, is to firstly consider how things might have proceeded in 17th century Scotland. Here Church ratification would have been swift; letters would have been sent to all presbyteries with calls for a public fast "for the sin of racial discrimination" and, importantly "the unchristian character of such discrimination being explained, and difficulties answered, in a paper giving the 'Reasons for a Fast'" (Prior 1941, p. 10). This would have been followed by Church disciplinary action (warnings, and if necessary, excommunication) and Parliament being "pestered" by the Church to take appropriate action, this all only taking "at most a month or two to swing into action throughout Scotland" (Prior 1941, p. 10).

Prior notes that the basis of such a public move and system "was discipline, ultimately excommunication" but this is neither possible nor the best way to proceed today. To implement a modern version Prior suggests clerical action, pastorally, in preaching "about it with the utmost concreteness" and partaking in "public agitation" (Prior 1941, p. 10). Prior's letter can be understood as an act of both of these forms of action; not only giving concrete examples of the issue but also, by writing to the *Outlook*, seeking to arouse 'public agitation'.

It is the second part of Prior's article that is important for what follows, because Prior also calls for prophetic action not just to communicant members of the church but to those outside the church "just as discipline formerly was not only applied to convinced Christians but to everyone in Scotland by the law of the land" (Prior 1941, p. 11). The problem Prior discerns is that the Church has not only lost its prophetic approach but that it now only preaches to and otherwise approaches "only the 'converted'" (Prior 1941, p. 11). This means that "One of the main reasons why the Church fails to influence the world today is that it has given up the attempt before it has even begun, and assumes to start

[5] Arthur and Clare were living in Wellington at this time, and the specific nature of the incident would seem to be one that they had witnessed.

off with that the world consists of people who 'won't understand.' Our forebears knew better" (Prior 1941, p. 11).

This, I argue, is the reasoning behind Prior's venturing into being a Public Philosopher/Public Intellectual. He wishes (driven by his study of Scottish theology that begin in the late 1930s and continued until 1949) to attain some sort of a prophetic voice and talk to those whom, it may have been decided "won't understand". In Prior's understanding, the Public Intellectual does adopt, in the tradition of the Scottish Reformers, "their bold prophetic approach to all sorts and conditions of men, and to all of these men individually" (Prior 1941, p. 11); and this involves their discussion in the public realm of matters that, on the face of it, may have only a sectarian interest, as an attempt to influence "the world today". This is why Prior, in the debates that follow, writes for non-church/non-sectarian journals. His aim is to address and engage in debate those whom it could be assumed (wrongly, Prior would say) 'won't understand.' So, for the public intellectual to 'convince the world today' they must undertake their 'sermonizing from the pulpit' in the pages of the journals that the society — both churched and non-churched — might read.

2 Public Debate One: Religious Education 1945

While Prior had previously undertaken involvement in public debate in church and religious journals under his own name here in New Zealand and in Britain, and also written under nom de plumes,[6] Prior's first venture into public debate in a wider public journal under his own name occurred in 1945 in the pages of the *New Zealand Listener* over the issue of teaching religion in schools. Writing a letter from Military Camp and harking back to his 1941 call for the prophetic, communal call of Christianity (and back to 17th century Scotland) Prior states the teaching of religion [that is, "what Christianity is and has done", taught in an objective fashion[7]] in schools "is part of the State's duty"; this duty balanced

[6]Prior wrote letters to the editor while a student under various nom de plumes including 'Independent Labour' and 'John Everdean' [with Clare Prior]; he also wrote some articles and letters under 'Richard Bramley'. For discussion of his writings under 'John Everdean' and 'Richard Bramley'; see Grimshaw (forthcoming).

[7]Here Prior is quoting "A.M.R." who wrote the original letter. "A.M.R" is most likely the pacifist and theologian Rev. Alun Morgan Richards (1907-2000). Prior knew

by the Church's "duty to teach people to be less 'touchy' about what teachers say" (Prior 1945a). His concern is to separate religious practice/observance from the duty to teach an understanding of Christianity and its history.

Prior continues to discuss this issue in greater depth in an article for the Presbyterian Church journal the *Outlook* published the same month (Prior 1945b). This in itself is interesting because here Prior is clearly arguing the matter to both the church and the unchurched at the same time. That is, to the unchurched to understand why the matter is important, while to the churched the argument is that religion in schools is not and cannot be what many within the church would wish.

Prior locates the debate and agitation for religious instruction in schools as part of an awareness by the Churches that sectarianism is an "evil" indicative of not only a "wrong relationship between different churches" but also "a wrong relationship between the church and the community. It has turned the Church into a clique for the religiously inclined, instead of an institution serving the whole People." Sectarianism is named as "a national evil" whereby the Church needs the help of the world and the State "to make her the kind of Church she ought to be" (Prior 1945b, p. 9). Prior denounces the sectarianism of Religious Education which is "thought of by both its advocates and its enemies as essentially an instrument for turning a godless nation into a godly one" (Prior 1945b, p. 9), and he also singles out for criticism The Campaign for Christian Order with its "smug slogans and slick antitheses as 'Man is beaten – God is waiting'".[8] Instead, the church needs to be more positive regarding the Education Act's guaranteeing of "free, compulsory and secular" education, this being, paradoxically "the nearest equivalent in our national constitution to a religious establishment" (Prior 1945b, p. 9) because there is no national church in New Zealand. This guarantee within the Education Act is, he argues, New Zealand's "National Covenant" and both Churches and teachers have a duty to honour it even if the religion established tends to be "our false national religion of Sectarianism." (Prior 1945b, p. 9) The Church needs to remember that the Act was formulated because of the "evil" in the Churches —

Richards from the 1930s and had engaged in debate and correspondence with him in both the *Student* and *Tomorrow* in the 1930s,

[8]The Campaign for Christian Order was a project of the National Council of Churches, established in 1941, as a response to the context of the war.

and which is still in them. Rather the Churches need to remember "fear and touchiness" (Prior 1945b, p. 9) are signs of sectarianism and apply as much to the Church's attitudes to atheism and agnosticism as to other churches and their activities. That the Education Act serves to prevent sectarianism is something the Church should be thankful for, as the result is the possible growth "of a genuine Church of New Zealand" (Prior 1945b, p. 10). As such the Act should serve to help reform religion in New Zealand in the manner of "the old Confessions of the Reformation" (Prior 1945b, p. 10), away from sectarianism, by importantly ensuring that Government servants are not subjected to any religious test.

Prior's second point expands his central argument of his *Listener* letter:

> It is no part of the State's function to turn a non-Christian population, or a non-Christian part of the population, into a Christian one; but it is part of the State's function, and a part in which teachers have a special interest, to turn ignorant Christians and non-Christians into well-informed ones.
>
> (Prior 1945b, p. 10)

Prior's proposal is not that the Churches offer to finance, select and train teachers to teach religious studies, (for that will only continue sectarianism) but rather that they need to support:

> [...] the incorporation of religious studies into the ordinary school syllabus on exactly the same footing as all other subjects [...] a syllabus so framed that a teacher of any religious opinions can use it without being insincere.
>
> (Prior 1945b, p. 10)

Neither Church nor State would have any need or cause to worry, for such an approach, in creating well-informed citizens, should be welcomed by both sides. This would mean that the underlying sectarian emphasis of education could and should be attacked by the Church. That it has not, Prior claims, is because the Church seems to prefer its internal sectarianism. As he concludes:

> To sum up: to ask the State to evangelise, is to violate the faith of both the Church and our nation; but we may ask it to

> remedy our weakness more than it has yet done, by adding to the gift of freedom the gift of knowledge; but we cannot even ask for this let alone obtain it, unless we really want it. (Prior 1945b, p. 30)

Having added what could be termed a 'sectarian dissent' in the Presbyterian journal, Prior returns to the more public debate within the letters page of the *Listener*, again emphasizing a central logical point that "[...] teaching *about* religion is not open to the same objection as teaching *of* religion [...]" (Prior 1945c, p. 5) and offering the solution of students learning "different possible interpretations, including anti-supernatural ones" so when they are able they can make up their own minds. The concern is to ensure the State does not impose a particular decision on either teachers or pupils. Prior's stated model is London University's Certificate of Religious Knowledge.

Prior's first debate echoes his 'Church and State' article (Prior 1941). The prophetic nature of the Church must be addressed to all the community, but not in a sectarian manner. The State too must not act in a sectarian manner by promoting sectarian division. Yet as all the debates on religious education in schools have done in New Zealand, it failed to initiate a change. There is to this day no teaching about religion in New Zealand state schools. This failure means sectarian views regarding religion and different forms/expressions of it are rife — as is a widespread lack of religious understanding or knowledge. In this case the prophet of religious education was (as always) without honour in his own land.

3 Public Debate Two: Writing in *Landfall* 1947-48

The launch of the quarterly *Landfall* in March 1947 provided another outlet for Prior to act as public intellectual. Created, financed and edited by the poet and patron Charles Brasch (1909-1973), *Landfall* was modelled on British arts and cultural journals. While in England, Prior had written reviews for T.S. Eliot's *The Criterion*. Knowing this,[9] Brasch asks Prior to review C.S. Lewis' *The Abolition of Man* (1943) in the inaugural

[9]Brasch met Prior though Ursula Bethell and the painters Toss Wollaston and Rodney Kennedy, while Prior's brother Ian, an eminent epidemiologist, married Brasch's cousin Elespie, in 1946.

issue of *Landfall*. Prior's review is, in retrospect, understandably and implicitly underscored by the work he was doing that became his first text, *Logic and The Basis of Ethics* (Prior1949a). His review is not so much concerned with Lewis' book as with discussing the nature of ethics itself.

Lewis' book arose out of the Riddell Memorial lectures delivered at the University of Durham in 1943 (Lewis 1943). Lewis takes as his central focus two texts for students: King and Ketley's *The Control of Language* (1940) [referred to as 'the green book' by 'Gaius and Titus'] and Biaggini's *The Reading and Writing of English* (1936) [the book by 'Orbilius'][10] and their discussions as to what constitutes the reality of and behind 'emotive' speech. Prior notes the importance of Lewis' lectures in that:

> They constitute the most vigorous attack yet made on the widely prevalent notion that moral judgements are a form of 'emotive' speech, which conveys no information about the real world but merely gives vent to the feelings of the speaker. (Prior 1947a, p. 63)

What is fascinating about Prior's review is not what he says in it about Lewis, but rather what he says in it about other philosophers. Prior dismisses those who Lewis attacks as the "follies" of "the philosophical underworld'";[11] but while inclining to "regard Mr Lewis's 'objectivist' account of ethical statements as the true one", he also believes Lewis scores somewhat of a "hollow victory" and is "curiously close to his victims in his readiness to assume that a reaction is somehow discredited by being labelled 'emotional'" (Prior 1947a, p. 65). For Prior, it is not whether a reaction is or could be labelled 'emotional' or otherwise that is important for the ethicist; that is, the degree of reaction is not, logically, suggestive of an ethical position or value. Prior suggests the focus should not be on the reaction, but rather on the basis for making the decision. That is, Prior argues that disinterestedness should "be made the *defining characteristic* of ethical sentiments" (Prior 1947a, p. 66) and states "the most important contemporary elaboration of this sugges-

[10]See Walter Hooper, *C.S. Lewis. A Companion & Guide* (Harper San Francisco, 1996).

[11]Those so dismissed are I.A. Richards (*Principles of Literary Criticism*, 1924); C.H. Waddington (*Science and Ethics*, (ed.), 1942). For Lewis' dismissal of them see Lewis, *The Abolition of Man* pp. 50-51.

tion" is that recently made by his mentor J.N. Findlay, writing in *Mind*.[12] This, he claims is supported in a more populist sense by Bertrand Russell in *Religion and Science* translating "[...] the 'pseudo-statement' 'This is good in itself' as 'Would that everybody desired this!'" (Prior 1947a, p. 67).

Prior's review is a guarded support for Lewis, who he feels is too keen to quickly offer the solution of "a rational recognition of and submission to an objective moral standard". Rather, one should always heed Hume's claim that reason "is and ought only to be, the slave of the passions" (Prior 1947a, p. 67).[13] This review's importance is that here Prior foreshadows the arguments later developed in *Logic and The Basis of Ethics*.[14] This is supported in Prior's review for the next edition of *Landfall*, where he critiques Popper's *The Open Society and its Enemies* (Prior 1947c), noting the similarities of Popper's critique of facts and norms in ethical statements to those made by Lewis (Prior 1947c, pp. 137, 138).[15]

It is interesting and important to note that Prior wrote two quite different reviews of Popper's text.[16] The first was for the New Zealand SCM journal The *Student* in March 1947, with the longer *Landfall* piece published three months later. The review for The Student is far more positive in that Prior discusses the importance of Popper's argument as a corrective to and for the Church. The 'Christian' reading of Popper is one that uses Popper's critique of historicism to support Prior's claim of the Christian's need to discern a difference between "a true and false historicism" just as Popper, Prior claims, "is more concerned to distinguish between 'good' and 'bad' forms of Christianity than to decide for or against Christianity as such [...]" (Prior 1947b, p. 12). Prior then asks

[12]Prior refers to J.N. Findlay, "Morality by Convention", *Mind*, April 1944. As Prior states of Findlay in the forward to *Logic and The Basis of Ethics*: "I owe to his teaching, directly or indirectly, almost all that I know of either Logic or Ethics." (p. xi.) Prior discusses Findlay's article in more depth in chapter viii of this text.

[13]In *Logic*, Prior notes the central importance of Hume to such a discussion (p. x) and in detail (chapter viii).

[14]While this is conjecture it seems to fit the timing noted by Mary Prior in her interview. See (Hasle1997/2003, p. 295).

[15]Prior makes no mention of this in his earlier review for the *Student*.

[16]It is clear that Prior's reviews of Popper were written alongside Prior's "Eighteenth century writers on twentieth century subjects", *The Australasian Journal of Psychology and Philosophy*, vol. 24: 3 (1946), pp. 168-182. A number of the points raised in his reviews of Popper also occur in this article.

if Popper, the anti-historicist is himself a historicist, with a history of "at least two acts, one before the "fall' and one after it [...]" and "at least one law of historical development, namely that the tribal 'paradise'- which, however, was in any case only a fool's one — can never be regained" (Prior 1947b, p. 12). All of which results, Prior claims, in "room for a Christian critique" of Popper's historicism (Prior 1947b, p. 12).

Having suggested Popper is not as scientific as he may seem, Prior then suggests that Popper's critique of 'utopian' social engineering should be applied to the current debates on Church Union. Prior's concern is that too much of the discussion is concerned with 'blueprints for an ideal united church' and too little on the practicalities of common theological training, inter-denominational participation in ordination and common parish magazines. Echoing his earlier calls on the role of the church in contemporary society, Prior, locating himself still within the church, claims "in the church as in society at large, our task is not to build the New Jerusalem, but to make what we can of the Jerusalem that know is" (Prior 1947b, pp. 12, 14). To enable this, the church should also learn from Popper's picture of science's "fellowship in criticism" (Prior 1947b, p. 14). For Prior identifies in Popper "not only the confession of a creed, but many suggestions for a scientific approach to social institutions which may be as usefully applied to religious institutions as to any others" (Prior 1947b, p. 12). Here Prior believes that debates about Church Union tend to be 'Utopian' when they should be 'piecemeal'; that is, not seeking to replace "our present society as a whole by one after an ideal pattern", rather aiming at "remedying particular evils one by one." (Prior 1947b, p. 12) For Prior agrees with Popper in stating "Only the piecemeal approach can be regarded as scientific" (Prior 1947b, p. 12).

Prior then applies a form of this noted Popperian "fellowship in criticism" in his far more stringent critique of Popper in *Landfall* (Prior 1947c). In an echo of Prior's own engagement as a public intellectual and indeed his 'pulpit' of 'theologizing on paper and in conversation', Popper is described as indulging in "weighty and timely [...] sermons on the duties of social scientists, politicians and citizens" for dealing with what is reduced by Prior to be "Perhaps the history of historicism"(Prior 1947c, p. 137); yet these which are unfortunately "buried in other material of more questionable worth, and so often disguised as digressions, some of the best of them even being relegated to footnotes"(Prior 1947c,

p. 137). Prior proceeds to discuss how two central points of Popper are, in one case "identical with that made by Mr C.S. Lewis in the second of his lectures on *The Abolition of Man*" (Prior 1947c, p. 137), and that both points develop positions first put forward in British ethical thought by the 18th century philosopher Francis Hutcheson (1694-1746). The first is a "dualism of facts and norms", in "that we cannot *justify* any decision by an appeal to the facts to which it 'pertains'" (Prior 1947c, p138). That is, the adoption of a norm is a fact, but the norm adopted is not. As stated, Prior notes that Lewis makes a similar claim in *The Abolition of Man*, but Prior observes that Popper adds the analysis that those attempting to do otherwise are "attempting to recover a 'tribal' mentality in which there is only ever one conceivable response to a given set of circumstances is even conceivable" (Prior 1947c, p. 138). Prior then notes a further dualism by Popper when he states that although arguments cannot determine a fundamental moral decision, it is most helpful to carefully analyse the consequences of the alternatives from which we have to choose. These decisions may be characterised as rational or irrational. Here Prior notes the similarity to Hutcheson's distinction between the irrationality of passionate states and the reason of calm desire, but both, Prior notes, recognise that in the end the decision must be made by something other than final appeal to reason — in Popper's case, our conscience (Prior 1947c, p. 138). Prior states that Popper's following of Hutcheson extends to them both being "unclear and ambiguous" (Prior 1947c, p. 138) as to the independent reality of norms and standards. Popper's "incoherence" is positioned as "an indiscreet zeal to repudiate any ethical position which could possibly be traced to a Platonic origin'" (Prior 1947c, p. 140).[17]

Hutcheson's second anticipation of Popper occurs, Prior claims, in Popper's discussion as to "what actions are morally obligatory" (Prior 1947, p. 141). Popper's location of pain and suffering as the basis of moral urgency is a position Hutcheson promoted and was taken up by Adam Smith in his *Theory of Moral Sentiments*. Prior states this is important to remember as Smith's "more eager economic disciples" have overlooked this and it is their legacy, "'the man of the system'", that Popper 'directs his polemic' against (Prior 1947c, p. 142).

Prior is critical of Popper, being wary of any whole scale appropria-

[17]Prior does allow him the possibility of holding "a position not unlike Kant" (Ibid. p. 140).

tion of Popper as a form of secular revelation or ethical critique. There is the implicit warning that potential Popper-ites could, themselves, limit the open society.

Having reviewed his immediate predecessor at Canterbury University College, Prior next reviews *The Moral Sense* by D. Daiches Raphael, Professor of Philosophy at the University of Otago. Noting that important work by Findlay and Popper had been written while in New Zealand, Prior however cautions against claiming this as a New Zealand text in that its research was carried out before Raphael arrived in Dunedin. (Such an argument of academic environmental determinism — the location of research provides its authenticity — perhaps reflects the isolation and limitations felt by Prior in these post-war years). Yet he also states that "the general climate of opinion" is in part determined by "what philosophers think and teach" (Prior 1947d, p. 314) — even when within the technicalities of their subject matter — so note needs to be made of what they have written. This said, *The Moral Sense* is, Prior notes, an important book in its own subject, helping to mark a turning point. After giving a brief overview of the past century of British moral philosophy, noting the importance of Moore's *Principa Ethica* (1903) and Pritchard's "Is Moral Philosophy Based on a Mistake?" (1912), Prior refers to 'Intuitionism' ("the logical gap between statements in which terms like 'good' or 'ought' do not appear and the ones in which they do") (Prior 1947d, p. 315). For Prior, Raphael's book is important because it is a conscious re-evaluation of the 18th century moralists (in this case Hutcheson, Hume, Price and Reid)[18] noting not only their anticipation of present-day problems, but also the solutions and the arguments made to support them. Here the echo of Prior's own position is clear: to understand the present in moral philosophy and ethical terms, we must, in the twentieth century, draw upon the moralists and the ethicists of the past, in particular those of the 17th and 18th centuries. For our modern problems are, in their own ways, the same, or at least similar to those confronted by philosophers and theologians at the turn of the Enlightenment. Furthermore, just as such thinkers operated as public intellectuals, so too should modern day moral philosophers, ethicists — and theologians. Prior, in this period, can be seen as trying to model

[18]Here again is the link back to Prior's "Eighteenth century writers on twentieth century subjects", *The Australasian Journal of Psychology and Philosophy*, vol. 24: 3 (1946), pp. 168-182.

such thinkers, not only in his engagement in public debate but also by looking to past models to do so — and, perhaps just as importantly, reminding his readers of such thinkers.

The centre of Prior's review is Raphael's chapter on Hume. Even after he terms its foray into Logic as "unfortunate" — demonstrating the problem with Raphael's analogy comparing a refusal to discharge an acknowledged obligation to the refusal "to draw the logical conclusion from admitted premises" — he praises it as the "most original in the book, and is probably the most important contribution that has yet been made to the interpretation of Hume's moral philosophy" (Prior 1947d, p. 317). Prior does critique a methodological "defect" in that the exposition on the 18th century thinkers is too often interrupted by "the voice of appraisal' (and what he terms Raphael's "anxious reminder"). This results in a "continual mingling of exposition, criticism and comparison (some of it too, a little laboured)" (Prior 1947d, p. 318) — a criticism he also made of Popper's work.

This is where Prior makes explicit his role as public intellectual. For while the text is "of the utmost value for students of philosophy", the "educated general reader (to whom the 18th century moralists originally addressed themselves)" will find it to have less appeal than it could and should have. (Prior 1947d, p.318) In fact Prior's religious journalism, his role as a public intellectual (and moralist in the philosophical sense of the term) can be read as an attempt to reinstitute the 18th century practice of such scholars. This claim helps to explain why Prior first turned to religious journalism and continued to write for publications designed for 'the educated general reader' for many years.

These criticisms of Raphael and Popper and the commendation of Findlay and the 18th century moralists are to find later, detailed expression in Prior's first text *Logic And The Basis of Ethics* (Prior 1949a).[19] In this Prior, while locating himself as an anti-naturalist, wishes to demonstrate to both naturalists and anti-naturalists[20] "how their position may

[19]In *Logic*, Popper is critiqued in chapter vii (pp. 69-76), especially his distinction between norms and facts and between 'validity and truth'. Raphael is critiqued for failing, in *The Moral Sense* of noticing in Hume's Treatise 'that there are two views' of 'possible subjectivist accounts of moral judgments'. Throughout modern moral philosophers are held up to measure against, primarily Hutcheson and Adam Smith and found, to greater or lesser degree, wanting. Findlay, Prior's mentor, is naturally accorded the most sympathy.

[20]Prior states that an 'anti-naturalist' holds that ethical predicates such as 'good',

be freed from logical faults" (Prior 1949a, p. viii) by reconsidering the 18th century moralists. An extended discussion of G.E. Moore's refutation of the naturalistic fallacy in *Principa Ethica*, Prior's text is one that needs to be re-read with reference to these earlier public discussions for in them he can be seen to be giving a public airing to the critiques and themes he is to later express in a scholastic tone. In a sense the 'public Prior' of these writings acts as the 'prior Prior' of the emergent logician.

Another example of giving a public airing of what is academic work occurs in the article written to commemorate the century of the founding of the Otago province, and especially, its Presbyterian, Free Church basis. Entitled simply, "Disruption" (Prior 1948a) this recounts the origin of the Free Church of Scotland and can be presumed to been drawn from the manuscript and research for his proposed 'A History of Scottish Theology' (Hasle1997/2003, p. 295). Prior states that to retell the story of the *Disruption* is important:

> [...] not only because it forms part of what might be called the pre-history of Otago and of the Presbyterian Church of New Zealand, but also because a proper understanding of it involves and illuminates principles of ecclesiastical organization, activity and development which concern many besides Presbyterians.
>
> (Prior 1948a, p. 8)

For Prior, the importance of the Disruption is in illustrating how denominationalism in New Zealand, as in most countries of "the New World", serves only to cut off "religious bodies not merely from one another, but from the community as a whole" (Prior 1948, p. 8). The problem is a move to sectarianism away from a "view of the Church as bearer 'of the means of grace' to all within its reach" (Prior 1948a, p. 9). The article, a detailed discussion of the move towards Disruption, is really another of Prior's calls for Church Union — and, implicitly, a warning of how not to proceed. Prior's conclusion is of the need to echo the call of the present Archbishop of Canterbury[21] that reunion in England would not be that *with* but rather that *of* the Church of England. As Prior notes,

'evil', 'right' and 'wrong' 'represent qualities which are sui generis, in a category on their own, different from all 'natural' qualities'. p. vii.

[21] Archbishop Geoffrey Francis Fisher (1945-1961).

"in our own country we have still to discover the proper equivalent of this language" (Prior 1948a, p. 18). Fourteen years later, another 'public intellectual', the historian and poet W.H. Oliver, commenting on the paucity of 'religious sociology' in New Zealand notes Prior's essay as suggesting "lines on which a study of Scottish Presbyterian transplantation might proceed" (Oliver 1962, p. 3).

4 Public Debate Three: The *Listener* December 1949-March 1950

Prior's next entry into the realm of Public Philosopher occurred in the weekly *New Zealand Listener*, the official journal of the New Zealand broadcasting service that also occupied a central position in New Zealand literary and cultural life at this time. If one sought to be a public intellectual then participation in the *New Zealand Listener* guaranteed a national audience. Prior's short review (one and one-half columns) (Prior 1949) sparked an ongoing battle and four month-long philosophical and theological debate in the letters pages until closed down by the editor on March 3 1950. The book reviewed was *Evolution and Philosophy* by a local priest, Father G.H. Duggan S.M. (Duggan 1949a).[22] Dedicated to St Thomas Aquinas and with a preface endorsement by the ornithologist Dr. R.A Falla of the Dominion Museum, Wellington,[23] it is an attempt, by a Catholic scholastic philosopher, to question the ideas and arguments of evolution, written for "the average educated and half-educated person". His basic argument is threefold. The universe is intelligible only if we admit it is dependent on and caused by an unchanging reality distinct from it, that is called 'God'. Secondly, a demonstration "that the Scholastic theory of moderate vitalism is true" and "the absolute impossibility of spontaneous generation". Appeal-

[22]Duggan was a noted contributor to the correspondence columns of the *Listener*. A Catholic priest from Greenmeadows in Auckland, he was recalled by the editor, M.H. Holcroft as "formidable in debate, using a strong intellect to defend conservative positions, both in theology and politics [...] when I met him [he] turned out to be a smallish man with large and rather appealing eyes."

M.H. Holcroft, *Reluctant Editor* (1969), Wellington, A.H. & A.W. Reed, pp. 57-58

[23]Falla concludes his preface: "[...] I have found his comments in fields in which I have done some study refreshingly stimulating, and should for this reason like to commend his book to students of biology."

ing to reason, the origin of life arises out a threefold (plant, animal and human) divine intervention and causality. Thirdly a discussion as to whether the variety of life occurred by evolution from a divinely caused single living thing in each kingdom, or a divinely caused "considerable number of distinct forms". The central basis of his argument is "the rational certitude that the universe depends for its existence on an unchanging First cause, distinct from itself, whom we call God" (Duggan 1949a, pp. 13-14). As Duggan concludes: "It is more probable, therefore, that the human body was directly formed by God. The matter from which it was formed could have been living or non-living, and from the philosophical point of view, the alternatives seem equally probable" (Duggan 1949a, p. 218).

Given the central argument, Prior's review is remarkably temperate. Duggan, he suggests, over-argues and makes rash accusations against atheistic philosophers, and in his use of the term 'self-contradictory' Prior compares him to "the free way in which 'Logical Positivists' fling around the charge of 'meaninglessness'" (Prior 1949b). This, Prior avers, is a case of "crying Wolf" (Prior 1949b). As for Duggan's reliance upon gaps in fossil records, Prior states that the gaps occur not because of the lack of fossil material, but rather because biologists "cannot decide which of the characteristics is most suitable for use as a dividing line". Indecision actually indicates the presence of transitional forms, not the absence as Duggan claims (Prior 1949b).

Duggan's letter of reply accused Prior of reading carelessly and allied himself with "St Thomas and common sense" against Prior and Hume's position "that a change that has no cause implies no contradiction." Prior's charge of overusing "self-contradictory" invokes the request for substantive referencing to support the claim, while his statement that biologists are undecided as to the placement of fossils is really, Duggan claims, due to their desire to "to have the transitional forms so necessary for the Darwinian theory of evolution from one stock" (Duggan 1949b).[24] Prior responds detailing examples of Duggan's "indis-

[24] Alongside Duggan's response, is an attack on Duggan in support of Prior by J. Malton Murray, who states given that man is "is totally ignorant of the plans and purposes" of a Creator (if there is one) then no organised religion is justified "in adopting an authoritarian attitude and pretending to know what nobody knows concerning the ultimate power behind the universe and man's relation to that power."

J. Malton Murray, "Letter" *New Zealand Listener*, December 23 1949, p. 5.

criminate" use of "self-contradictory", focusing on the Duggan's illogical use of the term, stating that a particular view as to the constitution of the material universe may mean a contradiction in our convictions is not to mean that it contradicts *itself* (Prior 1950a). Prior then discusses the distinction between "being caused", "being a change" and "being an effect". His concern is for logical clarity, in that there is a difference between "a self-evidently false" assertion "that a change may have no cause" and a self-contradictory one "that an *effect* (i.e. that which is caused) has no cause". He then takes issue with Duggan's use of the term 'nonsense' for a claim that may contradict itself, abruptly stating "It is something of a philosophical fashion nowadays to describe any position with which one does not agree as 'nonsense'; I must confess I regard the fashion as a bad one." He concludes rather impatiently by noting his willingness to answer "the rest of Father Duggan's letter if nobody else does, but this is enough in the meantime" (Prior 1950a).

What is important to note in these exchanges is that Prior is essentially conducting a public tutorial in philosophical logic in the letters pages[25] of a journal that, because it had the monology on radio listings for the country, had a weekly circulation of 80,000-100,000 copies[26] in a country with a population of just under 2million. This is not to suggest that every reader would have read this exchange in the letters column, but rather to note that in conducting this public tutorial Prior was certainly fulfilling the role of public intellectual.

Prior's review is attacked by another reader for its "outmoded arguments for evolution" and for his reliance on unnamed philosophers. In what is a direct challenge Prior is accused of being both illogical (A.A.N. 1950a)[27] and a careless philosopher in his review,[28] who should either

Holcroft notes of Murray: 'He was a determined atheist of a school that had been influenced by those slim brown volumes of the Thinkers' Library [...]". M.H. Holcroft, *Reluctant Editor* (1969) Wellington, A.H. & A.W. Reed, pp.57.

[25]Holcroft (1969) notes that in a survey of readers in the early 1950's he discovered that more saw the *Listener* as a literary journal than those who bought it for the radio listings. The most popular feature for the 'literary journal' readers was actually the letters page (p.37)

[26]Holcroft (1969), p. 26.

[27]A.A.N. (Wellington), "Letter", *New Zealand Listener* January 6 1950, p. 5: "[...] perhaps Mr Prior has forgotten the rule of logic that it is invalid to argue from the particular to the general'.

[28]Ibid: "Surely Mr Prior is aware that a philosophical system can only be built upon

have "remained silent" or "given us those scientific and factual proofs which we could reasonably expect from him" (A.A. N. 1950a).

Duggan's next letter continues the attack that Prior's review (and letter) contains 'bad philosophy' (my term). His first point is that, in arguing as to whether Monism is "incompatible with the principle of contradiction", Prior should 'know enough logic' to understand that the self-contradiction would only occur if Duggan had written "immediately incompatible" — but he did not and "in fact, the distinction underlies the theory of the syllogism" (Duggan 1950a). He then tackles Prior on the self-evident falsity of a proposition, suspecting Prior "has not grasped the difference' between 'evident" and 'self-evident'", stating that "to say that a proposition is self-contradictory is merely a short way of saying that it contradicts some self-evident truth, e.g. the principle of identity"(Duggan 1950a). Prior's distinction of 'cause, 'change' and 'effect' is dismissed as being "irrelevant" in this context, repeating the claim that change is possible without the intervention of a cause is nonsense — whatever the present day philosophical fashions.

Prior then responds to the criticisms of "A.A. N.", appealing first to the same "rule of Logic" A.A. N. invoked whereby "it is invalid to argue from the particular to the general" (Prior 1950b). Prior grants that under this the theory of evolution is not proved in the same way as a theorem of geometry — but this is true for all generalisations made by natural scientists, all of which stand open to correction from future discovery. However, this is no reason to abandon natural science. In a following letter, Prior next dismisses Duggan's claims that any self-contradictory statement is only "mediately" so (that is, not in themselves but only when combined with other statements), saying this "novel extension of the notion of self-contradiction" could be applied to any proposition believed to be false on any grounds (Prior 1950c). Prior comments that this means even though one may not believe that God turns stones into statues it would be "mediately" self-contradictory to say that he does since it would be "'immediately' self-contradictory" to say God does and does not. But, Prior states, someone who believes God does such an action would not be "much moved" by that argument "nor can I see that he logically should be" (Prior1950c). He then undertakes a detailed discussion of the uses of 'change' and 'cause', claiming that Duggan's

facts."

discussion of these in his letter implies a different usage to the one employed in both his text and his first letter (December 23, 1949). Duggan, he states, is guilty of the truism "that any changes that have causes have causes", and while this might be what he meant by stating "every change has a cause" it "simply has no bearing on the point" (Prior 1950c).

Duggan, replying to Prior's earlier letter (January 27, 1950) attacks him over his (it is implied) acceptance of "some theory of gradual evolution" (Duggan 1950b). This, states Duggan "requires a vast number of transitional forms"- which Prior cannot, it is claimed, provide. Duggan's claim is that gradual evolution is not actually a scientific theory (if it were, lack of evidence would have had it "scrapped") but it is "an integral part of a philosophical creed". So, if the theory needs to be "scrapped", then the creed 'will have to be re-examined" (Duggan 1950b). Duggan thus turns the issue into one of competing beliefs, with truth located on his side of the argument, having already 'scrapped' the theory of gradual evolution.[29]

Duggan, in a further letter then replies to Prior's letter of February 3, asserting he did not describe a self-contradictory position as 'mediately so'— this being enough for him to satisfactorily refute Prior's claim (Duggan 1950c). He again charges Prior with a careless reading of his comments, this time regarding the use of 'mediately' and 'self-contradictory', claiming that there is nothing novel in the way he used it but '[c]omment on Mr. Prior's dialectical methods I leave to the discerning reader.' Further, he charges that "Mr Prior dragged in the term 'effect'" when discussing uncaused change, again accusing him of 'bad logic' [my term] in that "change is a process while an effect may be a permanently existing thing. A motor-car is an effect, but not a change" (Duggan 1950c).[30] He then dismisses Prior's statement that

[29]Two further letters on this debate appear in the *Listener* February 10, 1950, p. 5. In the first, Robert Mouat charges Duggan with an incorrect usage of 'a is A' as a type of proposition. He then agues against Duggan, invoking Bertrand Russell, Einstein, Chesterton, Samuel Butler, Cyril Joad, Willi Hollitscher, Freud and McDougall. But he does thank Duggan "for the stimulus which he has given to thought in New Zealand." J. Malton Murray also re-joins the debate, attacking A.A.N, claiming a possibility of a far nobler life than mankind has yet attained, if he (A.A.N) throws off "the shackles of dogma and superstition." (J. Malton Murray).

[30]Duggan's tone is one of aggrieved petulance, determined to discredit Prior's claims to the philosophical high-ground.

"some changes have no cause" on the grounds of self-evident truth, "confirmed by an appeal to experience" using the example of the absurdity of dismissing any cause for the change of a "flat tyre" (Duggan 1950c).

The editor closed the debate on March 3 1950. While others do get involved (A.A.N. writes a defence against Prior claiming natural science and philosophy argue from different premises therefore if evolutionists "wish to enter the world of philosophical certitudes" they need to "first establish the validity of evolution as a philosophical science capable of explaining ultimate causes" (A.A.N. 1950b)) it is left to Prior and Duggan to sum up.

Prior gets the lead letter, quoting from a French text on the classification of fossils,[31] noting that the same view has been put forward in earlier writings by Lucien Cuenot who Duggan quoted from "with approval [...] when it suits him" (Prior 1950d). Prior concludes by dismissing Duggan's response as at "first a suspicious silence, and then a dogmatic assertion about the state of biological opinion which will not bear inspection" (Prior 1950d).

Duggan's letter deliberately ignores Prior, being a response to the letter of Robert Mouat (see fn 29), stating that while Mouat "does not look to logic for his metaphysics [...] But I want my metaphysics to be logical" (Duggan 1950d). This can be read as another indirect attack upon Prior, stating "whatever is true is logically valid but the converse does not hold." He then sums up his entire approach by stating: "Perhaps I should add that there are realms of the spirit beyond the reach of philosophy. But one must start with philosophy" (Duggan 1950d).

It is not surprising that the editor closed this correspondence. For four months Duggan and Prior had been attacking each other in the pages of the major mainstream public record of New Zealand life and letters. Neither was prepared to concede, both dismissed the other's credentials — and intellectual standing. In the process quite dense philosophical argument had appeared in a public journal in a manner that, from over seventy years' distance, seems scarcely possible today. Reading the correspondence one gets the feeling that Duggan and Prior were indulging in a game of intellectual points scoring, concentrating on the minutiae of each other's rebuttal, rather than on the thematic content itself. As such there is the sense that the editorial decision was made out

[31] The text quoted is *Traite de Zoologie* ed. Grasse (vol. VI 1949) p. 145.

of a fear that Duggan and Prior could/would continue *ad infinitum*![32] Prior's willingness to involve himself in a protracted discussion on evolution needs to be read three ways. Firstly, this is part of his call for a well-informed citizenry, not held in thrall to sectarian religious beliefs. Secondly, paradoxically, this is Prior as Calvinist combating the 'errors' of Catholic scholasticism. Thirdly, this is the modernist Logician attacking superstition and dogmatic religious belief. The influence of Popper's *Open Society* can also be detected; for while his critiques of Popper may be read as in-house philosophical discussion, his challenge of Duggan is the challenge to what he views as symbolic of 'a closed society'.

5 Public Debate Four: *Landfall* 1950

Having taken on Father Duggan in the pages of the *Listener*, Prior next returns to *Landfall* to challenge a (younger) contemporary, the historian Peter Munz[33] of Victoria University College, Wellington. In December 1949 Munz had published a long essay in *Landfall* entitled "Proust and Philosophy" (Munz 1949). In this essay he argues that:

> [...] the great works of metaphysics in the nineteenth and twentieth century are the novels, and not the fanciful treatises on that part of physical nature which is supposed to exist beyond the senses [...] the real metaphysics of our age is represented by the novels of Thomas Mann, Joyce and Proust. (Munz 1949, p. 337)

Just as Prior's public statements can be argued as an attempt to develop and then discuss the Logic that will come to be fully expressed

[32] As the editor states: 'We are sorry to leave some correspondents in full argument and to exclude others who wish to enter the discussion; but we have given this correspondence all the space that can be spared, and it must now be closed.'*New Zealand Listener*, March 3 1950, p. 14.

[33] Peter Munz (1921-2006) was born in Germany and emigrated with his family to Christchurch as Jewish German refugees in 1940. Accepted into Christchurch Teacher's College, Munz studied for his BA and MA at Canterbury University College, majoring in History- but he was also taught by Karl Popper. He travelled to Cambridge to study for his PhD (there being taught by Wittgenstein- and was present at the 'poker incident' debate between Popper and Wittgenstein). Munz returned to New Zealand in 1948 to take up a position as Senior Lecturer in History at Victoria University of Wellington and later held the chair in History 1968-1986.

in *Logic and The Basis of Ethics*, so it can be argued that Munz was here attempting something similar. In *Problems of Religious Knowledge* (1959) Munz undertakes a detailed discussion of "a kind of meta-theology" of symbols (Munz 1959, p. 12). Here, a decade earlier, he appears to be first attempting a public discussion of what will later eventuate.[34]

Having stated his thesis, in his article Munz proceeds to discuss "the knowledge and truths conveyed by Proust", which consist of propositions of Proustian consciousness, arising "from his recognition that they constitute what one ought to call Reality" (Munz 1949 p. 338). This, Munz claims is the overcoming of nominalism by the process of symbolization, whereby, in the attempt to make our own "feeling states meaningful' to ourselves, we are forced to enter the universe of the feeling states of others — and draw on their symbols to use as formulas for our own. This allows the subjective and particular feeling state to become trans-subjective" (Munz 1949, p. 342). Reality therefore does not exist in time and space, but is rather what we are aware of — and so "(t)he only problems connected with Reality are the problems of symbolization and of congruity." (Munz 1949, p. 343) Munz discusses Proust in reference to Whitehead, Bergson and Husserl, concluding that:

> Proust radically eliminated the notion that the external world is as such a given reality which we must confront and study. Here perhaps is an end to the 'bifurcation of nature' that was the burden of Whitehead's complaint, and an avenue along which might lie new eras of philosophical thought.
>
> (Munz 1949, p. 352)

Prior's involvement occurs because of a letter highly critical of Munz's essay, published in *Landfall* in June 1950. Written by two expatri-

[34]The role of Brasch's *Landfall* as testing ground for later academic texts could provide a fruitful avenue for an intellectual history of New Zealand. In the current audit culture of academic outputs and 'impact' factors, the academic focus on (primarily) overseas academic journals could be said to be unwittingly contributing to the much lamented 'dumbing down' of New Zealand society. Without public intellectuals can the public be blamed for being 'unintellectual'?

ate scholars, Ernst Badian[35] and Thomas McPherson[36] studying at University College Oxford, it is a systematic defence of philosophy against Munz's claims. Munz, they claim, makes "the familiar confusion between the formal and the material mode of speech" (Badian & McPherson, p. 178); Munz undertakes "distortions of ordinary words", "does not use language properly", and misuses the term nominalism (Badian & McPherson, p. 179). They then deliberately seek to wound Munz by comparing him to his past teacher Wittgenstein, stating:

> It will not to say that Dr Munz is struggling to express thoughts too deep to be expressed simply. If a thought is communicable at all, it is communicable simply. If it is not communicable, the thinker had better keep it to himself.
> (cf. Wittgenstein, *Tractatus Logico-Philosophicus*, 7.) (Badian & McPherson, p. 180)

Munz therefore should have kept quiet and not saddled "poor Proust [...] with a theory which is based on misuse of words" (Badian & McPherson, p. 180).

Munz's brief reply is that in the discussion of such subject among adults "there are implied standards of courtesy and dignity". Given that Badian and McPherson have not observed these standards (and so dismissing them as 'not adult'), "it would serve no good purpose to argue on the level they have set" (Munz 1950a, p. 180).

Given the tone of this interchange — and Prior's recent exchanges with Duggan — it is perhaps surprising that he decides to enter this debate. However, in his role as public intellectual he again conducts his by now familiar public tutorial on philosophical logic. Prior begins by identifying the exchange as one between "some points in the theory of

[35]Ernst Badian (1925-2011) like Munz was a Jewish refugee to New Zealand, moving with his family in 1938. He took his NZ BA (1945) and MA (1946) at Canterbury University College. An eminent classicist and historian, after teaching in Britain and then SUNY, Buffalo, he was appointed to the history department at Harvard University in 1971. In 1998 he was appointed Emeritus John Moors Cabot Professor of History *Emeritus*, Harvard University.

[36]Thomas McPherson (1925-) born in Dunedin and took his NZ BA (1946) and MA (1947) at Otago University. Primarily a philosopher of religion, he taught at Bangor and then Cardiff, retiring (1983) as Professor of Philosophy at University of Wales, College of Cardiff.

knowledge" to which Munz had replied by discussing "the ethics of controversy", stating that in such matters of "vital importance" Prior "is not so sure" that Munz "is a very reliable guide" (Prior 1950e). He then sets out to confront Munz, accusing him of "stumping out of the room in a huff" — something Prior states "may be the custom amongst historians when they disagree", but he wants to make clear, is not "characteristic of philosophers". The substance of Badian and McPherson's argument is, Prior states, "perfectly right" regarding (what he terms) "the very curious theory of knowledge propounded in Dr Munz's article". Munz has not articulated "a grand new discovery which will revolutionize philosophy" because "there *are* states of mind to which the subject-object antithesis is irrelevant."[37] Rather, Munz's proposal is "just an invitation to confusion" (Prior 1950e).

Charles Brasch, the editor of *Landfall* (and friend of Prior), having obviously previously alerted Munz to Badian and McPherson's letter and sought a response to publish, now did the same in the case of Prior's letter. For immediately following Prior's letter, Munz replies in a direct response to Prior, stating that he has written a paper and expressed a point of view with which others do not agree (Munz 1950b). But rather than saying so clearly, they choose to abuse him. Therefore, he abuses them back stating:

> There is an ire and irritation in their letters which is unbecoming to philosophers and which makes me feel that Messrs Prior, Badian and McPherson may be good philosophical technicians but have so far not benefited from the serenity and equanimity which philosophical pursuits have always bestowed on men. (Munz 1950b, p. 226)

Munz's central point is that many philosophers have either denied or overlooked "the fact that the cases which we describe as knowledge and the cases which we describe simply by the statement 'I am miserable' have something in common." The problem with Prior is that he reacts to Munz's "theory like an automaton" arising, Munz suspects, because "Mr Prior's theological interests have rendered him incapable of philosophical discussion" (Munz 1950b, p. 267). This in effect challenges the 'dual pulpit' public intellectual role of Prior. He is dismissed

[37] Prior's example is A says 'I'm miserable', to which B asks 'What about?' to which A replies 'Oh nothing-I'm just miserable'. A is not necessarily talking nonsense.

as not only too theological to be philosophical but also, by implication, too philosophical to be theological. Munz then undertakes a calculated insult by stating Prior reminds Munz "of a Catholic theologian who maintained that Barth's *Dogmatics* were all nonsense because they contradicted the Acts of the Council of Trent" (Munz 1950b, p. 267). Comparing the Barthian-influenced Prior with an anti-Barthian Catholic theologian was a direct attack on Prior's position as both a Philosopher and a Presbyterian and especially on Prior's well-known essay "Can Religion Be Discussed?"(Prior 1942).[38] Munz concludes by stating he knew his critics do not see "a similarity between two cases of awareness" (Munz 1950b, p. 257) as he does, but he expected their critique to show this and not just maintain that in their view there is no similarity.

Replying to Munz (Prior 1950f), Prior states he will seek to respond in the spirit of "'serenity and equanimity'" that Munz demands of a philosopher and so will not compare Munz to either a Catholic theologian nor an automaton (Munz not being like either) nor will he suggest Munz's interests have unfitted him for philosophical discussion (Prior 1950f, p. 369). What he does state is that it appears Munz gained opinion as to Prior's philosophical opinions from some source other than Prior; there may be others ("ill-humored fun-poking un-philosophical fellows") Prior notes who will accuse Munz of imagining the opinions attributed to Prior- but Prior will do no such thing, having "forsworn all such reflections on Dr Munz's intelligence" (Prior 1950f, p. 369).[39] Prior then, in what is yet another public tutorial on logic, lists four points that Munz attributes to him but which "I do not hold, and have never asserted, even in casual conversation." Prior first refutes that knowledge and the theory of mind expressed by 'I am miserable' do not have a point of similarity and so we can't refer to them by a single term, for "they are both states of mind and may be called such." Neither would he claim "that there is only one 'proper' way of using the verb 'to know'"; nor (and perhaps most crucially) does he believe "that everything that contradicts my own theories is nonsense". Instead, he would claim that

[38] Arthur Prior, "Can Religion Be Discussed?", *The Australasian Journal of Psychology and Philosophy*, vol. xx, no.2, September 1942, pp 141-151. In this the debate is 'a play' between 'Barthian Protestant', 'Catholic', 'Psychoanalyst', 'Logician' and 'Modernist Protestant'. This is a crucial text for tracking Prior's move from 'Barthian Protestant' to 'Logician' and concludes, tellingly with 'Barthian Protestant' stating 'Lord, I believe; help Thou mine unbelief!' (p. 151).

[39] Ibid.

"'knowledge' is one state of mind and what is customarily called 'feeling miserable' is another" and so in seeking a term to cover both it would be confused and confusing to use a term "now used for one" and not the other (Prior 1950f, p. 369). Thirdly, "that in all its customary usages the verb 'to know' is transitive; and that [fourthly] a transitive verb without an object is a logical monstrosity" (Prior 1950f, p. 369). Prior's parting shot is that while one is entitled to talk and write in a private language, if these are translated by another into plain English and made to appear commonplace or absurd then one should tell us where and why the translation is incorrect. This is the challenge thrown to Munz, for Prior states he, like Badian and McPherson, is unsure of what Munz means — unless it is what the latter take it to be. Prior concludes "For this reason it seems to me considerably more regrettable that he has refused to answer them than that he has refused to answer me" (Prior 1950f, p. 370).

Munz replies in the same volume as it is "necessary" for him "to make quite clear the issue on which I must differ from him", stating his [Munz's] claim is that "'feeling miserable' and 'seeing a chair' are both states of consciousness" that are "states of knowledge" (Munz 1950c, p. 370). The object of knowledge is a state of consciousness that in the first case "the outside world" enters "into the situation as a symbol of misery" and in the second enters as a chair (Munz 1950c, p. 370). Because, for Munz, the "state of consciousness is not different from the knower [...] in such acts of knowledge the knower and the known are really identical" (Munz 1950c, p. 370). Thus, in this case the use of the verb "to know" as transitive must be rejected. Munz also conjectures that he is "very much more of an idealist than Mr Prior", attempting a theory of knowledge in which "the world emerges in our consciousness only as a symbol" (Munz 1950c, p. 370). Badian and McPherson's assertion on the necessity of the simplicity of communication is dismissed as "a gratuitous dogma, to which nobody but a few positivists would like to subscribe" (Munz 1950c, p. 371). While this concludes the debate, this is the decision of the *Landfall* editor, not of the participants. For it is clear, like Prior and Duggan in the *Listener*, that Munz and Prior could have continued such a debate for many more exchanges. The issue for Prior as public intellectual is not only the limited number of available outlets in a small country but also that his participation is primarily reduced to reviews and exchanges in the letters/correspondence options. That is, his pulpit is at the discretion and control of others. To understand this

issue, we need to remember his hopes from 1936 of "of ending up eventually as the editor of a religious periodical" (Grimshaw 2018, p. 93); for only as editor would Prior not only have a regular editorial which would act as his pulpit, he could also create and curate the debate and discussion. The only real possibility for Prior to do so would have been to take over the editorship of the Presbyterian weekly, the *Outlook*, yet he most probably lacked the journalism background to do so, nor would it have enabled him to follow his philosophical interests.[40] For as is evidenced in his final foray as public intellectual, having been able to expand his philosophical contacts in person, Prior was able to discover a way past the very real limitations of New Zealand academic and intellectual life at this time.

6 Public Debate Five: *Landfall* 1952

In 1951, in the words of Mary Prior, Arthur and Mary "scraped" to attend that year's Meeting of the Australasian Philosophy and Psychology Society (Hasle 1997/2003, p. 295)[41] where he gave his paper "The Ethical Copula" (Prior 1951). What is of interest here is that Prior chose to write a detailed report for the layman in *Landfall*, for no other reason than "I found it interesting" (Prior 1952a, p. 49). He begins with a discussion of John Anderson's reputation as "a dangerous propagator of atheism, immorality and Red Revolution" (Prior 1952a, p. 50) noting that Anderson is most probably an anarchist, whose "immoralism" is expressed in being an absolutist on "goodness and badness". In Prior's description, while Anderson admits the science of Ethics which discriminates between goodness and badness and investigates causes and effects, it is not the role of Ethics "to coax or dragoon or bamboozle people into doing or being good rather than bad." For obligation is a bad thing because it is a social constraint, masquerading as something else. So, there is no such thing as "Morality with a capital M; in truth there are only moralities [...]" (Prior 1952a, p. 50). And while Anderson

[40] Prior's student, the philosopher Jonathan Bennett was acting editor of the *Outlook* from January-June 1953. Bennett took this on without any input from Prior and also notes that "After my two years as a student at Oxford, and one year as an instructor in the US, I was approached with an offer of the *Outlook* editorship on a permanent basis; and ANP strenuously urged me not to accept." (email to Grimshaw 4 July 2020).

[41] Mary Prior noted: 'There were no grants towards such things in those days.'

may be an atheist, Prior notes it seems to be strongly aligned to a type of Presbyterianism, "of a type now dying out", that is, of "some fairly small dissenting Scottish sect" influenced form with "definite echoes of Calvinism in his creed" (Prior 1952a, p. 51).

Prior then notes the battle between Melbourne and Sydney, commending W.D. Falk's paper on "Prescriptive Speech"[42] and noting the Andersonian line is that such linguistic focus are a "waste of philosophic time" and "have abandoned ethics for etiquette"(Prior 1952a, p. 52). What makes this conference report important is that Prior next turns to Professor J.J.C. Smart's paper on "Logical Paradoxes"[43] because he is not satisfied with either Smart's solution or any other he has come across "and would be interested to see some philosophical amateur who reads *Landfall* chip into the discussion. (He couldn't do worse than the professionals have done with this subject.)" (Prior 1952a, p. 52). The subject discussed is that of "redness" whereby if it is granted that the abstract character of redness is not red itself, is there a character possessed by the character of redness? But given that is self-contradictory, it must be abandoned, and so also we must abandon not only that redness does not characterize itself, but also that redness is not red. Does this mean that redness is red? The paradox being it "does not make sense" to either affirm or deny.

Smart's answer "had a quite shattering simplicity"; the question of 'redness' in itself is one we just "do not want to say", rather we affix 'redness' to things such as pillar boxes and say other things i.e. 'soap boxes' are not red. The logician's prohibition against "redness is red" is not a real one for it prohibits something no one wants to do. Here Prior states his disagreement (as a logician) because the paradox remains ("[...] though I can see that there are powerful reasons against saying so, I do want to say that redness is not red, and a little enquiry has disclosed the same ill-bred impulse in other persons also [...] (Prior 1952a, p. 53)) — and notes that doing so caused Smart ("who is of the Ryle-Melbourne

[42]A version of this was published as W.D. Falk, "Goading and Guiding", *Mind*, Vol. 62, No. 246 (Apr., 1953), pp. 145-171.

[43]Smart publishes a very thoughtful critical reading of Prior's *Formal Logic* (1955) in the *Australasian Journal of Philosophy*, vol. 34: 2 (156) pp. 118-126. Smart begins by stating "This book is marked by a wholly admirable eclecticism. In no other comparable treatise on logic, so far as I know, are so many alternative systems discussed."(p.118). Smart concludes "I hope this book will be rapidly sold out, as it deserves to be [...] the book is outstanding in its field." (p.126)

factor") (Prior 1952a, p. 53) to call him "an Andersonian" (Prior 1952a, pp. 52-53).[44] Having in the past turned to the public sphere to articulate his discussions prior to academic expression, here Prior inverts his model, attempting to see if his academic articulation can be discussed in the public sphere. This is Prior the public intellectual testing whether intellectual discussion of philosophical logic can really be made public.

Prior's increasing isolation from the issues of public discussion in New Zealand can be seen in that his challenge was only, briefly picked up by another 'public intellectual', the poet and critic A.R.D. Fairburn.[45] Fairburn, as "an 'amateur of philosophy" (Fairburn 1952a, p. 161) appeals to I.A. Richard's discussion in *The Philosophy of Rhetoric* as to how we arrive at a general abstractness from a particular concrete thing. Fairburn's contention is that it is impossible to detach the abstract character of redness from the experience of red objects in a manner that we could treat it as a detached entity – or define it negatively as "is itself not red." Fairburn states he could make similar statements i.e. "the moon is made of green cheese" but he could not expect others to be interested "unless they are psychiatrists."(Fairburn 1952a, p. 161) Fairburn suggests that there is linguistic confusion occurring arising from abstraction "in which the word 'is' bears a heavy load of guilt. Nouns and adjectives that belong to the same situation cannot be brought face to face at the altar without some rude person pointing out that they have been living together for years." (Fairburn 1952a, p. 161) His conclusion is that the philosophers present were seeking to play the game improperly (ping-pong played by hitting the bat with the ball whilst standing on their head is the example given) and so recourse should have been given "that Occam be asked to apply the guillotine" (Fairburn 1952a, p. 161).

Prior replies that, if he understands Fairburn correctly, his view "is

[44]Prior notes of the *Australasian Journal of Philosophy*: "it is still the main stamping-ground of the Andersonians who constitute (whatever one thinks of them) a genuine Antipodean philosophical school" (p. 53).

[45]For an informative biography of Fairburn; see http://www.bookcouncil.org.nz/writers/fairburn.html. Fairburn wrote for *Landfall* and had noted Prior's earlier reviews, stating his Lewis review "is a shade over specialist for a first number" (p.158) while his calling his Popper review "excellent." (p.164) See Lauris Edmond, ed. *The Letters of ARD Fairburn*. Auckland: Oxford University Press, 1981. Prior (under the nom de plume 'Richard Bramley') and Fairburn, both wrote for the New Zealand journal *Tomorrow* in the 1930s and were part of the wider (though small) New Zealand intellectual, cultural and artistic milieu of the 1930s-1950s.

a most respectable one" and that "he can be written down as an Aristotelian." (Prior 1952b) He however points out the Platonist counter-argument that such a reduction does not get rid of all statements with abstract subjects. To this (in the same issue, immediately after Prior's letter) Fairburn replies that he is probably both "a confused thinker" and a Nominalist. He is aware of the Platonist argument, but would argue that redness has no *a priori* existence "but is merely a mental process": "My interest in the controversy arises mainly from a belief that much unnecessary mischief has been caused throughout history by people who allow verbal abstractions to break their moorings" (Fairburn 1952b). And with that the debate ends.

7 Conclusion

Following this, Prior no longer involves himself in public discussions, for as Mary Prior notes he had discovered the Polish logicians and "1952 was the beginning" (Hasle 1997/2003, p. 298). Yet for five years Prior had involved himself very publicly with an attempt to bring the discussion of philosophical issues to the wider public of New Zealand. His ventures as public intellectual can be read as a part of that general post war desire to, as Mary Prior notes, "catch up on lost years" (Hasle 1997/2003, p. 294). What makes these public utterances important is that as well as being a part of the yet unwritten (and unconsidered) 'intellectual history of New Zealand' they are public evidence of the shifts and developments of Prior's thought in a very public and accessible manner. What runs throughout his public utterances is the way in which Prior used the public forum in New Zealand to attempt to facilitate the issues he was developing within his academic work and his first academic text. Here his models are those 17th and 18th century moralists who sought to create and inform an educated citizenry. That the public forums were willing to participate provides another insight into the intellectual history of New Zealand. On the one hand Prior was acting as a public intellectual in an environment that was prepared to include such figures in its presentation and discussion of life and letters in New Zealand. On the other hand, this was also indicative of an audience that itself acted as a type of communal public intellectual in that editors were prepared to accept such discussions within the pages of their publications. Yet tellingly, where the discussion moved into explicit discussion

of logic such as the concluding 'redness' debate, only the intellectual gadfly Fairburn would respond.

The public Prior perhaps presents the limit of Logic in the public arena.

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Dispelling the Freudian Specter: A.N. Prior's Discussion of Religion in 1943

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Abstract

Newly released letters between Arthur Norman Prior and Mary Wilkinson (later Prior) in 1943, reveal that Prior, after having struggled with Freudian explanations of religious belief in 1942, returned to Christianity in July 1943. With Freud's specter dispelled, Prior wanted to provide an answer to three articles, he had written from an atheist perspective, and therefore wrote *Faith, Unbelief and Evil: Fragments of a dialogue*. Furthermore, it turns out that Prior discussed and corresponded with Karl Popper, about faith and unbelief. This study situate Prior's discussion on religion in 1943 and discusses its relevance for his authorship.

Keywords: A.N. Prior, Religion, Atheism, Freud, Karl Barth, Karl Popper.

1 Introduction

Arthur Norman Prior is known by most as the founder of tense logic. His logic for tenses was formulated from a realist perspective, and his defense of this view made him one of the twentieth century's most important analytical philosophers of time. Even a casual reader of his

work will notice the many references to theologians such as Augustine, Aquinas, Jonathan Edwards, William of Ockham, and many more. One can of course expect that contemporary philosophers are acquainted with the works of these theologians. For Prior, however, his reasons for studying theology were not only professional, but also existential, though this was not evident in his later work in the sixties. Theology receded into the background of an agnosticism that was already present in his correspondence with his wife Mary from 1954. In 1968, he wrote that he used to be an expert in seventeenth and eighteenth century Scottish reformed theology, but that he no longer held any religious beliefs. His early works were mainly theological and include many articles on various theological topics. Two of his contributions to philosophical theology stand out: "Can Religion Be Discussed?" (Prior 1942 [11]) and "The Formalities of Omniscience" (Prior 1962 [24]). The impact of these two articles has been great. The latter, according to William Hasker, started the modern discussion of divine foreknowledge and human freedom (Hasker 1998 [3]), and it is arguably among the finest applications of modern logic to theology in the twentieth century. The impact of the former has also been great for philosophical theology. As Anthony Kenny notes, this was the first article in philosophy that Prior was remembered for (Kenny 1971 [6]). "Can Religion Be Discussed?" was later republished in Flew and MacIntyre's *New Essays in Philosophical Theology* (1955 [23]). According to Alvin Plantinga, this book was a wakeup call for Christian philosophers:

> In 1955 New Essays in Philosophical Theology appeared, a volume of essays that was to set the tone and topics for philosophy of religion for the next decade or more; and most of this volume was given over to a discussion of the impact of Verificationism on theism. Many philosophically inclined Christians were disturbed and perplexed and felt deeply threatened; could it really be true that linguistic philosophers had somehow discovered that the Christian's most cherished convictions were, in fact, just meaningless?
>
> (Plantinga 1984 [7])

Prior's paper was the lead essay of the book, and if one were only to associate his name with the author of "Can Religion Be Discussed?", then one would be excused for thinking him an atheist who considered

theology a meaningless illusion. In fact, it turns out that Prior's authorship of that article was the product of a crisis of faith. This has been known since Kenny's obituary of Prior, as well as from the discovery of a diary note from May 25, 1942 (Jakobsen 2016 [5]). Furthermore, it has been known, also since Anthony Kenny's obituary, that Prior's crisis didn't last long, and that he not only rather quickly resumed his study of theology (Kenny 1971 [6]), but he also became an elder in the Presbyterian Church in Christchurch. However, we did not know how long this crisis lasted or what to think of some of the unpublished articles apparently written during it. These articles display the same atheistic application of Freudian psychoanalysis as "Can Religion Be Discussed?" However, to add to the confusion, the archive also contained an article similar in style to "Can Religion Be Discussed?" but much more positive in its conclusion on the discussion between faith and unbelief. This article is titled "Faith, Unbelief and Evil: Fragments of a Dialogue" and, as Kenny notes, it "looks forward to Logic and the Basis of Ethics." From Kenny's obituary of Prior, along with the rough indications of what went on from 1942 to 1944 when Freud's influence waned, we have reason to think that Prior's crisis of faith was important for his development as a philosopher. The diary entry from March 25, 1942, confirmed this and increased our knowledge of the depth and importance of Prior's crisis of faith. Now, however, the letters between Arthur Norman Prior and Mary Wilkinson (later Prior) from 1943 have been released and can be studied at the Bodleian Library in Oxford as the Ann Prior Collection. From these we learn that Prior returned to the Christian faith in July 1943; that the unpublished articles "Children of the Damned" [28] and "Law and Order" [26] were written from an atheistic perspective; and that, finally, Prior wrote "Faith, Unbelief and Evil" in August 1943 as an answer to himself. These letters provide us with a unique key to unlock these three articles and suggest that Prior's return to the Christianity made the question of the foundation of ethics important. Finally, it turns out, from Prior's letters to Mary, as well as from a letter written by Karl Popper to Prior, that Prior felt compelled to tell Popper, who in 1943 was a professor in Christchurch, about his return to Christianity.

2 From Barth to Freud and Atheism

In 1971, Kenny, Prior's close friend, wrote about his friend's 1942 crisis of faith, saying that it "gave rise to his first philosophical article which is still remembered: '*Can religion be discussed*'" (Kenny 1971, 326 [6]) Kenny knew that the crisis did not last very long, a fact supported by Prior's continued cherishing of his theological library and his dismissal of Freudian explanations of belief in 1944. The discovery of the diary note from the middle of his crisis revealed that Prior wasn't merely going through a crisis of faith in 1942. He considered Christianity a thing of the past. On March 25, Prior wrote:

> I recollected that I had already in my Christian days compared theological systems with works of art—in the introductory paragraph of an article on Barth's Dogmatics which Alexander Miller tells me will be appearing in "Theology." On that occasion I was stressing the importance of form and structure in theology, of seeing how the bits of a theological system fit together and contribute to the "shape" of the whole thing. And indeed I have always been conscious that this has been my main interest in theology—that my main interest has been in that respect "aesthetic," though as a Christian I wasn't quite at ease about this.
>
> (Prior 2014 [27])

Indeed, as the letters make evident, in 1942, Prior considered himself an atheist. With Christianity behind him, Prior looked on theology with different eyes. In one diary entry, he called theology an illusion somewhat close to life (Jakobsen 2016 [5]). Why the change from Christianity to atheism? The immediate cause appears to have been his divorce from Clare, whom he had married in 1937. However, "Can Religion Be Discussed?" suggests that psychoanalysis and logic also played a role, and the letters confirm that psychoanalysis was an especially crucial factor. "Can Religion Be Discussed?" is written as a discussion between five stereotyped voices on religion. The title plays on the irony that what appears to be a discussion of religion cannot be so if the Barthian Protestant is right. According to Barthian, there is no common ground between the believer and the unbeliever on which a meaningful discussion can take place. The two other theological voices in the discussion — Catholic

and Modern Protestant — each model two different ways in which religion can be said to be absurd and meaningless. Modern Protestant's "milk and water" religion is mere emotion and lacks genuine theological content, and Catholic's adherence to divine simplicity, presented as the idea of God being identical with his own goodness, is rejected by Logician as meaningless. Barthian, on the other hand, "presents you with the 'nonsense' right from the jump." (Prior 1942 [11])

> Of course we can only talk nonsense when we try to talk about God — our language is the language of sinful men, and is utterly unfitted for such use. Of course the laws of thought, and the laws of grammar, forbid us to confess our faith — we try to speak of God, and it is impossible even to begin. But God, with whom all things are possible, comes to our rescue, and takes up our words and our thoughts and makes them carry His meaning and His message to men.
>
> (Prior 1942, [11, p. 149])

In a footnote to this comment by Barthian, Prior wrote:

> This is not a wild guess at what Barth might reply to a criticism such as Logician's. The idea that nonsense may be given sense by an act of sheer omnipotence is repeated again and again in his "Prolegomena to Church Dogmatics." On this miracle, for him, the very possibility of a science of theology depends. And on this miracle *alone*. Barth refuses explicitly and absolutely to try and justify his "nonsense" by criticizing or qualifying or revising the laws of thought (like Hegel; and Modernist; and perhaps even Kant, to whom Barth is obviously close). Nor, however, does he consider it any part of his business to affirm or accept their validity. The Miracle is his one standing-ground.
>
> (Prior 1942, [11, p. 149])

We have good reasons to think that Prior fundamentally disagreed with Barth's Hegelian influences, even though he was attracted to Barth's theology. Prior's reservations about philosophical idealism were due to the influence of J.N. Findlay, under whom Prior, in 1937, had written his master's thesis "The Nature of Logic." We only know the title because

Prior mentions it in an undated letter to Mary most likely written in 1947. In that letter, Prior also revealed the extent of Findlay's influence on his thinking:

> I am realizing how little I really knew when I wrote my M.A. thesis on "The Nature of Logic"; & what a cheek I had to submit it with so thin a background, and what a lot of work in it was really Findlay's.
>
> (Arthur Prior to Mary Wilkinson, B30 [8])

We can be quite sure that Prior's aversion to what he called "the philosophical disease of idealism" (Prior 1937, [10, p. 11]) was in large part due to Findlay. Another undated letter to Mary, also quite likely written sometime in 1947, confirms this. Prior was that year preparing for a logic course and had reread the idealist Bosanquet's *The Essentials of Logic*. It turns out that Findlay had used *The Essentials of Logic* in his teaching in 1936–7. Prior recollected the following to Mary:

> I have been re-reading Bosanquet's "Essentials of Logic." We used it for advanced Logic in my day, Findlay pulling it to pieces bit by bit. It is rather poisonous stuff & not Logic at all. I'm going to read a few Hegelian & Pragmatist Logics, through, I think; to keep track of the Enemy. I'll need it if I do land in Auckland next year!
>
> (Arthur Prior to Mary Wilkinson, B46 [9])

The obvious influence of Findlay's pulling *The Essentials of Logic* to pieces was noticeable in the problems Prior perceived in the logical implications of Barth's theology. In the years after he graduated, Prior wrote two critical articles on Barth: "Revaluations" [21] and, in the following year, a review of Etienne Gilson's "The Philosophy of St. Bonaventura" (1938). In "Revaluations," Prior wrote about "a certain philosophical disease called 'idealism' of which Barth's theology has not properly freed itself." It is evident that "Can Religion Be Discussed?" was influenced by this criticism. Prior's quotation in the article of Mark 9:23–25 — "Lord I believe, help Thou my unbelief!" — is an echo of his criticism of Barth five years earlier in "Revaluations":

> It has to be recognised that the question as to the falsehood of our belief is different from the question of our unbelief. We

> can pray, "Lord, I believe, help Thou mine unbelief," but it is meaningless to pray, "Lord, I believe, and my belief is false, but please make it true," and wicked to pray, "Lord, I believe, and my belief is false; but make me go on believing all the same." The Reality of God is deeper than all our doubts, and unaltered by them, if He is real—there is our comfort. But if He is *un*real, His unreality is deeper than all our certitude—there is our peril. And there is no way of evading this. Barth tries to evade it, often; all his critics, without exception, far more often. (Prior 1937, [10, p. 11])

In "The Philosophy of St. Bonaventura" (1938), Prior suggested that a way forward for Barth could be to look into the Anselmian–Augustinian tradition, where "the light of faith and reason comes in together, each lending strength to one another." However, he does not appear to have explored this line of inquiry further. In the earliest letter we have between Mary and Prior—on 24 February, 1943—Prior spelled out how the atheistic conclusion was reached in "Can Religion Be Discussed?"; it is evident that the logical criticism was a crucial premise. Referring to a conversation he had had with Karl Popper, who had read Prior's article, he wrote:

> [P]sychoanalysts tend to claim that standards of "normality" can be arrived at from psychoanalysis itself. I don't hold with this at all; and was quite appalled when Dr. Popper told me that he had gathered from my dialogue on "*Can religion be discussed*?" that I did. He said that the remarks by "Psychoanalyst" in that dialogue suggested that he considered he pad proven religion false by tracing it back to our attitude to our father, etc. What I really meant to suggest, by the order in which the participants said their piece in the dialogue, was that religion is first proved false (or rather nonsensical) by <u>someone else</u> (not by the psychoanalyst but by Logician).
>
> (Arthur Prior to Mary Wilkinson, February 24th 1943, [12, p. 4-5])

This quote helps us understand "Can Religion Be Discussed?" with regard to gaining a deeper understanding of how Prior lost his Christian

beliefs. The only standpoint that was acceptable from the perspective of Barthian orthodoxy embraced philosophical idealism, which to Prior's mind was the mere acceptance of nonsense as meaningful. This in itself didn't push him into atheism because, up until 1942, Prior simply found within himself the miracle of faith. His crisis woke him up to the cruel, cold, and bitter reality of the psychological roots of his urge to believe. In "Can Religion Be Discussed?", Prior put the following words into the mouth of Psychoanalyst:

> But a time may come [...] when circumstances will push them into an emotional crisis in which they will go mad unless they do something about it, and then in the painful process of their own analysis they will see for themselves the roots of their urge to believe. Only in that way are genuine atheists made. (Prior 1942, [11, p. 150])

The diary entry from March 1942 confirms this. Prior had not merely accepted Freud's story as an alternative adequate explanation of religion that is ultimately decided by a leap of faith. For Prior, in 1942, faith was a thing of the past. This fact is not possible to gather from merely reading "Can Religion Be Discussed?" In that article, Barthian appears to consider psychoanalysis an adequate explanation that one must accept or reject by faith—and that faith is a miracle:

> [F]aith is not the product of superior intellectual discernment; it is not a thing on which we are in any way entitled to compliment ourselves; it is an inward miracle of God's mercy, and that is all we can say about it.
> (Prior 1942, [11, p. 147])

On the other hand, in the diary entry Prior wrote that, even though theology is close to life, it is nonetheless an illusion: while we can learn much good from theology because it is close to life, it is nonetheless "real history distorted." Theology's story of God's covenant with man is "a distorted version of the same story that Freud tells in 'Moses and Monotheism,' the story of the 'growing-up' of the human race through various psychological crises." (Prior 2014 [27]) Prior's letter to Mary—on 24 February, 1943—confirms that he, in his own eyes, had turned from a childish (theological) belief in determinism to a mature belief in a more scientific determinism.

> When I first embarked on this psychoanalyzing of religion, it was only my own religion I had to go on, a religion essentially expressing the emotions of a son.
> (Arthur Prior to Mary Wilkinson, February 24th 1943 [12])

Prior had lost his Christian belief during 1942 as his marriage to Clare dissolved and as he realized that the more scientific version of reality, given by Freudian psychoanalysis, constituted a defeater of his religious beliefs. Prior's belief in God had been that of what he in "Reactions to Determinism" described as a "darling child." The psychological crisis of his divorce woke him up, and, with no superior intellectual discernment to defend his Christian beliefs, he grew up, and left his childish beliefs behind.

3 Dispelling the Freudian Specter

In Prior's letters to Mary from February to July 1943, it is evident that Prior was gradually questioning his doubts about Christianity. Finally, in his letter to Mary on July 4, he wrote about having been troubled about "an ever deepening feeling of unreality in all my mental oscillation between belief and unbelief." [13, p. 1] The atheism that had lasted throughout 1942, so clearly expressed in his diary note from March 25, 1942, was losing its grip on him:

> Lately I have thought much of my eighteen months or so of atheism as a kind of voluntary excommunication of myself. But I realized this morning that there was something sophistical in this conception of it. To abstain from Communion when one doesn't really want it anyway, is a very phony sort of "penance." Such abstinence can only have the significance of Christian repentance when one <u>does</u> want to be there. And I therefore resolved not to communicate this morning, but to do so at the next available opportunity. And this was a <u>real</u> self-excommunication, the thing demanded of me, by God. [...] And this was a genuinely Christian act, and my mind was very much at peace about it.
> ([13], p. 2-3)

Prior's atheism was over. It had lasted eighteen months, from the end of 1941, when Clare ran off with Prior's cousin to July 1943. He immediately began to read the bible again devotionally. He wrote to Mary that he returned to his tent (he was in the military serving in the air force) and read the story of Jacob, who struggled with God in Genesis 33:24–28. Two aspects of that story were emphasized in his letter to Mary: that Jacob struggled with the man "who turned out to be God," and that God changes Jacob's name to mean "peace of God." For Prior, both of these emphasized his own experience with making peace with God: "I had done what I had to do; and it was over; and I was at peace." [13, p. 3] The "next available moment" for taking communion came on July 18. Prior wrote about it on the same day in a long sixteen page letter to Mary:

> Its afternoon now, and a lot has happened since I wrote the above. I received communion at the service this morning– there were only four of us remained behind to communicate; [...] Mac said afterwards how glad he was about it; and he wished you had been able to be there, but I won't try and describe the service, except to say that the reading was the story of the Prodigal son. ([13], p. 4)

On the same day, Prior also wrote about a conversation he had had with Ursula Bethel (1874–1945), a New Zealand poet with a keen interest in theology with whom Prior corresponded during his studies. Prior's letters to Bethel provide valuable documentation of his relationship with his first wife Clare (Grimshaw 2018 [2]). By 1943, therefore, Prior had known Bethel for quite some time. While discussing C.S. Lewis' new book *The Allegory of Love*, Prior conveyed to Mary an earlier conversation he had had with Bethel:

> I put forward the idea that Freudianism had performed a secretly Christian function for me at a time when I had so abused Christianity that it was impossible for Christianity to do me any good directly, or something like that.
> (Arthur Prior to Mary Wilkinson, July 18th 1943 [14, p. 2-3])

During his talk with Bethel about the impact Freudian psychoanalysis had had on him, Bethel was reminded of a poem from William

Blake's Jerusalem. She thought it was relevant to Prior's experience, and gave it to him. He thought it excellent and passed it on to Mary.

> Each man is in his Spectre's power
> Until the arrival of that hour
> When his humanity awake,
> And cast his Spectre into the Lake.
>
> ([14, p. 2-3])

There can be little doubt that Prior found Blake's poem fitting. By 1944, it is evident that the Freudian ghost had been dispelled. As Prior wrote:

> God "dwelleth not in temples made with hands," even in the strange shrines erected by psychoanalysts in the mental depth they have discovered; he may certainly appear in such places if it pleases Him and furthers His purposes of love with men; but where He has told us to seek Him is in His Word and in the ordinances of His appointment.
>
> (Prior 1944 [21])

In 1943, however, this was all still future; and while his return to Christianity seems to have caused much joy, it also led him into deep reflection. First, he had to consider his relationship with Popper, who was one of those he had disclosed his atheism to. Second, he had to do something about the articles that he had written during those eighteen months of atheism.

4 Prior's Answer to Himself

During the first eight months of 1943, Prior and Mary discussed three articles by Prior written under the influence of atheism: "Reactions to Determinism," "Children of the Damned," and "Law and Order." The latter two caused Prior the most consternation. On July 25, while writing about Miller's use of his articles in general, he wrote that he didn't quite know "what to do now with *The children of the damned*." [28, p. 4-5] In 1943, Miller was editor of the journal *The Presbyter*, and Prior had thought of sending "Children of the Damned" [28] to Miller "as an

expression of the view that 'the Reformation of the Reformation' that his paper stands for, can only lead in the end to unbelief." [22, p. 3-4] Aware that he "love[s] to see [his] stuff in print," Prior contemplated not sending "Children of the Damned" to Miller before he was able to send an answer to it. The envisioned answer was explicitly directed at what Prior considered an atheistic part of "Children of the Damned":

> The most explicitly atheistic part of the article is the "insertion" in the section on Duncan which I have pinned on to the end; where I trace a sort of historical development from the old Calvinistic willingness to be damned just for God's glory, to a willingness like Duncan's to be damned for the salvation of God's people, and so for His glory indirectly; and this, I say, is a sort of "partial psychoanalysis" of the older attitude—"partial" because "God" still comes into it; the "love" involved is not yet fully revealed as purely human.
> (Arthur Prior to Mary Wilkinson, July 25th 1943 [5, p. 4-5])

Few were aware of the existence of "Children of the Damned" before Hasle's comprehensive categorization and description of the various items in the Prior archive at the Bodleian Library. "Children of the Damned" is a predominantly psychological examination of how four authors considered their parents more or less damned. The authors considered by Prior are the English theologian Frederick Denison Maurice, the Danish philosopher Søren Kierkegaard, the Presbyterian missionary to the Jews "Rabbi" John Duncan, and James Joyce. Freudian psychoanalysis, especially the Oedipus complex, was the pivotal center of Prior's examination of these authors' fears of damnation. Maurice, guilt-stricken and fearful of his mother's damnation, was on a mission to save her; he was "fed by a love between them of a kind which they felt to be wrong, which they never permitted to come into their consciousness, but which endlessly tormented the one with inexplicable fears, and goaded on the other to his endless theoretical and practical Christian labours [*sic*]." (Prior 2014 [16, p. 3]) Prior's letter of July 25 to Mary revealed that he was especially troubled by his application of psychoanalysis to Romans 9:1–5, where Paul bemoans Israel's rejection of Christ to the degree that he would wish himself "accursed and cut off

from Christ for the sake of my brothers, my kinsmen according to the flesh." Prior's comment on Paul is found in his analysis of Duncan:

> Earlier Calvinists sometimes held that complete submission to God's will demanded that one should be willing to be damned "for His glory." Duncan held this too; but his own willingness to be damned was for God's "glory" in a new, dynamic sense. He thought of God's plan for advancing His Kingdom as one involving "strategic retreats" from some fields (e.g., Israel), followed by new attacks from better points of vantage; and he could wish for his own damnation as part of such a "strategic retreat." In this there was less of pure submission to God's sovereignty than of love to those whose salvation was made possible by his loss. This is something like a partial psychoanalysis of the earlier Calvinism—the inhuman and irrational submission to God's arbitrary will has been revealed as a product of essentially human feeling.
>
> (Prior 2014 [16, p. 7])

From this letter, it is evident that Mary appears to have challenged Prior's dismissal of the traditional Calvinist interpretation as "inhuman and irrational submission to God's arbitrary will," which essentially is just a product of human feeling. According to Mary, Paul's words can also be interpreted, not psychologically as merely a human feeling, but as a temptation. This much seems apparent from Prior's words to Mary:

> The answer that I have in mind now is all in little bits, but I think the central part is this (you gave it to me long ago, when first writing to me about my unbelief & your belief when you treated Paul's wish to be accursed from Christ as a <u>temptation</u>).
>
> (Arthur Prior to Mary Wilkinson, July 25th 1943 [15, p. 4])

The goal of his answer is to supplement the psychoanalytical reading of Romans 9:1–5 with a theological reply. Freudian psychoanalysis is not in itself atheistic; however, the notion that psychoanalysis provides the final analysis does exclude God. In August 1943, Prior sent a

draft to Mary of what eventually became his answer to himself: "Faith, Unbelief and Evil: Fragments of a Dialogue." (Prior 2012 [25]) On July 29, Prior had decided that the form of his answer should be similar to that of "Can Religion Be Discussed?" The dialogue form that he chose reflected the fact that it was a reply to himself; this fact also influenced the subtitle. On August 9, Prior wrote that he will "subtitle it 'A fragment of a ~~dialogue~~ conversation,' because it really never ends." [16, p. 2] Furthermore, Prior did not want his answer to be considered as a purification of himself but rather as "a transposing to another key." [17, p. 2] It is evident that, without the letters, it would be very difficult to read back from "Can Religion Be Discussed?" and "Faith, Unbelief and Evil" to his personal religious beliefs. The letters show that deep existential questions and personal matters between him and various unnamed persons were being treated in those articles. Without the letters, we would be very much in the dark regarding them. His philosophical criticism of Barthianism in "Revaluations" and "The Philosophy of St. Bonaventura" can easily be used to interpret "Can Religion Be Discussed?" as the work of a Barthian Protestant who merely argues that, if Barth does not embrace philosophical realism, then one has a rationality defeater in psychoanalytical reductionist accounts of religious beliefs. The letters from 1943 and Prior's diary note from March 1942 show that he had indeed embraced such psychoanalytical accounts as the proper analysis of religious beliefs and was in "Reactions to Determinism" and "Children of the Damned" applying them to Calvinist theology. For eighteen months, Prior had, through Freud, transcended into atheism. Mary was the beginning of a "transposing to another key." At the center was Mary's suggestion that a theological reading of Romans 9:1–5 was also possible. Prior's consideration of Mary's suggestion constitutes the climax of the dialogue between Theologian, Historian, and Humanist in "Faith, Unbelief and Evil." Historian suggests that the Calvinistic way of understanding Romans 9:1–5 as a question of "being damned for God's glory" is more proper to Islam than to Christianity. The Humanist objects to this, pointing to the defense some German theologians made of Nazism:

> One of these gangster theologians, Stapel, dismisses Christian objections to what Nazis do and order one to do, as "moral hairsplitting", humanist rather than Christian, and

> says "If God orders His man to go to hell then his sworn adherent will accordingly go to hell." (Prior 2012 [13, p. 394])

With this reply, the scene is set for Prior to provide, through Theologian, the theological reply he had been working on. It deserves to be quoted at length because it is packed with meaning. It is the heart of Prior's reply to himself — which originated with Mary — and it demonstrates that Prior's subsequent focus on the foundations of ethics originated in his reply to his own atheism:

> [T]here's something more serious to be said against this willingness to be damned for God's glory. Even to contemplate such a thing is an implicit pushing aside of the salvation offered to us in Christ, who has taken our damnation upon Himself, and glorified His father even from hell. "Rabbi" Duncan, 19th century Scottish missionary to the Jews and then Old Testament Professor, once burst into tears before his students at the thought that Christ's dereliction on the cross, when He cried, "My God, why hast Thou forsaken me?", "was damnation—and He took it lovingly." I have a feeling that this—"taking damnation lovingly"—was one thing that Rutherfurd's God, for all His omnipotence unlimited by goodness, could not do. But it's one thing that the God of the Bible has done; and in this act lies the one thing that Rutherfurd's theology, like Humanist's philosophy, does not give us—a foundation for ethics. We are not called upon to do the really crucial acting here—we are not called upon to "take damnation lovingly," and we couldn't do it if we were; but we are called upon to live as those for whom God Himself has done this. And that is the whole of the negative side of predestination—the whole meaning of "predestination to damnation." And the positive side too. It is the gospel. (Prior 2012 [13, p. 395])

The importance of Prior's discussion of the foundations of ethics in "Faith, Unbelief and Evil" is highlighted by another letter from Prior to Mary from August 6, 1943. It turns out, that Prior was reminded of another article, "Law and Order," also written during his atheistic period. In his letter to Mary on August 6, Prior wrote:

> I have realized tonight that I still have at present an atheistical article in the hands of John Anderson, to wit, "Law and Order" for publication in the Australasian Journal of Psychology and Philosophy, if he feels so disposed and must communicate with him as swiftly as may be to get it withheld.
>
> (Arthur Prior to Mary Wilkinson, August 6th 1943 [18, p. 6])

At first, Prior considered rewriting the article "without the atheism" in order to offer it to the *Australasian Journal of Psychology and Philosophy* again, together with a rewritten "Children of the Damned." He was, however, unsure, and the next day he wrote again to Mary about "Law and Order," saying that, while "Children of the Damned" would be somewhat easy to rewrite without the atheism, the same would not be true of "Law and Order." This article was "a much tougher proposition to de-anti-Christianize." [26, p. 10] Prior decided to immediately mail Jon Anderson, the editor of the *Australasian Journal of Psychology and Philosophy*, by air-mail the same day to get the article withdrawn from publication. He was somewhat perplexed about what to do with the article and asked Mary what she thought. On the one hand, Prior felt that he needed to consider the atheism of the article; on the other hand, he considered the article to be theologically important. "Law and Order" is a brief two-page discussion of the ethical foundations of law. As Prior wrote to Mary, without the atheism it is "a simple account of the logical character of legal propositions." [19, p. 10] The argument opens with the two "atheistic" paragraphs. In these, Prior dismisses claims of the kind that "the universe is constructed on moral principles" and "there is a moral order in the universe" as "wishful thinking." On the contrary, Prior argues, there is no "way of proving that such-and-such is our 'duty' from descriptions of how things happen." (Prior 2014 [26]) In his letter to Mary on August 7, Prior, in a crossed out section, wrote that "it is Wittgenstein rather than Freud." Prior does not give a reason for crossing out this phrase. Perhaps he simply realized that it would be wrong to attribute the views in *Law and Order* to Wittgenstein. It is however evident, from the letter's postscript and his letters to Ursula Bethel, that Prior did attribute the view, that ethical prescriptions are disguised imperatives, to Wittgenstein:

> I'm replacing the opening two paragraphs of "Law and Order" with the following: "I propose here to give an account of the logical nature of legal propositions in the fairly straightforward sense of propositions which express 'the laws of the land.' The characteristic of these propositions that needs most to be explained is that they appear to transcend the sharp distinction made by modern students of 'logical syntax' between indicative and imperative sentences, or between 'descriptions' on the one hand and 'demands' or 'decisions' or 'policies' on the other. Legal propositions seem to be both indicative and imperative at once."
>
> (Arthur Prior to Mary Wilkinson, August 7th 1943 [19, p. 12])

What Prior sees as Wittgenstein's influence is the view that ethical propositions are really disguised imperatives. From a letter to Bethel, we learn that Prior "had to read up a lot about Wittgenstein" (Grimshaw 2018 [2, p. 133]) as part of his work on "The Nature of Logic," and that Prior especially seems to have focused on Wittgenstein's view of the logical status of ethical propositions:

> They [Wittgenstein and others] hold that there is no science of Ethics, for there are no "ethical propositions" or "ethical facts" which such a science might study. Ethical statements are not really statements conveying information at all—although they may have the form of an indicative sentence (e.g. "Murder is wrong"), these are really concealed imperatives. (Grimshaw 2018 [2, p. 133])

From Prior's answer to himself it is evident that, while he agreed with Wittgenstein's logical analysis, he disagreed with its application. The indicative and imperative distinction is not really about social convention or expectations of how society will react to certain behaviors. In "Faith, Unbelief and Evil," Prior's answer to himself constitutes a statement about the foundations of ethics that he does not appear to have pursued further: a grounding of ethics in Christian theism. While Prior never pursued the theory, he continued the study of the logical foundations of ethics. What his letters have shown is that this study, which

culminated in *Logic and the Basis of Ethics*, began with his return to Christianity and his urge to provide an answer to the atheism that had dominated his thinking from 1942 until July 4, 1943.

5 Dealing with Popper

It is evident from Prior's letter to Mary (quoted above) that he had confided with Popper regarding the underlying reason behind "Can Religion be Discussed?" In Prior's eyes, Popper and he had been fellow atheists. On August 7, Prior wrote to Mary that:

> [...] possibly the Christian reply to a great deal in 'Popperism' is simply to be silent on points where he feels a compulsion to speak. It's not always this, but is sometimes—and curiously enough that was my own reaction to some of his teaching as a fellow atheist.
>
> (Arthur Prior to Mary Wilkinson, August 7th 1943 [19])

Prior had attended lectures with Popper, and at one of them he had landed in an awkward situation because he had not disclosed his return to Christianity to Popper. Popper had given a lecture on materialism, which Prior gave a splendid account of in a letter to Mary on August 3, 1943. After the lecture, a discussion ensued, launched by a person whom Prior described as a rationalist. This rationalist proceeded to give an account of a recent affair in which a religious fundamentalist group had encouraged a strict disciplinary action on a child. The story, from the perspective of the rationalist, had the intended impact on Popper, who, Prior commented, "was very sensitive to ill-treatment of children." [28, p. 4] The rationalist concluded it by saying: "There's religion for you!" To this Popper smilingly replied: "Oh, I think even rationalists may be cruel to children sometimes!" The reply didn't end the conversation, and Prior, to his later regret, couldn't remain silent. The rationalist had insisted that no rationalist would ever be cruel to another person. At that point, Prior remarked, with biting irony: "In fact, thank God the rationalist aren't as other men." [28, p. 4] The class noticed the disguised reference to the account from the Gospel of Luke of the Pharisee and the Tax collector,[1] and they were with Prior to such a degree that

[1] Luke 18:9–14.

Popper apparently felt compelled to explain their reaction to the poor beleaguered rationalist. They were not attacking rationalism as such, Popper tried to explain, but rather self-congratulation. Suddenly, Prior had found himself in an awkward position, as Popper wanted to use Prior, whom he considered an atheist, to prove to the rationalist that he wasn't being attacked by religious believers. Prior recounted the story to Mary:

> Popper endeavored to explain to the bellicose man that [...] he was not being attacked by religious people. "Mr. Prior, for instance," and I was highly alarmed about what was going to come next and felt I was there under false pretenses, and said humidly, "Oh, never mind about me," and Popper went on more carefully (not knowing what was in my mind), "Mr. Prior for instance is quite tolerant toward rationalists—aren't you?" and I muttered a little tamely "I try to be" and then Popper went off on another tack. ([28, p. 4])

Prior emerged from the affair "feeling rather rotten" because he had not trusted "Popper to defend the non-rationalist against the bellicose man [...] but had to jump in and attack the man." He felt he should have trusted Popper to defend Christianity in that situation, and that he instead had pulled himself — and also, in the eyes of the class, the church — down to the same level as the man who had attacked Christianity. The awkward situation caused Prior to write a letter to Popper, explaining to him that he had returned to Christianity and that he wanted to apologize for his behavior. Popper wrote back to Prior on August 9. We know this because Prior kept Popper's letter among his personal correspondence. Popper's reply was warm and cordial — "really very nice," as Prior described it to Mary in his letter to her on August 9, 1943. In his reply, Popper first addressed Prior's return to Christianity:

> You need not be afraid concerning my attitude toward your change of mind. I liked your letter, and I feel that you are in a better state now than you were at the time when you told me about your atheism. These are matters in which one may change one's mind more often than once or twice, and one may even stay in a state of continuous fluctuation. (I need

not explain to you why I say that).

(Karl Popper to Arthur Prior, undated [30, p. 1])

Prior had conversations with Popper on other topics that same month, and it is evident from Prior's letters to Mary that he held Popper in high esteem. The exchange with Popper, and the letter from him to Prior, is an important new discovery. While we have known that Popper and Prior knew of each other and Prior applied for the temporary lectureship that became vacant after Popper left Christchurch, we have not had reason to think that there was a personal contact between the two men. (Copeland 2020, [1])

6 Conclusion

Prior apparently never published his atheistic articles "Children of the Damned" and "Law and Order." Neither did he, in his lifetime, publish his reply to himself in "Faith, Unbelief and Evil." Together with the diary note from March 25, 1942, they were kept among his scrapbooks and unfinished work on seventeenth and eighteenth century Scottish reformed theology. The specter of Freud had been dispelled. His doubts didn't leave however, and in 1968 he wrote that he no longer held any religious beliefs. (Kenny 1971 [6, p. 321]) Doubt appears to have returned sooner however. Already in a letter to Mary in 1954 Prior writes about his skepticism as a reason why he ought to step down as an elder in the Presbyterian Church:

> I don't know there isn't a God; but I don't know there is either, and I don't know as much as by being a Kirk elder and implicitly claim before the world to know—I don't "know that my Redeemer liveth"—and I don't think my state of mind can be rightly described even as believing the things I implicitly profess to believe. But what to do about it I don't know either; I only know I don't want to make a public fuss about it—I don't want to make any sensational renunciations —and of course the quietest thing one can do is just to go on as long as one can being a bad and negligent Kirk-elder; but I don't think that's quite the best thing either—it will do for a while, but not for a very long while " / What is a long while?— another six months?—till the new church is started?—till we

go to England?

(Arthur Prior to Mary Prior, May 21st 1954 [22, p. 7])

When Prior and Mary came to Oxford in 1956 in preparation for the John Locke Lectures, they appear to have attended church several times. However, when they ultimately moved to Manchester, they ceased attending church. Nonetheless, few philosophers in the middle of the twentieth century have done more for Christian philosophy than Prior. In a time where philosophy still questioned whether metaphysics made sense, Prior was convinced that many of the answers to logical problems in philosophy should be found with the Schoolmen. He remained close with his atheistic friends, such as J.L. Mackie and J.J.C "Jack" Smart, as well as with his Catholic friends Peter Geach, Elizabeth Anscombe, and Ivo Thomas. Prior unfortunately died before the philosophical discussion, initiated by him, of divine foreknowledge and human freedom turned in earnest to the theology of an open future. However, it is not a stretch to claim, that Prior's work on God's foreknowledge of future contingents was the birth certificate of that theory. For Prior, it was fundamental that orthodox Christian belief assumed God's providential control over the future, and hence for him denying God foreknowledge meant yet another change of mind from belief to unbelief. [4] Popper encouragement to Prior concerning one's change of mind on this matter indeed turned out to have been quite true.

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Prior and the "Logic of the Word of God"

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Abstract

The aim of this paper is to read Prior's paper: Arthur N. (1940): 'The Analogy of Faith', in order to see to what extent it offers some productive insights into Prior's view on logic. Our paper suggests that by viewing The Analogy of Faith, in this light Prior's considerations on 'the logic of the Word of God' constitutes a novel and still unexplored way of making sense of the idea of the analogy of faith. Furthermore, it also suggests that Prior's later achievements in Logic has its origin in his early theological thinking.

Keywords: Metaphysics, physicalism, dualism, time, God's Word, logic.

1 Introduction

A. N. Prior is best known for his invention of tense-logic in 1954. His invention of tense-logic made it possible to argue against Quine's view that logic has to be tenseless (Quine 1953 [12]). For Prior, the work of

the Logician was not to be in the business of metaphysics, but rather to provide "the metaphysician, perhaps even the physicist, the tense-logic that he wants, provided it be consistent." (Prior 1967, 59 [11]). In this sense, Prior argued, the Logician is like a lawyer with a client (the metaphysician) who has a case he wants to have argued, and the lawyer should thus spell out the best option, consistent with the clients choices and preferences. We find this view on Logic evident in Prior's early work. He did not appear to be interested in pursuing intense studies in formal logic until after his publication of *Logic and the basis of ethics* (1949). As the title of that book illustrates, Prior did not feel obliged to reserve the term Logic to Symbolic Logic or Formal Logic. Prior's 1940 article, *The Analogy of Faith*, illustrates this point. Here Prior argued that the reformers' idea of the analogy of faith should be understood as being about the logic of the word of God.

2 The Analogy of Faith

The Analogy of Faith, was published in the theological journal *The Congregational Quarterly* and is an investigation of a doctrine which the reformers argued was essential in order to make correct interpretations of Scripture. As such, it is a doctrine about how to arrive at the proofs of the Reformers doctrines by reading the Bible. Or, in other words, a meta-doctrine, motivated by the idea of *Sola Scriptura*. The Reformers had to distance themselves fundamentally from the Catholic Church, as understanding themselves as those who solely relied on the authority of Scripture, which meant that they had to provide a principle, from Scripture, from which the reformed particular doctrines could be shown to follow. The solution was 'to say that the only authoritative interpreter of the Scripture was the same Spirit by whose inspiration they were written.' (Prior 1940 [8]). The good question is, then, who are 'we'? Historically, Luther '[...] used the term "our theology" during his lectures on Galatians in 1531' (Hendrix 2008, 127 [6]), and Hendrix also points to the justified view that 'Luther did *not* have a personal theology.' (ibid. 126). The question is, however: how would one settle on the Spirit's interpretation of Scripture? Since all individuals will be able to claim for themselves that they, by the Spirit, interpret Scripture in accordance with the analogy of faith, interpretation collapses into subjectivism. Prior was, of course, aware of the fact that the reformers would vehemently deny this,

and quotes several reformers to that effect. However, many still take this perspective on the doctrine whereas Prior believed that by turning to Karl Barth it is possible to provide an answer to the claim of subjectivism. What is required, Prior argues, is to give up the idea that the individual believer is the proper reader of Scripture, and that '[...] the subject of the act of faith expressed in the Apostle's Creed "is the *Church*, and therefore not the individual as such. (Prior 1940 [8])'". The subjectivity is thereby made relative to the right community, namely the Church to which the proper interpretation of Scripture is given by the author of Scripture.

In addition to the relative-subjective element, the analogy of the faith also has an objective sense, namely the idea, also central to the reformers, that "what God says to us in one part of the Bible is to be interpreted by what He says in another, and cannot ultimately stand in contradiction to itself" (Prior 1940 [8]). Here Prior quotes a reply by John Knox to Queen Mary:

> "The Word of God is plane in the self; and yf tair appear any obscuritie in one place, the Holy Ghost, whiche is never contrariouse to him self, explanes the same more clearlie in other places." ', and this '[...] comparison of Scripture with Scripture was what the Reformers understood by the "analogy of the faith". (Prior 1940 [8])

This idea of an objectivity of interpretation of Scripture by the Spirit who authored Scripture, is by Prior summed up as quite simply meaning "The subjection of our minds to the logic of the Word of God as well as to its particular pronouncements. (Prior 1940, section III [8])." Several questions arise as to what Prior more exactly means with 'logic' and 'pronouncements' of Scripture. We get an idea of this if we take a look at Prior's discussion of the principle in light of what he considered an excellent example of its application by John Knox. Knox provides an obscure proof of an interpretation to a text in Proverbs, that few, according to Prior, would find a convincing exegesis of that text. This proof however clearly demonstrates how the analogy of faith works in action, since Knox's proof is packed with echoes and allusions to Scripture. This, Prior argues, testifies that "the Bible has worked its way into the very warp and woof of his language and his thought." (Prior 1940, section III [8]). On the basis of this Prior concludes:

> There is surely no higher test than this submission to "the logic of the Word of God" of whether a man's thought has really grown out of the Bible, and is not merely "dragging it in" to support ideas that come from a different source. Knox says in effect, "It was not from my own speculations, but from the Bible — and above all from the story of the Crucifixion — that I learned of God's power to bring good out of evil, and where should I learn how to draw out the practical bearings of this truth — where should I learn to 'interpret' this 'Biblical' truth, and not some quite different speculative one — if not from the Bible too?
>
> (Prior 1940, Section III [8])

The analogy of faith is thus about "catching the drift" of Scripture or the general strain of Scripture, rather than that of particular passages. The Bible should not be viewed as a collection of various tenets and precepts on the basis of which any deduction can be made. "We must learn how the Bible itself makes its deductions and see that our own argumentation moves in the same way." (Prior 1940, Section II [8]).

What this amounts to seems to be an attempt on the part of Prior to solve the problem of the classical issue of the correct exegesis of the Bible by suggesting an epithet to the traditional label *the Word of God*, viz. the word *logic*: the logic of the Word of God'. So, what we have here is a threefold conceptual configuration: 'logic, word, God', the combination of which makes a philosophical question; in fact a metaphysical one, and in order to puzzle out what Prior means by these words we will have to offer some, not too extensive, reflections.

The nature of God is a theological question, and, whereas words are normally considered mundane objects, the association with the entity 'God', and the word *word* in the singular, makes the concept a little more ethereal. Opinions differ with regard to the nature of Logic. According to Kant (1781, 948, [7]) logic is ' [...] der bloßen Form des Denkens [...] and 'Transzendentale L. [logic], eine Wissenschaft, welche den Ursprung, den Umfang und die objektive Gültigkeit der Erkenntnisse *a priori* bestimmt.' But this will not help us if we do not know what pure thought ('bloßen Form des Denkens') and knowledge ('Erkenntnis') is, it only leaves us with the understanding that it is transcendental; maybe implying that it is metaphysical. It may, then, be feasible to suggest,

along these lines, an epistemological physicalism, in which a distinction is made "between the different kinds of entities that may be known or not known to exist." (Götzsche 2013, 68 [5]). Prior seemed averse however to such epistemological dualities. In a modern context Michael Dummett is in line with Kant in that he says that there is a 'philosophy of thought [logic]' (Dummett 1991, 2 [1]) but then he has it that:

> We should investigate how our language [logic] actually functions; the answers to those questions will then determine the answers to the metaphysical ones. (Dummett 1991, 338 [1])

That is, things are turned on their heads: what logic appears to be is not ontological, nor is it metaphysical; logic is actually the *basis* of metaphysics, i.e. logic comes before metaphysics (cf. the title of Dummett's book). This would appear to be Prior's view, also manifested in his invention of tense-logic. In The Analogy of Faith (1940) [8] however, Prior's does not offer a clarification of the notion of 'logic', and his overall view is perhaps that expressed in (Prior 1955 [9]) that 'The best way to discover what logic is about is simply by doing logic' (Prior 1955, 1 [9]). In order to appreciate Priors presentation of the matter in question, and get closer to what relation his paper has to his later work we shall turn to another historical treatment of logic within the reformed tradition.

3 The logic of Calvinism

Prior is not the only one who has focused on the logic of Calvinism as it is expressed in the Westminster Confession. The Westminster Confession clearly makes a claim about the logical relation that holds between Scripture and the reformed doctrines:

> The whole counsel of God concerning all things necessary for His own glory, man's salvation, faith, and life, is either expressly set down in Scripture, or by good and necessary consequence may be deduced from Scripture: unto which nothing at any time is to be added, whether by new revelations of the Spirit, or traditions of men.
>
> (Westminster Confession 1.6)

Seizing upon the phrase "good and necessary consequence [...] deduced from Scripture" Bovell (2009) [2] has argued that this phrase in the Westminster Confession was influenced by the growing epistemological influence of skepticism in the seventeenth century which caused philosophy and theology to emulate the certainty of the conclusions within mathematics where conclusions are deduced from axioms.

> Protestant theologians were not immune to mounting cultural pressures to propose an "analogy of science" for their theologies. The certainty associated with mathematical method and knowledge was the only ray of hope.
>
> (Bovell 2009, 3 [2])

According to Bovell, seventeenth century theologians in general sought to focus their work on achieving "a sure basis for normativity in theology", and they sought "to contrive an absolute certainty for theology, a certainty that would be capable of providing the psychological stability requisite for serious religious commitment, especially in the face of rampant skepticism." (Bovell 2009, 4 [2])

Much speaks in favour of the view that seventeenth century protestant theology and philosophy aimed at achieving a certainty in which Logic was a key instrument. Indeed, this development happens early in the seventeenth century, much earlier than Descartes' first publication *Meditationes de Prima Philosophia* (*Meditations On First Philosophy*) published in 1641. In 1606, the protestant Jacob Lorhard (1561-1609) in *Ogdoas Scholastica* coined the word Ontology (Øhrstrøm, Schärfe & Uckelman 2008 [13]). Lorhard worked with theology as well as ethics, logic, astronomy and physics, and looked upon ontology in much the same way as Aristotle looked upon what later has been labelled metaphysics, namely as first philosophy, or as the knowledge that makes knowledge possible. Furthermore, Lorhard's work displays a clear influence of the reformed logician and rhetorician Petrus Ramus (1515-1572). These aspects indeed suggest that inspiration flowed both ways between rationalistic philosophers and seventeenth century theologians. Prior's analysis of the analogy of faith, as a logic of the word of God, suggests furthermore, that there is more to Westminster Confession's emphasis on "good and necessary deductions," than an attempt to emulate the mathematical certainty sought for by Descartes. The earlier motive was,

if Prior is right, the idea of sola scriptura, the self-authenticating foundation that would set the reformed churches on a foundation in which the sole authority was that of Scripture and not that of the Church, or even worse, that of Aristotle. In his analysis of the analogy of faith, Fuller points out that the reformers perceived Aristotle, and medieval scholasticism, with deep distrust for that reason:

> The reformers [...] realized that theologians had kept the Bible from speaking for itself because they were so prone to construe its statements in terms of medieval scholasticism, which drew so heavily upon the philosophy of Aristotle.
> (Fuller 1997, 65 [4])

The central concern of the Reformers was to defend the claim that the bible is enough—sola scriptura—and was not in need of any first philosophy or tradition of the Church in order to make its own message clear and authoritative. It came with its own logic. Thus Luther lamented the influence of Aristotle on the university where he, "this defunct pagan has attained supremacy [...] and almost suppressed, the Scripture of the living God." (Fuller 1997, 65 [4]). Calvin also stressed the different stand of the reformed Church with regard to Aristotle concerning its doctrines' dependence on Scripture alone.

> The doctrine which we have put forward has been drawn from the pure Word of God, and rests upon its authority. Not Aristotle, but the Holy Spirit teaches that the body of Christ from the time of his resurrection was finite, and is contained in heaven even to the Last Day. (Fuller 1997, 65 [4]).

Prior's claim about the analogy of faith is not that it sought a certainty derived from having its fundamental axioms proven, but rather that it was a consequence of the views of Luther and Calvin concerning the sovereign authority of the Bible. Bovell's claim is stronger, namely that the Westminster divines were seeking a Cartesian foundationalism:

> The innovative step taken in the Westminster Confession is its cultural adaptation of a Cartesian-like foundationalism, "[we seek] what we can [either] clearly and evidently intuit

> or deduce certainly; for in no other way is knowledge acquired," into a biblicist foundationalism, "The whole counsel of God [...] is either expressly set down in Scripture, or by good and necessary consequence may be deduced from Scripture. (Bovell 2009, 8 [2])

However much speaks in favour of this, it also appears quite plausible, that a line of reasoning within the reformed tradition goes back to the attempt by the reformers to view Scripture as self-authenticating. In an unpublished article, written in the first half of the 40s Prior began an investigation into what he termed *The Logic of Calvinism*. Like Bovell, Priors turns to the Westminster Confession which "is not just a collection of offhand pronouncements on various subjects strung together like beads on a rosary, but has a definite inward order and pattern." (Prior 2014, 149 [i]) His use of 'logic' here means much the same as in *the logic of the word of God*, namely, that of an inward order and pattern. His investigation into the pattern leads him to trace the ramified structure to the influence of Petrus Ramus. It is evident that what Prior calls the Logic of Calvinism, and what he seeks to trace back from the Westminster Confession, is not an attempt of theologians to model theological certainty on that of mathematics. It is rather an explication of central Calvinistic dogma into a Ramified structure that makes it evident that the sole authority of the Calvinist tradition is the word of God.

1. The Authority of the Word of God.
2. The Contents of the Word of God. ("God and His Works").
2.1. Of God.
2.11. Of God's general attributes.
2.12. Of God as the Holy Trinity.
2.2. Of God's Works.
2.21. Of God's Works in Eternity — His Decree.
2.211. Of God's General Decree.
2.212. Of God's Special Predestination of Men and Angles.
2.22 Of the Execution of God's Decree in Time.
2.221 Of Creation.
2.2211. The Creation of the World.
2.2212. The Creation of Man.
2.222. Of God's Providence.
2.2221. God's General Providence.

2.2222. God's Providence in Relation to Sin.
2.22221. The Covenant of Works and its Breaking.
2.22222. The Covenant of Grace.
2.222221. The Purchase of the Covenant of Grace.
2.222222. The Application of the Covenant of Grace.
2.2222221. The Inward Work of Grace.
2.2222222. The Outward Means of Grace.
2.22222223. The Fruition of Grace in Glory.

It is evident in this list, that the logic of Calvinism, can be viewed as a ramified structure branching out from two original tenets, 1. The authority of the Word of God, and 2. The Content of the Word of God. What Prior thus describes as The Logic of Calvinism is a way of thinking about Christian dogma in which it is evident that the tenets of Calvinism rests solely upon Scripture. It is of course evident that, while opponents of Calvinism would dismiss such a logic as subjectivism, Prior would be able to assert the same of the logic of Calvinism as he did for the analogy of faith.

Prior's 'Logic of Calvinism' and 'Logic of the word of God' is a view on Logic that takes subjectivism seriously, in the sense of accepting an inward, felt and experienced order seriously. It is not mere subjectivism however, because it is an ordering of the subject's interpretations of what he considered an objective feature of reality. In the early 1940s Prior did this with regard to Scripture and Doctrine within the Calvinist tradition, but later he did the same for ethics and tenses.

4 Prior's contribution to Logic and Analysis

Prior's contribution to logic differs significantly from that of Russell, especially with regard to his willingness to make analytic investigations into philosophical topics where the charge of subjectivism is often brought up. *The analogy of faith* is perhaps the most vivid and early example, but it points toward the much more serious formal investigations into ethics and tenses. For Russell, all proper philosophical analysis would end up either with the conclusion that the assumed philosophical problem was just a logical problem, or with the conclusion that it was meaningless (Russell 1914 [i]). For that reason Russell's philosophy implied a criticism of Bergson's philosophy of evolutionism, which,

according to Russell, implied a harmful rejection of logic (Russell 1914, 18 [i]). Prior agreed with Russell in rejecting Bergson's view on logic, but he discovered that philosophy with modal logic, in various interpretations, could give a much more rigorous sense to Bergson than what Russell was capable of. This discovery caused him to make the following reflection in an unpublished note, most likely written in the early 50s:

> Perhaps you could call my logic a mixture of Frege and Kolakowski. — I want to join the formal rigorism of the one with the vitalism of the other. Perhaps you regard this as a bastard mixture — a mesalliance. — I think it is a higher synthesis. And I think it important that people who care for rigorism and formalism should not leave the basic flux and flow of things in the hands of existentialists and Bergsonians and others who love darkness rather than light, but we should enter this realm of life and time, not to destroy it, but to master it with our techniques.
>
> (Prior, MS i box 6, Bodleian Library)

Prior's early philosophy and analysis of theology suggests that he was working with a much broader understanding of Logic than Russel, and for that matter also Bovell. This understanding undoubtedly owes much to the influence of J.N. Findlay. Reflecting upon his teaching of Prior, Findlay writes that he "greatly admired and valued his steadfast subordination of symbolic skill to metaphysical insight" (Findlay 1985, 26) [3]. While Prior never succeeded in writing up a 'Logic of the word of God', or for that matter 'Logic of Calvinism', he undoubtedly contributed much to analytic theology through his important analysis of the problem of foreknowledge and free will in Formalities of Omniscience (1962) [10].

5 Conclusion

Prior's early article 'The Analogy of Faith' offers productive insights into Prior's view on logic because it presents us with one of his earliest attempts to apply logic to a field against which the charge of subjectivism has often been raised. We have argued that Prior's view on the analogy

of faith provides a novel perspective on the idea that should be seen together with his work of the logic of Calvinism. 'The Analogy of Faith', like 'The Logic of Calvinism, is about the particular reformed way of thinking about Christian dogma in which it is evident that the tenets of Calvinism rest solely upon Scripture. Prior seems to have lost interest in pursuing these inquiries rather soon and, with regard to Calvinism, turned his interest towards the more historical aspects of reformed theology. When, however, Prior later undertook intense studies into formal logic he turned his logical acumen into other areas where the charge of subjectivism often has been raised. His conviction that logic should not leave the flow and flux to existentialist philosophers like Bergson is already present in his earliest work on theology.

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Early Prior on the Nature of Modality: Debates with Łukasiewicz

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Abstract

In the four years before creating his first system of tense logic, A.N. Prior developed a quantificational theory of modality based on the idea that propositions express states of affairs, while modal operators quantify over them. This theory is outlined in the unpublished 1950-51 manuscript "The Craft of Formal Logic" and further elaborated in several journal articles written in the two subsequent years. It was also in this period that he became familiar with the logic of Łukasiewicz and adopted his formalism and proof theory, but disagreed with his view on modality. Some of Prior's most important papers from the early period argue against Łukasiewicz's truth-functional understanding of modality and its treatment in many-valued logic. Prior wrote on the quantificational nature of modal operators, on possible states of affairs as an extra-logical parameter of truth and on the bivalent character of logical modality that, in his opinion, reflected more naturally the meaning of the modal predicates. This paper surveys issues concerning the nature of modality that preoccupied early Prior.

Keywords: Arthur Prior, modal logic, logical modality, truth-functional modality, history of modal logic, Łukasiewicz's modal logic, many-valued logic.

1 Early Prior

The "early Prior" period is the first phase of Arthur Prior's original contribution to modal and temporal logic. It is bounded at the lower end by the publication of Prior (1949), where we see his initial interest to set ordinary and modal logics apart, and at the upper end by the creation of his first tense logic papers, when in the first half of 1954 he emerged as a more matured author. During these five years, Prior developed a quantificational theory of modality based on the idea that propositions express states of affairs and modal operators quantify over them. He believed that it was these non-ordinary, 'peculiar' objects of quantification that provided the distinctive character of modal logic compared to ordinary predicate logic. This theory is outlined in the unpublished textbook "The Craft of Formal Logic" and further elaborated in a series of articles.

It was during this period that Prior gradually became familiar with the logic of Łukasiewicz and his followers. Łukasiewicz had profound and long-lasting influence on Prior's logic, although their views of modality differed significantly. Prior immediately adopted Łukasiewicz's formalism, but took critical position towards the truth-functional treatment of modal operators and the many-valued approach to modal logic. His debates with Łukasiewicz on the nature of modality are found on the pages of Prior (1952), where he promoted 'states of affairs' as an extra-logical parameter of truth, in Prior (1953), where he argued against the truth-functional nature of modal operators, in Prior (1953b), where he identified two different types of modality, in Prior (1954), where he constructed translational semantics for modal logic. These and several other articles, as well as Prior's correspondence with Łukasiewicz, Meredith, Popper and others from this period, show the development of the ideas and notions that are built in his mature modal and tense logics.

2 Setting up the Framework

Prior's quantificational theory of modality began to develop after he critically reviewed Boole (1847). Prior was impressed by Boole's suggestion to ground his algebraic propositional logic in a domain that would

provide values for propositional symbols. The domain was a propositional universe, imagined as a collection of 'all conceivable cases and conjunctures of circumstances' in which the considered propositions were true. Prior saw it as "an exhaustive collection of mutually exclusive 'truth-possibilities'," and an anticipation of Wittgenstein's 'logical space' whose boundaries were drawn with the 'truth-tables' (Prior 1949, p. 176 [19].) But a closer look revealed to Prior that Boole's assumption generated only modal interpretation for the propositional expressions of the calculus. Wanting a formal system that could also handle contingent propositions and arguments, Prior went on to correct Boole and in "The Craft of Formal Logic"[1] sketched his own propositional universe and a semantic theory for modality. Modalities were classified and defined in analogy with the quantificational theory. Using the phrase 'true in a state of affairs', Prior described 'necessarily p' as 'p is true in all possible states of affairs', 'possibly p' as 'p is true in some possible states of affairs' and 'p' without a modal adjective as 'p is true in the actual state of affairs'. Modal operators 'L' and 'M', borrowed from Feys (1950), were treated as the universal and existential quantifiers over 'possible states of affairs'. What made these operators distinct from ordinary quantifiers were the objects of quantification. Prior believed that the distinct object of quantification was the key element in his theory that kept the modal system from collapsing into ordinary quantifier logic.[2]

Simultaneously with setting up the new theory, Prior decided to formalise as many of his ideas as possible, using the symbolism of Łukasiewicz. He claimed that it enabled him to bring out the logical relations more clearly than ordinary language, especially the similarity between modal operators and quantifiers and the analogy between their respective logics. The analogy was the bases of his theory of modality. There were features of Łukasiewicz's logical language that Prior found very helpful in that respect. One was the use of so-called truth-functors, which formed truth-functions out of single propositions. Their variables, symbolised with 'δ', ε, 'ϕ', etc., stood for any one-place truth-

[1] A.N. Prior wrote "The Craft of Formal Logic" during 1950-51. It remained unpublished because after the reviewers advised Prior to make substantial changes to it, he wrote a completely new manuscript, which appeared in 1955 under the title *Formal Logic*. The manuscript of "The Craft" is kept in the Bodleian Library in Oxford, as part of the collection of Prior's material. It is digitised and available online on the Virtual Lab for Prior Studies.

[2] See Markoska-Cubrinovska (2016).

functor, like '–', '$\rightarrow$ q', 'q & ', etc., while the expression 'ϕp' symbolised any of the respective truth-functions. When the propositional variables in a formula are substituted with truth-functional variables, the resulting formula, like '(ϕp & ϕ–p) $\rightarrow$ ϕq' (known as Leśniewski's protothetic), takes a far more general form than the original one. "The chief technical difference between the elementary propositional calculus, without variable functors, and the δ-extension seems to be that, in the first, if two theses can interact [...] there is a most general form of their result, unique apart from re-lettering; whereas, in the second, if there is interaction, there are in general an infinity of different results" (Meredith 1952, [17]). Functor-variables seemed to suit early Prior's view of propositions well. Their use in Polish logic tradition encouraged him to promote his favourite view of propositions as propositional functions and the syntactic similarity between higher-order propositional functions and predicates. It enabled him to express modal propositions as propositional functions of basic propositions representing possible states of affairs. Another feature that he borrowed from Łukasiewicz were the quantifiers. Unlike the usual quantifiers that range over individual objects of predication, Łukasiewicz's 'Π' and 'Σ' quantified propositions. It made them good candidates for translating modal operators, which Prior at the time already analysed as quantifiers of possible states of affairs. In Prior (1954) he would formally translate the necessity and possibility operators as Łukasiewicz's quantifiers.

Prior soon realised that his general approach to modality differed significantly from that of Łukasiewicz. Still using Łukasiewicz's symbolism and proof methods, he continued developing his rudimentary theory of modality, but ended up arguing against some of Łukasiewicz's theses on the nature of modal operators and the relevance of many-valued logic for modal contexts.

3 Modality is not Truth-Functional: Prior contra Łukasiewicz #1

The framework that Prior developed in "The Craft" was based on the assumption that modal operators are similar in nature to quantifiers. The difference between the two fields was due, insisted Prior, to the nature

of the objects of quantification. But that also meant that modal operators were not truth-functors, as Łukasiewicz claimed. Right from the start, this was one of the main points of disagreement with the logic of Łukasiewicz. It was also the topic of his two earliest modal logic papers (Prior 1952, 1953), and his correspondence with Bochenski, Łukasiewicz and Popper from that period.

Łukasiewicz used Leśniewski's protothetic to analyse and reject certain modal theorems, on the basis that modal operators yield unwanted results when substituted for the truth-functor 'ϕ': "Professor Łukasiewicz has pointed out that if we let the 'ϕ' in Leśniewski's theorem be a modal operator, we are liable to obtain curious results. For example, if we let it be M, we obtain CKMpMNpMq [(Mp & M–p) → Mq], 'If both P and not-P are possible then any proposition at all is possible.' This is a fantastic contention; for it is plainly possible, at least logically, both that every man should be mortal and that not every man should be mortal, but many other things, e.g. that there should be some man who is not a man, are as plainly not possible. The obvious conclusion to draw from this (though it is not the one drawn by Professor Łukasiewicz) is that Leśniewski's theorem is not applicable to modal functions" (Prior 1950-51, pp. 728-9 [20]). This discussion makes the core of Prior (1953), the first paper on modal logic that Prior wrote.[3]

"On Propositions neither Necessary nor Impossible" argues against Łukasiewicz's exclusion of contingent possibility from modal logic. Łukasiewicz claimed that Aristotelian thesis 'Mp ↔ M–p', where 'M' means 'neither necessary nor impossible', "implies a contradiction" (Prior 1953, p. 105 [25]) and "that any system which admits propositions of the form Mp must reject the Aristotelian thesis 'Mp ↔ M–p', on pain of landing itself in absurdities" (Prior 1953, p. 106 [25]). In his earlier criticism of Boole, Prior (1949) already commented on the need for logic to include material premises as well, "such as 'If I didn't plant potatoes in the second row, I planted them in the fifth'" (Prior 1949, p. 178-9 [19]). By early Prior's standards, 'Mp ↔ M–p' should be allowed in a system of modal logic. But, why did Łukasiewicz want to reject it? The nerve of

[3]Prior (1953) is Prior's earliest written modal logic paper, received by *JSL* on 5 November 1951. It was clearly submitted before Prior (1952), which mentions it in a footnote on p. 139 as forthcoming. By then, the main argument of Prior (1953) was already known to Bochenski, who sent his comments to Prior in a letter from 26 October 1951.

Łukasiewicz's argument against contingent possibility was its application in Leśniewski's thesis '(ϕp & ϕ–p) $\rightarrow$ ϕq', which predicts that "if anything is true both of a given proposition P and of its contradictory, then it is true of any proposition whatsoever" (Prior 1950-51, p. 727 [20]). If Aristotle's 'Mp $\leftrightarrow$ M–p' is allowed, then the implication '(Mp & M–p) $\rightarrow$ Mq', obtained from Leśniewski's formula, leads to the absurd conclusion that any contingent proposition is true in that system. In other words, "it follows from this thesis, together with the assumption that some propositions are 'possible' in the Aristotelian [contingent] sense, that any proposition whatever is 'possible' (in that sense)." (Prior 1953, p. 105 [25]).

The rejection of the contingent possibility was unacceptable for Prior, since he believed that any useful logic should be able to say something about contingent propositions. He put Łukasiewicz's conclusion under scruteny and found that it was based on a wrong interpretation of Leśniewski's formula. Łukasiewicz thought of modal operators as truth-functors and freely substituted 'M' for 'ϕ'. For Prior that was the crucial mistake: 'M' was not a truth-functor and it could not replace a functor-variable. Leśniewski's thesis worked for truth-functions, but did not work for modal operators, and Łukasiewicz shouldn't have used it in modal context. To prove this, Prior constructed a *reductio* argument: he substituted the propositional operator 'ϕ' in '(ϕp & ϕ–p) $\rightarrow$ ϕq' with the operator 'not necessary'. The meaning of 'not necessary' coincided with the meaning of ordinary 'M'. The result of the substitution, "if it is true of any given proposition that both it and its contradictory are not-necessary, then it is true of any proposition whatever that it is not-necessary", was equally absurd as the Łukasiewicz's original one. It would hardly be acceptable to reject 'Necessary p' or 'Possibly p' from a modal logic, says Prior, because "it is surely a poor sort of modal logic which will not allow us to say both that some propositions are necessary and some are neither-necessary-nor-impossible" (Prior 1953, p. 106 [25]). He further pointed out that the absurd conclusion in his example was not even dependent on the Aristotelian thesis 'Mp $\leftrightarrow$ M–p'. It clearly followed solely from the interpretation of '(ϕp & ϕ–p) $\rightarrow$ ϕq'. The thesis holds only if 'ϕ' is substituted with truth-functional operators, like '–', 'p $\rightarrow$ ' etc. "What the above argument shows, I would suggest, is simply that modal operators such as 'It is necessary that' and 'It is neither necessary nor impossible that' are just not operators of this sort,

and that is why Leśniewski's formula is inapplicable to them" (Prior 1953, p. 107 [25].) Prior's conclusion is that modal operators are not truth-functional by nature. He compares them to quantifiers, for which he also claims are not truth-functional and do not feature well in place of the functor variable.

The nature of modal operators was a matter of discussion between Prior and Bochenski soon after Prior sent him the manuscript of Prior (1953). "Łukasiewicz takes for granted that the Aristotelian functors (modal) are to be interpreted as truth-value functors. And there the whole difficulty lies – for once you assume so much, you *do* get a contradiction [...] About the theorem of Leśniewski [...] you simply cannot doubt it (if interpreted) in *bivalent* logic. To me it [...] is even intuitive in itself." Bochenski had positive comments about Prior's argument for non-truth-functionality and suggested him to contact Łukasiewicz: "The proof you give in your second letter is amazingly simple. Could you not send it directly to Łukasiewicz?" (Bochenski 1951, [3]). Popper expressed a similar opinion on Prior (1953): "I agree with your view concerning Łukasiewicz 's criticism of modal logic. I too was astonished by his argument − after all, Leśniewski's "thesis" is not a thesis of logic, it only states a fact about the functors of non-modal logic" (Popper 1952, [18]). But Łukasiewicz did not find Prior's argument compelling enough to reconsider his position: "I did not forget that the modal functions are different from the functions of the so-called 'material implication', but I believe that the best and the most reasonable approach to them is to treat them as 'truth-functions'." He agreed with Prior's observation that they do not work in Leśniewski's principle of bivalence, but suggested a different explanation from his. "The two-valued logic is, of course, not applicable to them[...] All systems of modal logic, so for instance the systems of Lewis, are many-valued systems" (Łukasiewicz 1953b, [10]).

In the 1951 letter, Bochenski directed Prior's attention to Church (1951) and his comments on Łukasiewicz's dismissal of Aristotle's modal thesis 'Mp→M–p' in the context of the principle of bivalence. Church gives a concrete advice on how modal logic should avoid the undesirable consequences of the contingent possibility operator. "Advocates of modality may meet it either by rejecting the principle of bivalence *or* by distinguishing between variables having truth-values as their values (to which the principle of bivalence is applicable) and vari-

ables having propositions as their values (to which the connective or 'functor' M is applicable)" (Church 1951, pp. 229-230 [5]). Church's direction had almost immediate effect on Prior, visible already in his next paper. It also had a longer term effect on his general view of modality, giving him the confidence to stick to the position that modal logic should make use of values other than truth-values.

4 Modal Logic is not Many-Valued: Prior contra Łukasiewicz #2

Church's suggestion that modal logic can coexist with the principle of bivalence if modal operators are applied to "variables having propositions as their values" coincides with Prior's own thesis defended in his inaugural piece on modal logic in "The Craft". Prior insists there that modal concepts can be expressed in ordinary propositional logic as an extension of it, and can stay distinct from it only if variables behind modal operators are taken as propositions representing possible states of affairs and not as truth-values. Church's modal dilemma was saying practically the same thing: if you want to build a logical system for modality, either reject the bivalence principle '(ϕf & ϕ–f) $\rightarrow$ ϕg', or accept variables that stand for something other than truth-values. Hearing it from Church and emphasised by Bochenski must have been a strong encouragement for Prior to continue with this approach to modal logic. Soon after Bochenski's letter, Prior wrote Prior (1952).[4]

"In what sense is modal logic many-valued?" aims to show that a satisfactory interpretation for modality is possible without the use of many-valued logic. Prior proposed to analyse Lewis's 'strict implication', C'pq or L(p $\rightarrow$ q), as a special case of Russell's 'formal implication' $\forall$x(fx $\rightarrow$ gx), by interpreting the necessity operator according to his theory in "The Craft", as a universal quantifier of 'possible states of affairs'. For that purpose, he assumed a propositional universe with two possible states of affairs, generating four possible values for each proposition: true in neither state, true in the first state only, true in the second state only, and true in both states. Using these four values for both the an-

[4]Prior (1952) came out in June 1952 and is Prior's earliest published piece on modal logic, although he wrote it after Prior (1953).

tecedent and the consequent, he constructed a truth-table for 'p strictly implies q' in a two-state universe. The resulting matrix resembled those in Łukasiewicz's multi-valued logic, but in essence was a very different one.

Prior's matrices differed from the matrices of many-valued logic in two significant aspects. The critical difference consisted in the type of input values in the matrix. Łukasiewicz's matrices operated exclusively with truth-values. Input values in the matrices of Prior (1952) were ordered pairs in which only the first element was a truth-value and the second was not. The second element was a set of propositions describing a 'possible state of affairs', or, as Prior himself had put it earlier in "The Craft", "entities which already have a modal character" (Prior 1950-51, pp. 744 [20]). The other difference was in the number of truth-values that appeared in the matrices. While propositional variables in Łukasiewicz's matrices could have one of three or more truth-values, in Prior's case they could only be assigned truth or falsehood.

Prior announced in the title that he wanted to examine the treatment of modality in terms of many-valued propositional calculi developed by Łukasiewicz. Łukasiewicz believed "that the logic of modality cannot be satisfactorily studied unless we use a many-valued calculus for its formal expression," but Prior wasn't ready to give up the principle of bivalence so quickly, "for being necessary, being impossible and being neither are surely not alternatives to being true and being false" (Prior 1952, p. 138 [21]). If modal logic is not resolvable in bivalent terms, there has to be some sense of many-valuedness other than truth-valuedness that can explain modal meanings, without leaving bivalence aside. He took up Church's advice and implemented a Fregean resolution by "distinguishing between variables having truth-values as their values [...]and variables having propositions as their values" (Church 1951, pp. 229-230 [5]). In other words, truth-functional propositions would be treated in bivalent terms, and modal propositions in some kind of many-valued terms. The only "sense in which modal logic is many-valued" (Prior 1952, p. 138 [21]), according to Prior, was to view propositions as if expressing possible states of affairs and modal operators as quantifiers over them. In that way, modal propositions would appear to express more than two values. In the rest of the article, Prior reinterpreted propositions as predicates of possible states of affairs and illustrated his sense of many-valuedness by constructing various value-

tables for ordinary and modal propositions.

The theory outlined in Prior (1952) is a continuation of the one in "The Craft". While in "The Craft" Prior drew the parallel between quantification and modality from syntactic standpoint, in this paper he went a step further and made a semantic parallel. The first result of the semantic parallel is the following assumption: the modal value of a proposition is "the set of possible states of affairs in which the proposition in question is true" (Prior 1952, p. 140 [21]). Prior proposed that the sets of possible states of affairs in which propositions are true be called 'modal extensions', in accordance with the values of predicate functions. Then it becomes obvious that "there is multiplicity of modal values... just as there are of quantificational values" (Prior 1952, p. 141 [21]). For example, if the extension of 'f' = {a, b}, then 'fa' is true; if the modal extension of 'p' = {w, u}, then 'p(w)' is true. The multi-valued character of 'quantified predicates' is due to the multiplicity of objects in the predicates' extensions. Similarly, the multi-valued character of modal propositions is due to the multiplicity of possible states of affairs in the propositions' modal extensions.

There was very little understanding at the time for Prior's position on many-valued logic and modality. Łukasiewicz insisted that modality can only be analysed in many-valued logic and that "[a]ll systems of modal logic, [including] the systems of Lewis, are many-valued systems." (Łukasiewicz 1953b, [10]) Popper openly expressed his disagreement with the approach to modality and many-valuedness in Prior (1952): "I do not think the question in this [paper] forms a good question, and I do not think that the answer you give is a satisfactory answer. Surely, modal logic in *your* sense is, simply, not a many valued logic in the sense in which this term was used by Łukasiewicz" (Popper 1952, p. 1 [18]). But Prior stood firmly to his views, replying to Popper: "I agree, I think, with the substance of your objections to my paper 'In what sense are modal logics many-valued?' So far as I can see that paper does give the only sort of sense in which *logical* necessity, possibility, etc. can be represented by value-matrices, and as I insist, and you still more strongly, the matrices I give aren't at all truth-value-matrices; but since I wrote that paper I have come to see a great deal more point in associating certain *non*-logical senses of the modal words with matrices that are much more like truth-value matrices" (Prior 1952d, p. 3 [24]).

5 Logical vs Truth-Functional Modality: Prior contra Łukasiewicz #3

After suggesting that modality can be analysed with the two classical truth-values and the propositional universe as an extra-logical element, Prior went back to Łukasiewicz's three-valued system in order to examine its relevance for modal logic and understand the reasons behind Łukasiewicz's insistence on the truth-functional nature of modality and its treatment in many-valued logic. The result was Prior (1953b).[5]

"Three-Valued Logic and Future Contingents" was inspired by Łukasiewicz's original three-valued logic,[6] designed to deal with Aristotle's future contingents. Unable to evaluate future contingents as true (1) or as false (0) at the time of utterance, Łukasiewicz introduced for such indeterminate cases the third value (1/2).

What seems to have particularly fascinated Prior was how in three-valued logic the notion of 'possibility' was introduced solely from truth-value calculations. It had been observed that the material implication 'If not-p then p', ('–p → p', or the so-called *consequentia mirabilis*), "is true so long as Np [not-p] is no closer to truth than p is; but whereas in two-valued logic the only way for this to happen is by Np being false and p true, in three-valued logic it may also happen by Np and p both having the value 1/2." The latter case, when 'If not-p then p' is true "whether because p is true and Np [not-p]... false, or because p has the value 1/2 and Np... the same," is identical to saying 'It is possible that p', or 'possibly p', or 'Mp' (Prior 1953b, p. 321 [26].) Prior realised that this definition of 'Mp' was indeed truth-functional, as Łukasiewicz insisted. The matrix for 'M', derived from the truth table for '–p → p' showed that truth-functional 'Mp' is true when 'p' is true or indeterminate, and from there other modalities were defined: 'It is necessary that p' as '–M–p',

[5]Prior (1953b) was very likely written in the middle of 1952, before Prior sent a draft copy to J. Smart for an opinion and J. Smart replied: "Thanks for the letter and the article. I'm glad the *P.Q.* will be publishing something in pure logic. It's time they did!" (Smart 1952, p. 1 [31]). and then went on discussing sentences that are neither True nor False.

[6]Prior's main sources for Łukasiewicz's three-valued logic were (Łukasiewicz 1951) and (Lewis and Langford 1932). Originally, three-valued logic was developed and discussed by Łukasiewicz, Tarski and Wajsberg in Polish, in several papers from 1920, 1930 and 1932. It was first introduced in English by Lewis in (Lewis and Langford 1932), but without the use of Łukasiewicz's symbolism and unrelated to its original purpose – to deal with the future contingents. Prior aimed in Prior (1953b) to correct this.

'It is impossible that p' as '–Mp' and 'It is contingent that p' as 'Mp & M–p'.

Yet, Prior wasn't convinced that this was the right way to express modality. It bothered him that "certain features of the modal truth-tables [...] seem a little peculiar, from the point of view of ordinary modal logic." (Prior 1953b, p. 321-2 [26].) Łukasiewicz's modal functions did not entirely match Prior's intuitions about the corresponding modal notions. In the three-valued system, 'Impossibly p' is true whenever 'p' is false, although 'p' may contingently be false, in which case 'p' is not impossible in ordinary sense. In a similar way, 'It is contingent that p' is automatically false if 'p' happens to be true/false, although it may contingently be true/false; 'It is necessary that p' is true whenever 'p' is true, although it could just be contingently true; and 'It is possible that p' is always false when 'p' is false, although 'p' could be true while actually false. Analysing the discrepancy between the informal meanings and the truth-tables, Prior traced its source in the use of the third value. The third value was essential for defining modality in Łukasiewicz's system. In the cases where 'p' has one of the two classic truth-values, the operators do not differ from ordinary truth-functors. In those cases 'Mp' is equivalent to 'p', '–Mp' is equivalent to '–p', 'Qp' is equivalent to 'p & –p', etc. By introducing the third value, it becomes possible to differentiate 'Mp' from 'p', but the formal properties of 'M' and the other operators do not match "those of ordinary modal operators." What 'M' actually described, according to Prior, was the indeterminate truth-value of "propositions about the future" that are "neither true nor false when they are uttered, on the ground that there is as yet no definite fact with which they can accord or conflict" (Prior 1953b, p. 323 [26].) He concluded that Łukasiewicz's three-valued system was perfectly suitable to deal with "the problem which it was originally designed for handling – the problem of 'future contingents'" (Prior 1953b, p. 322 [26]), but was not good enough basis for modal logic.

Among the arguments supporting his claim, Prior emphasised the fact that Łukasiewicz's modal functions never produced the third truth-value. The basic modal function 'Mp', defined as '–p → p', is never indeterminate, being either true or false for all three values of 'p'. Consequently, no modal functions derived from 'Mp' can obtain the indeterminate value. This confirmed to Prior that modal logic was not many-valued: "For 'It is possible that p' is definitely true not only when p is

definitely true but also when it is not yet either true or false [...] This peculiarity accords well enough with our intuitive notion of a 'possibility' as that which is somehow real even when that of which it is a possibility is not yet so; and it has the effect of giving a two-valued character to the modal part of the three-valued system. [...] [T]he question as to the truth, falsehood or indeterminacy of a proposition of [a three-valued] system is a question as to *present* and therefore determinate fact, so that the logic or part of logic with which we handle such a question is itself in effect two-valued" (Prior 1953b, p. 323-4 [26].)

In the summary of his divergence from Łukasiewicz's many-valued modal logic, Prior concluded that what the two of them spoke about were different types of modality. Łukasiewicz analysed truth-functional modality, while what Prior had in mind was 'logical' modality. He illustrated the distinction with the notion of necessity. "[L]ogical necessity is not what the 'NMN' [–M–] of Łukasiewicz's three-valued logic refers to. For 'NMNp' is in this system a truth-function, while 'It is logically necessary that p' is in no system a truth-function, but rather expresses a consequential higher-order characteristic of some truth-functions." (Prior 1953b, p. 324 [26].) He further explained the difference between truth-functional and logical modality in terms of their formal evaluation and consequences. "In Łukasiewicz's system, whenever Np is true we have not only NMp but also, and consequently, CNpNMp [–p → –Mp] [...] And since CNpNMp [–p → –Mp] is [...] true, it is (in these circumstances) 'necessary'." But '–p → –Mp' is not logically necessary. Its truth-table shows that it is true when 'p' is true or false, but not when 'p' is indeterminate, which means that it is not a logical law. "If it did turn out to be a logical law, CMpp [Mp → p] would also be a logical law [...] [and] since in any case CpMp [p → Mp] is a law, 'p' and 'Mp' would be mutually inferable, the distinction between truth and indeterminacy would disappear [...] and the three-valued logic would collapse into a two-valued one" (Prior 1953b, p. 325 [26].) Prior realised that his disagreement with Łukasiewicz's approach to modal logic was the result of fundamentally different understanding of modality. Łukasiewicz's 'truth-functional' modality was formally defined within a system of ordinary logic, and it was possible to keep the modal area from collapsing into the ordinary one precisely because of the three-valued semantics. The other type of modality that Prior called 'logical', was defined by 'logical laws' derived from the principle of bivalence, which were in fact

Aristotelian type of self-evident reasoning principles, like '$p \rightarrow p$'.

Prior's correspondence reveals that he tried to clear up these points of disagreement directly with Łukasiewicz, sending him letters and material on the topic ever since Bochenski urged him to do so in October 1951. Łukasiewicz did not reply himself immediately, sending instead messages through others. In August 1952 Prior received his first letter from Meredith: "Professor Łukasiewicz has asked me to send you a copy of my paper on his C-δ calculus" (Meredith 1952 [17]). When he finally replied, Łukasiewicz confirmed that his understanding of modality was fundamentally different from Prior's: "I cannot agree with your explanation of modal logic [...] There are [...] points I cannot accept. (1) That modal functors are not truth-functors; it is not possible to construct otherwise a modal calculus, – all modal functors of Lewis are truth-functors" (Łukasiewicz 1955, p. 1 [11]). But he also admitted that Prior's criticism of the three-valued system was justified: "I agree with your remarks on my trivalued [sic] system treated as modal logic. In my opinion, this system is now obsolete as modal logic. But it was once historically important as the first many-valued system of logic" (Łukasiewicz 1956, p. 6 [12]). Łukasiewicz updated his three-valued system with a new, four-valued modal system and suggested to Prior to look at it instead. "I shall send you a paper on modal logic which I have recently finished and which will appear in the Journal of Computing Systems" (Łukasiewicz 1953b, [10]). The paper was Łukasiewicz (1953), and it came to Prior at the right time to help him crystallise the distinction between the different notions of modality.

6 Understanding Modality through Formal Translation

Łukasiewicz's new modal system in Łukasiewicz (1953) was constructed as an extension of his δ-propositional calculus with two special functors, 'Δ' for 'Possibly' and 'Γ' for 'Necessarily', which satisfied certain conditions. The conditions consisted of axioms that were asserted, like '$\vdash \Gamma p \rightarrow p$' and '$\vdash p \rightarrow \Delta p$', and others that were rejected, '$\dashv p \rightarrow \Gamma p$', '$\dashv \Delta p \rightarrow p$' and '$\dashv \Delta p$'. The rejection of the latter was to ensure that the system would stay modal. Łukasiewicz was aware "that a modal system may be made pointless not only by asserting '$\Delta p \rightarrow p$' and so identifying

'Δp' with the plain 'p', but also by asserting 'Δp' itself and so identifying it with the tautological function 'p → p'. That is, 'Possibility' may be misunderstood not only as a definite 'Yes' but also as saying nothing at all" (Prior 1958, p. 273 [30]). He set it up as four-valued because no two-valued or three-valued truth-functions satisfied all the required conditions for modality.

As this modal system was entirely truth-functional, Prior was inspired to use its base as a tool for expressing modality in extensional terms. Moreover, he was hopeful to do that for different notions of modality. Although in Prior (1953b) he distinguished between truth-functional and logical necessity, he did not say clearly what he meant by logical modality. Now he felt he was able to formally describe both notions, which prompted him to write Prior (1954),[7] where he compared Łukasiewicz's modal logic, representing truth-functional modality, with those of Lewis and von Wright that Prior associated with logical modality. The analysis of both systems of modal logic he did through formal translation of modal expressions into extensional.

"The Interpretation of Two Systems of Modal Logic" assumed that the differences between various modal systems were consequences of how the core notion of possibility was understood. The differences between Łukasiewicz (1953) and Lewis and Langford (1932) or von Wright (1951) were "due simply to the fact that what Łukasiewicz on the one hand and Lewis and von Wright on the other mean by 'Possibly' are quite different things, and I shall offer a pair of simple interpretations which will adequately account for the peculiarities of each" (Prior 1954, p. 201 [27].)

He first informally described the nature of Lewis's and von Wright's modalities. In their systems, 'Possibly p' means that the truth of p would not violate any logical laws, while 'Necessarily p' means that the false-

[7]Prior (1954) was written sometime in the middle of 1953, between Łukasiewicz's letter (2 May 1953) that recommended Łukasiewicz (1953) and 15 October 1953, when the journal received Prior's manuscript. There is a letter from J. Smart to Prior from 19 November 1953 in which he thanks Prior for sending him the paper. "Thanks for letting me see your 'interpretations of modal logic'. You seem to have mastered that variable functor stuff OK. Most ingenious, it appears" (Smart 1953, p. 1 [32]). About the same time, Ivo Thomas also mentioned to have seen it. "Your paper on the interpretation of the two modal systems seems to me of the first importance, and most helpful to me personally just at this moment, when I must write something coherent on Aristotelian modes" (Thomas 1953, p. 1 [33]).

hood of p would violate some logical law. All other features of these systems follow from the above principles. Thus, there are propositions such that the truth of both p and Np wouldn't violate any logical law, meaning that both are possible in that sense, "but the truth of KpNp [p & –p] would always violate a logical law" (Prior 1954, p. 201 [27].) It was the reason why Lewis, and Prior too, objected to Łukasiewicz's thesis '$(\diamond p \,\&\, \diamond{-}p) \rightarrow \diamond(p \,\&\, -p)$'. On the other hand, von Wright's rule of necessitation '$\vdash \alpha \rightarrow \vdash \Box\alpha$' looks natural when '$\Box\alpha$' means that the truth of 'α' is guaranteed by a logical law.

Next, he used a formal procedure to translate logical modalities into the system of Łukasiewicz (1953). Saying that no logical laws were violated with the truth of 'Possibly p' or that some were violated with the falsehood of 'Necessarily p', suggests that Prior thought of logical modalities in quantificational terms. So it seems natural that for expressing these modalities formally, he used Łukasiewicz's symbolic language with propositional functors and quantifiers. The functors enabled expressing complex propositions as predicates of basic propositions, while Łukasiewicz's quantification over propositions enabled straightforward translation of modal operators into quantifiers.

Since modalities in Lewis's and von Wright's systems are properties of propositions, Prior interpreted their modal propositions as high-order propositional functions. He transformed propositional variables 'p', 'q', 'r' etc., of their modal calculi into high-order propositional functions 'δp, γp, εp', the possibility operator symbolised as 'Δ' into the existential quantifier 'Σp', and the necessity operator symbolised as 'Γ' into the universal quantifier 'Πp', and then translated the rules and axioms of Von Wright's strongest system M'' into the extended C-N-δ calculus of Łukasiewicz and Meredith. The rule '$\vdash \alpha \leftrightarrow \beta \rightarrow \vdash \Delta\alpha \leftrightarrow \Delta\beta$' became '$\vdash \alpha \leftrightarrow \beta \rightarrow \vdash \Sigma p\alpha \leftrightarrow \Sigma p\beta$'; the necessitation rule '$\vdash \alpha \rightarrow \vdash \Gamma\alpha$' became '$\vdash \alpha \rightarrow \vdash \Pi p\alpha$', the axiom '$p \rightarrow \Delta p$' became '$\delta p \rightarrow \Sigma p\delta p$' and so on.

It turns out that von Wright's 'translated' rules and axioms "are provable in the two-valued propositional C-N-δ calculus with the single axiom $C\delta pC\delta Np\delta q\,[\delta p \rightarrow (\delta{-}p \rightarrow \delta q)]$, supplemented by Łukasiewicz's rules [...] for the introduction of quantifiers," which makes the translated M'' "simply an incomplete fragment of this C-N-δ-Π calculus" (Prior 1954, p. 202 [27]). All usual axioms and rules for the two-valued calculus in 'C' and 'N' continue to hold when 'p, q, r' are systematically replaced with 'δp, γp, εp' etc. Slightly more complicated was the ex-

tension of the rule of substitution to cover introductions of Δ, but Prior made some adjustments that he justified with some derivations and rejection of certain disputed formulae. The novelty of Łukasiewicz's system was the rejection operation '$\dashv$', and he kept his modal system from collapsing by rejecting the axioms '$\dashv \Delta p \rightarrow p$' and '$\dashv \Delta\ p$'. This feature made the new modal logic a complete system. In Lewis-von Wright systems there is no way of disproving the formula '$\Delta p \rightarrow\ p$', which, according to Prior, reflects their fragmentary character relative to the complete C-N-δ-Π system. Prior called their fragmentary character incompleteness, and compared it to the incompleteness of Łukasiewicz's earlier three-valued calculus. The fact that the translation was done in a two-valued system signalled to Prior that modal logic didn't really need many-valued logic in order to be formalised.

Reviewing Łukasiewicz's new modal system, Prior complained that although it was complete, it did not allow any "intelligible interpretation" of 'Possibly'. The system was four-valued, with each functor (including the possibility operator Δ) ranging over the values S (same as p), V (always true), N (same as not-p) and F (always false). Łukasiewicz insisted that any system of modal logic must be many-valued, because there was no functor of one argument in two-valued logic that could satisfy the formulae '$\vdash\ p \rightarrow \Delta\ p$', '$\dashv \Delta\ p \rightarrow\ p$', and '$\dashv \Delta\ p$'. But Prior claimed that if 'Δ' was made into a variable functor, by restricting its possible values to S and V, both Łukasiewicz's and Lewis's systems could receive two-valued interpretations. For example, "a formula like '$\Delta(2+2=5)$' has not a third or a forth truth-value, but no truth-value at all, for it is not a proposition, but a proportional function. It only acquires a truth-value, when the variable 'Δ' has been assigned one of its two possible values, and then it would be either simply true or simply false. '$\Delta(2+2=5)$' yields a true proposition with the substitution Δ/V and a false one with the substitution Δ/S" (Prior 1954, p. 204 [27].)

The result of Prior's formal translation of Łukasiewicz's modal logic into a two-valued high-ordered calculus is that the possibility operator was interpreted as a variable functor. Prior addressed Łukasiewicz's worry that two-valued system could not preserve the modal part of a propositional logic by giving his explanation how it could be preserved. In order for a form Δp to be readable as 'possibly p', the form Δp must be deductively weaker than p itself, (which is obtained by asserting '$p \rightarrow \Delta p$' and rejecting '$\Delta p \rightarrow\ p$'), without being too weak to be tauto-

logical (obtained by rejecting 'Δp'). In case there are no formulae more elementary than δp, these conditions are met by '$\Sigma p \delta p$' or '$\delta p \vee \delta - p$', which gives the modalities regulated by Lewis and von Wright. In Ł-modal systems, δp is deductively weaker than p without being too weak by standing ambiguously for Sp (i.e. 'p' itself) and the tautological form Vp. Prior then gives an alternative axiomatisation of Łukasiewicz's systems for this interpretation.

This discussion was repeated in condensed form in Prior (1957), in the first essay, "Basic Modal Logic and Ł-Modal System", where Prior would say that "the form 'Possibly p' has many meanings but there is as it were an upper and a lower limit to what it may mean." He claimed that although Ł's operator M was introduced as a constant, it turned out to behave like a variable, standing "either for the plain 'It is the case that' or for 'If it is the case that (so-and-so) then it is" (Prior 1957, p. 4 [29].)

7 Early Prior on Logical Modalities

In early Prior's writings, 'logical' modality is associated with the vague notions of 'logical law' and 'logical form'.

Prior clearly described his understanding of logical modality in a letter to Popper from 1952: "I take modal assertions to be assertions about the *forms* of propositions, and have such definitions as

$$M\delta\hat{p} = \Sigma p \delta p,$$

meaning, 'The functor δ is Possible = There is at least one p such that δp'. If, now, you take a true assertion of possibility such as '$MN\hat{p}$' ('The negation of a proposition is a Possible propositional form' [...]), and expand it by the definition, you get ΣpNp. This exemplifies many propositional forms – it is, e.g., a proposition of the form $\Sigma p\delta p$ – but so far as I can see one of the forms which it exemplifies is itself a Necessary propositional form, i.e. one such that all propositions of that form are true" (Prior 1952c, p. 4 [23]).

Prior's view of logical modalities is presented also in Bennett (1952): "In this [article[8]], propositions about the necessity of propositions are

[8] A. Prior "On the Symbolising of Modal Functions", Mind, 1953. The article that

reduced to propositions about the truth of all propositions exemplifying a given form. On this basis it is easily shown that what is necessary is necessarily necessary. For where it would normally be said that p is necessary, Mr Prior says that all propositions exemplifying some form exemplified by p are *true*, and he is able to show that assertions of this sort all exemplify a form of which all exemplifications are true. Thus, $\sim\Diamond\sim p . \dashv . \sim\Diamond\Diamond\sim p$" (Bennett 1952, pp. 86-87 [1]). These are the same formulations that appear in "The Craft" as well as in Prior (1955). This matter was previously discussed between Prior and Bennett in their correspondence: "Your demonstration of the truth of your analogue of the view that CLpLLp [Lp $\rightarrow$ LLp] depends, of course, entirely on your reduction of modal distinctions to distinctions of quantity. If [...] an assertion of the necessity of a given proposition is an assertion of the truth of all propositions which are like the given one in a certain respect, then CLpLLp [Lp$\rightarrow$LLp] does hold and my criticisms don't affect it" (Bennett 1952b, p. 1 [2]).

In Prior (1954), the notion of 'logical law' defines the predicates 'possibly' and 'necessarily', although it itself is not characterised any further and is assumed as self-evident. Prior often resorts to Aristotelian type of self-evident reasoning principles, like 'p $\rightarrow$ p' to make modal arguments. "[T]he assertion that 'If Socrates is dead he is dead' is logically necessary is not automatically made true by the fact that its argument, 'If Socrates is dead he is dead', has the truth-value it has, namely truth; it is true, rather, because the function 'If p then p', which 'If Socrates is dead he is dead' exemplifies, is true no matter what the truth-value of p may be" (Prior 1953b, p. 324 [26].) He similarly uses the principles of identity, contradiction and the excluded middle in Prior (1955). The article *"Is*

Bennett quotes has never been published, nor its manuscript located. Beside the extensive quotes in Bennett (1952), this article is also discussed in the 1952 correspondence between Bennett and Prior, Prior and Popper, and Mackie and Prior. As one of the editors of *Australasian Journal of Philosophy*, Mackie mentions receiving Prior's manuscript on modal functions and informs him about their technical capacities for printing the logical symbolism in that manuscript. He first wrote: "I have had your letter of May 25th with the enclosed... article.... A quick glance at [it] suggests that its symbolism (with the possible exception of $\Diamond$) would be not beyond out printers, but whether it would be beyond our readers is another matter!" (Mackie 1952, p. 1 [13]). Then, a few days later, he wrote again: "We can't do $\Diamond$ (in your Modal Functions) but it didn't seem to be essential to the argument: you could just refer to the fact that Lewis uses another symbol." (Mackie 1952b, p. 2 [14]).

Necessary Existence Possible?"[9] discusses whether the self-evident logical laws can be used in ontological arguments and whether "it makes sense to distinguish between necessary and contingent being" (Prior 1955, p. 545 [28]). Prior dismissed logical necessitation as a candidate for ontology, since objective properties could not have logical form and thus be logically necessary properties.

8 Conclusion

When early Prior sketched his modal theory in "The Craft of Formal Logic", he decided that the best tool to formalise it was the logical language of Łukasiewicz. Two features of that language fitted Prior's goal perfectly: Łukasiewicz's propositional quantifiers 'Π' and 'Σ' and the use of the δ-truth-functor. Prior's theory was quantificational in nature, based on the assumption that modal operators quantify states of affairs: 'Necessarily p' was short for 'p is true in all possible states of affairs', 'possibly p' for 'p is true in some possible states of affairs' and the plain 'p' for 'p is true in the actual state of affairs'. Łukasiewicz's 'Π' and 'Σ' were good candidates for representing modal operators conceived as quantifiers, since they were designed to quantify propositions. Truth-functors seemed to suit well his view of propositions as propositional functions of states of affairs.

But Prior's general approach to modality differed significantly from that of Łukasiewicz. He disagreed with him regarding the nature of modal operators and the relevance of many-valued logic for modal contexts. Assuming that modal operators are a special kind of quantifiers, Prior insisted they were not truth-functors, as Łukasiewicz claimed. His argument against the truth-functional nature of modality is given in Prior (1953), his earliest written modal logic paper. His next paper, (Prior 1952), followed a similar line of thought, arguing against Łukasiewicz's claim that modality can only be analysed in many-valued logic. Early Prior was convinced that modality couldn't be represented solely on truth-value basis. Something other than truth-values was also needed. In Prior (1952), he used 'possible states of affairs' beside the

[9] Prior (1955) was written in mid-1953. In a letter to Prior sent in September 1953, Mackie makes extensive comments on the manuscript of this paper (Mackie 1953, [15]).

two classical truth-values in order to complete the description of modality.

After showing that modality can in fact be analysed in bivalent terms with the use of 'states of affairs' as an extra truth-parameter, in Prior (1953b) Prior reassessed Łukasiewicz's three-valued modal logic. He concluded that Łukasiewicz's three-valued system was perfectly suitable to deal with "the problem which it was originally designed for handling – the problem of 'future contingents'" (Prior 1953b, p. 322 [26]), but was not good enough basis for modal logic. The three-valuedness was a condition sine qua non for the purely truth-functional definition of modality, however, it did not produce modal meanings that matched the intuitive use of modal words. And the intuitive use was what Prior wanted to capture with his theory. Prior realised that his previous disagreement with Łukasiewicz's approach to modal logic was the result of fundamentally different understanding of modality. Łukasiewicz's 'truth-functional' modality was formally defined within a system of ordinary logic, and it was possible to keep the modal area from collapsing into the ordinary one precisely because of the three-valued semantics. The other type of modality that Prior called 'logical', was defined by 'logical laws', which were in fact Aristotelian type of self-evident reasoning principles, and was essentially dependent on the principle of bivalence.

Although in Prior (1953b), Prior distinguished between truth-functional and logical necessity, he did not say clearly what he meant by logical modality. Łukasiewicz's new modal system in Łukasiewicz (1953) was constructed as an extension of his δ-propositional calculus with two special functors, 'Δ' for 'Possibly' and 'Γ' for 'Necessarily', which satisfied certain conditions. Prior now felt he was able to formally describe both notions, which prompted him to write Prior (1954), where he compared Łukasiewicz's modal logic, representing truth-functional modality, with those of Lewis and von Wright that Prior associated with logical modality. The analysis of both systems of modal logic he did through formal translation of modal expressions into extensional.

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Polish Roots of Meredith's System of Modal Logic

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Abstract

Irish logician Carew Arthur Meredith linked his work with that of two great logicians, Jan Leopold Łukasiewicz and Arthur Prior. In order to understand his systems of logic, these connections should be taken into consideration. This paper focuses on the first of them, stressing the extent to which Meredith's system of modal logic was influenced by Łukasiewicz, who developed his system of modal logic at the same time. As well as dealing with Łukasiewicz's direct impact on Meredith, the paper also discusses his indirect one—through Łukasiewicz's introduction of Meredith to the work of his former pupil, Mordchaj Wajsberg, who suggested the first semantics for Lewis's systems of strict implication. A better understanding of the connection between the systems of these three logicians could shed light on some of the systems' troublesome features.

Keywords: Carew Arthur Meredith· Jan Leopold Łukasiewicz· Mordchaj Wajsberg· four-valued logic· Meredith's modal logic· property calculus· extended class calculus.

1 Introduction

Although Carew Arthur Meredith spent most of his academic career in Ireland, he was considerably influenced by Jan Leopold Łukasiewicz, a

member of the Lvov-Warsaw School who immigrated to Ireland after World War Two (see, e.g. Meredith 1977, 514, [21]). However, the connection between Łukasiewicz's and Meredith's systems of modal logic has yet to be given sufficient deliberation. Therefore, the first aim of this paper is to stress the links that connect Meredith's system of modal logic with that postulated by Łukasiewicz.[1] Nor was Łukasiewicz the only logician to influence Meredith's work on modal logic. Meredith also continued in the work of Mordchaj Wajsberg, Łukasiewicz's student and a Holocaust victim. Consequently, I will also discuss the extent to which Meredith's system was influenced by Wajsberg's extended class calculus, which Surma (1977, 9, [32]) considers to be the first semantics of Lewis's calculus of strict implication.

All three systems presented in this paper have certain problems. Meredith's and Wajsberg's systems are rather unknown; nevertheless, both have their place in the history of modal logic. There are also problems with the interpretation of certain features of Meredith's system, while understanding Łukasiewicz's is problematic, too. In his system, Łukasiewicz included certain non-standard features, causing some authors not to consider it a system of modal logic at all (see, e.g. Haack 1974, 89–90, [5]). Finally, despite all three systems concerning modal logic, they are all extensional.[2]

In this respect, a comparison of these three systems could be beneficial in demonstrating the interaction between them. A better understanding of this interaction could in turn help to resolve certain interpretational problems. This is particularly important in the case of Meredith's system of modal logic. In his paper published in this same is-

[1] In spite of adopting certain features of Łukasiewicz's system of modal logic, Meredith also focused on Łukasiewicz's system itself. Specifically, he suggested a shorter and more concise axiomatisation of the system, introducing as a primitive operator an operator of necessity 'H'. In this way, Meredith created a system with just three axioms (see Meredith and Prior 1962, 121, [19]):

1. $\vdash p \supset (\delta\delta Hp \supset \delta q)$
2. $\dashv p \supset HHp$
3. $\dashv Hp \supset p$

The symbol '$\dashv$' is reversed turnstile and it means that the formula which follows is not a thesis of the system. In contrast, '$\vdash$' turnstile means that the formula which follows is a thesis of the system. The symbol 'δ' stands for a functorial variable. Its meaning will be explained later.

[2] This issue is discussed in more depth in the papers by Font and Hájek (2002, 173–174, [4]) and Surma (2012, 166–167, [33]).

sue, Per Hasle (2019 [6]) argues that Meredith's contingent constant 'n' and his property calculus played an important role in Arthur N. Prior's development of hybrid logic. In addition, in 1956 Meredith and Prior postulated U-calculus, which is based on Meredith's property calculus and was one of the first systems of modal logic to combine quantification over possibilia with accessibility relation and contain evidence of possible worlds semantics (see Copeland 2002, 99–100, [1]).

2 Łukasiewicz's Four-Valued System of Logic

Jan Leopold Łukasiewicz became renowned primarily as the founder of many-valued logic. The system of three-valued logic and the system of n-valued logic, which he introduced in the early twenties of the twentieth century, made his name well known far beyond the borders of his homeland. The lesser known fact is that Łukasiewicz's investigation of systems of many-valued logic did not stop at their development. After World War Two, he (1970d, 396–397, [14]) began to be critical of the systems of many-valued logic that he had presented previously. In 1953, he announced his final system of many-valued logic (see Łukasiewicz 1970c, 391–392, [13]). It was a system of four-valued logic, and it will be referred to in this paper as Łukasiewicz's system of modal logic.

Łukasiewicz had two reasons for introducing his system of modal logic. First, he had attempted to formalise Aristotle's syllogistic and in his view none of the contemporary systems of modal logic were suited to this purpose (see Łukasiewicz 1957, v, [10]). In contrast to other contemporary systems of modal logic, the semantics of Łukasiewicz's many-valued logic is based on truth-values (see Woleński 1999, 77, [36]). Therefore, Łukasiewicz's many-valued systems of logic do not require the existence of possible worlds or time instants, and are extensional, hence truth-functional. Łukasiewicz (1998, 261, [15]) was convinced that any decent system of modal logic had to be extensional. Consequently, the main objection that Łukasiewicz (1970c, 363–364, [13]) had against contemporary systems of modal logic was that they did not accept the rule of extensionality.[3]

[3]The rule of extensionality that Łukasiewicz discussed several times appeared in Łukasiewicz's writings in different forms. When he presented his objections against Von Wright, he claimed that Von Wright's system did not fulfil the formula $(p \supset q) \supset (\delta p \supset \delta q)$. Later he also introduced the rule as $(p \leftrightarrow q) \supset (\delta p \leftrightarrow \delta q)$ (see Łukasiewicz

In discussing Łukasiewicz's views on the systems of modal logic of his contemporaries, it is important to point out that his philosophy of logic was different from when he developed his three-valued and n-valued systems of logic. When he (1970a, 173–176, [11]) dealt with his previous systems of many-valued logic in his paper *Philosophical Remarks on Many-Valued Systems*, Łukasiewicz argued that only his three-valued and n-valued logic were genuine systems of many-valued logic, and was critical of the systems of contemporaries such as Emil Leo Post and Luitzen Egbertus Jan Brouwer. Łukasiewicz was convinced at that time that there is only one true system of logic in the reality and it could be identified empirically, which one it is (see Surma 2012, 85 [33]).

However, Łukasiewicz changed his mind after World War Two when presenting his own system of modal logic. He shifted to conventionalism and pragmatism in logic and he argued that systems of logic are just instruments. According to him, we would probably never have been able to decide which of these instruments was true (see Łukasiewicz 1970c, 378–379, [13]). Surma (2012, 86–87 [33]) suggests that Łukasiewicz held in his later period a view called 'local pluralism', i.e. the view that various logical systems are true in various fields of ontology.

Secondly, Łukasiewicz (1970c, 370–371, [13]) did not consider his previous systems of logic to be sufficient for the formalisation of modal logic either. He criticised the notion of possibility that occurred in these systems: specifically, the view that possibility is an intermediate value '1/2' between the truth '1' and the falsehood '0' as postulated in three-valued logic, and that possibility has infinitely many degrees in the interval between truth and falsehood (1, 0) as postulated in n-valued logic. After World War Two, Łukasiewicz differentiated two different truth-values— '2' and '3' between truth '1' and falsehood '4'. He (1957, 159–160, [10]) described these four truth-values using the classical two truth-values, where '1' is the truth and '0' the falsehood:

1 = <1,1>

2 = <1,0>

3 = <0,1>

4 = <0,0>

1970c, 376 [13]) or $(p \leftrightarrow q) \supset (\delta p \supset \delta q)$ (see Łukasiewicz 1970b, 316 [12]). The meaning of the functorial variable 'δ' will be explained later.

Another difference from previous systems of many-valued logic lay in the relation of Łukasiewicz's modal logic to the calculus of propositions and determinism. All tautologies of the classical calculus of propositions are also tautologies of Łukasiewicz's system of modal logic (see Font and Hájek 2002, 161–162 [4]). This is not the case in previous systems: for instance, the rule of contradiction $\neg(p \wedge \neg p)$ and the rule of excluded middle $p \vee \neg p$ are not tautologies in these systems (see Malinowski 2006, 14–15, [16]).

The question then arises of whether the postulation of a four-valued system of logic meant that Łukasiewicz was no longer interested in denying determinism, as rejection of these rules was important for his denial of determinism. The answer to this question is complicated. On the one hand, Katarzyna Kijania-Placek (2002, 92, [8]) points out that the four-valued system of logic contains theses that violate indeterminism. On the other, even in his last book Łukasiewicz (1957, 207–208, [10]) was eager to reject determinism and convinced that Aristotle's concept of contingency could be used for this issue.

Łukasiewicz (1957, 166–168, [10]) suggested two versions of axioms for his system of many-valued logic. The system where a primitive modal operator is an operator of the possibility 'Δ':

1. $\vdash \delta p \supset (\delta \neg p \supset \delta q)$
2. $\vdash p \supset \Delta p$
3. $\dashv \Delta p \supset p$
4. $\dashv \Delta p$

and axioms where the primitive operator is an operator of necessity '$\Box$':

1. $\vdash \delta p \supset (\delta \neg p \supset \delta q)$
2. $\vdash \Box p \supset p$
3. $\dashv p \supset \Box p$
4. $\dashv \neg \Box p$

In this system he used turnstiles, which means that the formula is a thesis of the system; and reversed turnstiles, which implies that the

formula is not a thesis of the system (see Łukasiewicz 1970c, 352–353, 361, 370, [13]). He did so in order to deal with the issue of triviality of modal logic raised by Timothy Smiley (see Prior 1967, 77, [25]). Smiley had proved the completeness of modal logic, but his proof also demonstrated that the laws of modal logic as $\Box p \supset p$ and $p \supset \Delta p$ collapse into $p \supset p$ (see Meredith and Prior 1962, 115, [19]).

Łukasiewicz also added into the system a functorial variable 'δ', which could be replaced by a truth-value, an operator or a fragment of a logical formula transformed into a function as, e.g. $(p \vee q) \wedge$ or $\neg\, p \wedge$ (see Łukasiewicz 1970b, 313–315, [12]).[4] In addition, the system contains two modal operators 'Δ'; that is, a primitive modal operator in the axioms of the system, and '∇' which is defined as $\delta(\Delta p \supset p) \supset \delta \nabla p$ (see Łukasiewicz 1970d, 393, [14]). He (1970c, 370, [13]) described his modal operators as twins since they are indistinguishable when they are separated, but can be distinguished when they are together. Specifically, Łukasiewicz's system holds that $\dashv \Delta\Delta p$ and $\dashv \nabla\nabla p$ but $\vdash \Delta\nabla p$ and $\vdash \nabla\Delta p$. Łukasiewicz argued that the operators of possibility represent different kinds of possibility, but their interpretation was an issue with which several of his followers struggled (see Surma 2012, 159–160, [33]).

He defined implication in his system of modal logic as (see **Tab. 1.**):

Tab. 1. *The matrix for implication in Łukasiewicz's system of modal logic (see Łukasiewicz (1970c, 361, [13]))*

$\supset$	1	2	3	4
1	1	2	3	4
2	1	1	3	3
3	1	2	1	2
4	1	1	1	1

and negation and modal operators as (see **Tab. 2.**):

[4] It is important to point out that it has to be *a fragment* of a formula. 'δ' could not be replaced by a formula, as the result would not be a well-formed formula.

Tab. 2. *The matrix for negation, necessity and two possibility operators in Łukasiewicz's system of modal logic* (*see Łukasiewicz 1970d, 393,* [*14*])

	$\neg$	$\Box$	Δ	∇
1	4	2	1	1
2	3	2	1	2
3	2	4	3	1
4	1	4	3	2

The truth-values of the necessity operator reveal a unique feature of Łukasiewicz's system of modal logic (see **Tab. 2.**): namely, that the formula bound by a necessity operator could never be true. No apodictic statement is true in Łukasiewicz's system of modal logic. He (1957, 169, [10]) considered this feature one of the most important advantages of his logic. Consequently, he (1970c, 375, [13]) claimed that in his system of four-valued logic, the formula $\dashv \Box\alpha$ holds. The variable 'α' could be replaced by any formula. Therefore, the thesis $\dashv \Box\alpha$ is stronger than theses $\dashv \Delta p$ and $\dashv \neg\Box p$. The thesis $\dashv \Box\alpha$ in his system of modal logic avoids the paradoxes of modal logic formulated by Willard Van Orman Quine. For instance, Łukasiewicz (1957, 171, [10]) cited the paradox:

1. The Morning Star is necessarily identical with the Morning Star.

2. But the Evening Star is not necessarily identical with the Morning Star (being merely identical with it in fact).

3. But one and the same object cannot have contradictory properties (cannot both be A and not be A).

4. Therefore, the Morning Star and the Evening Star are different objects.

that Quine introduced (1947, 47, [28]) and Arthur N. Prior (1957a, §160, [23]) reformulated. In Łukasiewicz's system of modal logic, the paradox does not arise because premises 1. and 2. are not true (their truth-value is not '1'). They have the form $\Box(a = a)$ and $\neg\Box(a = b)$ respectively. If 'a' stands for '*Morning Star*' and 'b' for '*Evening Star*', and are

factually identical as they are both the planet Venus, the truth-value of premise 1. would be '2' and of premise 2. it would be '3'.[5]

Besides Quine's modal paradoxes, there is another reason why Łukasiewicz rejected true apodictic statements. In his (1957, 205, [10]) view, the acceptance of apodictic statements has a disastrous effect on logic, metaphysics and the philosophy of science:

> Under the influence of Plato's theory of ideas Aristotle developed a logic of universal terms and set forth views on necessity which were, in my opinion, disastrous for philosophy. Propositions which ascribe essential properties to objects are according to him not only factually, but also necessarily true. This erroneous distinction was the beginning of a long evolution which led to the division of sciences into two groups: the *a priori* sciences consisting of apodeictic theorems, such as logic and mathematics, and the *a posteriori* or empirical sciences consisting chiefly of assertoric statements based on experience. This distinction is, in my opinion, false.

Because of his rejection of true apodictic statements, Łukasiewicz also rejected the rule of necessitation: $\vdash \alpha \vDash \vdash \Box\alpha$. He (1970d, 395–396, [14]) called this rule Aristotle's law, because it appeared for the first time in Aristotle's *On Interpretation*. It means that whatever is a theorem is necessarily a theorem. This rule, which is accepted in several standard systems of modal logic, leads, according to Łukasiewicz, to similar paradoxes to those that the acceptance of true apodictic statements does. Besides, Łukasiewicz (1957, 206, [10]) considered this rule superfluous. When something is asserted it is sufficiently true, according to him. There is no need to strengthen the truthfulness of a statement by the addition of the operator '$\Box$' to create 'super-true'. As he (1970c, 377, [13]) argued:

> I think, roughly speaking, that true propositions are simply true without being necessary, and false propositions are simply false without being impossible. This certainly does not

[5] If $(a = a)$ has a truth-value '1', then $\Box(a = a)$ has a truth-value '2'; and if $(a = b)$ has a truth-value '1' and $\Box(a = b)$ has a truth-value '2', then $\neg\Box(a = b)$ has a truth-value '3'.

> hurt our logical intuitions, and may settle many controversies.

Łukasiewicz's system of modal logic is not just the least known of his many-valued systems of logic; it is also the most controversial. The features that he found important, including the extensionality of the system of modal logic, the rejection of true apodictic statements and the rejection of the rule of necessitation, made his system unacceptable to several logicians (see, e.g. Prior 1969, 35–39, [26]; Haack 1974, 89–90, [5]). Furthermore, the use of two truth-values and two modal operators for possibility made its interpretation difficult (see Font and Hájek 2002, 173 [4]). Evaluations of Łukasiewicz's system of modal logic were not favourable. As Prior (1957b, 3, [24]) argued:

> Ever since this system was put forward in 1953 logicians, including Lukasiewicz himself, have been finding new oddities in it.

and Peter Simons (2017, [31]) wrote:

> Despite a number of attempts to make sense of the system, it has generally been concluded that because of these oddities it is not really a system of modal logic.

There is, however, one system of modal logic that historians of logic have so far overlooked, which continued Łukasiewicz's system of modal logic and could bring a valuable interpretation to it—the system of his co-operator, Carew A. Meredith.

3 Wajsberg's Extended Class Calculus

Despite a certain closeness to Łukasiewicz's system of modal logic, Meredith's system of modal logic was based on C. I. Lewis's system S5 (see Meredith and Prior 1965, 99, [20]). This feature of Meredith's system of modal logic was influenced, however, by the work of logicians from the Lvov-Warsaw School, as Meredith adopted the semantics that Mordchaj Wajsberg had proposed prior to World War Two.

Mordchaj Wajsberg postulated an extended class calculus that is equivalent to Lewis's system of strict implication, and proved its completeness (see Wajsberg 1977, [34]). Historians of the Lvov-Warsaw

School consider Wajsberg's achievement to be the first proof of the semantic completeness of Lewis's calculus of strict implication (see Woleński 1989, 134, [35]; Surma 1977, 9, [32]). Łukasiewicz probably drew Meredith's attention to Wajsberg's calculus because the property calculus that Meredith postulated was very close to Wajsberg's original intentions (see Copeland 2006, 379, [2]).

Wajsberg was not the first to formalise a class calculus. He was preceded by David Hilbert and Wilhelm Ackermann (1950, 44–54, [7]) who, in their book *Grundzüge der theoretischen Logik* [Principles of Mathematical Logic], presented, among other systems, a class calculus. Hilbert and Ackermann (1950, 27, [7]) began their investigation of the calculus of propositions, postulating its axioms as:

1. $(X \vee X) \rightarrow X$
2. $X \rightarrow (X \vee Y)$
3. $(X \vee Y) \rightarrow (Y \vee X)$
4. $(X \rightarrow Y) \rightarrow [(Z \vee X) \rightarrow (Z \vee Y)]$[6]

The variables 'X', 'Y' and 'Z' are propositional variables here. Later in their book, Hilbert and Ackermann were curious as to whether similar variables could also be used in the formalisation of Aristotle's syllogistic (see Hilbert and Ackermann 1950, 44–48, [7]). The answer was yes. To do so without the use of quantifiers, they suggested an interpretation of variables 'X', 'Y' and 'Z' in which they stood for classes. In this interpretation, 'X' stands for the class of all objects belonging to the class X, $X \wedge Y$ is an intersection of classes X and Y, and $X \vee Y$ is a union of those classes. Thus, a universal affirmative statement would be formalised as $\neg X \vee Y$ and it would mean:[7] 'The union of the class of not-men and the class of mortals comprises all things' (see Hilbert and Ackermann 1950, 47, [7]). The range of variables in this calculus is indicated by the use of vertical lines. Namely $\mid X \vee Y \mid$ means 'X or Y

[6]The operator '$\rightarrow$' stands for implication (elsewhere in the paper '$\supset$' is used). The axioms are introduced in the form in which they appeared in Hilbert and Ackermann's book. However, in order to make the formulas clearer I have added round brackets.

[7]Hilbert and Ackermann originally used a different type of negation, but due to presentational difficulties I have replaced it with the negation used elsewhere in the text.

holds for all objects', while $\mid X \mid \vee \mid Y \mid$ means 'X holds for all objects or Y holds for all objects'. Similarly, '$\mid \neg X \mid$' stands for 'not-X holds for all objects', while '$\neg \mid X \mid$' stands for 'X does not hold for all objects'. In this way, Hilbert and Ackermann (1950, 47–49) were able to define all four statements of Aristotle's syllogistic:

SaP: $\mid \neg X \vee Y \mid$

SeP: $\mid \neg X \vee \neg Y \mid$

SiP: $\neg \mid \neg X \vee \neg Y \mid$

SoP: $\neg \mid \neg X \vee Y \mid$

Hilbert and Ackermann (1950, 53ff, [5]) did not present axioms for their class calculus. However, in the second edition of their book they pointed out that Wajsberg had postulated axiomatization for their class calculus, as well as an interesting extension of it.

Wajsberg (1977, 52, [34]) used the axioms that Hilbert and Ackermann had postulated for the calculus of propositions as a basis for the axioms in his paper from 1933. He also added the operators that limit a range of variables in Hilbert and Ackermann's class calculus. Wajsberg's interpretation of these operators and variables differs slightly from that presented by Hilbert and Ackermann, however. Specifically, Wajsberg introduced '$\mid X \mid$' as 'X is necessary' and '$\mid \neg X \mid$' as 'X is impossible'. Similarly, he defined a strict implication '$\Rightarrow$' as $\mid X \rightarrow Y \mid$. The axioms of his system are (see Wajsberg 1977, 52, [34]):

1. $(X \vee X) \Rightarrow X$
2. $X \Rightarrow (X \vee Y)$
3. $(X \vee Y) \Rightarrow (Y \vee X)$
4. $(X \rightarrow Y) \Rightarrow [(Z \vee Z) \rightarrow (Z \vee Y)]$
5. $(X \Rightarrow Y) \Rightarrow (\mid X \mid \Rightarrow \mid Y \mid)$
6. $\mid X \mid \Rightarrow X$
7. $\neg \mid X \mid \Rightarrow \mid \neg \mid X \mid\mid$

Wajsberg (1977, 52, [34]) claimed that this concept of strict implication was similar to Lewis's calculus of strict implication, and that '$| X |$' is Lewis's '$\Box p$'. In Wajsberg's extended class calculus, the notion of necessity is closely connected with quantification, as can be demonstrated by the change in the interpretation of '$| X |$' (see Meredith and Prior 1962, 120, [19]).

4 Meredith's System of Modal Logic

Meredith (1953, [17]) postulated his system of modal logic in 1953, in the same year that Łukasiewicz published the first paper on his system of modal logic. Nonetheless, the only paper in which Meredith introduced this system appeared considerably later, in 1965 when the introductory manuscript *Note on my Modal System* was included in Meredith and Prior's joint paper *Modal Logic with Functional Variables and a Contingent Constant* (see Meredith and Prior 1965, 105–108, [20]; Hasle 2019, [6]).

Meredith's system of modal logic contains two primitive operators '$\supset$' and '$\Box$', two primitive constants '0' and 'n', and one primitive functorial variable 'δ'. It is a system of logic of propositions, and is many-valued. Apart from the traditional truth-values—the truth '1' and the falsehood '0'—it contains the truth-value 'n' which stands for contingently true, i.e. (1,0), and '$\dot{n}$' which stands for contingently false, i.e. (0,1) (see Meredith and Prior 1965, 99–100, [20]).[8] Both truth-values that Meredith introduced into this system also play the role of constants. Consequently, they could appear in well-formed formulas of the system. As previously mentioned, 'n' is a primitive constant of the system, which means that it is contained in the axioms of the system (see Meredith and Prior 1965, 103, [20]):

1. $\Box\{\delta[(p \supset 0) \supset (q \supset r)] \supset \delta[(r \supset p) \supset (q \supset p)]\}$

2. $\Box p \supset [\delta(p \supset q) \supset \delta q]$

[8]Meredith might also have had in mind another interpretation. This appeared in *Computations and Speculations*, where 'n' is defined as a sequence of truth-values where the first value is the truth and every other value is false, namely '1, 0, 0, ..., 0'; and where '$\dot{n}$' is defined as the sequence where the first truth-value is false and every other value is the truth, namely '0, 1, 1, ..., 1' (see Meredith and Prior 1962, 119, [19]).

3. $\delta 0 \supset [\delta(0 \supset 0) \supset \delta(\Box p)]$

4. n

5. $p \supset \Box(n \supset p)$

6. $\Box n \supset p$

As with Łukasiewicz's system of modal logic, Meredith's system too is based on matrices (see **Tab. 3.**):[9]

Tab. 3. *The first published version of the smallest matrix satisfying the axioms of Meredith's system of modal logic* (*see Meredith and Prior 1965, 104* [*20*])*:*

$\supset$	1	n	ṅ	0	$\Box$
1	1	n	ṅ	0	1
n	1	1	n	n	0
ṅ	1	n	1	n	0
0	1	1	1	1	0

However, there is apparently a mistake in the third and fourth column of the second row as in Meredith's *Note on My Modal System* the correct version of the matrix appeared (see Meredith 1953 [17]). Prior (1967, 78 [25]) published the corrected version of the matrix in his book *Past, Present and Future* (see **Tab. 4.**):

[9] Apart from the smallest matrix, Meredith and Prior discussed also matrices where appeared more than four truth-values. In his letter to Prior from 10th October 1956, Meredith (1956 [18]), suggested a matrix where a contingent truth different than 'n' is represents the constant '*T*' and the constant '*F*' represents a contingent falsehood (see **Tab. 5.**): **Tab. 5.** *The alternative matrix satisfying the axioms of Meredith's system* $(\subset, \Box, 0, n, \delta, p)$ *from Meredith's* (*1956*) *letter to Prior.*

$\subset$	1	T	n	F	0
1	1	0	0	0	0
T	1	?	0	0	0
n	1	1	1	0	0
F	1	?0	0	?	0
0	1	1	1	1	1

Tab. 4. *The smallest matrix satisfying the axioms of Meredith's system* $(\supset, \Box, 0, n, \delta, p)$ *from Prior's Past, Present and Future* (*see Prior 1967, 78,* [25])

$\supset$	1	n	ṅ	0	$\Box$
1	1	n	ṅ	0	1
n	1	1	ṅ	ṅ	0
ṅ	1	n	1	n	0
0	1	1	1	1	0

Despite the fact that Meredith used 'n' and '$\dot{n}$' instead of Łukasiewicz's '2' and '3', the truth-value table for implication is similar in both systems of modal logic. And there are further similarities between the two systems: Meredith's system is also extensional, and the functorial variable 'δ' is used in it. In addition, the formula '$\Box n$' can never be true in Meredith's system of logic. As 'n' is an axiom, the rule of necessitation $\vdash \alpha \vDash \vdash \Box\alpha$ also does not hold unconditionally in Meredith's system of logic. Meredith and Prior (1962, 118, [19]) pointed out that the rule of necessitation is applicable only to those formulas that do not contain 'n'.

Finally, it has been mentioned before that Meredith's system is four-valued, and that his definition of truth-values is close to Łukasiewicz's definition. This feature could shed more light on our understanding of the truth-values of both Łukasiewicz's and Meredith's systems. For Meredith's 'n', Łukasiewicz's truth-value '2' could be interpreted as contingently true, i.e. true in this world but false in another. Similarly, Łukasiewicz's truth-value '3' could be understood as Meredith's '$\dot{n}$' or contingently false, i.e. false in this world but true in another. The involvement of possible worlds may sound inappropriate, as neither Łukasiewicz's nor Meredith's system of modal logic require possible worlds semantics. The possible postulation of worlds as intensional entities would be directly against Łukasiewicz's (1998, 261, [15]) conviction that every decent system of modal logic must be extensional. It appears that Meredith's system also fulfilled this condition (see Meredith and Prior 1965, 108, [20]).

If it is the case, then 'the world' as the meaning of 'n' cannot be a possible world as an intensional entity. It could, however be 'the world' in an interpretation suggested by Arthur N. Prior, namely 'the totality

of what is the case' (see Meredith and Prior 1965, 99, [20]). Prior described this as a conjunction of all true propositions that do not lead to paradoxes (see Meredith and Prior 1965, 100–101, [20]).[10] The contingent constant 'n' is also described alternatively as a sequence of truth-values that means true in this world and false in all other worlds (1, 0, 0, ..., 0), or everything that could be said truly (see Meredith and Prior 1962, 119–120, [19]). There is no evidence that Meredith, who rarely discussed the metaphysical implications of his systems in his papers, held precisely this same view (see Rybaříková and Hasle 2017, 49–54, [30]). Although, Prior found Meredith's 'n' troublesome, his attempt at its reformulation led to the introduction of world-propositions and consequently that of hybrid logic, as Hasle (2019 [6]) points out.

There are also essential differences between Łukasiewicz's and Meredith's systems. Meredith's matrix for '$\Box$' differs from that of Łukasiewicz. In contrast to Łukasiewicz, in Meredith's system of logic the formula '$\Box\alpha$' could be the thesis of the system. Nor did Meredith include turnstiles in his system. The threat of triviality of the modal logic is prevented in Meredith's system by the use of contingent constants. Finally, Meredith's system is based on Lewis's system S5 and the axiom of extensionality. Hence, Meredith was also interested in Wajsberg's extended class calculus, and for this reason developed a system of logic that he entitled 'property calculus' (see Meredith and Prior 1962, [19]; Prior and Meredith 1996, [27]; Copeland 2006, 379–380, [2]).

5 Meredith's Property Calculus

Meredith published just one paper on his system of modal logic. For his property calculus, the situation is even worse. Throughout his life, no paper on property calculus was printed. The only Meredith's paper that deals with property calculus appeared in print long after his death. It was discovered and published by B. Jack Copeland. Copeland (2016, 3513–3515, [3]) found Prior's and Meredith's joint paper *Interpretations of Different Modal Logics in the 'Property Calculus'* from 1956, in which

[10] Because I used Prior's own words here I used the term 'proposition', while in the rest of the text I have instead used 'statement'. The reason is that 'proposition' in Prior's definition is not the proposition as defined by Frege, e.g. the entity placed in the third realm; rather, he considered them to be logical constrictions (see Rybaříková 2016, 70–71, [29]).

property calculus was used as a semantics for systems *T*, *S4* and *S5*, in a similar manner to that of Wajsberg prior to World War Two. Meredith and Prior (1962, 120–121, [19]) also discussed property calculus in the unpublished manuscript *Computations and Speculations*, while the calculus appeared too in Prior's (1967, 42–44, [25]) *Past, Present and Future*.

Property calculus differs, however, from Wajsberg's extended class calculus. First, Meredith used notation that better suited the notation of contemporary modal logic, i.e. Wajsberg's '$| X |$', is '$\Box p$' in Meredith's property calculus. The formula '$\Box p$' means 'p is a property of every object', while '$p(a)$' stands for 'p is a property of an object a'. From the meaning of the formula, it follows that Meredith considered propositional variables in property calculus to play the role of predicates. This interpretation is, however, very close to original ideas of Hilbert, Ackermann, as well as Wajsberg (see Meredith and Prior 1962, 120–121, [19]).

From these initial ideas, Meredith created a genuine calculus by introducing two-place predicate 'U', as (see Prior 1967, 42, [25]):

$$(\Box p)a = \forall b(Uab) \supset (pb)$$

and (see Prior and Meredith 1996, 133, [27]):

$$(\diamond p)a = (\neg\Box\neg p)a = \exists b[(Uab) \wedge (pb)]$$

Prior and Meredith (1996, 133, [27]) proposed axioms of the system as:

1. $(Uab) \vee (Uab)$
2. $(Uab) \supset [(Ubc) \supset (Uac)]$
3. $(Uab) \supset [(Ucb) \supset (Uac)]$

and the relation of reflexivity that is derived from the axiom 1:

4. Uaa

symmetricity that is derived from the axiom 3 and reflexivity:

5. $(Uab) \supset (Uba)$

and transitivity, which is also axiom 2.

6. $(Uab) \supset [(Ubc) \supset (Uac)]$

It has already been mentioned that in their paper Prior and Meredith (1996, 133–134, [27]) gave their interpretation of *T*, *S4* and *S5* in property calculus. Later, Prior (1967, 42–44, [25]) introduced a more elaborate proof of this claim in which he interpreted variables '*a*', '*b*' and '*c*' as possible worlds and the predicate 'U' as the relation of accessibility. It was Peter Geach who suggested this interpretation to Prior. The interpretation apparently did not correspond to the views of Meredith, who instead described '*a*', '*b*' and '*c*' as name-variables (see Prior 1967, 42, [25]; Rybaříková and Hasle 2017, 47, 50, [30]).

Notwithstanding the above, there is a certain connection between Meredith's system of modal logic and property calculus. Meredith claimed that he developed his system of modal logic as a part of property calculus. He described implication, negation and identity as (see Meredith and Prior 1965, 102–103, [20]):

$$(p \supset q)x = (px) \supset (qx)$$

$$0x = Falsum\, x\, (e.g. \neg(x\varepsilon x))$$ [11]

$$(p = x) = \forall x[p(x)]$$

In this way, 'n' is also introduced as:

$$(nx) = a\varepsilon x$$

$$\Box(n \supset px) = pa$$

where the first formula means that ''a' is a certain constant value of 'n''. In *Computations and Speculations*, Meredith and Prior (1962, 120–121, [19]) described the relationship of the contingent constant 'n' and the variable 'a' as follows:

[11] Here, Meredith probably used the operator 'ε ' that was introduced by Polish logician Stanisław Leśniewski. It is interpreted as the Polish 'jest' or Latin 'est', and differs from the English 'is'. Prior (1955, 64, [22]) and Lejewski (1954 [9]) suggested its interpretation for English-speaking logicians as the operator of weak inclusion. Hence, the interpretation of the formula $\neg(x\varepsilon x)$ would be 'It is not the case, that the x is an x'.

> In Meredith's system with n, n is represented by the property of being identical with a selected object a, formulae which express properties of a as well as formulae which express properties of all objects being taken as theorems. This is analogous to the use of matrices in which the value n, or 'true in n only', is designated as well as the value 'true in all worlds'.

Since a contingent constant could also play the role of proposition, it appears that in property calculus it stands for a proposition that is contingently true, i.e. if it is the case that 'n', then there is an object 'a' that has this property.

6 Conclusion

To conclude, Meredith's system of modal logic was considerably influenced by the work of Jan Leopold Łukasiewicz and Mordchaj Wajsberg. Łukasiewicz's impact could explain why Meredith's system was extensional, and provides a better understanding of the notion of 'world' that appeared in Meredith's system. Wajsberg's extended class calculus, namely the idea that propositional variables could also be interpreted differently, heavily influenced Meredith's property calculus which later became U-calculus. Moreover, Meredith's system was even defined as a part of property calculus, and the origins of the contingent constant 'n' appear to be connected with property calculus. These origins could also lead to a better understanding of the contingent constant.

Unfortunately, this interpretation could not explain all unclear passages in Meredith's system of modal logic and his property calculus. While it is apparent that Meredith's interpretation of U-calculus differs from the one suggested by Prior, it is by no means obvious, how he precisely interpreted this calculus. Łukasiewicz and Wajsberg's views do not provide any clues to the interpretation of the two-place predicate 'U' and formulas derived from it. Further historical research is needed to answer this question.[12]

Łukasiewicz's system of modal logic might also have benefitted from Meredith's work, as Meredith's system provides a valuable interpreta-

[12] I am indebted to Per Hasle for stressing this issue with the interpretation of U-calculus to me.

tion of his system. Through Meredith's system of modal logic, his property calculus and Prior's work, certain ideas of Łukasiewicz penetrated mainstream modal logic. This might have pleased Łukasiewicz, even though he would hardly have appreciated the prevalence of intensional systems in current modal logic.

It is more challenging to find any benefits that Meredith's property calculus would have had for Mordchaj Wajsberg, as the introduction of possible worlds semantics made Wajsberg's result interesting only from a historical point of view. Nonetheless, Meredith's papers made Wajsberg's work more renowned. For years, Meredith's system of modal logic and his property calculus were not sufficiently discussed. It was B. Jack Copeland (2002 [1], 2006 [2]) who pointed out its importance. More recently, Hasle (2019 [6]) has also stressed its contribution to Prior's development of hybrid logic. Let us hope that with growing interest in Meredith's work, the work of Mordchaj Wajsberg will also be investigated in more depth.

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The Beginnings of Hybrid Logic: Meredith, Prior and the Contingent Constant n

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Abstract

Arthur Prior and Carew Meredith cooperated on the formulation of several systems of logic. One of the most interesting and consequential ideas to come out of their cooperation was the notion of 'world propositions'. The idea was first introduced by Meredith in 1953. From 1956 to 1965 Meredith and Prior in various connections discussed the idea, leading to a crucial paper in 1965, in which Prior decisively improved the earlier notions of world propositions. This is turn led to Prior's working out the first versions of hybrid logic in *Past, Present and Future* (1967) and *Papers on Time and Tense* (1968). Even though Arthur Prior himself did not use the term 'hybrid logic', his contribution to this discipline from 1967 and till his death in 1969 is by now well studied and documented, especially by (Blackburn 2006, [1]). However the prehistory from 1953 till 1965 has so far been largely neglected. This study fills in that gap and shows how the idea of world propositions was discussed and developed between Meredith and Prior till 1965, leading to Prior's hybridization in 1967 and later. This development is also related to some of Prior's crucial metaphysical tenets concerning time and its logic. Paradoxically, these tenets were at the same time promoted and challenged through the techniques of hybridization, as pointed out by Blackburn. However a very late note by Prior (written in Norway a few days before Prior's death) does seem to indicate that Prior upheld his metaphysics of time to the last, notwithstanding the possible doubts induced through hybridization.

Keywords: C.A. Meredith, A.N. Prior, World propositions, Instant propositions, Hybrid logic, Metaphysics of time.

1 The 'Meredith n' and the prehistory of Prior's hybrid logic

In 2006, Patrick Blackburn presented and analyzed Arthur Prior's crucial contribution to the development of Hybrid Logic, a story which had till that time been largely ignored.[1] These publications do show an early awareness of the ideas that were to lead to the modern discipline of hybrid logic, and indeed discuss these ideas in a manner still worth studying. Blackburn noted that

> Over the last few years the basic ideas of hybrid logic have become increasingly familiar to modal logicians. Nowadays most researchers in modal logic (and most researchers in the neighbouring field of description logic) know how to 'name' worlds using nominals, and are aware that this use of 'formulas as terms' can be traced back to work of Arthur Prior from the 1960s. (Blackburn 2006, [1], p. 329).

Blackburn 2006 [1] concentrates on Prior's contribution in *Past, Present and Future* (Prior 1967) as well as Prior's relevant subsequent work, especially some chapters in *Papers on Time and Tense* (Prior 2003, first published in 1968, [18]). There is, however, also an interesting prehistory not covered by (Blackburn 2006, [1]). The later publication (Blackburn and Jørgensen 2016, [2]) shows a clear awareness of this fact, but the subject is not further investigated there. It is however noted that

> Meredith's property calculus was one of the stepping stones — perhaps the major stepping stone — on the way to Prior's hybrid logic, but we are woefully short on historical detail here. (Blackburn and Jørgensen 2017, p. 3674, [2]).

[1] Blackburn however mentions that some writings by Hasle and Øhrstrøm (jointly and individually) had earlier on dealt with the *ideas* underlying Prior's hybrid logic — namely (Øhrstrøm 1988, [21]), (Hasle 1991, [6]), (Øhrstrøm and Hasle 1993, [22]) and (Øhrstrøm and Hasle 1995, [23]) (cf. Blackburn 2006, p. 349, [1]).

This paper fills in most of that historical detail, at least in so far as Meredith's crucial idea of the contingent constant n — and hence often called 'Meredith's n' — is concerned. It is in any case evident that hybrid logic was first, albeit in a very rudimentary form, anticipated by the Irish logician and mathematician C.A. Meredith (1904-1976) in 1953. In so far as this is accepted, the document (Meredith 1953, [9]) may be regarded as the foundational document of hybrid logic. At any rate, the cooperation between Meredith and Prior between 1956 and 1965 crucially contributed to Prior's ideas about world propositions and instant propositions, which are the essential prerequisite for Prior's hybridization in *Past, Present and Future* and later.

The first known contact between the two is a short letter from Meredith to Prior dated 20 August 1952 (found in box 2, *Prior's Papers*, Bodleian Library, Oxford). The letter was sent together with Meredith's paper on Łukasiewicz's $C-\delta$ calculus, a move which was suggested to Meredith by Łukasiewicz himself. However, there is no known further exchange between Meredith and Prior before the spring of 1956, when Prior went to Ireland. The trip was planned in order to meet Łukasiewicz, who however died in February 1956, while the Priors were in the process of organizing their trip to Ireland. They went nonetheless, and Prior instead met with other Irish logicians, including Meredith (cf. Copeland 2006, pp. 374-375, [4]). This in turn led to an invitation from Prior to Meredith to attend the Logic Colloquium, which Prior organized in Oxford in the summer of 1956.[2]

The first place in the exchanges between Meredith and Prior wherein we find an explicit mention of 'Meredith's n' is in a letter from Meredith to Prior, dated 10 October 1956 (Meredith's letter is found among *Prior's Papers*, Box 2, Bodleian Library, Oxford). It cannot be excluded that the idea had been discussed between them before this letter, sometime between Prior's visit to Ireland and October 1956. However in all likelihood this is the first exchange about it, and Meredith's note from 1953 could well have been sent at the same time. But in any case, the

[2]The 'Logic Colloquium' was held at Balliol College in Oxford on 14th-15th July, 1956. The programme is found in *Prior's Papers*, Box 11, The Bodleian Library. C.A. Meredith gave a presentation entitled ' Theory of Deduction in Combinatory Logic'. This colloquium was the first in what turned out to be a series of logic colloquia in the United Kingdom. It played an important part in reviving philosophical and formal logic in the United Kingdom at a time where the field had been more or less put aside by "Ordinary Language Philosophy". See also (Kenny 1970, p. 338).

importance of these inputs to Prior took quite some time to mature. In the October letter, Meredith – always a man of few words and many formulas, at least in writing — simply wrote 'n = the world', and went on to state several axioms for n, the three most characteristic ones being (with a small modification by Prior, and in modern notation)[3]:

A. n

B. $\Box n \subset p$

C. $p \subset \Box(n \subset p)$

By A, n is itself an axiom, thus asserting that such a constant expressing 'the world' unquestionably is itself the case, even though contingent. B exactly captures the contingency of n, since it says that $\Box n$ implies anything, i.e. that $\Box n$ is false (B is equivalent to asserting $\neg\Box n$). And C, Meredith noted, says that 'the world is everything that is the case'. Note that the assertion of n as an axiom requires the ordinary modal logic rule of necessitation $\vdash \alpha \rightarrow \vdash \alpha$ to be restricted, or we should have a conflict with A.[4]

Meredith presented his systems in several versions with small deviations among the axioms, depending on how he could refine (and that in his work above all meant abbreviate) axioms and proofs, but to all extents and purposes the above axioms are the same as those found in his 1953 note. We do not know of any immediate reaction from Prior to the letter or the note, but at the beginning of the sixties these ideas found their way into a joint book manuscript by Meredith and Prior entitled *Computations and Speculations* (Meredith and Prior c1962, [10]).[5] The manuscript was at one time submitted to Oxford University Press, but it was not accepted and never published in its entirety. However,

[3]The designations A, B and C are not Meredith's; they are introduced here simply for subsequent ease of reference.

[4]This was also noted by Prior in (Meredith and Prior c1962, p. 118, [10]): "An incidental consequence of n's being a theorem but $\Box n$ decidedly not one is that the 'rule of necessitation' (if α is a theorem so is $\Box\alpha$) only holds without exception for that part of Meredith's system in which n doesn't occur".

[5]For more information on this manuscript, see (Rybaříková, Z. and Hasle, P. 2017, [20])

from its contents five papers were extracted and published.[6] One of these, and a crucial one for this study, was the paper 'Modal Logic with Functorial Variables and a Contingent Constant' (Meredith and Prior 1965; submitted 1964, [11]). As part of this paper, Meredith's 1953-note was published almost exactly as written in 1953 with only one minor change (Meredith and Prior 1965, the pages 105-108, [11]).[7] It is quite evident already in 1964/1965 that Meredith's contingent constant n was a crucial inspiration to Prior's idea of world propositions as introduced in that very same paper – even if this inspiration appeared in part as a correction to a problem with Meredith's n, of which Prior had become aware. Before analyzing this issue, and presenting Prior's first idea of world propositions (or instant propositions, as Prior also called them later on), there is an intermediate stage to remark on.

In 1961, Prior paid a visit to Poland and gave several talks in that connection. One of them was 'Logic in England Today' (Prior 1962a, [12]), which was translated into Polish and published as (Prior 1962b, [13]). Prior in this talk and paper devoted quite some attention to Meredith. In the original English manuscript (Prior 1962a, [12]), we find a long passage on Meredith's n, in which Prior states:

> For all his virtuosity in [...] formal manipulations, and his training being mathematical, Meredith likes to do philosophical jobs with his logic too. He has a modal system with a contingent constant n for 'the world' in Wittgenstein's (Tractatus) sense of 'everything that is the case' — the logical product of all true propositions [...] Meredith's n [...] has such laws as $p \subset \Box(n \subset p)$ p □ □(n □ p) — any true proposition is strictly implied by n, since it is a conjunct of it. And a possible world is a proposition which, though possibly true, says so much that if any proposition be conjoined with it the

[6]There are two versions of *Computations and Speculations* among *Prior's Papers* in the Bodleian Library (Box 8). For a closer analysis and account of the manuscript, see (Rybaříková and Hasle 2017, section 6: Appendix on *Computations and Speculations*, [20]). This appendix also lists the five papers stemming from the manuscript.

[7]The change was about one short formula in (Meredith 1953, [9]), which was erroneously asserted to be valid. Prior made a note about this by hand in the copy sent to him, and this small correction is followed in (Meredith and Prior 1965, [11]). The Meredith manuscript with Prior's notes is found in *Prior's Papers*, Box 16, Bodleian Library.

> result will be either an impossibility or strictly equivalent to the original. In a metaphysical mood Meredith once remarked that 'worlds' are the only real individuals; it is certainly true that his own interests have seldom taken in the ordinary calculus of names and predicates. (Prior 1962a, pp. 9–10, [12]).

Two things must be noted about this statement. Firstly, it can be questioned whether philosophical issues really mattered much to Meredith, at least in relation to his logical work (see Rybaříková and Hasle 2017, [20]). Secondly, Meredith never himself directly described his n as a conjunction (at least in any letters and documents known to us). It is true that his associating this very special contingent constant with the *Tractatus* notion of 'the world' makes such a thought rather obvious, but it is not a formal necessity in Meredith's systems to regard the n in this way. On the other hand, this Priorean description must have occurred in discussions between the two without Meredith objecting to it. Thus in their joint work on *Computations and Speculations*, though in a passage clearly written by Prior, we find the following words:

> But the constant used by Meredith is 'the world', in the sense of Proposition 1 of Wittgenstein's *Tractatus*, i.e. 'everything that is the case'. One can think of this as a conjunction of all truths, or perhaps of all 'atomic' truths. Meredith symbolises it simply as n, and gives axioms which bring out its special character. (Meredith and Prior c1962, p. 117, [10])

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Both of these reservations take on some significance when discussing the most crucial single paper in this story — and indeed the early history of the development of hybrid logic — namely (Meredith and Prior 1965, [11]).

2 The Introduction of the Priorean Notion of World Propositions

The paper 'Modal Logic with Functorial Variables and a Contingent Constant' (Meredith and Prior 1965; submitted 1964, [11]) marks the decisive step toward Prior's hybridization in *Past, Present and Future* and later. More precisely, the paper introduces that formal notion of world propositions, which is the precondition of Prior's subsequent hybrid logic. In the opening lines we find an important explanation of the paper and its parts:

> The present [i.e. the first] section is by Prior; the two which follow it, by Meredith. Meredith's sections were originally produced in 1953 and circulated among colleagues; subsequent references to them in the literature... may be clarified if these two notes are made more widely available. (Meredith and Prior 1965, p. 99, [11])

As already observed, one of these sections (namely the last one, section 3) is identical with (Meredith 1953, [9]).

In the first section, it becomes clear that by 1964, Prior had come to see a fatal problem with Meredith's n, which he had happily endorsed earlier on. After a more general exposition and discussion of Meredith's modal system, Prior observed that

> ... it is clear that there can be no such proposition as Meredith's n. For the conjunction of all truths would have to contain as conjuncts (a) itself, (b) its own double negation, (c) every fact as to what it implies; to name only a few of the impossibilities. (Meredith and Prior 1965, p. 101)

But, Prior goes on to say, we can get something quite close to the underlying idea of Meredith's n by introducing

> a function Wp, to be read as something like "p comprehends all truths", and defined by $Wp = p \wedge \forall q(q \supset \Box(p \supset q))$.
> (Meredith and Prior 1965, p. 101, [11])

Prior notes that we then have something quite close to Meredith's axioms for n (i.e. A, B, and C above), but in a conditionalized form; we may render them like this:

i. $Wp \supset p$ (if p is a world proposition, it is true)

ii. $Wp \supset (q \supset \Box(p \supset q))$ (if p is a world propostion, and q is true, then p stricly implies q)

iii. $Wp \supset \neg\Box p$ if (p is a world proposition, it is contingent)

From here Prior proceeds to consider what he calls the 'definition of a possible world', namely

$$W(m)p \stackrel{\text{def}}{=} \diamond p \wedge \forall q[\Box(p \supset q) \vee \Box(p \supset \neg q)]$$

And finally, Prior observes that

> The concept of a set of "possible world" propositions has a tense-logical analogue in that of a set of descriptions of the total state of the world at given instants
> (Meredith and Prior 1965, p. 102, [11])

We now have in place the fundamental notions which enable Prior's hybridization in *Past, Present and Future* (and later writings), as well as the definitions which made precise one of Prior's most fundamental convictions — that instants are not entities in their own right, but rather, they are 'logical constructions':

> A world-state proposition in the tense-logical sense is simply an *index of an instant*; indeed, I would like to say that it *is* an instant, in the only sense in which 'instants' are not highly fictitious entities. To be the case *at* such-and-such an instant is simply to be the case in such-and-such a world; and that in turn is simply to be the case when such-and-such a world-proposition is the case. (Prior 1967, p. 189, [14])

It is altogether clear how Prior's steps towards hybridization and the idea of instant propositions took decisive inspiration from Meredith's ideas, but also how he significantly improved these, in fact taking the first and decisive step already in 1964/65. That raises a final question about the 1965 paper. It is an oddity about this paper that after Prior's objections in section 1, the paper without further discussion proceeds to present Meredith's system and his n, which has just been declared an impossibility. Of course, the first sentences of the paper's section 1 about making available these hitherto inaccessible notes could motivate the step of presenting them "nonetheless", but this does not seem quite enough. It would seem that Meredith did not perceive Prior's observations sufficient grounds for discarding his system. As already noted the idea of n as a *conjunction* was not necessary for Meredith's system. It was a philosophically interesting idea, but not an inherent condition of the viability of his system. And as for the concomitant philosophical issues, Meredith was apparently willing to consider them, but they were definitely not first on his agenda.

3 Prior's Hybrid Logic --- the Third Grade of Tense Logical Involvement

In *Past, Present and Future* chapter V, Prior again gave an exposition of Meredith's modal system and the n. He did not here reiterate his criticism about the 'impossibility' of Meredith's n in (Meredith and Prior 1965, [11]). He did however make this observation in the Appendix B of *Past, Present and Future*, where he further elaborated his ideas on instant propositions:

> [W]e should avoid the temptation to think of world-propositions as being singled out from others in virtue of their

> *form*, or as having a certain extensiveness of intuitive content (as asserting that so-and-so, the "so-and-so" being a conjunction whose conjuncts are or could be all facts about what is, what has been, and what will be). This conception of a world-proposition (I start with it myself) has some usefulness, but we must get away from it in the end.
>
> (Prior 1967, p. 188, [14])

In this manner, Prior concludes the development away from conceiving world propositions as conjunctions.

While it is not the aim of this paper to discuss Prior's philosophy in a broad perspective, it may be worth at this point to recapitulate Prior's metaphysics of time and its logic – that is, his three basic and interwoven philosophical tenets about time and tense logic:[8]

- Firstly, Prior believed in real human freedom (freewill), and furthermore, that room for this belief could only be found in a tensed language[9] — which must hence not be reducible into an untensed language
- Secondly, Prior believed in the primacy of the so-called *A-series* notions of past, present and future, which form the core of a tensed language, over the so-called *B-series* notions, consisting of a set instants together with an earlier-later relation by which they are ordered
- Thirdly, Prior believed that instants were not entities in their own right, but rather, that they were logical constructions out of propositions.

Keeping this in mind, an important further step in Past, Present and Future is the transition from the world predicate Wp and its various

[8] A considerable number of fine papers about Prior's philosophy exist, many of which have been written since 2000. As far as I can see the most recent encompassing one is (Hasle and Øhrstrøm 2016, [7]), which gives a good and comprehensive (though practically formula-free) overview and discussion of Prior's philosophical motivations. Another fine and authoritative source to be mentioned is (Copeland 2017/1997, [5]).

[9] Cf. Prior's letter to Kripke dated 13 October 1958 and quoted in (Hasle and Øhrstrøm 2016, p. 11, [7]). The letter is found in *Prior's Papers*, Box 4, Bodleian Library.

versions to the use of special propositional variables *a, b, c,*...to stand for worlds, respectively instants, now understood as a special kind of propositions. We could instead still "conditionalize" as we saw in i.-iii. above,[10] but the use of variables facilitates what Prior calls '*The development of the U-calculus within the theory of world states*' (this is the title of section 6 in chapter V). The U-calculus is the B-series counterpart to the A-series tense logic, and thus the "embedding" of this calculus within a tense logic enriched with instant propositions goes a long way towards Prior's philosophical objectives implied above.

In chapter V of *Past, Present and Future*, Prior reiterates the definitions of world propositions which we have already seen in (Meredith and Prior 1965, [11]), and plays around with them in various ways in a manner typical of that book (and many other Prior works) – which delightfully reflects the richness and possible variations of these ideas, but also makes it very difficult to recount without becoming absorbed in intricate details. We'll skip over these variations and just bring out the most decisive definitions and features as stated in *Tense Logic* and the *Logic of Earlier and Later* (Prior 2003/1968, pp. 117-138, [18]), Prior's fullest systematical presentation of his idea of hybridization. In that article, Prior depicted what he (with a polemical allusion to Quine)[11] called 'Four Grades of Tense Logical Involvement'. The first grade defines tenses entirely by the B-series notions of instants (as entities) and the earlier-later relation. The second grade treats tenses (tense operators) on a par with instants and the earlier-later relation.

The third grade, which will be presented in a little more detail below, lays out the hybrid logic of *Past, Present and Future* with full systematicity.[12] The fourth grade consists in defining the necessity-operator in terms of tense logical operators and adjusting the system accordingly; however this last move belongs to another discussion than the issue of

[10]Prior notes: "In this line of investigation, as in others, we can probably dispense with world-variables, if we wish, by adding to our theses conditions corresponding to the axioms ...e.g. in the calculus without world-variables we would aim to prove, instead of $(Ta \sim p \equiv \sim Tap)$, the thesis $\diamond p \wedge \forall q : (\Box(p \supset q) \vee \Box(p \supset \neg q))) \supset (Tp \sim r \equiv \sim Tpr$". (Past, Present and Future, p. 92).

[11]In the paper 'Three Grades of Modal Involvement' (Quine 1953, [19]), Quine had argued against the value of modal logic, and by implication, against what Prior was in fact doing (and putting to great usefulness) in 'The Logic of Earlier and Later'.

[12]Blackburn and Jørgensen 2016 [2] actually characterize Prior's third grade as the quintessential hybrid logic of Prior, Cf. p. 3671, and especially footnote 8.

hybridization, and we shall now list the vital elements of the third grade.

We have already seen that from the idea of the Wp function in the 1965 paper, Prior moves on to further develop the notion of an 'instant proposition', and in the 1968 article he introduces his masterpiece of hybridization as follows:

> What I shall call the third grade of tense-logical involvement consists in treating the instant-variables *a, b, c,* etc. as also representing propositions.
>
> (Prior 2003/1968, p. 124, [18])

The essential features of the system can be seen from the following few definitions, axioms and a few characteristic theorems (taken from Øhrstrøm and Hasle 1995, pp. 216-230 and p. 384, [23]; we shall here adhere to their notation). These definitions and axioms are added to ordinary minimal tense logic, i.e. the system known as Kt, and they are:

(DB) $a < b \equiv_{def} \Box(a \supset Fb)$ (*definition of the earlier-later relation*)
(DT) $T(a,p) \equiv_{def} \Box(a \supset p)$ *definition of 'truth at an instant'*)

Axioms for instant variables:

(11) $\exists\, a : a$

(12) $\sim \Box \sim a$

(13) $\Box(a \supset p) \wedge \Box(a \supset \sim p)$

Some characteristic theorems:

(DL) $\forall a : T(a,p) \equiv \Box p$

(DG) $T(a,Gp) \equiv \forall b : (a < b \supset T(b,p))$ (*with* $G = \sim F \sim$)

(DH) $T(a,Hp) \equiv \forall b : (b < a \supset T(b,p))$ (*with* $H = \sim P \sim$)

The debt to Meredith and his contingent constant n is obvious. We have already seen how his ideas were in (Meredith and Prior 1965, p. 101, [11]) developed into the two predicates Wp and $W(m)p$ (the latter was in *Past, Present and Future* called Qp):

$$Wp = p \wedge \forall q(q \supset \Box(p \supset q))$$

$$W(m)p \stackrel{\text{def}}{=} \diamond p \wedge \forall q[\Box(p \supset q) \wedge \Box(p \supset \neg q)]$$

It is obvious how these definitions, perhaps especially the latter $(W(m)p, respectivelyQp)$, are captured by the axioms I2-I3. What was once axioms about the contingent constant n is now, in a transformed manner, axioms about instant propositions. I1 mirrors the original axiom, which we here called A, simply asserting the n as an axiom, but now in a one might say more cautious form, which just asserts the existence of at least one instant proposition. DB and DT are epitomes of the power of hybridization; for one thing, they allow the free co-habitation of A-series and B-series notions within one and the same language (and that would be the essential point in the view of modern hybrid logic); and for another thing, they allow for the definition of B-series notions in terms of tense logical concepts (and that was the essential point to Prior himself, witness his philosophical motivations).

It may be added that apart from the original exposition in Prior 1968, the third grade is investigated in a perhaps more accessible form in the aforementioned (Øhrstrøm and Hasle 1995, pp. 216-230, [23]), and Prior's hybridization is excellently explained in (Blackburn 2006, [1]) with a focus on its relation to modern modal logic and hybrid logic.

4 Discussion and conclusions – hybrid Heaven, or hybrid Hell?

The path from Meredith 1953 to Prior's instant propositions as well as his third grade of tense logical involvement, that is, his hybrid logic, is obvious. We have thus added the prehistory of hybrid logic, running from 1953 till 1968, to the thorough account of its more modern history in (Blackburn 2006, [1]).[13] Blackburn focuses on the development from ca. 1967 till our time and in this connection concentrates on modern

[13]It should be mentioned that we have here passed over the closely related history of Meredith and Prior's contribution to the development of possible world semantics. The U-calculus can be seen as a calculus of the earlier-later relation, as has been done here, but in fact it can also be seen as a calculus for the accessibility relation, as brilliantly demonstrated in Copeland 2006 [4]. Making this relation clearer might enrich the account here given, but it would hardly make any change to the picture of how Meredith' n and its consequences contributed to hybrid logic.

(post Prior) modal logic which we have refrained from doing here. The present paper has however been a little anachronistic when it comes to the very term 'hybrid logic', for this was not in use in Meredith's or Prior's day. Blackburn observes that

> Prior did not speak of hybrid logic; that term only gained currency in the 1990s, long after Prior's death; the term was first used in passing in (Blackburn 1990),[14] and the publication of Blackburn and Seligman (1995)[15] was the baptismal event. Prior regarded hybrid logic as a part of tense logic, indeed it was the third grade of tense logical involvement, as he explained in his paper "Tense Logic and the Logic of Earlier and Later", which also can be found in (Prior 1968/2003).
>
> (Blackburn and Jørgensen 2016, p. 3671, [my footnote], [2])

The logic which Prior thus developed is aptly called hybrid, because it allows two originally quite different languages to be unified within one and the same language, or as Prior put it himself already in *Past, Present and Future*:

> This gives us all we need for moving freely in and out of *U* calculi from the tense-logics to which they correspond. We can also see more clearly the sense in which the B series is definable in terms of the A series but not vice versa. The tensed *p* can only enter the B-series logic as part of the form *T*(*a*,*p*) (which, however, is itself tense-logically definable); the B-series logic has no counterpart of the simple tensed *p*.
>
> (Prior 1967, p. 197, [14])[16]

This was a triumphant result for Prior. Apart from being a very powerful system of logic in its own right, these results allowed Prior all the expressive power of both kinds of languages while at the same time asserting the primacy of the tenses, i.e. the A-series logic. It also allowed a very clear conception of 'instants' as being logical constructions out of

[14] *Nominal tense logic and other sorted intensional frameworks*. PhD thesis, Centre for Cognitive Science, University of Edinburgh.

[15] Hybrid languages. *Journal of Logic, Language and Information*, 4(3), 251–272.

[16] The inconsistent use of hyphenation is in the original.

propositions. In other words, this achievement seemed to strongly bear out the crucial philosophical objectives implied earlier on. Meredith's original ideas had indeed been brought to full fruition.

However, Blackburn in a penetrating analysis of things to follow makes it clear that some doubt crept in soon afterwards. For Prior soon discovered that hybridization was not limited to tense logic, but possible and desirable when accounting for other indexicals such as *I*, *here*, *now*. These observations would lead *inter alia* to Prior's famous late notion of *Egocentric Logic* (Cf. Prior 2003/1968, pp. 223-240, [18]) as well as the work about *Worlds, Times and Selves* (Cf. Prior 2003/1968, pp. 241-256, [18], and *Prior and Fine* 1977, [16]). Blackburn investigates and charts how Prior discussed these issues in a number of papers which were, unfortunately, to prove to be among the last ones he ever wrote before his untimely death in October 1969.[17] A particularly strong expression of some emerging doubt is, Blackburn says, to be found in the paper 'Quasi-Propositions and Quasi-Individuals' (Prior 2003/1968, pp. 213-221, [18]). The doubt — or at any rate an awareness of problems — that was expressed in that paper was a preoccupation of Prior's for the period that remained of his career. Blackburn says

> As I said earlier, I know of nothing in Prior's published work that satisfactorily resolves the issues raised in "Quasi-Propositions and Quasi-Individuals". What is clear is that in his last working years he was actively struggling to reconcile his belief in the suitability of modal and hybrid formalisms for certain tasks, with the realisation that the expressivity of his strong hybrid languages undercut his attempt to capture his cherished distinction between tensed and untensed talk [i.e. A-series talk versus B-series talk].
>
> (Blackburn 2006, p. 366, [1])

I think it is beyond dispute that Blackburn has a point. His argumentation is clear and well underpinned, and involves much more detail than can be recounted here. With hybrid languages, the contention that some part of the language is derived from, or based on, some other part

[17]Written on paper from Grand Hotel Bellevue, Åndalsnes, Norway. This was the last place Prior stayed, before he arrived in Trondheim, where he died on 6th October 1969.

of it comes to seem somewhat arbitrary, not to say a mere postulate. On the other hand, if the full hybrid tense logical language does not provide an argument *per se* for Prior's philosophical tenets, that does not make it inconsistent still to hold them. One might recall Prior's struggle with Relativity Theory (cf. P*ast, Present and Future* pp. 203-205). It is beyond doubt that Relativity Theory poses a challenge to Prior's philosophy of time, but also that it does not undisputably invalidate it. In 'Some Free Thinking on Time' (Prior 1996, [17]), where Prior — as the title suggests — permitted himself a more direct and slightly less stringent statement of his thoughts, we find this remarkable passage:

> So it seems to me that there's a strong case for just digging our heels in here and saying that, relativity or no relativity, if I say I saw a certain flash before you, and you say you saw it first, one of us is just wrong — is misled it may be, by the effect of speed on his instruments — even if there is just no physical means whatever of deciding which of us it is.
>
> (Prior 1996, p. 50, [17])

While Blackburn is certainly right in observing that Prior had become aware of new challenges and struggled with them, he probably nevertheless dug in his heels here, too. At any rate, what is likely his last written statements seems to indicate this. Prior died in Trondheim on 6th October 1969 whilst on a lecture to Norway. The last place he stayed before arriving in Trondheim was in Grand Hotel Bellevue in Åndalsnes. On a sheet of hotel paper (found in *Prior's Papers*, Box 7, Bodleian Library) he made some notes, most likely for the presentation to be held in Trondheim. The opening sentence of that note says:

> What is Time? Time is a logical construction.
>
> (Prior 1969, [15])

And Prior adds:

> What looks like propositions about time are really generalised tensed propositions about other things
>
> (Prior 1969, [15])

The rest of the one-page note is devoted to this and other cherished A-series notions, including the (reality of) the passage of time:

> Time flows on
> = All events are becoming more past. But events are logical constructions too. Whatever is or has been or will be the case, will have been the case. (Prior 1969, [15]).

This is followed by some formulas to bear home the point.

However, we of course do not know whether Prior would have retained his positions in the face of the later developments of hybrid logic, or how he might himself have contributed to these developments. One can only hope with Blackburn and Jørgensen that "Hopefully further archival research will reveal more here too". (Blackburn and Jørgensen 2016, p. 3675, [2]).

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Prior to Prior

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Abstract

In this paper I revisit the debate about tense- versus tenseless theory, or A- versus B-theory. Canonically, Arthur Prior's seminal paper *Thank Goodness That's Over* is said to have triggered the switch from the old to the new B-theory. I argue that Moritz Schlick made the case for indispensable A-sentences 25 years prior to Prior. More precisely, I assert that both philosophers support the same theses: 1) A-notions are indispensable and 2) A-sentences are not in general translatable into B-sentences. While this is the case, Schlick's argument is based in a very different context than Prior's and also Schlick's reasons for holding 1) differ from Prior's. Therefor it is questionable whether Schlick's paper could have had the same influence that Prior's paper had.

Keywords: A-theory, B-theory, tensed theory of time, tenseless theory of time, indexicals, Moritz Schlick, Arthur Prior.

1 Introduction

There are three main areas of research in contemporary philosophy of time.[1] Firstly, there is the debate about the nature of time; secondly,

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[1]For a slightly opinionated introduction to philosophy of time see (Fischer, 2016b).

there is the debate about the persistence of objects through time; the third debate, which concerns this paper, goes under different names, and even what is supposed to be at stake varies, depending on the different presentations of the debate. However, there is a clear chasm, with notions like *A-theory*, *tense*, *tensers* and *indexical* on the one side and *B-theory*, *tenseless*, *detensers* and *non-indexical* on the other side.

The debate that is the topic of this paper concerns the linguistic reference to the present.[2] This reference can be encoded in different ways, via the temporal indexical 'now', or other temporal adverbs, as well as the tense or aspect of a sentence, and this is one of the reasons why there are different names for the debate. In this paper I will simply talk about *A-* and *B-notions* as an umbrella term to include all the ways in which the linguistic reference to the present moment can be encoded, and I will call the corresponding sentences *A-* and *B-sentences*.

Roughly, the story is that the so-called old B-theoreticians asserted that A-sentences can be translated into B-sentences without loss of meaning and that they should be translated, typically, to arrive at a more objective language. Then Arthur Prior and John Perry argued that A-sentences and beliefs cannot be translated into their B-theoretic counterparts, while at the same time being indispensable for our actions. This was one of the few moments at which philosophy got as close to objective progress as it may ever get. After the articles of Prior and Perry, virtually everybody accepted that A-sentences are not translatable into B-sentences. Nowadays, B-theoreticians typically follow David Hugh Mellor, who argues that, although A-sentences are not translatable, they can be made true by B-facts and B-facts only.

In this paper I will question whether Arthur Prior really was the first to argue for the non-translatability of A-sentences into their B-counterparts. Moritz Schlick asserted, allegedly in a completely different context, that a sentence containing the temporal indexical 'now' cannot be translated into the corresponding sentence with a time and date indication. If Schlick and Prior really arrived at the same conclusion, the surprising finding is that Schlick did so 25 years earlier.[3] Just how sim-

[2]The NTT included metaphysics in a way that is not adequate to talk about merely linguistic reference to the present moment any more (see (Fischer, 2016a, p. 69)), nevertheless, the debate started out as a debate about sentences.

[3]We can reasonable assume that Prior did not know about Schlick's argument. I've searched the *Nachlass of Prior* (http://nachlass.prior.aau.dk) and the *Vienna Cir-*

ilar the arguments of Schlick and Prior really are I will assess in this paper. To do so, I will first recapitulate the canonical story of the A- and B-theory as it pertains to my question. Then, I will sketch the context in which Moritz Schlick presented his argument: the protocol sentence debate. Finally, I will compare both arguments.

2 The orthodox history of tense

In this section I will present the canonical history of the A- vs. B-theory. The rationale of the old B-theoreticians is that A-notions bring with them a kind of variability that must be avoided. Take indexicals for example. According to the Stanford Encyclopaedia of Philosophy an indexical is a 'linguistic expression whose reference can shift from context to context' (Braun, 2015). Philosophers like Rudolf Carnap have claimed that the context dependence of A-notions generates a variability in the corresponding A-sentences that is at odds with an objective language, which is especially troublesome in the case of scientific language. But Carnap also thought that there is an easy fix at hand. One can get rid of the context dependence 'by means of the addition of person-, place-, and time designations' (Carnap, 1928).

Carnap's quote pretty much captures the spirit of the old B-theoreticians, who thought that all A-sentences are translatable without loss of meaning into their respective B-counterparts. For how exactly this translation was supposed to work they had different strategies. Gottlob Frege supported a date indication analysis, while Bertrand Russell opted for a token-reflexive analysis. For example, a sentence like 'It is raining now' would translate to something along the lines of 'It is raining on Friday, the 30th of November 2018' according to Frege and 'It is raining at the time point co-temporal with this utterance' following Russell.

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cle Archive (http://viennacirclefoundation.nl): in both sources neither correspondence between Prior and Schlick can be found, nor any indication that Prior knew of Schlick's work. David Jakobsen made me aware that also an argument from silence can be made to the same conclusion: Prior would have written about such an important historical precursor to tense-logic in the first chapter of *Past, Present and Future* (Prior 1967). Given how historically interested Prior was, he would have mentioned Schlick's argument there, if he knew about it. On top of that Martin Prior has told me in personal communication that he cannot recall his father, Arthur Prior, ever having mentioned Schlick.

UNTRANSLATABLE A-SENTENCES

In 1959 Arthur Prior argued in his seminal paper *Thank Goodness That's Over* (Prior, 1959) that reference to the present moment is both important for our actions and not translatable without loss of meaning into tenseless concepts and sentences. Since Prior's argument is right at the heart of my paper, let me quote at length.

> One says, e. g. "Thank goodness that's over!", and not only is this, when said, quite clear without any date appended, but it says something which it is impossible that any use of a tenseless copula with a date should convey. It certainly doesn't mean the same as, e. g. "Thank goodness the date of the conclusion of that thing is Friday, June 15, 1954", even if it be said then. (Nor, for that matter, does it mean "Thank goodness the conclusion of that thing is contemporaneous with this utterance". Why should anyone thank goodness for that?) (Prior, 1959)

Obviously, Prior directly addresses Frege's date indication analysis and Russell's token-reflexive analysis, and obviously he dismisses both. For Prior tensed sentences cannot be translated into tenseless ones without loss of meaning. Adding date and time indications creates a different sentence, one that is admittedly meaningful, but means something else. Prior asserts that tensed sentences convey a meaning that cannot be expressed by B-sentences. On top of that, but obviously related to this, Prior rejects the idea that A-sentences are somehow incomplete. We don't have to look at our watch to understand sentences like 'It's raining now'. In a nutshell, Prior opposes both main creeds of the old B-theory: A-sentences are neither in need of a date and time addition, nor can the corresponding B-sentences express the same propositions or trigger the same actions.

20 years later (in 1979) John Perry argued quite along the same lines as Prior. Perry made a more general point: indexicals (in general) convey a sort of information that cannot be encoded in non-indexical notions. Like Prior, Perry holds that A-beliefs are indispensable for our actions. Perry's case for temporal indexicals is taken from everyday academic life. A tardy professor, 'who desires to attend the department meeting on time, and believes correctly that it begins at noon, sits mo-

tionless in his office at that time. Suddenly he begins to move. What explains his action? A change in belief. He believed all along that the department meeting starts at noon; he came to believe, as he would have put it, that it starts now' (Perry, 1979). So, according to Perry, the action of the professor, the sudden standing up and rushing towards the location of the meeting, can only be explained by a belief with an A-content. The corresponding B-belief, that the meeting starts at noon, just does not get the tardy professor moving.

Prior's and Perry's arguments make a strong case for the untranslatability of A-sentences into B-sentences, so strong indeed that nowadays it has been virtually universally accepted. This is acknowledged by A- and B-theorists alike. Quentin Smith, one of the latter, accepts that 'recent defenders of the tenseless view have come to embrace the thesis that tensed sentences cannot be translated by tenseless ones without loss of meaning.' (Smith, 1994). It is fair to assert that here we have one of the few cases in philosophy in which progress has nearly incontestably been made. So, was B-theory abandoned after Prior and Perry? Surely not! B-theory is still defended today, even by the majority.

But how is it possible to accept the untranslatability of A-sentences and still be a B-theorist? The B-theorists, championed by David Hugh Mellor, have developed a novel way to deal with A-sentences that has become known as the *New Tenseless Theory of Time* — NTT. I will elaborate on this in the next subsection, but basically the idea of the NTT is that A-sentences are made true by B-facts, and B-facts only.

HOW TO BE A B-THEORETICIAN NOWADAYS

The NTT was chiefly devised by David Hugh Mellor in his seminal books Real Time (Mellor, 1981) and Real Time II (Mellor, 1998). There is an important difference between Mellor's account in Real Time and his account in Real Time II that we will address in what follows, but both agree on the general point that A-sentences are made true by B-facts. This is a remarkable twist in the debate between the two camps. The old B-theory was firmly rooted in considerations about language. It was concerned with whether certain sentences are equivalent or not. By accepting the untranslatability and, as a reaction to Prior and Perry, including B-facts into the discussion the new B-theories essentially include ontology. This is not meant as a criticism of the NTT, but merely

as an indication of the commitments one must make to be a Mellor'ian B-theorist.[4]

The novel idea of the new B-theory is to distinguish strictly between language and ontology. By keeping these two levels apart, the new B-theorists can accept the untranslatability of A-sentences on the language level and at the same time maintain that reality does not have an A-structure. The new B-theorists insist that acknowledging A-sentences does not necessitate the acceptance of A-facts. Even when we accept A-sentences, we can still wonder: is 'reality itself somehow tensed [...] or is it merely that we describe a tenseless [...] reality from a tensed [...] point of view? (Fine, 2006, p. 261).

Now, it is not enough to assert that for every token of an A-sentence there is a corresponding B-fact that makes the sentence true (if true). There must also be a constant meaning through all the tokens. I don't have to look at my watch to understand a sentence like 'It is raining now'. Mellor's first idea was that A-sentences mean a function from utterances (tokens) to truth conditions. With this ingenious move it is possible to combine the desired variability in the truth values and truth makers with the desired stability in meaning. The A-sentence in question has different truth conditions from utterance to utterance, and thus can both have different truth values and be made true by different facts. In this way, it is possible for B-theorists to accommodate that sentences like 'It is raining now' need not be true all the time and at the same time to explain how such A-sentences are made true by B-facts.[5] There is a B-fact for every time that such a sentence is truthfully uttered; it will be different B-facts in each instance, but nothing aside from B-facts is needed. Mellor resourcefully exploited the fact that a function can have a varying co-domain. Hence, an A-sentence can have both a constant meaning (the function) and varying truth values and truth makers.

Challenging Mellor's view, William Lane Craig has argued that the NTT as a token-token-reflexive theory falls prey to the same problems as the token-reflexive versions of the old B-theory. He uses his famous

[4]Note that this commitment might not have been tenable for someone like Carnap, who shunned metaphysics throughout his career, and even had an explicitly purely syntactical period. See (Fischer, 2016a).

[5]This is obviously only half of what the new B-theorist must maintain, and indeed Mellor not only argued that A-sentences can be made true by B-facts, but also that they cannot be made true by A-facts. His argument for the latter, however, goes beyond the scope of this paper.

example of 'There are no tokens' (Craig, 1996, p. 18) to show that the NTT cannot give a coherent account of the truth conditions of tensed sentences.[6] In response to this, Mellor has adjusted his theory. In Real Time II he maintains that A-sentences mean a function from time points to truth conditions. This analysis keeps the nice features of the account he has put forward in Real Time, while at the same time it can account for the meaning of A-sentences if there is no relevant utterance.

This must suffice as a recapitulation of the orthodox history of the A- versus B-theory of time.[7] The observation most important for this paper is that Prior's argument had a huge impact on the debate. The translatability of A-sentences was given up for good, and, though this did not settle the debate, it shaped the future of the debate. Now the perhaps surprising thing is that someone had already argued for the untranslatability of A-sentences into B-sentences a quarter of a century earlier: Moritz Schlick (Schlick, 1934). Granted, he did so in a different context, the Vienna Circle's protocol sentence debate. I will sketch this context in the next section, in order properly to asses Schlick's argument, and then compare it to Prior's argument.

3 'Here now blue' - Schlick'ian confirmations

This section is concerned with a part of the history of philosophy that is not normally mentioned in philosophy of time. The first subsection covers a topic that is not philosophy of time at all. The protocol sentences debate is usually part of (the history of) the philosophy of science. Nor does the next part, which is as clearly relevant to the debate between A- and B-theory as Prior and Perry's famous papers, belong to the canon in philosophy of time. If it can be established that Schlick already made the case for the untranslatability of A-sentences, this may have to change. But let us take one step at a time and first sketch the context in which Schlick wrote his brilliant paper *Über das Fundament der Erkenntnis* .

[6]The development of the NTT can be nicely observed in (Oaklander & Smith, 1994).

[7]Of course, the debate didn't stop there. A good staring point for an panoptic overview of the arguments for and against the A- and B-theory are William Lane Craig's books (Craig, 2000a) and (Craig, 2000b).

PROTOCOL SENTENCES

In their quest to put science on a strong foundation, the Vienna Circle searched for the elements on which ultimately all scientific knowledge could be based.[8] These basic elements are supposed to be sentences which are infallible and thus can be the touchstone for all further hypotheses. They have been coined *protocol sentences* quite literally in reminiscence of the test records that scientists write.

As logical positivists, the members of the Vienna Circle are firmly rooted in the empiricists' tradition. They maintain that all (meaningful) sentences are either tautologies or Realsätze (real sentences). Real sentences, then, are further classified as protocol sentences and non-protocol sentences. The special feature of protocol sentences is that they are synthetic sentences which are not hypotheses (Schlick, 2009)[p. 514] – at least in theory.

The philosophers of the Vienna Circle were quite divided about how such protocol sentences ought to look, or whether they have a specific form at all. But, just to give you an idea, Otto Neurath presents in his paper *Protokollsätze* (Neurath, 1932), after which the debate is named, the following example:

Ottos Protokoll um 3 Uhr 17 Minuten: [Ottos Sprechdenken war um 3 Uhr 16 Minuten: (Im Zimmer war um 3 Uhr 15 Minuten ein von Otto wahrgenommener Tisch)]

Otto's record at 3:17: [Otto's speech-thought at 3:16 was: (In the room, at 3:15 was a table that was perceived by Otto)]

Protocol sentences have a quite peculiar form with two nested sets of brackets which each contain well-formed sentences that are not protocol sentences themselves, according to Neurath. In contrast to this, Carnap (Carnap, 1932), in accordance with his general philosophical convictions, denied that there is any specific form in which protocol sentences must be presented. It is even a matter of mere convention whether they are regarded as part of the scientific language itself or not.

[8] As this paper is not primarily concerned with the Vienna Circle, the following sketch of the protocol sentence debate and the context in which it arose will be quite superficial. The interested (and German-speaking) reader is referred to the excellent (Stöltzner & Uebel, 2009).

Without getting entangled in the gory details of the specific way to state a protocol sentence properly, Schlick reacts on a much more general level, regarding protocol sentences as the rock on which (scientific) knowledge is to be built. This requires them to have two features at the same time. They need to be firm ground for further knowledge, i. e. eternal, intersubjective, objective etc.; and they need to be immediately given, not hypotheses themselves. Tautologies are out of the question, as they contain no factual content, so protocol sentences must be real sentences. Yet, according to Schlick, at this point a dilemma arises: The available sentences are insufficient, and the sufficient sentences are unavailable. What he asserts in this context might seem oddly familiar:

> If I make the confirmation 'Here now blue' this is not the same as the protocol statement 'M. S. perceived blue on the n-th of April 1934 at such and such a time and such and such a place.' The latter statement is a hypothesis and as such always characterised by uncertainty. The latter statement is equivalent to 'M. S. made [...] (here time and place are to be given) the confirmation "here now blue." ' And that this assertion is not identical with the confirmation occurring in it is clear. (Schlick, 1966)

Schlick wholeheartedly accepts the untranslatability of A-sentences; for him it is obvious that an A-sentence and the corresponding B-sentence are not identical. It is worthwhile to note the way Schlick argues for this. According to him, the B-sentences (B1) 'M. S. perceived blue on the n-th of April 1934 at such and such a time and such and such a place.' is (obviously) equivalent to (B2) 'M. S. made [...] (here time and place are to be given) the confirmation "here now blue." '. Now, following Schlick, the form (B2) reveals that this B-sentence is not equivalent to (A1) 'Here now blue'. (B2) contains (A1) and further semantically relevant parts, and therefore they cannot be equivalent, from which it follows that (A1) and (B1) are not equivalent if the equivalence of (B1) and (B2) is accepted.

Schlick's argument hit home, and the quest for an immutable basis for scientific knowledge was abandoned by the Vienna Circle. The historical situation may have (unfortunately) prevented the influence of Schlick's position on the matter. Yet, the systematic resemblance of the two arguments is striking. Schlick literally asserts that the indexicals

'here' and 'now' are not replaceable by date and time indications. In the next section I will take a closer look at what Schlick and Prior actually assert in comparison to each other.

COMPARISON BETWEEN PRIOR'S AND SCHLICK'S ARGUMENTS

Let us begin the comparison of Schlick's and Prior's arguments by taking a closer look at Prior's paper. He concedes that 'half the time I personally have forgotten what the date is and must look it up or ask somebody when I need it for writing cheques, etc.; yet, even in this perpetual dateless haze one somehow communicates, one makes oneself understood, and with time-reference too.' (Prior, 1959, p. 17). In a brilliantly casual style Prior conveys a profound philosophical insight in this quote, namely, that A-sentences are not incomplete sentences that need B-theoretic time and date amendments. I have succinctly summed this up in the point that I need not look at my watch to understand the sentence 'It is raining now'. For Prior, A-sentences contain a special kind of information that cannot be expressed in a B-sentence and this is important for our actions. A-notions are indispensable, according to Prior, because only A-beliefs can trigger the relief after e. g. a stressful dentist appointment; only they make us say 'thank goodness, that's over!'.

Let's take a look at the essential Prior-quote again: 'One says, e. g. "Thank goodness that's over!", and not only is this, when said, quite clear without any date appended, but it says something which it is impossible that any use of a tenseless copula with a date should convey. It certainly doesn't mean the same as, e.g. "Thank goodness the date of the conclusion of that thing is Friday, June I5, I954", even if it be said then.' This quote captures Prior's pivotal theses: 1) A-notions are indispensable and 2) A-sentences are not in general translatable into B-sentences without loss of meaning.

Schlick agrees with this: For him, A-sentences are not translatable into B-sentences without loss of meaning. He only says this explicitly for confirmations, though. This is why, strictly speaking, we have to include "in general" to 2). However, I think, his argumentation is indicative. Schlick states that confirmations cannot 'be replaced by an indication of time and place, for as soon as one attempts to do this, the result, as we have seen, is that one unavoidably substitutes for the observation statement a protocol statement, which as such has a wholly

different nature.' (Schlick, 1966, p. 225). This "wholly different nature" depends on the indexicals used within the confirmations, according to Schlick. The meaning of indexicals cannot be captured by definitions as they crucially really on their context. But in contrast to Carnap, Schlick does not think that therefor we have to get rid of indexicals. Quite the contrary! For Schlick indexicals are indispensable. Confirmations, essentially including indexicals, are the only synthetic sentences, which are not hypotheses (Schlick, 1966, p. 226) and, thus, all knowledge (in the sense of *Erkenntnis*) depends on them (Schlick, 1966, p. 227). As we have seen, this happens not in the way that protocol sentences have been envisaged to work. Schlick's account of the role of confirmations in hypotheses-confirmation is so poetic that I feel compelled to quote it in German: Confirmations 'liegen keineswegs am Grunde der Wissenschaft, sondern die Erkenntnis züngelt gleichsam zu ihnen auf, jeden nur in einem Augenblick erreichend und sogleich verzehrend' (Schlick, 1934, p. 99). According to Schlick confirmations are not suitable to play the role as the foundation of science that the Vienna Circle had intended for protocol sentences. Nevertheless, they play a role in knowledge acquisition. In Schlick's words, knowledge flickers like a flame up towards them, and then there is a brief moment when they nourish the flame of knowledge, but, in doing so, they are themselves burned up.

Summing up we can establish that Prior and Schlick agree that 1) A-notions are indispensable and 2) A-sentences are not in general translatable into B-sentences. In contrast to Prior, however, Schlick goes one step further: 'A genuine confirmation cannot be written down, for, as soon as I inscribe the demonstratives "here", "now", they lose their meaning'. This statement might seem unreasonable, but it actually fits well into Schlick's way of conceiving the situation. A-sentences essentially refer to the moment in which they have been uttered. By writing down an A-sentence, one produces an artefact, e. g. a sentence in chalk on a blackboard. This artefact persists longer than the moment to which the expressed A-sentence essentially refers. Hence, the A-sentence quite literally loses its intended meaning when written down.

4 Conclusion

In this paper, I have argued that Moritz Schlick made the case for the indispensability of A-sentences 25 year prior to Arthur Prior. Both philoso-

phers agree on the main points: 1) A-notions are indispensable and 2) A-sentences are not in general translatable into B-sentences. However, Schlick's argument is based in a very different context than Prior's and therefor it is questionable whether it could have had the same influence on the debate about A- and B-theory that Prior's paper had.

Please note that I have not argued for the A-theory of time in this paper, although I do support a version of the A-theory. I have merely presented Prior's and Schlick's arguments in favour of the A-theory. Accordingly, I have not subscribed to the arguments of Prior and Schlick. This paper merely compares the two lines of argumentation, without assessing their persuasiveness in the debate between A- and B-theory.

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Letters between Mary and Arthur Prior in 1954: Topics on Metaphysics and Time

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Abstract

This paper will introduce and discuss correspondence between Mary and Arthur Prior and between Arthur Prior and J.J.C Smart from 1954 on the five topics: freedom, abstract entities, modal logic, religion and theology and finally the logic of time. It is claimed that the logic of time was formulated in the context of reflections on the first four of these.

Keywords: Mary Prior, Arthur Prior, J.J.C. Smart, Freedom, Abstract entities, Platonism, Modal Logic, Religion and Theology, The Logic of Time, Tense-logic.

1 Introduction

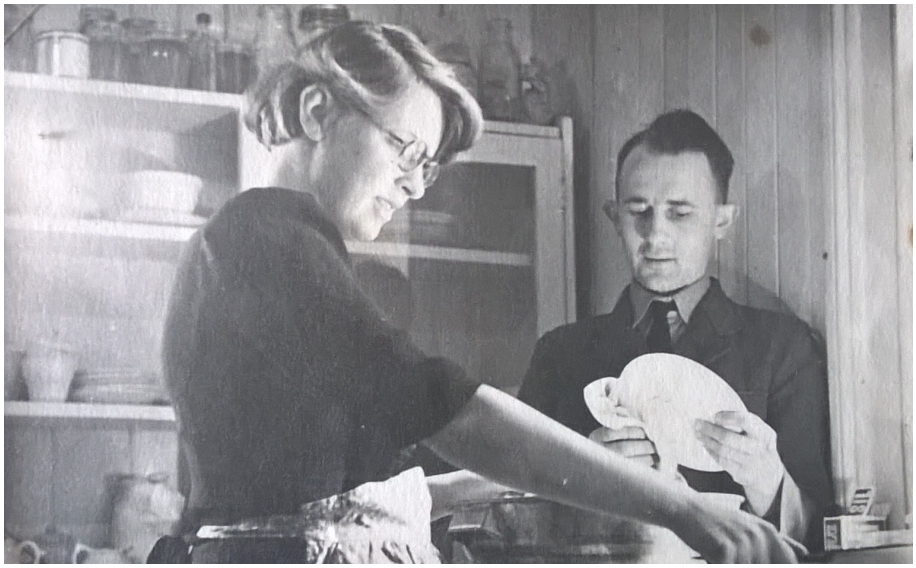
In 1954, on the 27th August, Arthur Norman Prior presented his idea of tense-logic for the first time at the Second Philosophical Congress, held at Victoria University Wellington, New Zealand.[1] The letters between Prior and his wife Mary and between Prior and his fellow philosopher and friend J.J.C "Jack" Smart provide a window into the time leading up to the tense-logic talk. Prior and Mary were not only a married couple exchanging letters of love when away from each other. They were also two philosophers whose relationship was characterized by their shared interest in philosophy. Mary had finished her MA in philosophy in 1950, and in 1954 Arthur was now Professor of Philosophy at Canterbury University College, Christchurch. Naturally, their letters frequently turned to philosophical topics. In the following we will discuss the topics that were brought up in the letters and suggest that they contribute to Arthur's final presentation of tense-logic on the 27th August in Wellington.

In August 1954 Mary was still in the Sanatorium in Christchurch recovering from tuberculosis and preparing to return home to Arthur, Martin and Ann. The letters between Arthur and Mary have recently been made available to researchers and it is one of the most remarkable collections of this kind in modern analytic philosophy as it provides a behind-the-scene view of Arthur Prior's philosophical writings in the 1950s.[2] Mary and Arthur were both able writers and since they were separated from each other in extended periods, as in 1954, or during Arthur's travels, we are in the fortunate situation of having many letters between them. The importance of the correspondence between Arthur and Jack Smart with regard to tense-logic has been described elsewhere ([1] Jakobsen 2017), but its importance is highlighted by the letters between Arthur and Mary as well. The letters make it possible to track Arthur's final decision a few weeks before 27th August to make tense-logic the topic of his Presidential Address for the Philosophical Congress. The correspondence with Smart played an important role in this decision. Indeed, it turns out that at the end of July 1954, Arthur

[1] New Zealand section of the Australasian Association of Psychology and Philosophy, Second Philosophical Congress, Wellington 27th – 30th August 1954.

[2] The collection of letters between Arthur and Mary after 1945 is now kept at Aalborg University and labelled as the Martin Prior Collection (A-F folders).

was still planning to use another of the topics discussed between him and Jack Smart for his presidential address.



An early photo of Mary and Arthur Prior believed to have been taken in 1944, probably at the home of Jonathan Bennett's parents.

2 An overview of the correspondence

We have included 9 letters ranged chronologically from 15th June to 27th August, as well as the programme of the event in Wellington. The period is chosen because of the topics discussed in them as they serve to stress this important period in Prior's life. We have included the only known letter from Prior to Smart in 1954. We have chosen to exclude some letters from Mary to Arthur, as they do not contain philosophically relevant material, and likewise we have for the same reasons excluded 26 letters written by Jack Smart to Arthur Prior that year, but relevant sections are quoted. The full letters from Smart can be found in Box 3 at the Bodleian Library, Oxford, in the Prior Collection.

Table 1. The list of letters included or discussed. The content of these letters is also briefly sketched. The letters from Smart to Prior are part

of the Prior Archive at the Bodleian Library, and have not been included here due to potential copyright restrictions. Also included, but not listed here, is the program of the Second Philosophical Congress.

Heading	Date	Author	Content
5.1	15th June, 1954	Arthur to Mary	Political and religious questions from the Presbytery Public Questions Committee
5.2	1st July, 1954	Arthur to Mary	Encloses letter to Smart written the day before (5.3)
5.3	30th June, 1954	Arthur to Smart	Abstract entities and Quine's *New Foundation for Mathematical logic*
5.4	8th July, 1954	Arthur to Mary	Deals with political questions related to freedom in preparation for speech
	20th July, 1954	Jack to Arthur	Concerns the topic of abstract entities in reply to Arthur's 30th June letter
5.5	29th July, 1954	Arthur to Mary	Discusses major points in Smart's 20th July letter
	30th July, 1954	Jack to Arthur	On tense-logic, determinism and Diodorus
5.6	9th August, 1954	Arthur to Mary	On modal logic, the ontological argument, Diodorus, and attitudes to time in medieval logic and theology
	9th August, 1954	Jack to Arthur	An extensive argument against Arthur's tense-logic.

5.7	13th August, 1954	Mary to Arthur	Abstract entities and time
5.8	17th August, 1954	Mary to Arthur	Necessary existence and the ontological argument
5.9	27th August, 1954	Arthur to Mary	Report from the first day of the philosophical congress

3 Topics on Metaphysics and Time

The letters touch upon five main topics:

A. Freedom (political and philosophical point of view)

B. Abstract entities

C. Modal logic including the ontological proof for the existence of God

D. Religion and theology

E. The logic of time

We shall focus on each of these in turn.

A. FREEDOM

In the letter to Mary of the 8th July [5.4], Arthur writes about a talk he is planning to give on "the philosophical basis of freedom". He doesn't like the title, but emphasizes that freedom should be treasured not because of some philosophical basis, but for its own sake. He also points out that "a philosopher can properly urge people to be consistent about their basic belief". In the letter his main emphasis is on political freedom, i.e. freedom from oppression, and this involved a duty to act and live in coherence with the basic freedom. He says:

> if we have a duty to defend the free world, then we have a prior duty to <u>be</u> the free world.
>
> ([2] Arthur to Mary 8th July, 1954)

There is an explicit mention of pacifism in 5.4. Until 1942 Prior had been a pacifist, but then changed and joined the Royal New Zealand Air Force. And his comment to Mary makes it clear that in his mind the notion of political freedom is somehow also related to personal and existential freedom.

This relation becomes obvious in Smart's letter, 30th July 1954. In this letter, the first paragraph deals with political freedom, whereas the paragraph following deals with Diodorus and determinism, i.e. the logical analysis of existential freedom. Mary also mentions Diodorus in her letter to Arthur on the 20th August 1954. Determinism and free choice, were clearly important themes to Mary and Arthur's religious views. At that time, they were members of the Presbyterian Church and obviously aware of the tension between Calvinism and the notion of free choice. Obviously, the religious vocabulary also gives rise to a number of reflections on abstract entities and time in general.

B. Abstract entities

Arthur Prior's work in the 1950s on abstract entities shows that his position on this topic differed from the Wittgenstein-inspired nominalism in which abstract entities such as classes, propositions and sets are meaningless. Prior, on the other hand, writes to Smart [5.3]:

> Nothing is meaningless, in short (leaving out cases in which a word like 'pob' is just used without any meaning being assigned to it), except what is ungrammatical in a simple schoolboy sense, and certain 'statements' which themselves purport implicitly or explicitly to be about meaning' (like the heterological stuff and the Liar).
>
> ([3] Prior to Smart, 30th June 1954)

Indeed, according to Prior, it was "a safe principle of philosophical methodology, that if Wittgenstein says that a thing is meaningless, it is a necessary truth" ([4] Prior 2014). For Prior, propositions about such entities were either true or false and not meaningless. In his criticism of this position he had found inspiration from Quine's *New Foundation for Mathematical Logic* [5]. While inspired by Quine however, he disagreed with him on the view that we are ontologically committed to all the entities we quantify over. Prior was much involved with this topic in his

discussion with Smart, and also enclosed a copy of his letter to Smart in his letter to Mary on the 1st July. [6] Smart's reply came back on the 20th July. It turns out, that Smart, like Prior, disagreed with Quine on ontological commitment as a consequence of quantifying. Smart writes:

> I can't myself see that quantifying over predicate variables entails Platonism. Quine's arguments on this score are of a general philosophical kind and are weak.
>
> ([7] Smart to Prior, 20th July, 1954)

In Arthur's letter to Mary on the 29th July, he seems to have decided that he should present his thoughts on Platonism and abstract entities at the philosophical congress.

> I'll definitely devote the larger part of my Wellington thing to a discussion of whether the question of Platonism v. nominalism is purely a verbal question.
>
> ([8] Arthur to Mary 29th July 1954)

He didn't do so.[3]

Prior's view on abstract entities are however relevant for the discussion of tense-logic. According to Prior, we are not ontologically committed to the temporal entities (dates, instants, moments etc.) over which we quantify in the so-called l-calculus (the logic of earlier and later). Prior's point is that, although the temporal entities do not exist in a strictly ontological manner, they can be seen as logical constructions over which we can quantify. He says:

> the l-calculus should be exhibited as a logical construction out of the PF calculus rather than vice versa.
>
> ([9] Prior 1958, p. 116)

This position is still one of the main differences between the proponents of tense-logic, i.e. the A-theory, and the defenders of the priority of the earlier-later calculus, i.e. the B-theory.

[3]Editors' note: Prior is probably referring to the conference that took place in Wellington 27th-30th August, 1954. However, at this conference his main contribution was his paper "The Logic of Time-Distinctions".

C. Modal logic including the ontological proof for the existence of God

In 1955 Arthur Prior published *Is Necessary Existence Possible?* [10] From Smart's letters we can see that already he had begun his work on necessary existence and the ontological argument in November 1953. On Smart's recommendation, Arthur sent a paper on necessary existence to the journal *Analysis*. Though he disagreed with Arthur, he nonetheless stated:

> Your defence of the ontological argument is immune to my criticism. ... I must say it is difficult to find a knock down proof of the contradiction of your thesis. You ought to send it to some journal and see if the big brains can find a hole in your reasoning! ([11] Smart to Prior, 23th November 1953)

Arthur followed Smart's recommendation and sent it to *Analysis.* From Smart's letter in February 1954 we can see that the article was rejected and Smart takes a swipe at MacDonald, a logician and co-founder of the journal Analysis. He writes:

> The exchange with M. Macdonald[4] shows her up as what I thought – somewhat narrow minded, which an editor shouldn't be. She has an anti-metaphysical bias in the wrong sort of way. Your note on the ontological argument[5] [sic] is a piece of analysis. And a much more interesting piece of analysis than the dull, and often quite mistaken, stuff so frequently published in Analysis.
> ([12] Smart to Prior, 3rd February 1954)

On Monday 9th August 1954, Arthur Prior was attending a university workshop at Otago University, Dunedin. At this event he gave a talk on the history of logic which he sketched in a letter to Mary. One of the things he considered in his talk was modal logic, which has been "neglected after the end of the Middle Ages until very recently". Furthermore, he considered Leibniz' modification of the ontological proof and

[4] Margaret Macdonald (1907-1956). Macdonald had been one of Wittgenstein's students at Cambridge. (We are grateful to the anonymous reviewer for pointing this out).

[5] Smart abbreviates ontological argument as ont. argt.

the related thesis of modal logic *CMNMpNMp* which in fact turns out to be equivalent with the thesis *CMLpLp*. This means for instance that if it is possible that God's existence is necessary, then God's existence is necessary. (Arthur Prior to Mary, 9th August 1954 [5.6]) Arthur appears to expect that Mary understands the importance of the distinct modal thesis necessary for the ontological argument. From her subsequent response, it is clear that she supported Arthur's work on the ontological argument. She writes [5.8]:

> I've been thinking about your necessary existence thing and drawing morals from it. It seems to me to be a paradigm of philosophical argument. I mean the argument against has a philosophical rigour which objections like "what Q. could that answer?" just haven't. It would be rash to claim that to any philosopher it is clear that the argument is no good because there are people who'll object to logic itself! But its clear that to most philosophers of whatever school and its good to see a philosopher dealing w. an argument as an argument, and not simply brushing {2} it up in order to secure his own particular "school" against another. To be interested in "what is" instead of "what ism," wh. is the curse. And that is what logical formulation can do so well – get philosophy into a common language and clear from the language of the cliques. The best philosophy has always had that rigour e.g. Moore[']s Nat. Fall.[6] Stuff and the ontological argument itself. It was to the strength of Berkeley – or so it appears to me to be, a rigour which gave no quarter.[7] So much "philosophical" argument consists of changing the subject instead of arguing it out and I think Berkeley and Hume did try to argue out specific problems.
>
> ([13] Mary to Arthur 17th August 1954 [5.8])

Arthur definitely agreed with Mary that the ontological argument was a paradigm of a philosophical argument and he was very interested in the various systems of modal logic applied in the analysis of the argument. Among other things he discussed, in *Formal Logic* (1955)[14],

[6] Editors' note: This is a reference to G.E. Moore's Natural Fallacy. A.N. Prior addressed problems regarding this idea in *Logic and the basis of Ethics* (1949).

[7] Editors' note: A military term which means to give no clemency.

an S5 modal version of the argument ([15] Jakobsen & Øhrstrøm 2017). It turns out that modal logic provides a nice syntax for reasoning in a number of contexts, including temporal reasoning as shown in his talk in Wellington on the 27th August 1954.

D. Religion and theology

In 1954 Prior was an elder at St. Martin's, one of the Presbyterian Churches in Christchurch. From a letter to Mary, 15th June 1954, he was invited to take part as a co-opted member of the Public Questions' Committee. The Committee has a long record going back to 1917 when it was established in order to draft resolutions on social questions for the General Assembly. The question raised at the meeting had to do with war, peace and the hydrogen bomb.[8] In 1954 this scary bomb had been tested at the Bikini Islands. The question for the Presbyterian Committee had to do with the possible response, if any, of the Church. The chairman of the committee suggested that the Church could actually make a difference in this matter, and indeed "had the one solution in its hand". At least four of those present objected, each on their own grounds. On theological grounds the Presbyterian minister to the Dutch Reformed Church, Willem van Wyngen argued against the position. He did so referring to eschatological perspectives. The view seems to be that the final future of this world would occur according to a divine master plan, which is certainly not in the hands of any human being. On a fatalistic ground, the pacifist Alan Brash suggested that even if the whole community became communist, God could be trusted to preserve his kingdom. Arthur found that suggestion silly, and argued that we could similarly say that "even if we were all blown up, God could be trusted." Again, the idea seems to be that a divine master plan will unfold independently of any human intervention. On ethical grounds, Graham Miller objected that it would be dishonest to say that the church has the solution in its hands, because the truth is that "we don't know where we are." Finally,

[8]The General Assembly had earlier recommended the following as a consequence of the hydrogen bomb: "In view of the dreadful destructive power which the recent experiments in nuclear explosions have revealed, the Presbytery urges the government to support, as a matter of greatest urgency, and by all means available to it, the efforts now being made to establish international control over the production of atomic weapon." (Private correspondence with assistant archivist Andrew Smith, The Presbyterian Archives, New Zealand)

Arthur mentioned that the Chairman's suggestion was "taking God's name in vain", and would merely be pious nonsense. This causes him to write about his earlier reflections on the relationship between Barthianism and atheism. In his youth Prior was a strong adherent of the Swiss theologian Karl Barth. Barth's theology, often characterized as neo-orthodox, sought to strike a path between liberal and conservative theology. Contrary to liberal theology Barth emphasized that theology must be based upon the Bible as God's word, and contrary to traditional conservative theology, Barth rejected the need for a philosophical defence of Christian beliefs. While Prior agreed with Barth on both views, he criticised Barth for being too influenced by Philosophical idealism.

> I was reminded of years ago, and the feeling I used to have that the Barthian is somehow closest of all Christians to the atheist. The closeness lies in the common recognition that the Church's destiny isn't only to correct the world, but also to be corrected by it; not only to make claims, but to make confessions. ([16] Arthur to Mary, 15th June 1954)

From the time Prior entered Knox College in 1932, he had been a member of the Presbyterian Church and considered himself a Barthian Calvinist. As a Barthian thinker he reflected on how Barthian theology should relate itself to scepticism. His search for an answer, in coherence with Barthian fideism[9] of Christian beliefs, would ultimately depend on Predestination, not on being able to provide a rational defence of Christianity. His words to Mary suggest that his Barthianism was of the past. Although he found it "extraordinarily difficult to break with these people [fellow Presbyterians]", he had nonetheless considered stepping down as an elder. He writes: "just going on being a bad elder is a solution which, when it comes to a point like this, I just reject."

E. The logic of time

On the 27th August 1954, Prior presented tense-logic publicly for the first time, doing so for the Presidential Address at the Second Philosophical

[9]Fideism, from faith (fides) in Latin and is the view that faith is independent of reason.

Congress.[10] He later published the manuscript, "The Syntax of Time-Distinctions", in *Franciscan Studies* (1958)[9]. As stated earlier, his plan at the end of July had been to give a talk on abstract entities. However, it appears that further correspondence with Jack Smart made him change his mind. We are not in possession of the letter by Prior to Smart in which he writes about tense-logic and Diodorus, but from Smart's letter, 30th July 1954, it is evident that Prior has written to him about these matters. Smart writes:

> I don't feel the problem of Diodorus as a live one. Why shouldn't we say that what has happened might not have happened? Of course the universe is deterministic and if by 'impossible' we don't mean 'ruled out by the laws of nature' but (rather eccentrically) 'ruled out by the laws of nature + initial conditions' then what happens is 'necessary' and what doesn't happen is 'impossible'. But 'past' and 'future' doesn't come into the matter – they only date events w.r.t. the moment we are at present discussing the matter in. I don't believe in any metaphysical difference between past and future – in fact I believe the assertion of such difference can be refuted. And here I have Quine on my side – cf his article on Strawson in Mind. But I only mention this because you are a friend of Willard's.[11]
>
> ([19] Smart to Arthur, 30 th July 1954)

In his letter to Mary dated 9th August 1954 Arthur reported from his talk at the university workshop at Otago University, Dunedin. Among other thing he had discussed the "Diodoran solution" (probably of the so-called Master Argument) as well as "different attitudes to time in medieval logic theology".

It appears from Smart's letter also dated 9th August 1954 [21], that the discussion on tense-logic continued between Prior and Smart. Prior's Presidential Address on the 27th August may be seen as a response to Smart's way of seeing things. Smart was present at the conference and Prior was not only aware of his coming, but they were both looking for-

[10] New Zealand section of the Australasian Association of Psychology and Philosophy, Second Philosophical Congress, Wellington 27th – 30th August, 1954.

[11] Willard Van Orman Quine (1908-2000).

ward to seeing each other again. Smart's reference to Quine and Strawson was important information for Prior and was in fact included in his Address. During his talk Prior presents the basic tense-logical formalism involving four operators:

Fp for "it will be the case that *p*"

Pp for "it has been the case that *p*"

Gp for "it will always be the case that *p*"

Hp for "it has always been the case that *p*"

Among other things, Prior considered the following two important implications:

PF1: $p \supset GPp$ ("What is the case will always have been the case")

and

PF2: $p \supset HFp$ ("When anything is the case, it has always been the case that it will be the case")[12]

According to Prior it was his earlier teacher in logic J.N. Findlay who in "Time: a Treatment of Some Puzzles", 1941, invented tense-logic. In the important footnote Findlay writes:

> And our conventions with regard to tenses are so well worked out that we have practically the materials in them for a formal calculus... The calculus of tenses should have been included in the modern development of modal logics. It includes such obvious propositions as that x present = (x present) present x future = (x future) present = (x present) future; also such comparatively recondite propositions as that (x).(x past) future; i.e. all events, past and future will be past."[13]

Mary Prior recalls that "it was probably as late as in 1954 or early 55, perhaps he was working on the John Locke Lecturers, that he came and sat on the bed in high excitement. He read the all important footnote.

[12]Prior is in fact using Polish notation, i.e. *CpGPp* and *CpHFp*.

[13]"Time: a Treatment of Some Puzzles," in A.G.N. Flew's *Logic and Language* (first series, 1951), p. 52

He felt he could formalise tense distinctions, drawing inspiration from this footnote of Findlay's. I date this from the fact that I have a vivid memory of the event occurring in a sunporch in the house we moved into in mid-1954." ([22] Hasle 2003, p. 297) There is however a problem with this date. Namely, that Mary from January to August was in the sanatorium and, according to Martin Prior, she quite possibly did not come to the house before the end of August. If that is true, then it would mean that the "bedside story" took place in 1953, in the earlier house on 18 Grange Street in Christchurch. Actually, Martin Prior recollects a sunporch in that house as well. It is of course also possible that the event took place at the sanatorium. At least it is obvious that Mary knew what Arthur was going to present in Wellington, including the use of tense operators. In Arthur's letter to Mary on the 27th August it is clear that she already then knew about tense-logic. Here Arthur writes: "I put up my formulae on blackboard & and started organising last night-&-this-morning's party; & then when the hour was due, delivered my piece. I felt very laboured in giving it, but was assured that it didn't look that way, & the discussion was lively." ([23] Arthur to Mary, 27th August 1954). What speaks for placing the event at the sanatorium is the fact that there is no mention of tense-logic in the letters from Smart to Arthur before July 1954. Given the intensity of the correspondence between Smart and Prior it is unlikely that they would not have discussed a new finding of that kind.

One of the important observations in Prior's Address is that there is an asymmetry between PF1 and PF2. It is hard to imagine a tense-logical system without PF1. If something is the case now, then it will always have been the case. On the other hand, it is not difficult to imagine a tense-logical system without PF2. The reason is, that although p is the case now it might not have been going to be the case at any earlier time. Prior illustrates this in the Address referring to Łukasiewicz's three-valued logic, according to which future contingents, have the truth-value "indefinite". This means that PF2 is not true in all cases. As Prior understands it, this tense-logic (Prior's PF-calculus) is in accordance with medieval logic, but not with medieval theology, e.g. conceived in the Thomistic manner, which is more in accordance with what Prior calls the l-calculus:

> Time, one might say, figures in the 1-calculus not as it does in

> medieval logic ... but rather as it does in medieval theology, in which God is said to behold all events in an unchanging present. ([9] Prior 1954/8, p. 117)

It is evident that Prior, like William of Ockham (c. 1285-1347) and several other medieval logicians, as opposed to some medieval theologians, "took tenses far more seriously than our own common logic does" (Ibid). A reference to Quine is most likely assumed here.

It appears that one of the participants at the Wellington Congress reacted very negatively towards this claim. In his letter to Mary, Prior records this encounter:

> There was a very pugnacious priest at the back who said that he was 'a Thomist & a strict Thomist', that this was the first exhibition he had seen of 'logistics', & that (this very aggressively & totally irrelevantly) he wanted to know if I was a 'realist'. I had a great deal of pleasure in telling him that I was far more of a realist than he was, & that he would in fact classify me as an 'extreme' realist."
> ([23] Letter from Arthur to Mary Prior, 27 Aug. 1954)

Prior's ontological realism concerning time is the driving force behind tense-logic. Taking tenses seriously – which is a phrase most likely used for the first time in "the Syntax of Time Distinctions" – means for Prior the acceptance of the reality of the present. The present is, he later argued, the same concept as the real "considered in relation to two particular species of unreality namely the past and the future" ([24] Prior 1970, p. 245). Mary and Arthur shared a philosophical foundation in the Scottish Common Sense tradition. Commenting on Arthur's discussion with Smart on abstract entities with regard to time, Mary mentioned the tradition. Disregarding truths about abstract entities would, to Mary, be "skimping the carving on the underside of the seat because only God and the carving will ever know what it's like?" ([25] Mary to Arthur Prior, 13th August, 1954). In this manner tense-logic is fundamentally a recognition of the "carving on the underside of the seat"; a modelling of the tensed way reality presents itself to us as what has been, is and will be.

4 Conclusion

A.N. Prior's presentation of tense-logic on the 27th August 1954 reflected a number of topics and discussions, in particular those mentioned in his correspondence with Mary during June, July and August of that year.

Arthur used his earlier work with modal logic for his formulation of tense-logic. As we have seen, he had been occupied with systems of modal logic as a part of his formalisation of the ontological proof for the existence of God. Furthermore, he was for this purpose able to benefit from his substantial correspondence with G.H. von Wright on modal logic.

The discussion on topics like political freedom, determinism and future contingency formed a fruitful background for Prior's formulation of tense-logic, and he was able to relate to medieval logic and theology. In fact, he included basic ideas from the logic of William of Ockham, and in his presentation of tense-logic he took a stand against the view of Thomas Aquinas on the relation between time and eternity. In this way it also became obvious that his ideas were relevant in the context of the discussion regarding divine foreknowledge and human freedom.

Prior's tense-logic also reflected his discussions on abstract entities mentioned in his letters to Mary and Jack. As we have seen, he did not accept any ontological commitment to the existence of temporal instants or dates, although he did quantify over such logical constructions in his Wellington paper. It is often taken for granted, by objectors to Prior's presentism, that since presentists quantify over non-present objects they are committed to a realist position on non-present objects ([26] Jakobsen 2011). Recent work by Craig (2017)[27] however, has made it plausible that Quine's principle should be rejected in metaphysics. In this context it is highly interesting that Smart as well as Prior dismissed Quine's principle. Smart considered it "philosophical arrogance" ([7] Smart to Prior 20th July 1954), and Prior considered Quine's view "a piece of unsubstantiated dogma" ([28] Prior 1971, p. 48) The history of tense-logic that unfolds in the correspondence between the B-theorist Smart and the A-theorist Prior suggests instead, that tense-logic should be considered a paradigm case of why existence, contrary to Quine, cannot be defined as being the value of a bound variable.

5 Appendix: Letters between Mary and Arthur Prior, and Arthur Prior and J.J.C Smart

5.1 Letter from Arthur to Mary Prior, 15, June, 1954[14]

23 Vernon Terrace
Hillsborough
Tues. 15/6/54.

Darling,

O'Brien on Ogden v[15] Richards[16], with discussion, went off very pleasantly. Albert Rose drove me home, and I took him up and showed him round the house. He's more or less in process of shifting himself, to a place in lower Dyers' Pass Rd., and was very interested in our floors. He also thought the extension of our hot water system to the wash-house wd. be feasible, so I saw Gordon Ritchie about this again today, and asked him to recommend a plumber; he mentioned one and I've rung him, but he's out; but I'll be ringing him again tonight.

Bob Sprackett[17] called this morning just after breakfast to ask if I minded being co-opted (non-votingly, of course) on to the Presbytery's Public Questions Committee[18], and could I go along to a discussion of War there this morning. It was feasible, so I did; he called for me at 10, and the meeting went on till c. 11.30. I moved on from it to College, and collected letters there from (a) you and (b) Ivo Thomas. Ivo had a solution (most neat and ingenious) to one of the three problems I've

[14]Editors' note: This letter has been edited by Martin Prior, Peter Øhrstrøm and David Jakobsen. It is part of the Martin Prior Collection, presently kept at Aalborg University folder B, item 5. The letter is written on standard unheaded writing paper. The letter was written while Mary was hospitalised with tuberculosis. - The use of { } indicates the page number in the handwritten letter.

[15]Editors' note: This looks like v ('versus'), but it might also '&'

[16]Editors'note: Charles Kay Ogden and Ivor Armstrong Richards (1923) The Meaning of Meaning.

[17]Editors' note: Colston Robert (Bob) Sprackett (1916-1993) was the minister of St. Martin's Presbyterian Church in Christchurch. His wife Joan was Mary's second cousin. During the war he was a pacifist.

[18]Editors' note: "This Committee was first established in 1917, to draft resolutions on social questions for the General Assembly." See http://thecommunityarchive.org.nz/node/71236/description

submitted to the JSL; and also describes the Boole celebrations he went to in Dublin. Mail at home included a note from Jack Smart and letters from Masterton, containing a gift of £26 to help pay nurse. I {2} banked this, together with a Bldg. Soc. cheque for £6-7-6 that came the other day, before 3 this afternoon. By my calculation, our overdraft with the Bank of N.Z now stands at about £3760; and we have £112-16-8 in the Savings Bank.[19]

Have rung Wall saying you'd do Priestley; he's not sure if he still has it but will send it to you if he has. The Grenell girl at 3YA[20] also wants to speak to me about something, but I don't know what as I haven't yet been able to catch her in.

The clock has just struck 5 which means that I may now permit myself to slip off and buy 10 cigarettes. Which I shall proceed to do, without delay.

5.55 p.m. – have managed to get on to La Grenelle. It was an enquiry from Wellington about Gilbert's visit, and esp. about his part in the Congress. I referred them to George.

7.55 p.m. Ann back home. I thought of posting this on the way home, but missed the plumber again, and will have to ring him after 8.30, so might as well post this then.

Gillian told me last night that {3} she has been offered the £250 German Scholarship and will be taking it; which means that we won't have her in the second term. I made a hurried arrangement with Michael to lecture to Stage II on Utilitarianism after she's gone, while I take over her Stage I stuff. This will mean as a further by-product that I can't be completely free on Thursdays in the 3rd term, but will have a 3-4 lecture. However, may be you'll be home by then (September).

The Home Laundry is collecting what we want collected this Thursday.

At the Pub. Questions Committee meeting this morning there was a very healthy uneasiness about the Government's present moves in connection with the Indo-China situation (towards a Pact with the Yanks, Aussies, French &c for defending that area; a pact which the actual

[19]Editors' note: Colston Robert (Bob) Sprackett (1916-1993) was the minister of St. Martin's Presbyterian Church in Christchurch. His wife Joan was Mary's second cousin. During the war he was a pacifist.

[20]Editors' note: The 3YA was a Christchurch radio channel which links up to YA services throughout New Zealand. The letter 3 means the Canterbury region.

neighbours of Indo-China, India, Indonesia, Burma &c. – don't want to have formed). With luck there will be some resolution about it in Presbytery, and Farquhar suggested getting in touch with the corresponding Anglican body to see if something can't be done there. – United general principles about war and peace and the hydrogen bomb &c. we couldn't arrive at; not surprisingly. The people there included Bob, Farquhar, Alan Brash[21], Alun Richards[22], van Wyngen,[23] Graham Miller[24], Walter Hendrie[25]. Alan B. was {4} propounding a rather silly sort of pacifism. Said that even if we did get all Communised God could be trusted to preserve His Kingdom &c. I couldn't forebear pointing out that you could equally argue that even if we were all blown up, God could be trusted &c. &c.

- The people that talked most sense were Graham Miller and van Wyngen – oddly close together in spite, I'm sure, quite vast theologi-

[21]Editors' note: Alan Anderson Brash OBE (5 June 1913 – 24 August 2002). He was a pacifist and leading minister of the Presbyterian Church of Aotearoa New Zealand. He was deputy general-secretary of the World Council of Churches in Geneva, from 1974 to 1978. https://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=2352093.HewastheuncleofJonathanBennett(pc.MartinPrior).

[22]Editors' note: Rev. Alun Morgan Richards (1907-2000). Born South Wales, came to New Zealand with parents age 5, campaigned between wars against Compulsory Military Training. Like Arthur Prior, he travelled through France and Nazi-Germany in the 1930s with his wife. They also visited Communist Russia. Organizer for extension studies at Victoria University 1938. Lost his job when spoke against the war, and the professorial board voted to dismiss him. Editor of "Outlook" Christchurch, from March 1948 to April 1955. See https://www.presbyterian.org.nz/archives/Page194.htm

[23]Editors' note: Rev. Willem van Wijngen (in English name usually spelt Wyngen); born 27.3.1913; brought to NZ to minister to Dutch settlers 1951 Wanganui 6.3.1952. Died 16.8.1993 in the Netherlands. https://www.presbyterian.org.nz/archives/Page206.htm

[24]Editors' note: Rev. John Graham Miller (1913-2008). Studied Law at Otago University 1932 to 1936. Law Society Prizeman in Conveyancing 1936. Ordained Evangelistic Missionary to New Hebrides (Vanuatu) 1941, Papakura SAP 5.2.1953 - resigned 12.12.1965 then to Australia. Further work in Australia and Vanuatu (New Hebrides). Retired in 1980. See https://www.presbyterian.org.nz/archives/Page183.htm

[25]Editors' note: Rev Walter Max Hendrie; born: 10 December 1912 in Glasgow, Scotland; died: 23 April 1997. Ordained 1942. He was called to Inverbervie (Scotland) parish in 1949. He then moved to New Zealand to take up the position of Youth Director for the Presbyterian Church of New Zealand, a position he occupied with considerable distinction. After seven years in that position he returned to parish work at St Giles in Papanui, Christchurch. (from Obit.) https://www.presbyterian.org.nz/archives/Page168.htm

cal differences. The closeness came out e.g. when the chairman (May) wanted to have a statement concluded with a few remarks to the effect that the Church has the one solution in its hands etc. van Wyngen sat on this on eschatological grounds; Miller on the ground that it was dishonest, and that it was better to tell the public frankly that we don't know where we are; me, on the grounds that it was a sort of conventional pious appendage which committees seem to think they must tack on to everything they say. – "taking God's name in vain, isn't it?" I asked, turning to van W., and he agreed. I was reminded of years ago, and the feeling I used to have that the Barthian is somehow closest of all Christians to the atheist. The closeness lies in the common recognition that the Church's destiny isn't only to correct the world, but also to be corrected by it; not only to make claims, but to make confessions. – It is extraordinarily difficult to break with these people. Maybe I should have said No then to Bob: but {5} just going on being a bad elder is a solution which, when it comes to a point like this, I just reject.

- O'Brien said last night that the work of Ogden[26] & Richards, undoubtedly aided in the understanding of literature[27] and that people felt rightly that fruitfulness is a sign of truth, so he tried to separate the truth in them from its "materialistic" accretions. It was not done brilliantly; yet not badly either. He gave at the end some quite priceless ridiculous quotations from O. & R. They assert for example that until man started actually dissecting brains, it was thought that inside the brain you would find a soul; now that brains have been opened up, we know that this isn't so. – O'Brien's job wasn't all that easy; I have a harder one – to dissect the true from the false, or the believable from the unbelievable, in Christianity. Plischke[28] complained the other day that people like John Beaglehole retain the moral points of Christianity, but cut them off from the root, and that's "illogical". I suggested that JCB mightn't see it that way – might argue that even in Christians the real roots of their morality &c. were not what they thought they were; that he was building on what have been the real roots all the time, these being by Christians erroneously described.

Walther Hendrie objected this morning to the "pragmatic" character

[26]Editors' note: This looks like v ('versus'), but it might also '&'.

[27]Editors' note: The word is difficult to read.

[28]Editor's note: Ernst Anton Plischke (1903-1992) was the architect St. Martin's Presbyterian Church, Christchurch.

of a lot of the material before us; that our starting-point oughtn't to be {6}what a terrifying thing the hydrogen bomb is, and so on, but ought to be the Gospel – that's what we ought to be talking about. I just asked "But is it necessary to say it in Hebrew?" and the company dissolved.

Must push off and post. Love and love and love. See you tomorrow.

Skig
X O X O X O X O X

5.2 Letter from Arthur to Mary Prior, 1, July, 1954[29]

23 Vernon Terrace
Hillsborough
Thurs. 1/7/54.

Darling,

I enclose (a) a communication that came for you today; and (b) my letter to Jack Smart.[30]

We got a wire from Andy[31] today saying that he had the Wellington senior registrarship, and would be starting on July 12. So I sent him a Congratulations wire from the 4 of us.

Also got Ivo's[32] reply to my cable – an affirmative – and have informed Goodell. So that clears that up.

Have just marked a Stage II Logic test I sprung on them a couple of weeks ago – will be able to hand it back to them tomorrow. Martin's not done so badly at his lessons today, and is taking more kindly to them. Ann has a bit of a cold in her nose. But temp's not particularly high (under 99).

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[29]Editors' note: This letter has been edited by Martin Prior, Peter Øhrstrøm and David Jakobsen. It is part of the Martin Prior Collection, presently kept at Aalborg University folder B, item 5. The letter is written on standard unheaded writing paper. The letter was written while Mary was hospitalised with tuberculosis. The letter had enclosed with it a letter to Smart dated 30th June, 1954 (see 5.3).

[30]Editor's note: This is a reference to Arthur's letter to Smart, B5 from 30. June 1954. Mary Prior had studied an MA in Philosophy a few years earlier and showed a lot of interest in the philosophical questions Arthur Prior worked with.

[31]Editors' note: Andy is Mary's brother Andrew Cameron Howitt Wilkinson (1923-1999). He graduated in Medicine from Otago University and later worked as a general practitioner. When Mary first contracted tuberculosis it was first diagnosed as pneumonia about which Andrew was strongly sceptical and was very persistent in getting the diagnosis corrected.

[32]Editors' note: Ivo Thomas (1912-1976), born Herbert Christopher Thomas. He entered the Order of Preachers and did philosophical studies 1936-1938. He became professor of Philosophy at Hawkesyard Priory. He received the Dominican highest and most distinguished degree, that of Master of Sacred Theology. He wrote a dissertation on The Logic of Kilwardby. (Otto Bird, In Memoriam. Ivo Thomas. Notre Dame Journal of Formal Logic, vol. 18, nr. 2, 1977, s. 193). He and Arthur wrote many letters to each other kept in the Bodleian Library Oxford.

I was busy about town this morning, and with the kids this afternoon (it being Miss B's afternoon off).[33]

This is the scrappiest of scrappy letters, but at least I've been giving you some decent enclosures.

Heaps and heaps of love
- Skig
X O X O X O X O X

[33]Editors' note: This is a reference to Miss Brown, the second nurse who took care of Martin and Ann in 1954, when Mary was hospitalised.

5.3 Letter from Arthur Prior to J.J.C. Smart, 30th June, 1954

23 Vernon Terrace
Hillsborough
Christchurch N.Z.
30/6/54

Dear Jack,[34]

Have you read Quine's New Foundations for Mathematical Logic,[35] in his collection From a Logical Point of View?[36] Maybe you read it years ago in its original setting; I read it for the first time a few weeks ago, and it has been seeping into my mind and re-shaping my thinking ever since. Not my thinking about formal logic, but my thinking about philosophy. – You know how I have always been irked by these linguistic prohibitions which people throw about these days. I want to say, for example, that there is no such thing as the sum of the Moon and ten; and I am told that I mustn't say "the sum of the Moon and ten". And I want to say that redness isn't red; and I am told that I mustn't even raise the question of whether it is red or not. And I want to say that while "hits doesn't sprint well" doesn't make sense, for it has a verb where a noun ought to be, "hitting doesn't sprint well" not only makes sense but is demonstrably true (for abstract objects don't sprint at all, and therefore don't sprint well, and hitting is an abstract object, ergo hitting doesn't sprint well); but I am told that I mustn't put that sort of words into that sort of sentence-frame (though I'm never told at all clearly why I mustn't). But irked as I have been by these authors, I have felt obliged to pay some attention to them because it has appeared that only by so {2} doing can I avoid contradicting myself. And now Quine tells me in effect that I can say all these things I have always wanted to say without contradicting myself, and has shown me one way of doing it. So I am experiencing a

[34]Editors' note: This letter has been edited by Martin Prior, Peter Øhrstrøm and David Jakobsen. It is part of the Martin Prior Collection, presently kept at Aalborg University folder B, item 5. The letter is written on standard unheaded writing paper. The letter is attached to 5.2 dated 1th July 1954 to Mary and appears to be a copy of the actual letter to Jack. It is one of the few letters we have from Arthur Prior to J.J.C. Smart.

[35]Editors' note: Quine, W.V., New Foundations for Mathematical Logic, *The American Mathematical Monthly* Vol. 44, No. 2 (Feb., 1937), pp. 70-80.

[36]Editors' note: Quine, W.V., *From a Logical Point of View, Philosophy and Phenomenological Research 15 (4):574-575 (1955).*

sense of liberation very much like that to which Russell testifies, when he and Moore discovered that they could believe that trees are really green, etc.; only it is liberation from a prison which Russell himself later constructed. – It boils down to this (Quine doesn't talk about characters and properties, as I do, but about classes; but that's an irrelevant fad.)[37]:- It is clear that if there were any such character as the character of non-self-characterisation it would have contradictory properties; therefore there can be no such character. But if there is no such character, then that character does not characterise redness. And it seemed to me to follow from this that redness does not fail-to-characterise-itself, and since it obviously does not characterise itself, either then we must either say that there is no such character as redness (which is absurd) or go in for theories of types, categories, linguistic prohibitions and all that. But if I deny that the inferential form

X is Y
∴ X is characterized by Y-ness

{3} universally holds, I am spared all this humiliation; and that seems to me a very small price to pay for this liberty. The exceptions will occur when there is no such character as Y-ness – which is, of course, a different case from that in which there is nothing that is Y. And even in these cases I can make intelligible and true statements which are ostensibly about the character of Y-ness, just as I can make intelligible and true statements which are ostensibly about the present king of France or the integer between 3 and 4. Nothing is meaningless, in short (leaving out cases in which a word like "pob" is just used without any meaning being assigned to it), except what is ungrammatical in a simple schoolboy sense, and certain "statements" which themselves purport implicitly or explicitly to be about meaning (like the heterological stuff and the Liar). – Popper's on to this line too, in the latest Mind. It's the revolution of the year – I'm not, as you know, one for climbing on band-wagons; in fact, I probably tend to err a bit in the contrary direction; but this is a band whose tune I like, and I'm getting out the bloody trumpet and preparing to blare forth with the boys. – Some specimen statements

[37]Editors' note: This is in the margin.

and arguments I am prepared to commit myself to (to bring out the full frightfulness of my position [)]: - {4}

1. My pencil does not characterise itself (for only characters characterise and my pencil is not a character).

2. Non-redness does characterise itself.

3. The character of non-self-characterisation does not characterise itself.

4. The character of non-self-characterisation is not characterised by non-self-characterisation. (The contradictory of this does not follow from (3)).

5. The character of being the present queen of England, and the present Queen of England, "exists" in the same sense as of "exist". [They are different objects, and more over very different sorts of objects, but are nevertheless both objects, in the same sense of "objects".][38]

6. The character of non-self-characterisation, and the present King of France, and the sum of the Moon and 10, and the integer between 3 and 4, do not exist (in the same sense of "do not exist").

7. The character of being the present King of France exists, and the present King of France does not exist.

8. Whatever is red is extended, but the character of redness is not extended.

9. The relation of strict implication exists, but does not strictly imply anything, and is not red.

10. If statements (1)-(9) are not all true (as I think they are), then some of them are {5} false, but none of them are meaningless.

11. It is possible that there should be a Necessary Being, but if there is He exists in the same sense of "exist" as you and I do. [The doctrine of "analogy" goes overboard with the theory of types. They

[38]Editors' note: This is added in the margin.

are the same thing anyway.][39] (My present position removes a possible objection to my defence of the possibility of Necessary existence but entails the second part of statement 11).

12. I cannot take a photograph either of the other side of the moon or of the number 2 (and here I say exactly the same thing of the two objects, though of course it is true for very different reasons in the two cases).

13. I do not live in England, and neither does my power of standing on my head live in England.

14. I do not like tripe, and neither does the fourth figure of the syllogism like tripe. (I and the fourth figure of the syllogism constitute a pair of non-tripe-likers; though only I, and not the fourth figure, am a tripe-detester).

15. The fourth figure of the syllogism[40] is not aware that it is different from consequentia mirabilis[41] and neither is my grocer aware that he is different from the consequentia mirabilis, and neither is my cat; for the fourth figure of the syllogism is not aware of anything, and my grocer is not given to logical reflection {6} and I have no cat. (Despite the difference of these reasons it is the same predicate

"() is aware that () is different from the consequentia mirabilis"

that is used, along with "it is not the case that", in all these cases, and rightly thus used. Though there may be certain disguised differences of structure between the first two statements and the third. – It will be noted that the integer between 3 and 4 is not aware that it is different from consequentia mirabilis for the same reason that my cat is not; though it is also not aware of it for a further reason, which it shares not with my cat but with the fourth figure of the syllogism. And the fourth figure has this advantage over my cat that it is unaware of its difference from the consequentia mirabilis, whereas my cat is neither aware

[39] Editors' note: This is added in the margin.

[40] Editors' note: The fourth figure can be represented as the implication: $x(P, M) \& y(M, S) \supset z(S, P)$ where x, y and z are quantors (all, some, none, not all)

[41] Editors' note: The consequential $(\sim \phi \supset \phi) \subset \phi$.

of it nor unaware of it. At this point my cat is in the same boat with the property of non-self-characterization and the barber who shaves all and only those who do not shave themselves, though it is knowable a priori that the prop. of non-s.c.[42] and the aforesaid barber are in this position, while that my cat is so is a purely empirical fact. The property of being at once ten feet tall and not ten feet tall is {7} not, I should say, in this position,{7}not, I should say, in this position, but shares with my grocer and the 4th syllogistic figure the privilege of being unaware of its difference from the consequential mirabilis; for this property exists, though it necessarily has no instances. – When I say, by the way, that my cat is neither aware nor unaware of its difference from the consequentia mirabilis, I do not mean that the 2 statements "My cat is aware ..." and "My cat is unaware ..." are without truth-values, but that they are both false and that in consequence "It is not the case that my cat is aware ..." and "~ my cat is unaware ..." are both true. Similarly with my cat's fellow travellers).

Now if you tell me that nobody ever says these things, or that these questions don't arise, I shall consider it a personal affront, for I have just said these things, and I have raised these questions.

- Yours,
  Arthur

P.S. I'm inclined to think that if God does necessarily-exist, that's something He hasn't on His own. I should say that the existence of most abstract objects, where they exist, is necessary. Maybe He's the only concrete necessary existent. But I'm only feeling my way about in this new paddock – gambolling around experimentally, and sniffing the grass.

[42] Editors' note: non-self-characterization.

5.4 Letter from Arthur to Mary Prior, 8, July, 1954[43]

23 Vernon Terrace
Hillsborough
Thurs. 8/7/54

Darling,

It's 8.30, and I've just more or less finished the dishes, so there isn't much time to write. While I was doing the dishes I was thinking about what I was going to say next Wednesday about Freedom and so forth, and I think I can rough out a pretty good speech. Must try and get it written reasonably early so I can get it typed and give copies to reporters. Roughly something like this: I've been asked to speak on "the philosophical basis of freedom", but don't like the title much. There are some things we do and value [because] of other things; but others which we just do and value for their own sake, and that's that. {2} In any case there's no need to build up an elaborate philosophical argument in order to talk New Zealanders into believing in freedom. It's part of our heritage, tradition &c. But a philosopher can properly urge people to be consistent about their basic belief – we're being told right and left about our duty to "defend the free world", and I don't want to dispute that – am a returned man myself and all that. But if we have a duty to defend the free world, then we have a prior duty to be the free world.

- Then a crack at sundry politicians (needn't name them).

- And an answer – by – anticipation to the charge that I'm being idealistic. Can't in one breath ask blokes to be idealistic enough to risk their life for freedom, and then in other breath say we shouldn't be too idealistic about it. [And Westerners who want to filch freedom in the name of freedom are like commies[44] filching peace from us in name of peace.][45] – These anti-freedom blokes are in fact being subversive, in

[43]Editors' note: This letter has been edited by Martin Prior, Peter Øhrstrøm and David Jakobsen. It is part of the Martin Prior Collection, presently kept at Aalborg University folder B, item 5. The letter is written on standard unheaded writing paper. The letter was written while Mary was hospitalised with tuberculosis.

[44]Editors' note: A "commie" is New Zealand slang for a "Communist."

[45]Editors' note: Written in the margin.

a more subtle and sinister sense than the handful of uninfluential commies and pacifists that the term is usually applied to. – And after {3} this theory, a bit of the practical NZ is a pretty free country for most of us; I certainly have nothing to complain of but I'm worried about the way the shoe's beginning to pinch the school-teaching profession. Small-scale and large-scale intolerance; probable bad effect on quality of teaching &c. And finish with that.

Must apologize for treating you like a public meeting. But aforesaid the thing was going around in my head while I was dish-washing, and inevitably kept encircling when I turned to this immediately thereafter; esp. when pressure of time made it impos. for me to sit down and let such things subside (work'em of on a bit of note paper for use next Wednesday).

Heaps and heaps of love
- Skig
XOXOXOXOXOX

5.5 Letter from Arthur to Mary Prior, 29th July 1954[46]

CANTERBURY UNIVERSITY COLLEGE
CHRISTCHURCH, N.Z.
Thursday. 29/7/54

Darling honey,

Re Jack' letter – I'll definitely devote the larger part of my Wellington thing[47] to a discussion of whether the question of Platonism v. nominalism is purely a verbal question. I shall contend that

1. The question as to whether there are abstract entities isn't a verbal question or a question about language at all.

2. The question as to whether "there are abstract entities" is true is partly a verbal question, exactly as the question as to whether 'My eyes are brown' is partly a verbal question. (If 'brown' is being used to mean what it ordinarily meant by "square", it's false, since my eyes aren't square, while if it's being used as usual, it's true; since my eyes are brown).

3. Platonism isn't a thesis about language. Whether nominalism is, is more or less up to the nominalists.

4. Nominalism is just a matter of language if it is no more than a preference for using the word "entity" in a restricted sense, to mean what I'd call a 'concrete entity'. In this sense of "nominalist", I'm quite prepared to become one. Let'em have "entity" in their restricted sense, and for what I {2} previously called an "entity" I'll use the word "object" instead. Or if they want to restrict the sense

[46] Editors' note: This letter has been edited by Martin Prior, David Jakobsen and Peter Øhrstrøm. It is part of the Martin Prior Collection, presently kept at Aalborg University folder B, item 4a, dated 29/7/54. The letter is written on Canterbury University College writing paper. It is sent by Arthur from the family home in Christchurch to Mary, who was still in the sanatorium.

[47] Editors' note: Prior is probably referring to the conference that took place in Wellington 27th-30th August, 1954. However, at this conference his main contribution was his paper "The Logic of Time-Distinctions". This makes it uncertain, whether Prior presented his thoughts on Platonism versus nominalism at that occasion. He might simply have changed his plans.

of "object", they can have that one too, and all familiar words, and instead of "entity" or "object" I'll say "bimps". And if they want to restrict the sense of "bimp" I'll take any word they care to give me. But since they give me none, I'll use "bimp" in what follows.

5. Nominalists, then, want to restrict words like "entity", "object", "being" &c. to concrete bimps. O.K., let'em, and I'll follow suit. They also, so far as I can see, wish to shroud abstract bimps in a blanket of silence, and not talk about them. This does, indeed, raise a difficult question of etiquette. What does common courtesy require of me when I am in the presence of a man whom I know to be afflicted by this extraordinary phobia? Ought I to say, "look here, old man, I'm sure you'd be happier if you left the room for a while – we're going to talk about abstract bimps? And perhaps after a while a convention would grow up by which I need only say, and politeness would only allow me to say, 'We're going to talk about you-know-what'. However, I argue that if this is how things stand, there's no real difference of opinion bet.[48] me and the nominalists, and it is only a matter of words.

6. Or perhaps it is the word 'not' whose meaning the nominalist wishes to restrict. He doesn't want to {3} admit that virtue is not square, because he wants to use 'not' to mean 'of some shape other than –'. Again, so be it. If this is what 'not' means – and let's not quarrel about how we shall use a word – I too will refuse my assent to 'Virtue is not square'. Indeed, I'll say that in this sense of 'not' it's definitely false; for it is false that virtue is of some shape other than square. How the nominalist says 'Virtue has no shape' I don't know; but I can say it for him, if he'll give me some other word to use for 'not' in my sense. (And if he won't I'll make one up).

7. But I know that this modus vivendi will not satisfy the nominalist. He doesn't want to say that it is false that virtue is not square. He wants to say that both 'Virtue is square' and 'Virtue is not square' are neither true nor false, but meaningless. Though I gather that he wants now to modify that to the contention that they are meaningless in his language, but not meaningless in mine, and that we

[48] Editors': Probably an abbreviation for 'between'.

can talk either language as we please. If he means this last modification seriously then it implies that there are truths which are expressible in my language, but aren't expressible in his. If it doesn't imply this, then how does he express the truth which I express by saying that virtue is not square? – or, for that matter, the truth which I express by saying that virtue has no shape?

8. Do I believe that mathematics is the 'physics of the supersensible'? I can't say that I like this description much. The over-and-under talk is a political metaphor that I {4} don't see the point of, and why physics? (Why not, say, the 'chemistry of the supersensible['])? I insist only that there are nonsensible bimps, and that we may study them; I am indifferent as to whether we call the study of them 'mathematics', 'physics' or even 'metaphysics'. As to 'mathematics', I gather that many people would like to use that word for symbolic games in which the symbols are uninterpreted; me, I think these games are good fun, and useful too, and I don't mind at all if they are called 'mathematics', so long as the study of non-sensible bimps, which is something quite different, is called something; or at all events, so long as it goes on.

The bit in all this that I'll have to give most thought to is 7 – it is there that the central issue lies I think.

Parton[49] and Crowther[50] were shrouded in gloom at morning-tea today, about the way the voting went yesterday. They reckon the Council won't proceed with caution and fall back on the second proposal when it's clear that a suitable rector can't be found, but will regard us as having given them the green light and will appoint one by hook or by crook. – One is tempted to regard the vote yesterday as a revealing one, in a negative sort of way; it seems to show, in particular, that neither Garrett[51] nor Allen belongs to the real hard-core academic party here, which consists (with Parton going) of Philips[52], Crowther and myself; but I guess

[49]Editors' note: H.N. Parton had been teaching Chemistry at Canterbury University College since 1930.

[50]Editors' note: Allan Crowther was appointed Professor of Psychology at the same time as Prior was appointed Professor of Philosophy. At that point, subsequent to Sutherland's death, the Department of Philosophy and Psychology was split.

[51]Editors' note: John Garrett was Professor of English Canterbury University College in Christchurch.

[52]Editors' note: Neville Phillips taught History at Canterbury University College.

that's smug.

{5} Rang John McLeod about PAS for Martin this afternoon, and he quite unsolicited started talking to me about you and assured me that there was no evidence of cavitation in your tum[53], and that he'd be surprised if your stomach content or whatever it is was positive.

Kids get their X-rays tomorrow morning – I gave Martin a little touch of school this afternoon – he seems to have just now an irritating little cough, which I must tell John Mac about on Wed. – Both their temperatures are reasonable and Ann has kept the bed dry for the past few nights, so maybe that bout of wetting it is over.

Today I answered an ad. in the paper for fixing fireplaces – rang a phone-number and left a message for the joker that does it. He may be round tonight or tomorrow morning, or may ring me at College in morning.

Hell, aren't these evenings cold! Must post this and get to bed. I wish you were going to be in it.

I love you and love you and love you
Skig
X O X O X O X O X O X

PS. Left some turps at ???[54] to be taken up to you today.

[53]Editors' note: The word is not totally readable. The following line may suggest that it has to do with the stomach.

[54]Editors' note: The word is not readable: it could be "Corry", short for "Coronation", but it is unclear how this would apply. The word "turps" is short for turpentine and suggests that Mary was doing some oil painting at the Sanatorium.

5.6 Letter from A.N. Prior to Mary Prior 9th August 1954[55]

Law Court Hotel
Dunedin
Mon. 9/8/54

Darling mine,

Here I am snug in bed after a bath at last. It's been a good day, - Ron met me at train and we came to the hotel; I changed my shirt and washed, and then we had a Benedictine in the Lounge. Then went to DIC[56] and bought a shirt and a couple of handkerchiefs; to Modern Books to see their stock; to Dick White's[57] (dropping your letter in at Moray Place P.O. on the way), where I found no books worth buying and no Dick and learnt that he was convalescing from some illness or operation, and on to Knox[58]. Tea at the Master's table with Hubert, Ron, a Dr. Hornbrook who is Assistant Master and a Dr. Morris or something like that who is Dr. H's room-mate. {2} Then coffee in Hornbrook's room, at which Hubert and Jocelyn appeared; main other guest (beside Ron and me) John Allen[59] (your cousin) after that down to Ron's room for the fray, Jocelyn didn't come to this but Hubert did, and drove me here afterwards.

The position about the Phil. chair is that applications haven't yet closed. (They will at end of month; there's been some muddling delay).

[55]Editors' note: This letter has been edited by Martin Prior, Fatima Sabir, Peter Øhrstrøm, Farshad Badie and David Jakobsen. The letter is written from Dunedin by A.N. Prior to his wife Mary Prior and is part of the Martin Prior Collection, presently kept at Aalborg University (Folder A – Item 3, 8pp, the letter is written on Canterbury University College Christchurch writing paper). Prior was attending a university workshop at Otago University.

[56]Editors' note: DIC is a departmental store.

[57]Editors' note: Dick White is the husband of Mary Prior's paternal grandmother's sister. His nickname was Eefie White, after the well-known Dunedin rag-and-bone man. White was assistant in the Newbold's Bookshop, which was known for its antiquarian books.

[58]Editors' note: Knox College. Prior was a student here from 1932 to August 1936, when Prior got married to Clare Hunter. According to Martin Prior, it has been erroneously said that he was expelled from the college and stated that he was very sorry and would not do it again. In fact, Prior resigned by his own decision (Grimshaw, M. 2013. 'A.N. Prior on James Joyce', *Philosophical Enquiries*, 193-202).

[59]Editors' note: John Allen is Mary Prior's mother's sister's son, who became a Presbyterian minister.

The show in Ron's study went, I think, pretty well. I kept going impromptu for quite a time, on such lines as these[:]

> Philosophy in a very live condition today, and pursued by a variety of methods. Ordinary speech approach at Oxford, and logical approach. {3}
>
> Sketch history of logic – Aristotle concentrated on 'All'[,] 'Some' and 'Not', Stoics on 'If' and 'And' and 'Or' (a few stock dilemmas to show what Stoics were interested in) both interested in necessity and possibility; ancient logic ends with Boethius; new original work done towards end of Middle Ages; anti-logical repercussions of Reformation and Renaissance and at first of new science also, but latter issues at last in de Morgan's logic of relations; then mathematico-logical tie-up of modern times.
>
> Modern ideas illustrated by discussion of existence (mixture of Quine and Russell on dragons dished out here).
>
> Modal logic neglected after end of Middle Ages until very recently – specimens of new {4} work being done – votes taken on *CMMpMp*, *CMNMpNMp* and *CMNpMNMp* – problem of deciding between first two; some consequences of accepting *CMNMpNMp* (effect on validity of Leibniz's modification of ontological proof – ontological proof gone into as preparation for this).
>
> Possibility of deciding about *CMMpMp* and *CMNMpNMp* by defining 'possible' – Diodorus's definition of 'possible' – relations of truth and time; different attitudes to time in medieval logic and theology – reversion to problem of *CMMpMp* etc. and Diodoran solution.
>
> Question of necessary existence, whether meaningful if existence not a predicate; my answer briefly sketched.

It was, in short, a {5} wide-ranging ramble giving among other things a pre-view of tomorrow's and Thursday's lectures. And it was a most intelligent and responsive audience (gathered, I was told, from all sorts of faculties). Ron kicked off the discussion, and was very good at getting

balls rolling. Discussion rambled over all sorts of things – the notion of unrealised possibilia; the historical origins of the divergent medieval approaches to Time; the place of Latin in education; Hubert told me, and I more or less gathered as much from Ron, that there's been quite a craze for asking people to like this this year. They've had in particular a variety of blokes {6} on the body-mind problem – Passmore (a very hot discussion with him, I gathered from Hubert), some medical johnny, Helmuth Rex, Dennis Gray. And other birds on other things.

Talking of Dennis – Ron tells me he's got the Armidale chair; the news came out last week. So must congratulate him tomorrow.

It's just gone midnight – will turn in.

All my love and love
Arthur.

Tues. afternoon – Went along to the University this morning and was taken to along by Passmore to morning tea with Sofer. The latter seems a very sound and competent bird – a very considerable contrast to poor old Henry. At Prof. Board here tomorrow night, I gathered, a rather sticky issue is coming up. I've forgotten {7} the precise form in which it's coming up but the background to it is that the Liaison Officer here seems to regard himself primarily as a careers advisor rather than as having a job to encourage people to take culturally worthwhile courses, with the result that subjects that aren't good 'teaching subjects' tend to get left out in the cold. The proposal that's coming up is for some sort of change in the machinery of giving advice to freshers; Sofer is anxious to get something done about it while preventing the feud the Liaison Officer is in from coming into the open. Probably a Committee will be set up. In the course of conversation about this I mentioned that little booklet about the various subjects that has been got out at CUC[60], and both Sofer and Passmore were highly interested in it, so must write to Gorden T.[61] and get him to send them down copies.

After that was yarning with Passmore for a bit and then in with Dennis Gray, who turned on some very fine sherry. Then back here to the pub for lunch, and I'm now writing this in the writing room; will be wandering back to University later to be there about 3. The lecture's 5-6,

[60]Editors' note: Canterbury University College.

[61]Editors' note: Probably Gordon Troup from the French Department at Canterbury University College.

then I go to Passmores for evening meal and for evening's discussions.

I gather that Mackie, Hubert and Baier[62] are likely to be in for the Chair, and that Ryle is likely to give Baier a big push when he's down here. But they have a {8} good local committee and a good English one. The local committee includes Hubert Ryburn, Morell and Manton; I've forgotten who else. But they all sounded the sort of people who'd enjoy John Mackie on the philosophy of education, so I shall see to it that Hubert gets that. – At the same time, Passmore tells me that there are bods in Australia trying to persuade John M. to hold his horses for a job that's coming up at Canberra. – John P. is supporting Mackie all right; and I've the impression that Hubert will attach considerable weight to his recommendation. John P's annoyance over John M's review of his Hume book is partly due to the fact that most of the things that Mackie said ought to have been in Passmore's book in fact were in Passmore's lectures that Mackie attended.

It's about 5 to 2 now; must scribble a line to Gordon T., and post this and other letters on my way to University.

I love you and love you and love you – * *[63] like yesterday only haven't time to say so – lots of love darling

- Skig
X O X O X O X O X

[62]Editors' note: Kurt Baier (1917-2010) an Austrian moral philosopher, who taught at Melbourne University. In 1958, he married the New Zealand moral philosopher, Annette Stoop (1929-2012).

[63]Editors' note: These two words are unreadable, but the second word could be "same".

5.7 Letter from Mary to Arthur Prior, 13th August 1954[64]

Dearest,

Your same blue and same father is intriguing. How does one recognize the same blue in disparate things anyhow. This seems the basic problem. The father travelling thru time[65] w. his tail light is after all destroyed by one blink. We have to be assured from moment to moment that it is the same father-with-tail-light procreating that we saw before, etc. etc. So the problem is the same as with blue. Only w. the father there is at least a hypothetical way of lessening uncertainty, while w. blue the uncertainty is greater. And in fact we do make mistakes about shades and even colours notoriously often. I am not sure the Q. is not psychological to some extent, though the chore seems irreducible. Am inclined to go very Scottish Common Sense[66] and regard memory as irreducible and a necessary thing in recognition. Am not sure that I want to say that we go carrying {2} blue samples in our mind by the sackful, tho' perhaps that's O.K.

(Doctor's on his round and the nearer he gets the less I can think. It's John MacL[67]. today.)

The fact is tho' that the seeing of 1 blue thing does tend to evoke comparison w. other blue things. No doubt there's some quite behaviorist way of putting that but do we want it? Isn't it short circuiting – skimping the carving on the underside of the seat because only God and the carving will ever know what it's like?

I'm afraid I'm no real help. Just trying to dredge up a few things – esp. those we tend to have phobias about, and perhaps Platonists shouldn't. I mean think of the awful Qs. One wd. have to answer if one were to plonk for anything as crude as this ragbag of samples in the mind. Yet don't we say when in a shop choosing materials e.g. paint or

[64] Editors' note: This letter has been edited by Martin Prior, Peter Øhrstrøm and David Jakobsen. It is part of the Martin Prior Collection, presently kept at Aalborg University folder C, item 10. The letter is written on standard unheaded writing paper. It was kept in an envelope stamped 13th August 1954.

[65] Editors' note: The text is not clear.

[66] Editors' note: The reference to Scottish Common Sense is interesting. The Priors were inspired by the tradition, especially the philosophical realism of Thomas Reid who is mentioned in *Logic and the basis of ethics* (1949).

[67] Editor's note: John MacLeod was a doctor at the Sanatorium, recollection of Martin Prior.

paper or cloth – "that's just the color I was thinking of". Well I dunno. Anyway this is no help to you as you'll get it in Chch when you return. Perhaps as well.

Lovely to think I'll be seeing you again on Sunday.

XXX
m.[68]

[68] Editor's note: Apparently written in lipstick.

5.8 Letter from Mary to Arthur Prior, undated[69]

Monday night

Dearest,

I've been thinking about your necessary existence[70] thing and drawing morals from it. It seems to me to be a paradigm of philosophical argument. I mean the argument against has a philosophical rigour which objections like "what Q. could that answer?" just haven't. It would be rash to claim that to any philosopher it is clear that the argument is no good because there are people who'll object to logic itself! But its clear that to most philosophers of whatever school and its good to see a philosopher dealing w. an argument as an argument, and not simply brushing {2} it up in order to secure his own particular "school" against another. To be interested in "what is" instead of "what ism," wh. is the curse. And that is what logical formulation can do so well – get philosophy into a common language and clear from the language of the cliques. The best philosophy has always had that rigour e.g. Moore[']s Nat. Fall.[71] Stuff and the ontological argument itself. It was to the strength of Berkeley – or so it appears to me to be, a rigour which gave no quarter.[72] So much "philosophical" argument consists of changing the subject instead of arguing it out and I think Berkeley and Hume did try to argue out specific problems.

Tuesday – Lunch Time: Because I'm on the library today I can skip out of {3}lunch early. But as Gilly has dishes to do we can't make an early start, so here I am already to go, the shacks around me empty and unnaturally silent. I can hear the kids at Beckenham school out playing. It

[69]Editors' note: This letter has been edited by Martin Prior, Peter Øhrstrøm and David Jakobsen. It is part of the Martin Prior Collection, presently kept at Aalborg University folder C, item 11. The letter is written on standard unheaded writing paper. It was kept in an envelope stamped Tuesday 17. August 1954. It was partly written Monday night. The other part on Tuesday 17. August.

[70]Editors' note: During 1954 Arthur worked with the ontological argument, and at several occasions discussed it with Mary.

[71]Editors' note: This is a reference to G.E. Moore's Natural Fallacy. A.N. Prior addressed problems regarding this idea in *Logic and the basis of Ethics* (1949).

[72]Editors' note: A military term which means to give no clemency.

carries me back to the Balfour St house when you were away when that same noise assailed me. The very same noise as the blue of 2 chairs can be the same.

I'm glad you find Mrs Kirk[73] so good and sensible, and glad she finds M.[74] "good". Here the quotes mean she said it, not me. Don't let M. miss next hour for the sake of school. Here nothing is allowed to interfere w. ours.

After all the cold today is a pleasure. It[']s so warm here. I'm sitting in the sun, just loving it.

That book of Snow[']s is good. He gets so well the excitement of science – even the physical appearance typical of scientists too – <u>not</u> white coated figures, but dressed w. an {4}air of "mucking about" about them. So many scientists seem to do half their work in the clothes they go tramping in when they can get away w. it.

There[']s pictures tonight, and I'm expecting to go. Think it[']s a reasonable thing but a DRRRRRAMA wh. is a bit tiresome. Why is tragedy usually corny or gruesome and quite uncathartic on the films?

How started sewing up my new pink frock.

Now I'll stop and get ready to meet Gilly. She can[']t be long.

All kisses
Polly.

[73]Editors' note: According to Martin Prior, Mrs Kirk gave him lessons in the latter part of his year with tuberculosis.

[74]Editors' note: 'M'. is for 'Martin'.

5.9 Letter from Arthur to Mary 27th August 1954[75]

26 Wade St.
Wadestown
Wellington
Saturday, 27/8/54

Darling,

It's 2.15 a.m., & I'm at last in bed at the end of the 1st. day of Congress, wh. has gone very pleasantly.

Picked up Jack in town ~~this~~ yesterday morning & brought him up here for lunch. He was vastly struck with Elespie[76] & enjoyed the visit, & after lunch & couple of beers we proceeded to College. I put up my formulae on blackboard & started organising last night-&-this-morning's party; & then when the hour was due, delivered my piece. I felt very laboured in giving it, but was assured that it didn't look that way, & the {2} discussion was lively. Passmore, Jack, Ryle & I had a cup of tea in one of them little tea-shops, & then Jack & I proceeded up here. Ian[77] was late back for dinner, & so missed us, but Elespie drove us over. The speakers for the evening were Pat Hutchings & Erle Robinson, on 'Essences'. There were good spots in both, but they were shockingly long, & it was just about 10 o'clock before the discussion so much as started. And when it subsided, about 11, a mob of us started for here – Jack & George & Ryle & Passmore & Denis & Pat & Erle & Michael Shorter & Pat's girl Susan & Rosemary & her husband & Michael's hostess Mrs. Somebody & Ron Butler & Brian Stewart & sundry hosts. And everyone enjoyed themselves thoroughly, both the philosophers & Ian & Elespie. Denis said I did have nice relations & asked me how I managed it. And Ian wants Jack {3} across to lunch today, when he'll be home. Charles Brasch's[78] idea that Ryle was at Eunoe's wedding appears to be incorrect; but Ryle is a brother of some vastly important

[75]This letter has been edited by Martin Prior, David Jakobsen and Peter Øhrstrøm.

[76]Elespie Prior (born Forsyth, 1919-2003) was the wife of Ian (see the next footnote).

[77]Ian Amberry Miller Prior (1924-2009) was the half-brother of A.N. Prior. He and his wife lived at the address of this letter. He was a cardiologist and a prominent member of New Zealand's anti-nuclear movement.

[78]Charles Brasch (1909-1973) was a cousin of Elespie and a well-known New Zealand poet

medico who wrote a book that Ian has & who invented the 'Ryle tube'[79] which is used in gastric lavages, & [I] will be able to tell Ann all about it & how it was invented & first tried out on the inventor's wife & all that. - Apparently Ryle's brother was, moreover, a sufferer from angina & his book contains some classical description of one of the subsidiary mental features of the condition. (I have this from Ian. It's apparently in the book he has).

Day-Time (still morning – 10.40).
In the discussion of my paper yesterday, I had one occasion to mention Entities, & on this particular occasion I think the Ryleans were quite glad that I {4} was able to speak as I did.

There was a very pugnacious priest at the back who said that he was 'a Thomist & a strict Thomist', that this was the first exhibition he had seen of 'logistics', & that (this very aggressively & totally irrelevantly) he wanted to know if I was a 'realist'. I had a great deal of pleasure in telling him that I was far more of a realist than he was, & that he would in fact classify me as an 'extreme' realist.

George Hughes was interested in the bit about the hidden assumption, in common talk about time, that it is infinite, & asked a question which got me bringing that out more fully. And Ryle asked the question I had hoped he would, enabling me to bring out the fact that there are no inverted commas implicit in my formulae. {5} Jack spoke much as in his letters, being supported by Passmore, who also had a little axe of his own to grid which I was able to deal with quite amicably.

Must buzz off now & post this & meet Jack.

Love & love & love (& do get some sleep! And God I hope you're home now – I think you will be, or there'd have been a wire or something) & love & love & love

Skig[80]

[79] The 'Ryle tube', a thin flexible tube, which is inserted into the stomach through the mouth or nose of a patient and is used for withdrawing fluid from the stomach or for giving a test meal. [J.A. Ryle (1889–1950), British physician] (http://www.encyclopedia.com/caregiving/dictionaries-thesauruses-pictures-and-press-releases/ryles-tube

[80] This is one of the nicknames Prior used of himself in letters. Martin recollects 'Skiggers' and assumes that 'Skig' is an abbreviation.

6 The programme for the Second Philosophical Congress

NEW ZEALAND SECTION OF THE
AUSTRALASIAN OF PSYCHOLOGY & PHILOSOPHY
SECOND PHILOSOPHICAL CONGRESS
Wellington 27th – 30th August, 1954

Friday 27th: 2.30 p.m.
Presidential Address by Professor Prior (Christchurch)
Subject: "The Syntax of Time-Distinctions"
Chairman: Dr. Williams, Principal, Victoria University College. Room A1

8. p.m.
Mr. Hutchings and Mr. Robinson (Wellington)
Symposium on "Essences".
Chairman: Professor Passmore (Dunedin).
Staff Common Room.

Saturday 28th: 2.30 p.m.
Dr. Becroft (Auckland)
Subject: "The Theory of Mental Dispositions"
Chairman: Mr. Hudson (Wellington) Law Reading Room

8. p.m.
Professor Ryle (Oxford)
Subject: "Inferring".
Chairman: Professor Hughes (Wellington) Staff Common Room

Sunday 29th: 10.30 a.m.
Mr. Bradley (Auckland)
Subject: "The Meaning of Freedom"
Chairman: Mr. Durrant (Dunedin)
Law Reading Room

8.p.m
Mr. Hinton (Wellington)
Subject: "Logical Necessity"
Chairman: Mr Shorter (Christchurch)
Staff Common Room

Monday 30th: 10 a.m.
Mr Grey (Dunedin)
Subject: "Cartesian Logic and the Cogito".
Chairman: Professor Smart (Adelaide)
Room A1

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Arthur Prior and Special Theory of Relativity: Two Standpoints from the *Nachlass*

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Abstract

This paper explores the evolution of Arthur Prior's views on the special theory of relativity. It focusses on unpublished texts that can be found in his online *Nachlass*. I will compare and contrast the views expressed in this material with his mature views, which were most fully expressed about a decade later in his best-known book, *Past, Present and Future* (1967). The intervening decade was a productive one for Prior, and his views on relativity developed significantly. Prior's views in the *Nachlass* material center on two, relatively straightforward, standpoints: (1) Time is not relative to an observer, and (2) The language of time in the special theory of relativity is artificial and does not describe what I shall call ontological time. However, by the time he published *Past, Present and Future*, these two standpoints seem to have been modified, or at least to have slipped into the background somewhat.

Keywords: Special Relativity, Arthur Prior, The Nachlass of A.N. Prior, Modal logic, Temporal logic, Multiple Keyword Search.

1 Introduction

Arthur Norman Prior (1914 - 1969) viewed tense logic as the language of temporal metaphysics and his metaphysical views were shaped by

both theological issues and his interest in science, particularly physics. The story of how issues concerning predestination helped shape the development of temporal logic is now well known; for a detailed account, see [5]. However less is known about how his views of Einstein's special theory of relativity changed and developed.

This paper is part of a larger attempt to explore the development of Prior's views on science in general, and the special theory of relativity in particular, and to investigate how they interacted with the development of tense logic. Given the centrality of time in Prior's work, it would have been both odd and disappointing if Prior had *not* been interested in the special theory of relativity. But he *was* interested, and his views on relativity and the development of his views are of considerable interest.

In this paper, I shall focus on a small but significant portion of the story: the ideas expressed in the unpublished material on the special theory of relativity from around 1957-58 that can be found in the Prior online *Nachlass* [9]. I shall compare and contrast these early views with Prior's mature views as expressed in his 1967 book *Past, Present and Future*, and in particular, with the detailed discussion given in Appendix B.5 of that book. As the material in the appendix makes clear, Prior's mature views were both technical and nuanced. The views to be found in Prior's earlier *Nachlass* material, on the other hand, seem to center on two, relatively straightforward, standpoints:

i . *Time is absolute and not relative to an observer*, and

ii . *The language of time in the special theory of relativity is artificial and does not describe ontological time*.

However, as I shall discuss, by the time he wrote *Past, Present and Future*, Prior seems to have softened his initial standpoints or switched focus, and I will discuss the changes involved.

Furthermore, it should be added that the term *ontological* in the second standpoint can be discussed since this is not a term that Prior uses in any of the included text. But as you will see he uses phrases like "the real passage of time" in quote (3) and in quote (3) he compares "having happened" with "existing", however to avoid these related meanings I will use *ontological* as a term of art.

Some historical background will be useful. In the late 1950s (where this paper starts) and in late 1967 (where it ends) Arthur Norman Prior

was at two very different places in his career. Indeed, he was located in two geographically and intellectually distinct places as well. In the late 1950s he was living in Christchurch, in the province of Canterbury in the south island of New Zealand, far away from many newly-found colleagues engaged in logic and philosophy. He had met these colleagues in 1956 during his one year long sabbatical at Oxford University. According to [3], this had been a very happy year for Prior: he had given the John Locke Lectures, and these had been published as a well-received book *Time and Modality — The John Locke Lectures* [13] by Oxford University Press.

However, he then had to return to the isolation of New Zealand. During his short period back in Christchurch (he would return to Europe for good in 1959) Prior wrote several texts where special theory of relativity was mentioned; these form the basis of this paper. They are not the earliest of Prior's writings that mention relativity, but they are the earliest texts by Prior the successful tense logician: they were written shortly after the 1957 publication of *Time and Modality*, a book which does not directly mention the special theory of relativity.[1] None of these texts were published by Prior himself; they were either speech notes, lecture notes, letters or sketches. One of them [16] was posthumously published (in [2]). Another is from his brief exchange of letters with the young Saul Kripke, then a Harvard undergraduate.

In 1967, on the other hand, Arthur Prior was at the height of his career. Among other things, he had by then been a professor at Manchester (where he had supervised the PhD theses of Robert Bull and Max Cresswell), he had visited UCLA in 1965 and met the "Californian Tense Logicians",[2] and was now a fellow at Balliol College at Oxford University. His book *Past, Present and Future* thus reflects the efforts of an intellectually intense decade.

The special theory of relativity does not play a prominent role in *Past, Present and Future* — the book addresses several themes, the dominant one being (in)determinism and branching time semantics. However, unlike *Time and Modality*, it does explicitly treat the special (and even the general) theory of relativity as an important topic for temporal logic to explore, and contains Prior's most developed discussion of

[1] Though 'space-time' is mentioned in passing on page 28 and page 31.

[2] Nino Cocchiarella, Richard Montague, Hans Kamp, E. J. Lemmon, Dana Scott and others; see [10] for a useful account.

the topic: "Relativity, theory of" appears in the book's index, relativity is briefly discussed at three places in the main text, and (most importantly) it is explored from a logical perspective in the two and half page long Appendix B.5. Sadly, Prior himself was unable to develop the ideas expressed here further, as he started to fall ill and died soon afterwards in 1969 while lecturing in Trondheim, Norway [3].

There is significant material by Prior on relativity that will not be discussed in this paper. First, there is a recently discovered text ?Essays Scientific?, published with other of Prior?s early writings [**?**]. ?Essays Scientific? was written by Prior in September 1931 (when he was 16 years old) and it is clear that it is an interesting and valuable find. Second, the special theory of relativity is mentioned in the last two pages of what is often regarded as the founding text of Priorean tense logic, "The Syntax of Time Distinctions" [17]. This paper, which was based on a 1954 talk Prior gave in New Zealand, uses what he calls "the time series of special relativity" to give an example of non-linear time that falsifies $\Diamond\neg\Diamond p \rightarrow \neg\Diamond p$.[3] Third, there are other papers addressing themes from the special theory of relativity; an interesting example is the posthumously published [19] with its "distant pulsating body" argument. However the focus in the present paper is on the texts in the *Nachlass*, and how the two standpoints expressed there link with Prior's mature views as expressed in *Past, Present and Future*.

The paper is structured as follows. In Section 2, I shall briefly describe Prior's *Nachclass* and the systematic multiple keyword search used to find the material on which this paper is based. In Section 3, the two standpoints will be presented with the help of Prior's own words from the *Nachlass*. Section 4 contains a brief presentation of the content of Appendix B.5 from [18], and in Section 5, I discuss what became of the two standpoints in this mature work. Section 6 concludes by noting topics for further research.

[3]There is a brief but interesting discussion of "The Syntax of Time Distinctions" and this example on page 41 of *Past, Present and Future*. There Prior explicitly remarks that the counterexample was given in his 1954 address, says that his proof in the paper was "a little sketchy and unsure", and compares his counterexample to a related example proposed by Kripke.

2 Exploring the *Nachlass*

The work reported here began with a multiple keyword search of Prior's online *Nachlass* for texts discussing special relativity.[4] This search found five texts written by Prior which mention the special theory of relativity [12], [16], [20], [21] and [15]. The texts are:[5]

[12] *Is there a Problem with Science and Religion?* (1956-61). Edited by Martin Prior, Jørgen Albretsen, David Jakobsen and Peter Øhrstrøm. This text, with the editor's comments, is just over seven pages long. The text is a coherent draft paper, with minor omissions and reworkings; the editors provide detailed comments. The text is undated, but the editors note that it refers to Michael Ramsey as the archbishop of York, which means it was written between 1956 and 1961

[16] *Some Free Thinking about Time* (1958). Edited by Peter Øhrstrøm. This text is about three and half pages in length. The text is clean; the editors note only one possible brief omission. An earlier version was posthumously published in 1996 in [2].

[20] *1. Parts of Speech* (*Text 105*) (19??). Edited by Adriane Rini, Max Cresswell and Martin Prior. An undated text, just over two pages long. The text is fragmented: it seems that either something is missing, or that the text is personal jottings. The part that mentions special relativity is the last paragraph, where Prior quotes and briefly comments on Kurt Gödel's views on relativity.

[21] *The Place of Time in Logic* (19??), Edited by Peter Øhrstrøm and Fabio Corpina. This text is less than two pages in length, and at least 10 pages are missing from the manuscript. The extant comments about special relativity occur in the very last paragraph.

[15] *Letter from Prior to Kripke 27/10/1958* Edited by Thomas Ploug and Peter Øhrstrøm. Just over one page long. Prior's response to Kripke's

[4] All this material is available for download at https://nachlass.prior.aau.dk/.

[5] The search also found Kripke's letter which led to Prior's response listed below. The three preceding letters [14], [7] and [8] provide crucual background; a closer study of these letters is conducted in [11].

letter of October 13, 1958 in which Kripke suggested that a tenseless logic might be preferable to a tensed logic for relativistic physics.

These are all the texts in the online *Nachlass* [9] in which Prior mentions the special theory of relativity. The paragraphs where the special theory of relativity is mentioned are the sources of the two standpoints discussed in the following section.

However, before presenting the standpoints, I will briefly discuss how the multiple keyword search that found these texts was conducted. Prior's *Nachlass* can usefully be divided into three parts. First, there is the physical *Nachlass* material. The largest part of this is contained in 28 boxes at the Bodleian library in Oxford, but new material (such as the 1931 text "Essays Scientific" mentioned earlier) continues to come to light. Second, there is a photographic record of this physical *Nachlass*; the image files are made available in what is called the Virtual Lab. After this, volunteers transcribe the material in the Virtual Lab and make it publicly available in the online *Nachlass* as a pdf file. This is an important step, as pdf files (unlike image files) are searchable. These transcribed files were the resource I made use of.

As mentioned earlier, this paper is part of a larger attempt to investigate Prior's views on science, and for this purpose a search engine more powerful than the one already contained in the online *Nachlass* is required: what is needed instead is a search engine that works with bigger libraries (including books and published papers), that can search on multiple words at one time, and that returns a savable output file. So I developed a prototype Python program that can work through a collection of pdfs, searching several pdfs for multiple words at one time. The program outputs a list with the texts in which the individual searchwords occur, stating where and how many times they were found.

Such a tool is useful for several reasons. First, it helps if the library of texts is large; when the searches for this paper were carried out there were already 68 items in the online *Nachlass*. Second, it is important to be able to search for multiple words. For example, Prior does not always talk of 'special theory of relativity'. He also uses terms like 'relativistic physics', 'special relativity' and so on. All of these should be searched for simultaneously. Third, searches can reveal relevant new search words. So it can be useful to be able to extend the list of search words with the new items, and then repeat the search and to have files

recording the results of various search results. Writing a small Python program that let some of this be done seemed sensible. The way the program carries out the search is shown in Figure 1.

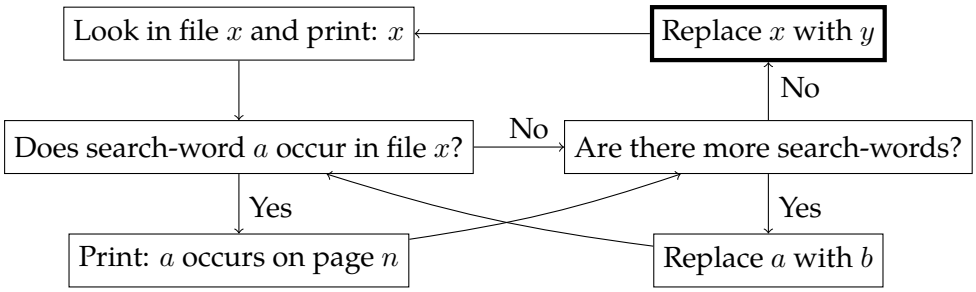

Figure 1: Structure of the search program.

The five texts listed above are the relevant results of the program searching the complete online Prior *Nachlass* for the words: 'relativity', 'relativistic' and 'physics'.

3 Two Standpoints from the *Nachlass*

After the search program had found the relevant texts, a careful reading was conducted. This suggested that Prior's views in the online *Nachlass* make two main points about how time and the special theory of relativity go together (or do not go together): (1) *the present is absolute and not relative to an observer*, and (2) *that the language of the special theory of relativity is artificial and does not describe ontological time*. It is certainly open to discussion whether this simple classification adequately mirror's Prior's views in the *Nachlass*, but it seems a useful first summary. In any case, in the following pages I will present them by extensively quoting Prior's own words, so the reader will be in a reasonable position to judge.

The first standpoint is clearly present in *Some Free Thinking about Time* [16]:

> People who are doing relativity physics are concerned with the relations of before and after and simultaneity, but these aren't the first things as far as the real passage of time is concerned - the first thing is the sequence of past, present, and

> future, and this is not just a private or local matter, different for each one of us; on the contrary, pastness, presentness and futurity are properties of events that are independent of the observer; and under favorable conditions they are perceived properties of events. [page 3]

Here an explicit statement of the first standpoint ("pastness, presentness and futurity are properties of events that are independent of the observer") is being used as part of an argument in support of the second standpoint — it provides a reason for thinking that the question 'did A happen before B?' is *not* a meaningless question, even though the "people who are doing relativity physics" think it is.

The first standpoint appears again in [16]; I have included the part where 'having happened' is compared with 'having existed' — a comparison that we will meet again.

> When an event X is happening, another event Y either has happened or has not happened - 'having happened' is not the kind of property that can attach to an event from one point of view but not from another. On the contrary, it's something like existing; in fact to ask what has happened is a way of asking what exists, and you can't have a thing existing from one point of view but not existing from another, although of course its existence may be known to one person or in one region, without being known to another person or in another region.[page 3]

Moreover, the first standpoint turns up again in 'Parts of Speech' [20]; unfortunately this text is very fragmented and it comes to an abrupt end at a particularly frustrating point. Nonetheless, the following quote is fascinating: it offers an argument that seems similar to that used in quote (3) and (3), and here Prior draws on the writings of Kurt Gödel to support this line of thought:

> *"But the special theory of relativity requires us to admit that "each observer has his own set of 'nows', & none of these various systems of layers can claim the prerogative of representing the objective lapse of time." In a footnote Gödel dismisses the possibility that the lapse of time may be "relative", i.e. may take place differently*

> *for each observer, & nevertheless be "objective", each observer's own time-lapse being perfectly real. "A relative lapse of time, however", Gödel says, "would certainly be something entirely different from the lapse of time in the ordinary sense, which means a change in the existing. The concept of existence cannot be relativized without destroying its meaning completely." What this mean, I take it, is that if I ask the question "When I was taking my Easter holidays in 1941, had that stellar explosion I am now observing taken place or not?", it"* [page 2]

Here the text stops, so we do not quite know what Prior meant by bringing these remarks into the text, but the text clearly *does* express the first standpoint, and we again meet the similarity (and maybe even the equality) between 'happened' and 'existed' that we saw in quote 3. Moreover the first standpoint is again being used to support the second standpoint: this is seen in the contrast between "relative lapse of time" and "lapse of time in the ordinary sense", because "the concept of existence cannot be relativized without destroying its meaning completely" and therefore a relativized lapse of time will lose its meaning as well.

Recall the second standpoint: the language of the special theory of relativity is artificial and does not provide a description of ontological time. In the online *Nachlass* material, this standpoint is presented in far more detail and more frequently than the first.

In *Is there a Problem with Science and Religion?* [12], Prior says that the religious tendency of "holding fast to a creed" may be felt by a scientist to be "intellectually disreputable", and that he himself agrees that it probably is. However, he then goes on to say that science has it own forms of intellectual disreputability, and it is the second standpoint that he uses as an example to illustrate this:

> On the other hand, scientists have their own kind of intellectual disreputableness, namely this:- If a question doesn't lend itself to solution by the scientific techniques of the day, scientists may invent a language in which this question just can't be formulated but in which the questions that can be answered are formulated with great precision and neatness. An example of this sort of thing is the special theory of relativity, which consists at least partly in the construction of

> a language in which the question as to which of two events happened first in many cases just can't be asked. (...) Well, so far, that's all right, and not intellectual disreputable at all. But then a scientist may go on to say that the questions he has thrust on one side just don't exist, and so the scientific picture of the world gets more and more impoverished. And I can't see why a religious person, or for that matter even a person who isn't religious, shouldn't be prepared sometimes to fight the scientists at this point, and to risk being called unscientific because he insists on the reality of positions which someone for one reason or another has pushed on one side.

In *Some Free Thinking About Time* [16] Prior presents the second standpoint several times. Here the discussion is not a 'fight' between science and religion as in the previous quote, but a fight between Prior's view on time — the A-theory of time — and what Prior calls the "tapestry view of time", or the B-theory of time, as it is usually called. Prior starts his argument as follows:

> (...) there is no way of determining whether the light-signal first crossed my path or yours. And the conclusion drawn in the theory of relativity is that this question - the question as to which of us is right, which of us really saw it first - is a meaningless question; outside our private paths, the time-direction and space direction just aren't as distinct as that.[Page 3]

But Prior forcefully denies that there is anything 'meaningless' here:

> Coming back to this allegedly meaningless question as to whether you or I saw the light- flash first, surely what it means is just this: When I was seeing the flash, had you already seen it, or had you not? In other words, when my seeing it was a present fact, had your seeing it become a past fact, or had it not? And I just cannot be persuaded that such a question is meaningless - its meaning seems to me perfectly obvious.[page 3]

Which leads him to conclude that the theory of relativity isn't about real space and time. Rather it offers an elegant but artificial tapestry that links observed facts together in a simple way:

> So it seems to me that there's a strong case for just digging our heels in here and saying that, relativity or no relativity, if I say I saw a certain flash before you, and you say you saw it first, one of us is just wrong - or misled it may be, by the effect of speed on his instruments - even if there is just no physical means whatever of deciding which of us it is. To put the same point another way, we may say that the theory of relativity isn't about real space and time, in which the earlier-later relation is defined in terms of pastness, presentness and futurity; the 'time' which enters into the so-called space-time of relativity theory isn't this, but is just part of an artificial framework which the scientists have constructed to link together observed facts in the simplest way possible, and from which those things which are systematically concealed from us are quite reasonably left out.[Page 4]

Prior makes a simular point in his 27th October 1957 [15] response to Kripke's letter of 13th October:

> There are areas of science within which certain questions arising out of ordinary tense- distinctions aren't answerable, and in which 'it is better to use a language in which such questions cannot even be stated; and I take it that the moral of Special Relativity is that the theory of light- propagation is such an area. [Page 1]

Summing up, both standpoints are presented as they appear in the online *Nachlass* material, however Prior's main statements concerning relativity physics in this period are centered on the second standpoint. Indeed, he tends to use the first standpoint as an explanation of the meaning of the allegedly meaningless question 'did A happen before B?'. Putting it the other way around, one might say that if one admits that the question 'did A happen before B?' is meaningless, then one cannot accept the first standpoint.

4 Special Relativity in *Past, Present and Future*

This section briefly summarizes and explains some technical aspects of Appendix B.5 of *Past, Present and Future* [18] that I will refer back to

in Section 5. The appendix is devoted to the tense logic of the special theory of relativity, and is the most detailed piece Prior published on the subject.

First, a quick overview. In the appendix, Prior argues that a tense logic for special theory of relativity should be at least as strong as the modal logic S4.2.[6] Prior writes *modal logic* here instead of *tense logic* because he refers to the *Diodorean modal logic* where $\Box\varphi$ is defined in tense logical terms as $\varphi \wedge G\varphi$ and $\Diamond\varphi$ is defined as $\varphi \vee F\varphi$, this terminology is also seen in his earlier publications *Time and Modality* from 1957 [13] and *Diodoran Modalities* from 1955 [22].

According to Prior, in the mid 1960s, the modal logic S4 was commonly accepted as the logic for relativistic physics. Prior's reason for choosing the stronger logic S4.2 instead of the weaker S4 is that S4 allows too much: though S4 might be appropriate for the *general* theory of relativity, it isn't for the special theory, as Prior states it himself in Appendix B.5:

> (...) *if our tense-logic is geared to the earlier-later relation, or one of the earlier later relations, of relativistic physics, the resulting Diodorean-modal system is S4. This seems to me to need a small correction, and I would suggest that while S4 does indeed give the Diodorean-modal logic appropriate to the* <u>*general*</u> *theory of relativity, the Diodorean-modal logic appropriate to the* <u>*special*</u> *theory is at least S4.2.* [p. 203]

Both relativistic theories make use of an indefinite number of frames of reference (each of which has a 'local proper time' conforming to the still stronger modal logic S4.3, the linear tense logic of classical physics) and each frame of reference may disagree with another frame of reference on the order of events a and b. However, Prior then says of special relativity that:

> This, however, is only true within limits, and in some cases an event b is earlier or later than an event a with respect to <u>all</u> frames of reference, and so may be said to be 'absolutely' earlier or later. In particular, if the space-time points a and

[6]The axioms of S4, S4.2 and S4.3 are noted below. For more detailed information about these and other modal logics, see [1]. In what follows I will use contemporary logical notation rather than the Polish notation that Prior favoured.

> *b* could conceivably be linked by the path of a light signal, one of them will be absolutely earlier than the other, and the other absolutely later[Page 203]

This quote is peculiar, since it seems to refer to some absolute initial or final event in time, a point that Prior does not mention further. However, it is this that leads him to argue that "the Diodorean-modal logic appropriate to the *special* theory is at least S4.2" [Page 203], a logic lying between S4 and S4.3.[7]

Let us look at the details. The modal logic corresponding to general theory of relativity is S4, the logic of transitive and reflexive structures.[8] In S4, temporal branching is permitted with *no* restrictions. On the other hand, the modal logic corresponding to classical physics is S4.3, the logic of transitive, reflexive and *connected* structures; such structures do not allow for temporal branching at all.[9]

Prior claims that the modal logic of special relativity should lie between these two extremes. More specifically it should be at least as strong as S4.2,[10] the logic of transitive, reflexive and *convergent* structures; such structures *do* permit branching, but only in those cases where the branches meet up again. Prior writes that:

> [i]t is not immediately obvious that the line-patterns associated with these theories have anything to do with the theory of relativity (...)[Page 204]

By "the line patterns associated with these theories", Prior seems to mean the different degrees of branching associated with the modal logics S4, S4.2 and S4.3. He then goes on to show, with the help of a space-time diagram, that although it may not be "immediately obvious", $FGp \to GFp$, the key axiom for S4.2, is indeed valid in (special relativistic) space-time. The space-time diagram depicted in Figure 2 is a modified version of the one he gives in Appendix B.5. It shows three

[7]There are infinitely many distinct modal logics between S4 and S4.3. Indeed, there are even infinitely many distinct Diodorean modal logics between S4.2 and S4.3, as G. E. Hughes, another philosophical logician from New Zealand proved; see [6].

[8]The axioms of S4 are $G\varphi \to GG\varphi$ (transtivity) and $G\varphi \to \varphi$ (reflexivity).

[9]The axioms of S4.3 are those of S4 plus $G(G\varphi \to \psi) \vee G(G\psi \to \varphi)$.

[10]The axioms of S4.2 are those of S4 plus $FG\varphi \to GF\varphi$, which guarantees convergence.

'light-cones', so called because the lines are light signals emitted from each point. Let us focus on point a: everything that is inside the light-cone *above* point a is in a's possible future, and everything inside the light-cone *beneath* point a was (possibly) in a's past. Points lying outside the light-cone cannot intersect with point a because of the universality of the speed of light — but they can, as Prior points out, intersect with a's future. Let us go through Prior's presentation of the validity of the

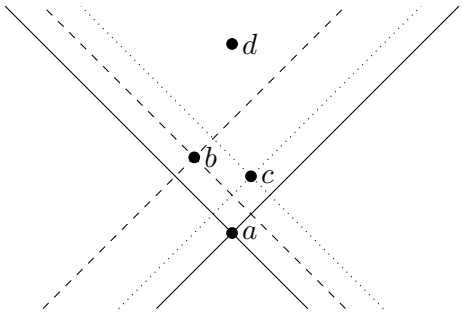

Figure 2: Space-time diagram showing an absolute future point in space-time d that is future in both a's and b's future light-cone, where a, b, c and d are points in space-time.

S4.2 axiom in special relativity with the help of Figure 2. Suppose that FGp holds at a. That is, suppose that at a there is some point in the future (point b, say) where p will always be the case — that is, p will be the case everywhere in b's future light-cone. Given this, then it is true that for any point in a's forward light-cone, say c, that p will eventually be the case in c's future light-cone. So GFp must hold at a. So the truth of the antecedent FGp at an arbitrary point a in a space-time diagram guarantees the truth of its consequent GFp, thus the S4.2 axiom is valid.

When he introduces the S4.2 axiom, Prior also notes the corresponding B-language formula:[11]

$$a < b \rightarrow (a < c \rightarrow \exists d(b < d \wedge c < d))$$

Here $a < b$ is to be read as b lies within the future light-cone of a. This formula is the B-language expression of the convergence property

[11]Here I have changed notation: Prior used Polish notation and the U-calculus in which $a < b$ would be written $U(a, b)$.

relevant to special relativity: if both b and c lie in the future light cone of a, then there exists some point d that lies in the future light cones of both b and c. Prior concludes Appendix B.5 by showing that Formula (4) can be derived from the axiom $FGp \rightarrow GFp$ in the U-calculus. That is: $FGp \rightarrow GFp$ is a simple axiom that axiomatically captures the content of convergence as expressed in the more complex B-language expression.

A fourth point that Prior makes in the appendix is that any two distinct points are connected "by some sequence of Ps and Fs". As he puts it "In this space-time, we might say, all futures tends to merge, but if time stopped some futures would be left separated" [p. 205]. For example in Figure 2 points b and c are not directly connected with each other: neither of the points lies in the other ones future or past light-cone, but at d both points are past. Hence from point b we can reach c using a two-step FP sequence via point d and vice versa. More generally, as Prior notes, if we assume that the future is unbounded, then we can reach *any* space-time point using a two-step FP sequence. For this reason, Prior suggests that the full logic of special relativity should contain the axiom $Gp \rightarrow Fp$ (time is unbounded towards the future). He also suggests adding axiom $GGp \rightarrow Gp$ (density).

So the main points Prior makes in the appendix of *Past, Present and Future* are that: (1) in some cases one event is earlier or later than another with respect to *all* frames of reference, (2) the modal logic of special relativity is at least as strong as the converging logic S4.2, (3) the characteristic S4.2 axiom $FGp \rightarrow GFp$ is strong enough to derive the corresponding B-language formula describing convergence, and (4) any two space-time points can be connected by some sequence of Ps and Fs, and indeed, connected by a two step sequence if the future is unbounded.

5 Where Did The Standpoints Go?

The main question asked in this section is suggested by its title: what became of the two *Nachlass* standpoints in *Past, Present and Future*? As we shall see, the first standpoint is present, but only in a weakened form. Moreover, the second standpoint is not found there at all; one has to look elsewhere in *Past, Present and Future* to find it.

Recall the first standpoint: time is absolute and not relative to an observer. This standpoint is present, though in a weaker version. It is a

weaker version because, as Prior states in Quote (4), in *some* cases an event is 'absolutely' earlier or later with respect to all frames of reference, in particular "if the space-time points a and b could conceivably be linked by the path of a light signal". Here Prior tacitly admits that there might be cases where disagreements on the order of events can occur. This becomes explicit when we consider the way he proves the validity of the characteristic S4.2 axiom: the intermediate points b and c both lie in the light cone of a, and they *cannot* be temporally compared. What *can* be said is that at some future point d, these two points can be temporally 'reconciled', and that this reconciliation can always be accomplished with a two-step FP sequence if time is unbounded towards the future.

Moreover, it is worth emphasizing (since occasionally Prior's language seems to suggest otherwise) that the S4.2 axiom does *not* guarantee the existence of some unique perspective which unites all observers; the reconciliation it offers is conditional. The simplest way of proving this is by considering a temporal modal structure based on two disjoint copies of the real numbers. Here we have two independent 'parallel temporal universes', or (to use the language of Appendix B.4) we do *not* have a unique time series. Nonetheless, in any such model $FGp \to GFp$ is valid (and so is the unbounded future axiom $Gp \to Fp$).

Recall that this says that: the language of the special theory of relativity is artificial and does not describe ontological time. As we saw in Section 3, in the *Nachlass* material Prior writes more frequently about the second standpoint, so it is remarkable that this standpoint isn't mentioned in Appendix B.5 in any obvious way. Was it not important to Prior any more? Or was it left out — temporarily suspended — for the sake of focus?

Indeed, in the modal logic S4.2, standpoint one only holds in a very weakened form. In this logic, convergence allows the perspectives of observers suitably arranged in space-time to *eventually* be reconciled by zigzagging through a sequence of F and P steps. So there has been a change of emphasis regarding standpoint one. But why? This brings us to standpoint two.

One plausible answer to these questions can be found in Appendix B.4, which is called *The uniqueness of the time-series*. There, three pages before the start of Appendix B.5, we find the following quote:

> I am sure that these observations [about several non-overlapping time-series] have some bearing on the topic of the next section [B.5], tense-logic in the theories of relativity; I wish I were clearer as to what that bearing is. In anticipating that section, I feel a bit like someone who, having delivered a Berkeleian attack on the differential calculus, will shortly be nevertheless using it. Point-instants (and even events) seem as mythical to me as matter did to Berkeley; and what I understand of the theory of relativity leaves me about as happy as the calculus left him. Still, it's Science, so in the meantime we can only try (as I shall be trying in the next section) to do our sums right, however obscure their meaning; and wait for Weierstrass." [Page 200]

Clearly Prior did *not* discard his previous opinion on the ontology of time. In Appendix B.4 he is admitting that he will essentially *do his sums right*. That is, he will work with an artificial system, his hope perhaps being that the physicists will eventually realize that their view of time needs augmenting with a deeper analysis. Prior's language in appendix B.4 is strikingly reminicent of that used in his 1958 fragment *Some Free Thinking About Time*:

> When that formidable mathematical engine the differential calculus was first invented, its practitioners used to talk a mixture of excellent mathematics and philosophical nonsense, and at the time the nonsense was exposed for what it was, by the philosopher Berkeley, in a pamphlet entitled 'A Defence of Free Thinking in Mathematics'. And the mathematicians saw in the end that Berkeley was right, though it took them about a century and a half to come round to it. They came round to it when they became occupied with problems which they could only solve by being accurate on the points where Berkeley had shown them to be loose; then they stopped thinking of the things he had to say as just a reactionary bishop's niggling, and began to say them themselves. Well, it may be that some day the mathematical physicists will want a sound logic of time and tenses; and meanwhile the logician had best go ahead and construct it, and abide his time. [Page 4]

So even though Prior still considered time in the special theory of relativity artificial, he would not just ignore it. Rather he will develop his own sound logic within the special theory of relativity - *however obscure its meaning*. In this connection, one point is well worth emphasizing: Arthur Prior did indeed get his sums right. In 1980, Robert Goldblatt (another modal logician from New Zealand) published a paper proving that S4.2 was indeed the modal logic of Minkowski space-time; see [4].

This answers both questions posed at the beginning of this paragraph: Yes, Prior's early standpoints were still important to him, and yes, the second standpoint seems to have been suspended during the writing of Appendix B.5 for the sake of focus. However, as his remarks in Appendix B.4 make clear, these standpoints are difficult to reconcile with the physics (and indeed the logic) of the special theory of relativity.

So it seems that Prior keeps the second standpoint, but modifies the first. This fits well with the conclusion I drew in section 3: if one accepts standpoint one, one has to accept standpoint two as well. As we have just seen, Prior does not keep to a strong version of standpoint one in Appendix B.5: he allows periods where the time can be relative to an observer and periods where time is not relative to an observer. In periods where time is *not* relative to an observer, they will not disagree on the order of events, and 'did A happen before B?' is therefore a meaningful question, but in the periods where time *is* relative to an observer, they then *can* disagree on the order of events (and they can also not disagree). Does that yield the question 'did A happen before B' a meaningless question or not? It seems that sometimes the question is meaningless — or better perhaps: undefined — and sometimes it is not. So the 'softening' of standpoint one leads to a view which seems to match quite well with the scientifically-aware layperson's view of what relativity tells us: such people know that in everyday life we can rely on our temporal intuitions, but when dealing with topics such as cosmology and particle physics, it is wiser to defer to the language of physics.

6 Conclusion

As part of a larger attempt to explore Prior's ideas about science, his writings about the special theory of relativity in the online *Nachlass* were collected through a small search program developed for the purpose. The

five texts which resulted from the search were read and Prior's arguments concerning the special theory of relativity were condensed into two main standpoints: (i) time is *not* relative to an observer, (ii) the language of time in the special theory of relativity is artificial and does not describe ontological time.

These two standpoints were then compared with the mature views expressed in *Past, Present and Future*, particularly Appendix B.5. The comparison was done to see whether (and how) Prior's view on time in the special theory of relativity developed during the last decade of his life. As we have seen, Prior turned from insisting that there is only *one* absolute frame of reference, and that we can not disagree about the order of events without one of us being wrong, to proposing S4.2 as the modal logic of relativity. As S4.2 allows for changes of reference frame, this might suggest that Prior 'softened up' during the decade. But the motivation of Appendix B.5 (and the remarks in Appendix B.4) make it somewhat unclear what Prior's final position really was. It is now widely accepted that Prior got it right: as Goldblatt confirmed, S4.2 is indeed the modal logic of Minkowski space-time, that is, the modal logic of *relative* time. But would Prior have agreed that S4.2 is the logic of *ontological* time, or was he 'playing along' with the physicists, without giving up any of his original standpoints? On balance, it seems that he would have viewed S4.2 as the logic of an elegant but artificial tapestry.

Clearly the work reported here is only the first step towards a deeper understanding of Prior's views on relativity. Obvious further questions to explore include: if more papers had been included would other standpoints have appeared? How would the two standpoints presented here look in that light? Were the standpoints discussed in this paper prefigured in the newly discovered text "Essays Scientific" that Prior wrote when he was 16? Finally, from a logical perspective, it might be interesting to explore the underlying logic of Minkowski space-time with a more expressive A-series language such as hybrid logic.

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Time, Tense, and Eternity

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Abstract

The paper considers the question: how should God's eternity be understood? Should divine eternity be conceived as timelessness or as omni-temporality? I consider three arguments in favor of divine timelessness: the argument from God's knowledge of future contingents, the argument from the special theory of relativity, and the argument from the incompleteness of temporal life. I show that these arguments are at best inconclusive. Furthermore, I consider three arguments in favor of divine omni-temporality: the argument from the impossibility of atemporal personhood, the argument from divine action in the world, and the argument from divine knowledge of tensed facts. I show that while the first argument is weak, the latter two arguments are rather strong. In the last section of the paper I point out that the defender of divine timelessness can escape the arguments for divine temporality by embracing the tenseless theory of time. I conclude that if we are to understand divine eternity, we must first settle the question of the tenseless vs. tensed theory of time.

Keywords: Eternity, divine foreknowledge, the special theory of relativity, the tenseless theory of time, the tensed theory of time.

1 Introduction

"God," declares the prophet Isaiah, "is the high and lofty One who inhabits eternity" (Is. 57.15). But being a prophet and not a philosophical

theologian, Isaiah did not pause to reflect upon the *nature* of divine eternity. Minimally, to be eternal means to exist without beginning and end. To say that God is eternal means minimally that He never began to exist and will never cease to exist. To exist eternally is to exist permanently.[1]

There are, however, at least two ways in which something could exist eternally. One way would be to exist omnitemporally throughout infinite time. In this case God would have an immemorial and everlasting temporal duration. The other way in which a being could exist eternally would be by existing timelessly. In this case God would completely transcend time, having neither temporal location nor temporal extension.

Philosophical theologians have been sharply divided with respect to God's relationship to time. What are the principal arguments which they have offered for divine timelessness and temporality?

2 Arguments for Divine Timelessness

ARGUMENT FROM SIMPLICITY OR IMMUTABILITY

Traditionally Christian theologians like Thomas Aquinas argued for God's timelessness on the basis of His absolute simplicity and immutability (*Summa theologiae* 1a. 10. 3). The argument can be simply formulated. As a first premiss, we assume either

1. God is simple

or

1′. God is immutable.

Then we add

[1]For an analysis of what it means to be permanent, see Brian Leftow, *Time and Eternity*, Cornell Studies in the Philosophy of Religion (Ithaca, N.Y.: Cornell University Press, 1991), p. 133; cf. Quentin Smith, "A New Typology of Temporal and Atemporal Permanence," *Noûs* 23 (1989): 307-30. According to Leftow an entity is permanent if and only if it exists and has no first or last finite period of existence, and there are no moments before or after it exists.

2. If God is simple or immutable, then He is not temporal, from which it follows that

3. Therefore, God is not temporal.

Since temporality and timelessness are contradictories, it follows that

4. Therefore, God is timeless.

I agree that God's timelessness can be deduced from either His simplicity or immutability. Is this a good reason for thinking that God is timeless? That depends on whether we have any good reason to affirm (1) or (1′). Here we run into severe difficulties. For doctrines of divine simplicity and immutability which are sufficiently strong to support divine timelessness are even more controverted than the doctrine of divine timelessness itself. Philosophically there seem to be no good reasons to embrace these doctrines and weighty objections lodged against them.[2] These cannot be discussed here; the point is that (1) and (1′□) are even more difficult to prove than (4), so that they do not constitute good grounds for believing (4).

ARGUMENT FROM DIVINE KNOWLEDGE OF FUTURE CONTINGENTS

Many thinkers have argued that God's knowledge of future contingent events, for example, future human free actions, implies divine timelessness. The reasoning seems to go as follows:

5. A temporal being cannot know future contingent events.

6. God knows future contingent events.

7. Therefore, God is not a temporal being.

Again, if God is not a temporal being, then it follows that God is timeless.

[2]See discussion in Thomas V. Morris, *Anselmian Explorations* (Notre Dame, Ind.: University of Notre Dame Press, 1987), pp. 98-123; Christopher Hughes, *On a Complex Theory of a Simple God,* Cornell Studies in Philosophy of Religion (Ithaca, N.Y.: Cornell University Press, 1989).

Despite the denial of (6) on the part of a wide range of contemporary thinkers from process theologians to so-called "open" theists, a biblical doctrine of divine omniscience makes (6) incumbent upon an orthodox theologian.[3] The argument hinges, therefore, on the truth of (5). On behalf of (5) it is usually claimed that contingent events, not being deducible from present causes, can be known only insofar as they are real or existent. Given (6), it follows that future contingent events are real or existent for God. Defenders of divine timelessness such as Boethius, Anselm, and Aquinas thus typically maintained that all events in time are real to God and therefore can be known by Him via His *scientia visionis* (knowledge of vision).

How can we make sense of this claim? The most plausible move for the defender of divine timelessness to make will be to hold that the four-dimensional space-time manifold exists tenselessly and that God transcends that manifold. A good many physicists and philosophers of time and space embrace such a tenseless view of time (spacetime realism). Such a view makes sense of the traditional claim that all events in time are present to God and therefore known to Him via His *scientia visionis*.

But is spacetime realism a necessary condition of God's knowledge of future contingents? I think not. In assessing the question of how God knows truths about temporal events, we may distinguish two models of divine cognition: the *perceptualist* model and the *conceptualist* model. The perceptualist model construes divine knowledge on the analogy of sense perception: God looks and sees what is there. Such a model patently underlies the classic doctrine of *scientia visionis.* Absent a tenseless theory of time, the perceptualist model of divine cognition does encounter real difficulty concerning God's knowledge of future contingents, for, if future events do not exist, there is nothing there to perceive.[4]

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[3]I take for granted that there are contingent events such as human free acts; see also my *The Only Wise God: The Compatibility of Divine Foreknowledge and Human Freedom.* Grand Rapids, Mich.: Baker Bookhouse, 1987.

[4]Notice, however, that if we think of statements or facts as with in God's perceptual purview, then even on a perceptualist model, God must know the future, so long as the Principle of Bivalence holds for future-tense statements. For He perceives which future-tense statements presently have the property of truth inhering in them or which future-tense facts presently exist. Thus, by means of His perception of presently existing realities He knows the truth about the future.

By contrast on a conceptualist model of divine knowledge, God does not acquire His knowledge of the world by anything like perception. His knowledge of the future is not based on His "looking" ahead and "seeing" what lies in the future (a terribly anthropomorphic notion in any case). Rather God's knowledge is more like a mind's knowledge of innate ideas. It is therefore inappropriate to speak of God's *acquiring* knowledge at all. Rather as an omniscient being, God has essentially the property of knowing all truths; there are truths about future events; *ergo*, God knows all truths concerning future events. So long as we are not seduced into thinking of divine foreknowledge on the model of perception, it is no longer evident why knowledge of future contingents should be impossible.

We can go further, however. For the doctrine of middle knowledge (*scientia media*) is a version of the conceptualist model which allows us to say considerably more about the basis of God's foreknowledge of future contingents. Divine foreknowledge is based on (i) God's middle knowledge of what every creature would freely do under any circumstances and (ii) His knowledge of the divine decree to create certain sets of circumstances and to place certain creatures in them. Given middle knowledge and the divine decree, foreknowledge follows automatically as a result without any perception of the created world. This complex and interesting doctrine must be pursued at another time.

In sum, the argument from God's knowledge of future contingents is inconclusive, since a conceptualist model of divine cognition remains a viable alternative to perceptualist accounts.

ARGUMENT FROM SPECIAL RELATIVITY

A third argument for divine timelessness arises from the concept of time in Einstein's Special Theory of Relativity (STR). According to Einstein's theory, there is no unique, universal time and so no unique, worldwide "now." Each inertial frame has its own time and its own present moment, and there is no overarching, absolute time in which all these diverse times are integrated into one. So if God is in time, then the obvious question raised by STR is: *Whose time is He in?* The defender of divine timelessness maintains that there is no acceptable answer to this question.

We can summarize this reasoning as follows:

8. STR is correct in its description of time.

9. If STR is correct in its description of time, then if God is temporal, He exists in either the time associated with a single inertial frame or the times associated with a plurality of inertial frames.

10. Therefore, if God is temporal, He exists in either the time associated with a single inertial frame or the times associated with a plurality of inertial frames.

11. God does not exist in either the time associated with a single inertial frame or the times associated with a plurality of inertial frames.

12. Therefore, God is not temporal.

What can be said in response to this argument? Although it may come as something of a shock to many, the most dubious premiss of the argument is (8). For STR's concept of time rests upon decrepit epistemological foundations. Einstein's re-definition of simultaneity in terms of clock synchronization by light signals simply assumes that the time which light takes to travel between two relatively stationary observers A and B is the same from A to B as from B to A in a round-trip journey. That assumption presupposes that A and B, while at relative rest, are not both in absolute motion, or in other words that neither absolute space nor a privileged inertial frame exists. What justification did Einstein have for so radical a presupposition? The answer, in a word, is verificationism. It is empirically impossible to distinguish uniform motion from rest relative to such a frame, and Einstein believed that if absolute space and absolute motion or rest are undetectable empirically, they therefore do not exist (and may even be said to be meaningless). Historians of science have shown that at the philosophical roots of Einstein's theory lies a verificationist epistemology, mediated to the young physicist chiefly through the influence of Ernst Mach, which comes to expression in Einstein's analysis of the concepts of time and space.[5]

[5]See especially Gerald J. Holton, "Mach, Einstein and the Search for Reality," in *Ernst Mach: Physicist and Philosopher,* Boston Studies in the Philosophy of Science 6 (Dordrecht: D. Reidel, 1970), pp. 165-99: idem, "Where Is Reality? The Answers of Einstein," in *Science and Synthesis,* ed. UNESCO (Berlin: Springer-Verlag, 1971), pp. 45-69; and the essays collected together in idem, *Thematic Origins of Scientific Thought.* See also Lawrence Sklar, "Time, Reality, and Relativity," in *Reduction, Time and Reality,* ed. Richard Healey (Cambridge: Cambridge University Press, 1981), p. 141.

The untenability of verificationism is so universally acknowledged that it will not be necessary to rehearse the objections against it here.[6] Verificationism provides no justification for thinking that Newton erred, for example, in holding that absolute time, grounded in God's sempiternal duration, exists independently of our physical measures of it and may or may not be accurately registered by them. With the demise of verificationism, the philosophical underpinnings of STR have collapsed. In short, there is no reason think that (8) is true.

Moreover, contrary to (9), it does not follow from the correctness of STR that if God is in time, then He is in the time of one or more inertial frames. Because according to General Relativistic cosmological models, space itself is expanding, there is no universal inertial frame with which God can be associated, even though there does exist a preferred foliation of spacetime and so a cosmic time in which God can be conceived to exist.[7] Based on a cosmological, rather than a local, perspective, cosmic time serves to restore the classical notions of universal time and absolute simultaneity which STR denied.

ARGUMENT FROM THE INCOMPLETENESS OF TEMPORAL LIFE

Brian Leftow, as well as Eleonore Stump and Norman Kretzmann, argue that the fleeting nature of temporal life is incompatible with the life of

[6]Verificationism proposed a criterion of meaning that was so restrictive that it would consign vast tracts of apparently perfectly intelligible discourse to the trash heap of nonsense; moreover, the criterion seemed to be self-refuting. See the excellent discussion in Frederick Suppe, "The Search for Philosophical Understanding of Scientific Theories," in *The Structure of Scientific Theories,* 2d ed., ed. F. Suppe (Urbana, Ill.: University of Illinois Press, 1977), pp. 3-118.

[7]Cosmic time is related to the local times of a special group of observers called "fundamental observers." These are hypothetical observers, associated with the galaxies, who are at rest with respect to the expansion of space itself. As the expansion of space proceeds, each fundamental observer remains in the same place, though his spatial separation from fellow fundamental observers increases. Cosmic time relates to these observers in that their local times all coincide with cosmic time in their vicinity. Because of their mutual recession, the class of fundamental observers do not serve to define a global inertial frame, technically speaking, even though all of them are at rest. But since each fundamental observer is at rest with respect to space, the events which he calculates to be simultaneous will coincide locally with the events which are simultaneous in cosmic time. One could say that God exists in the time of the inertial frame of every fundamental observer; but then there is no problem, since all their local times fuse into one cosmic time.

a most perfect being such as God. A temporal being is unable to enjoy what is past or future for it, possessing only the fleeting present. The passage of time thus renders it impossible for any temporal being, even God, to possess all its life at once. By contrast a timeless God lives all His life at once because He literally has no past or future and so suffers no loss. Therefore, since God is the most perfect being, He is timeless.

We can formulate this argument as follows:

13. God is the most perfect being.

14. The most perfect being has the most perfect mode of existence.

15. Therefore, God has the most perfect mode of existence.

16. Temporal existence is a less perfect mode of existence than timeless existence.

17. Therefore, God has a timeless mode of existence.

The key premiss here is (16), which rests on very powerful intuitions about the irretrievable loss that arises through the experience of temporal passage, a loss which intuitively should not characterize the experience of a most perfect being. Some philosophers of time might try to avert the force of this consideration by adopting a tenseless view of time according to which things and events do not in fact come to be or pass away. The difference between past, present, and future is a subjective illusion of consciousness. On this view of time no temporal being ever really loses its past or has not yet acquired its future; it (or its temporal parts) just exists tenselessly at its various temporal locations. A temporal God would exist at all temporal locations without beginning or end and so would not lose or acquire portions of His life.

The problem with this escape route is that it fails to appreciate that the argument is based on the *experience* of temporal passage, rather than on the objective reality of temporal passage itself. Even if the future never becomes and the past is never really lost, the fact remains that for a temporal person the past is lost *to him* and the future is not accessible *to him.* For this reason, it would be futile to attempt to elude the force of this argument by postulating a temporal deity in a tenseless time.

Perhaps, however, the realization that the argument is essentially experiential in character opens the door for a temporalist alternative. When we recall that God is perfectly omniscient and so forgets nothing

of the past and knows everything about the future, then time's passage is not so tragic for Him. His past experiences do not fade as ours do, and He has perfect prescience of what the future holds. So it is far from obvious that the experience of temporal passage is so melancholy an affair for an omniscient God as it is for us. Moreover, the life of a perfect person may have to be characterized by the incompleteness which would in other contexts be considered an imperfection. Timelessness may not be the most perfect mode of existence of a perfect person. All this goes to call into question (16). Still, this last argument, like the argument from divine foreknowledge, does have some force and so needs to be weighed against whatever arguments can be offered on behalf of divine temporality.

3 Arguments for Divine Temporality

ARGUMENT FROM THE IMPOSSIBILITY OF ATEMPORAL PERSONHOOD

One argument frequently raised in the literature is that timelessness and personhood are incompatible. Some philosophers have denied that a timeless God can be a self-conscious, rational being because He could not exhibit certain forms of consciousness which we normally associate with personal beings (namely, ourselves). For example, Robert Coburn has written:

> Surely it is a necessary condition of anything's being a person that it should be capable (logically) of, among other things, doing at least some of the following: remembering, anticipating, reflecting, deliberating, deciding, intending, and acting intentionally [...] But now an eternal being would necessarily lack all of these capacities in as much as their exercise by a being clearly requires that the being exist in time [...] Hence, no eternal being, it would seem, could be a person.
>
> (Robert C. Coburn, "Professor Malcolm on God", *Australasian Journal of Philosophy* 41 (1963): 155)

Since God is essentially personal, He therefore cannot be timeless.

We can formulate this argument as follows (using *x, y, z* to represent certain properties allegedly essential to personhood):

18. Necessarily, if God is timeless, He does not have the properties *x, y, z*.

19. Necessarily, if God does not have the properties *x, y, z*, then God is not personal.

20. Necessarily, God is personal.

21. Therefore, necessarily, God is not timeless.

The defender of divine timelessness may attempt to turn back this argument either by challenging the claim that the properties in question are necessary conditions of personhood or by showing that a timeless God could possess the relevant properties after all. With respect to the second strategy, even if Coburn were correct that a personal being must be capable of exhibiting the forms of consciousness he lists, it does not follow that a timeless God cannot be personal. For God could be *capable* of exhibiting such forms of consciousness but be timeless just in case He does not *in fact* exhibit any of them. In other words, the hidden assumption behind Coburn's reasoning is that God's being timeless or temporal is an essential property of God. But that assumption seems dubious. Suppose, for the sake of argument, that God is in fact temporal. Is it logically impossible that God could have been timeless instead? Since God's decision to create is free, we can conceive of a possible world in which God alone exists. If He is unchanging in such a world, then on any relational view of time God would be timeless. But then it seems that there are possible worlds in which God exists temporally and possible worlds in which He exists timelessly. God's temporal status is thus plausibly a contingent rather than essential property.

So if timelessness is a merely contingent property of God, He could be entirely capable of remembering, anticipating, reflecting, and so on; only were He to do so, then He would not be timeless. So long as He freely refrains from such activities He is timeless, even though He has the *capacity* to engage in those activities. Thus, by Coburn's own lights God must be regarded as personal.

At a more fundamental level, it is in any case pretty widely recognized that most of the forms of consciousness mentioned by Coburn

are not essential to personhood or could be exemplified timelessly. Take deciding, intending, and acting intentionally, for example. All of these forms of consciousness are exhibited by a timeless God. With respect to deciding, omniscience alone precludes God's deciding in the sense of making up His mind after a period of indecision. Even a temporal God does not decide in that sense. But God does decide in the sense that His will inclines toward one alternative rather than another and does so freely. Because God is omniscient, His free decisions are either sempiternal or timeless rather than preceded by a period of ignorance and indecision.

As for intending or acting intentionally, there is no reason to think that intentions are necessarily future-directed. One can direct one's intentions at one's present state. God, as the Good, can timelessly desire and will His own infinite goodness. Such a changeless intention can be as timeless as God's knowing His own essence. Moreover, in the empty world we have envisioned, God may timelessly will and intend to refrain from creating a universe. Hence, it seems that God can timelessly intend, will, and choose what He does.

In short, the argument for divine temporality based on God's personhood cannot be deemed a success.

ARGUMENT FROM DIVINE ACTION IN THE WORLD

In our thought experiment above, we abstracted from the actual existence of the temporal world and considered God existing alone without creation and asked whether He could exist timelessly. But, of course, the temporal world does exist. The question therefore arises whether God can stand in relation to a temporal world and yet remain timeless. It is very difficult to see how He can. Imagine once more God existing changelessly alone without creation, but with a changeless determination of His will to create a temporal world with a beginning. Since God is omnipotent, His will is done, and a temporal world comes into existence. Can God remain untouched by the world's temporality? It seems not. For at the first moment of time, God stands in a new relation in which He did not stand before (indeed, there was no "before"). Even if in creating the world God undergoes no *intrinsic* change, He at least undergoes an *extrinsic* change. For at the moment of creation, God comes into the relation of *sustaining* the universe or, at the very least, of *co-existing with*

the universe, relations in which He did not stand before. Since He is free to refrain from creation, God could have never stood in those relations, had He so willed. But in virtue of His creating a temporal world, God comes into a relation with that world the moment it springs into being. Thus, even if it is not the case that God is temporal prior to His creation of the world, He nonetheless undergoes an extrinsic change at the moment of creation which draws Him into time in virtue of His real relation to the world. So even if God is timeless without creation, His free decision to create a temporal world also constitutes a free decision on His part to exist temporally.

The argument can be summarized as follows:

22. God is creatively active in the temporal world.

23. If God is creatively active in the temporal world, God is really related to the temporal world.

24. If God is really related to the temporal world, God is temporal.

25. Therefore, God is temporal.

This argument, if successful, does not prove that God is essentially temporal, but that if He is a Creator of a temporal world — as He in fact is —, then He is temporal.

One way to escape this argument is to deny (23). This might not appear to be a very promising strategy, since it seems obvious that God is related to His creatures insofar as He sustains them, knows them, and loves them. Remarkably, however, it was precisely this premiss that medieval theologians like Aquinas denied. Thomas agrees with (24). On his view, relational properties involving God and creatures, like God's *being Lord*, first begin to exist at the moment at which the creatures come into being (*Summa theologiae* 1a. 13. 7). Hence, if God stands in real relations to His creatures, He acquires those relational properties *de novo* at the moment of creation and thus undergoes change. And anything that changes, even extrinsically, must be in time. Thomas escapes the conclusion that God is therefore temporal by denying that God stands in any real relation to the world. Since God is absolutely simple, He stands in no relations to anything, for relations would introduce complexity into God's being. Aquinas holds, paradoxically, that while creatures are really related to God, God is not really related to creatures. The relation of

God to creatures exists only in our minds, not in reality. On Aquinas's view, then, God undergoes no extrinsic change in creating the world. He just exists, and creation is creatures' coming into existence with a real relation to God of being caused by God.

This is certainly an extraordinary doctrine. Wholly apart from its reliance on divine simplicity, the doctrine of no real relations is very problematic. God's sustaining the world is a causal relation rooted in the active power and intrinsic properties of God as First Cause. Thus, to say the world is really related to God by the relation *is sustained by,* but that God is not really related to the world by the relation *is sustaining* seems unintelligible. It is to say that one can have real effects without a real cause–which seems self-contradictory or incomprehensible.

Moreover, God is surely really related to His creatures in the following sense: in different possible worlds, God's will, knowledge, and love are different than they actually are. For example, if God had not chosen to create a universe at all, He would surely have a different will than that which He has (for He would not will to create the universe); He would know different truths than the ones He knows (for example, He would not know *The universe exists*); He would not love the same creatures He actually loves (since no creatures would exist). It is the implication of Aquinas' view, however, that God is perfectly similar in every possible world: He never wills differently, He never acts differently, He never knows differently, He never loves differently. Whether the world is empty or chock-full of creatures of every sort, there is no difference in God. But then it becomes unintelligible why this universe or any universe exists rather than just nothing. The reason cannot lie in God, for He is perfectly similar in all possible worlds. Nor can the reason lie in creatures, for we are asking for some explanation of their existence. Thus, on Thomas's view there just is no reason for why this universe or any universe at all exists. Therefore, Thomas's attempt to evade the present argument by denying (23) is implausible.

Recent defenders of timeless eternity have turned their guns on (24) instead. Brian Leftow as well as Eleonore Stump and Norman Kretzmann have tried to craft theories of divine eternity which would permit God to be really related to the temporal world and yet to exist timelessly. I do not have the time to discuss these theories now; suffice it to say that the general consensus is that they have failed to make good on their promises. In summary, it seems that we have here a powerful argument

for divine temporality from God's relation to the world.

ARGUMENT FROM DIVINE KNOWLEDGE OF TENSED FACTS

Defenders of divine temporality have argued that a timeless God cannot know certain tensed facts about the world — for example, what is happening now — and therefore, since God is omniscient, He must be temporal.

We can formulate the argument as follows:

26. A temporal world exists.

27. God is omniscient.

28. If a temporal world exists, then if God is omniscient, God knows tensed facts.

29. If God is timeless, He does not know tensed facts.

30. Therefore, God is not timeless.

Again, this argument does not prove that God is essentially temporal, but, if successful, it does show that if a temporal world exists, then God is temporal.

Defenders of divine timelessness have attempted to refute this argument either by arguing that a timeless God can know tensed facts or by arguing that God may still qualify as omniscient even if He is ignorant of tensed facts.

Let us look first at the plausibility of denying (29). Can a timeless God know tensed facts? Although Jonathan Kvanvig, Edward Wierenga, and Leftow have all argued that God can know the facts expressed by tensed sentences, an analysis of their respective positions reveals that in the end they all embrace the view that the factual content expressed by tensed sentences is tenseless.[8] Despite first appearances to the contrary, they all accept the truth of (29). Kvanvig, Wierenga, and Leftow's

[8]Jonathan L. Kvanvig, *The Possibility of an All-Knowing God* (New York: St. Martin's, 1986), pp. 150-65; Edward R. Wierenga, *The Nature of God: An Inquiry into Divine Attributes,* Cornell Studies in Philosophy of Religion (Ithaca, N.Y.: Cornell University Press, 1989), pp. 179-85; Leftow, *Time and Eternity,* pp. 312-37. See also Jonathan L. Kvanvig, "Omniscience and Eternity: A Reply to Craig," *Faith and Philosophy* 18 (2003): 369-76; Edward R. Wierenga, Omniscience and Time, One More Time: A Reply to Craig," *Faith and Philosophy* 21 (2004): 90-7.

accounts are the most sophisticated attempts to explain how a timeless God can know the facts expressed by tensed sentences, yet they all finally deny that God knows tensed facts. Thus, (29) seems secure.

The defender of divine timelessness has no recourse, then, but to deny (28). He must deny that omniscience entails a knowledge of tensed facts. He can do this either by revising the traditional definition of omniscience or else by maintaining that tense, while an objective feature of time, does not strictly belong to the factual content expressed by tensed sentences. Let us examine each strategy in turn.

Leftow entertains the idea of revising the definition of omniscience in such a way that omniscience does not entail knowledge of all truths. He argues, in effect, that there are many sorts of truths which God cannot know, so there is no harm in admitting one more class of truths (namely, tensed truths) of which God is ignorant.

The problem is that such a consideration should not affect the definition of "omniscience" as such. In any case, does Leftow succeed in showing that there are truths which God cannot know? It seems not. His examples of things God cannot know include how it feels to be oneself a failure or a sinner. But Leftow has confused *knowing how* with *knowing that*. *Knowing how* does not take truths as its object. God can know such truths as *Being a failure feels lousy, Sinners feel guilty and hopeless,* and so on. God's not knowing how it feels to be Himself a failure or a sinner is not an example of truths He fails to know and so does not constitute a restriction on His omniscience. Leftow furnishes no example of any truth which might be conjoined with "knows that" such that we cannot say, "God knows that ____," where the blank is filled by the truth in question. Therefore, he has not adequately motivated denying that knowledge of tensed truths properly belongs to omniscience. The traditional definition of omniscience requires it, and we have no grounds which do not involve special pleading for revising the usual definition.

So what about the second strategy for denying (28), namely, maintaining that tense does not, strictly speaking, belong to the factual content expressed by tensed sentences, even though tense is an objective feature of the world? Tense might be analyzed as a feature of the mode in which the factual content is presented to someone expressing it, or of the way in which a person grasps the factual content, or of the context of someone's believing the factual content. On such analyses, an omniscient being could be timeless because omniscience is traditionally

defined in terms of factual knowledge and tense is not part of the factual content of tensed sentences. Tense is an objective feature of the world, but since it does not belong to the factual content of a sentence, a being which knew only tenseless facts could on the traditional definition count as omniscient.

Even though such analyses are plausible and attractive, they do not ultimately save the day for the defender of divine timelessness. For as the greatest conceivable being, God is not merely factually omniscient, but also maximally excellent cognitively. Just as it is a cognitive perfection to have first-person knowledge *de se*, it is a cognitive perfection to know what time it is, what is actually happening in the universe. A being whose knowledge is composed exclusively of tenseless facts is less excellent cognitively than a being who also knows what has occurred, what is occurring, and what will occur in the world. This latter person knows infinitely more than the former and is involved in no cognitive defect in so knowing. On the analogy of knowledge *de se*, we can refer to such knowledge as knowledge *de praesenti* (knowledge of the present). A being which lacks such knowledge is more ignorant and less excellent cognitively than a being which possesses it. Accordingly, if we adopt views according to which tense is extraneous to the factual content expressed by a tensed sentence, we should simply revise premiss (28) to read

28′. If a temporal world exists, then if God is maximally excellent cognitively, then God has knowledge *de praesenti*

and, with appropriate revisions, the argument goes through as before.

4 Eternity and the Nature of Time

On the basis of our foregoing discussion, we have seen comparatively weak grounds for affirming divine timelessness but two powerful arguments in favor of divine temporality. It would seem, then, that we should conclude that God is temporal. But such a conclusion would be premature. For there does remain one way of escape still open for defenders of divine timelessness. The argument based on God's action in the world assumed the objective reality of temporal becoming, and the

argument based on God's knowledge of the temporal world assumed the objective reality of tensed facts. If one denies the objective reality of temporal becoming and tensed facts, then the arguments are undercut. For in that case, nothing to which God is related ever comes into or passes out of being, and all facts are tenseless, so that God can be the immutable, omniscient Sustainer and Knower of all things and, hence, exist timelessly.

In short, the defender of divine timelessness can escape the arguments for divine temporality by embracing the tenseless theory of time. It is noteworthy, however, that almost no defender of divine timelessness has taken this route. Virtually the only proponent of timeless eternity to embrace consciously the tenseless theory of time in defending God's timelessness is Paul Helm.[9]

It seems, then, that in order to adjudicate the question of the nature of divine eternity and God's relationship to time, philosophical theologians have no choice but to grapple with a further question, one of the most profound and controverted issues of metaphysics: Is time tensed or tenseless? This is difficult and mysterious territory. But we have no choice: if we are to understand eternity, we must first understand time.

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[9]Paul Helm, "Eternal Creation: The Doctrine of the Two Standpoints," in *The Doctrine of Creation*, ed. Colin Gunton (Edinburgh: T. & T. Clark, 1997), pp. 42-3; Helm, *Eternal God*, pp. 25-7, 44, 47, 52, 79.

Legal Pardon, Tensed Time, and the Expiation of Guilt

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Abstract

This paper deals with topics at the intersection of theology, philosophy of law, and philosophy of time. It explores the relation between legal pardon, tensed time, and the expiation of guilt. I first discuss the biblical notion of God's forgiveness of sins. I argue that we ought to think of divine forgiveness, at least in part, on the analogy of a legal pardon. I then point out that the idea of pardon as defined in the American justice system by the U.S. Supreme Court requires that tense be taken seriously. The Court recognizes that the pardoned offender was guilty, but as a result of his pardon he is now innocent in the law's eyes. I emphasize that although an advocate of tenseless time may hold that guilt is a property that a person may have and then no longer have, the theory of tensed time is needed in order to fully represent the content of a Priorean statement like "Thank goodness, I'm forgiven!" (including the relief and gratitude it implies). The reason is that a statement of this kind concerns a tensed fact. I conclude that matters of time and tense have important and perhaps unexpected application in the philosophy of law and theology.

Keywords: the idea of pardon, the expiation of guilt, divine forgiveness and time, tenseless time, the tensed theory of time, A.N. Prior.

1 Introduction

In this paper I wish to explore the relation between legal pardon, tensed time, and the expiation of guilt. The distinction between personal forgiveness and legal pardon is well-known and widely recognized in the literature on forgiveness.[1] The philosophical literature typically treats forgiveness as a subjective change of attitude or judgement on the part of the person wronged, a determination to put away feelings of resentment, bitterness, or anger, a relinquishing of the desire for revenge or a claim to requital. By contrast, the issuing of a pardon by an executive authority effects an objective change in the legal status of the pardonee, regardless of the subjective attitudes of the governing authority toward the person accused of a crime.

2 Divine Forgiveness as Legal Pardon

Theologians have a stake in this matter because divine forgiveness is in some respects much more akin to legal pardon than to personal forgiveness.There are at least two reasons for thinking that divine forgiveness implies a legal pardon of sinners on God's part.

First, *God stands in a governmental relationship to human beings*. In his classic *A Defence of the Catholic Faith concerning the Satisfaction of Christ, against Faustus Socinus* (1617) the famed international jurist Hugo Grotius identified Socinus' "fundamental error" in his critique of traditional atonement theories as his assumption that God is to be construed on the model of an offended party in a personal dispute, such as between a creditor and a debtor (II). For such a private person has no right to punish another. Certainly, God is offended by sin, but He does not act as merely the offended party in punishing it. Rather God should be considered to act as a Ruler. "For to inflict punishment, or to liberate any one from punishment [...] is only the prerogative of the ruler as such, primarily and per se; as, for example, of a father in a family, of a king in a state, of God in the universe" (II). God as Supreme Ruler is responsible for the administration of justice in the universe and so has the right of punishing and the right of forgiving wrongdoing. Although God has

[1] See, e.g., Hughes, 2014, §3.1.

the right to forgive sins, Grotius thinks it would be unjust of God to let certain sins go unpunished, such as sins of the unrepentant. Therefore, it would be inconsistent with the justice of God that He should remit all punishment whatsoever.

On the contemporary scene legal philosopher Jeffrie Murphy has made a similar distinction between the private and public spheres in an effort to carve out conceptual space for exercises of mercy consistent with the demands of retributive justice. Distinguishing between a creditor in a civil lawsuit and a judge in a criminal case, Murphy maintains that as a litigant in a civil lawsuit, the creditor occupies a "private role" and so does not have "an antecedent obligation, required by the rules of justice, to impose harsh treatment" by demanding repayment of the debt owed (Murphy, 1988, pp. 175-6). He is therefore free to show mercy without prejudice to justice. By contrast a judge in a criminal case "has an *obligation* to do justice—which means, at a minimum, an obligation to uphold the rule of law. Thus if he is moved, even by love or compassion, to act contrary to the rule of law—to the rules of justice—he acts wrongly" (Ibid., p. 175). Murphy thinks that the judge *qua* judge cannot, like the creditor, act mercifully without prejudice to the demands of justice. Like Grotius Murphy thinks that the executive power can exercise mercy but only within the limits of individualized justice.

Given God's status as Judge and Ruler of the world, it is more accurate to think of divine forgiveness on the analogy of a legal pardon by a Ruler rather than on the analogy of the forgiveness extended by a private person. Kathleen Moore has made the point forcefully by observing that when people ask God to forgive their sins, they are clearly hoping that God will not inflict the full measure of punishment they know they deserve. "These people would discover the seriousness of their conceptual confusion if God forgave their sins and punished them nevertheless–which is always an option for God" (Moore, 1989, p. 184). God's forgiving sins should have the character of a legal pardon by the executive power of the state.

Second, *the consequences of divine forgiveness as described in biblical revelation imply God's pardon of sinners*. The Levitical system of sacrificial offerings in the Tabernacle and Temple, offerings which New Testament writers took to prefigure Christ's own death as the ultimate sacrificial offering (Rom 3:21-26; 8.3; Eph 5:2; Heb 9.6-14; 10.1-18), aimed, not

merely at the cleansing of consecrated objects from impurity, but more fundamentally at the expiation of the sins of the people and their forgiveness. Repeatedly the promise is given, "the priest shall make atonement on your behalf for the sin that you have committed, and you shall be forgiven" (Lev 4.35; *cf.* 4.20, 26, 31, *etc.*). At the heart of the new covenant prophesied by Jeremiah lay the forgiveness of sins: "I will forgive their iniquity, and remember their sin no more" (Jer 31.34). Christians considered Jesus, by his sacrificial death, to have inaugurated that new covenant (Mt 26.28; Mk 14:22-24). So in the Acts the consistent apostolic proclamation is that "everyone who believes in him receives forgiveness of sins through his name" (Acts 10.43; *cf.* 2.38; 5.31; 13.38; 26.18). In short, in Christ "we have redemption, the forgiveness of sins" (Col 1.14; *cf.* Eph 1.7).

It is noteworthy that the object of divine forgiveness is just as often said to be sins as sinners. Not only are people forgiven for their sins, but their sins are forgiven. God is said to "take away" (*aphaireō*) our sins (Rom 11.27). This fact makes it evident that divine forgiveness is not (merely) a change of attitude on God's part toward sinners.[2] Divine forgiveness has as its effect, not (merely) God's laying aside feelings of resentment or bitterness or anger (or what have you, according to one's favorite analysis of forgiveness), but rather the removal of the liability to punishment that attends sin. As a result of divine forgiveness, a person who formerly deserved punishment now no longer does so. Because of the forgiveness that is to be found in Christ, one is no longer held accountable for one's sins. "There is therefore now no condemnation for those who are in Christ Jesus" (Rom 8.1). On the contrary, they are now reckoned by God to be righteous in His sight (Rom 4.5-8). The biblical concept of forgiveness thus entails God's pardoning people for their sins, freeing them of liability to punishment and constituting them

[2]We encounter here the debate over whether the Levitical sacrifices and Christ's sacrificial death served to propitiate God, to change His attitude toward sinners from wrath to acceptance. It has become conventional wisdom among contemporary theologians that because the New Testament authors use katalassō ("reconcile") and its cognates only with respect to human beings, not God, God does not need to be reconciled to humanity, but only humanity to a welcoming God. I leave aside whether such an argument from silence is cogent. But if God does not need to be reconciled to sinners, that fact shows all the more that divine forgiveness is not a change of attitude on God's part, in the way that forgiveness is usually understood by contemporary philosophers analyzing human relationships.

righteous before God.[3]

On the basis of God's role in the government of the world and the biblical consequences of God's forgiveness of sins, we ought to think of divine forgiveness, at least in part, on the analogy of a legal pardon. Now, of course, there will be significant disanalogies between divine pardon and the pardoning power as it exists in human justice systems – for example, the U.S. President may issue pardons for personal political advantage — but, still, given the similarities between divine forgiveness and legal pardon, we may expect to gain a good deal of insight into divine forgiveness by exploring the pardoning power vested in heads of government.

3 Pardon and Its Effects

From ancient times, heads of state have exercised the power to pardon crimes. So when the framers of the U.S. Constitution met in Philadelphia in 1787 they naturally included in the Constitution the pardoning power. Since this power is not defined in the Constitution, U.S. courts have interpreted the presidential power to pardon on the model of the pardoning power of English monarchs, which the framers doubtless presupposed. The power of English monarchs to pardon was, in turn, understood as a divine right, an act of grace reflecting God's ability to pardon sins. In Kathleen Moore's pithy conclusion, "Presidents used pardons as they chose, having been given a pardoning power patterned after that of the English Kings, which was patterned after God's" (Moore, 1989, p. 51).

Chief Justice John Marshall, in a landmark decision, describes a pardon as follows:

> A pardon is an act of grace, proceeding from the power entrusted with the execution of the laws, which exempts the

[3]The characterization of divine forgiveness as legal pardon does not prejudice the question of the basis of divine forgiveness. In the New Testament, God's forgiving us our sins is based upon Christ's satisfying for us the demands of divine justice. Grotius was a strong defender of a penal substitutionary theory of the atonement and argued against Socinus that the satisfaction of God's retributive justice by Christ was not inconsistent with God's issuing a pardon to us on those grounds (*Defence of the Catholic Faith concerning the Satisfaction of Christ VI*).

> individual, on whom it is bestowed, from the punishment the law inflicts for a crime he has committed.
>
> (*United States v. Wilson*, 32 U.S. 150 (1833))

Marshall's description was later cited by the Supreme Court as a correct characterization in *Burdick v. United States*, 236 U.S. 79, 89 (1915). According to this characterization a pardon is an act of mercy, coming from the person(s) possessing the power of the executive, which removes a criminal's liability to punishment for a specific crime he has committed.

Marshall's description seems an apt characterization of a divine pardon as well. God is the power Who executes His divine *torah*, and His pardon is an act of grace by which He exempts elect sinners, who have violated His law, from the punishment they deserve.Every element of Marshall's definition finds a theological analogue. No wonder Daniel Kobil characterizes Marshall's vision of a pardon as "something akin to divine forgiveness" (Kobil, 1991, p. 594)!

What are the effects of a pardon?Marshall says that it exempts the individual from the punishment prescribed by the law for his crime.This much is uncontroversial.But pardons do much more than merely exempt a convicted criminal from punishment for his crime. A pardon removes *all* the legal consequences of the criminal's conviction. A pardon thus restores to a person any civil rights which were restricted as a result of his conviction, such as the right to vote, to serve on a jury, or to obtain a business license (*Knote v. United States* 95 U.S. 153 (1877)). We shall return to the effect of a pardon in restoring a person's civil rights, a feature of pardons which is also uncontroversial, even if in some cases difficult to adjudicate.

The truly controversial question is whether a pardon serves to remove the criminal's guilt. Following the English model, the U.S. courts were at first emphatic as to the effect of a pardon in expiating guilt. In *Ex parte Garland* (1866) the Supreme Court famously declared:

> [...] the inquiry arises as to the effect and operation of a pardon, and on this point all the authorities concur. A pardon reaches both the punishment prescribed for the offence and the guilt of the offender; and when the pardon is full, it releases the punishment and blots out of existence the guilt, so that in the eye of the law the offender is as innocent as

> if he had never committed the offence. If granted before conviction, it prevents any of the penalties and disabilities consequent upon conviction from attaching; if granted after conviction, it removes the penalties and disabilities, and restores him to all his civil rights; it makes him, as it were, a new man, and gives him a new credit and capacity.
>
> (*Ex parte Garland*, 71 U.S. 333, 380-1 (1866)

Like Marshall's description of a pardon, this characterization of the effects of a full pardon is an apt description of a divine pardon. God in His mercy is similarly said to "blot out my transgressions [...] and blot out mine iniquities" (Ps 51. 1, 9 KJV). Paul exults, "If anyone is in Christ, he is a new creation; the old has passed away, behold, the new has come" (II Cor 5.17). The pardoned sinner's guilt is expiated, so that he is legally innocent before God.

But as a description of the effects of human pardons, *Garland*'s sweeping assertions have been eroded by subsequent court decisions.[4] In the *Harvard Law Review* of 1915 Samuel Williston published what has been called a "seminal" and "landmark" article, "Does a Pardon Blot Out Guilt?," in which he criticized *Garland* and its judicial progeny and which has been frequently cited by the courts. Williston complained, "Everybody [...] knows that the vast majority of pardoned convicts were in fact guilty; and when it is said that in the eye of the law they are as innocent as if they have never committed an offense, the natural rejoinder is, then the eyesight of the law is very bad" (Williston, 1915, p. 648). The truth, says Williston, is rather as Lord Coke wrote: *Poena mori potest, culpa perennis erit*.[5] A moment's reflection suggests that Williston must understand by "guilt" simply the property or fact of having committed the crime. On this understanding, to be guilty of a crime is just to have committed the crime.

That this is how Williston understands guilt is evident from the remainder of his article.He blames the verdict of the English Court in *Cuddington v. Wilkins* (*80 Eng. Rep. 231* (*K.B. 1615*)) as laying the main foundation for the view that after a pardon the law could not see the criminal's guilt. Cuddington had brought an action against Wilkins for

[4]For a thorough review of the relevant judicial decisions see *In re Sang Man Shin*, 125 Nev. 100, 104-9 (2009); *Robertson v. Shinseki*, 26 Vet. App. 169, 176-9 (2013).

[5]"Punishment may expire, but guilt will last forever."

calling him a thief. Wilkins justified this appellation because Cuddington had once been convicted of theft. But Cuddington replied that he had been pardoned by the king for the alleged felony. The Court decided for Cuddington, "for the whole court were of opinion that though he was a thief once, yet when the pardon came it took away, not only *poenam*, but *reatum*."[6]

Williston disagrees. According to Williston,

> The true line of distinction seems to be this: The pardon removes all legal punishment for the offense. Therefore if the mere conviction involves certain disqualifications which would not follow from the commission of the crime without conviction, the pardon removes such disqualifications. On the other hand, if character is a necessary qualification and the commission of the crime would disqualify even though there had been no criminal prosecution for the crime, the fact that the criminal has been convicted and pardoned does not make him anymore eligible.
>
> (Williston, 1915, p. 653)

The point is this: a pardon removes the legal disqualifications (abridgement of civil rights) resulting from the fact of conviction; but a pardon does not affect any disqualifications resulting from the commission of the crime. The fact that a crime has been committed cannot be erased. It is this fact that Williston identifies as guilt. Though pardoned, the person still stole or lied or acted recklessly and so remains guilty of the crime he committed.As such he may, despite his pardon, be disqualified from certain activities, such as giving testimony or practicing law.

Henry Weihofen in a later review, citing Williston's criticism, complains of "the mischief that results when a court applies literally the unfounded dictum of *Ex parte Garland* that a pardon 'blots out' guilt, and makes the offender a 'new man', etc." (Wiehofen, 1939, p. 181; *cf.* pp. 189-90). The effect of a pardon (other than on grounds of innocence) is "to absolve from further punishment and restore civil rights, but *not to undo what is past or blot out of existence a fact*, namely, that *the person has committed a crime and been sentenced and punished* for it" (Ibid., my emphasis).

[6]Hob. 67, 81, cited by Williston, 1915, p. 651.

An examination of various district, state, and appellate court cases walking back the assertions of *Garland* reveals that the courts in such cases tend to presuppose this same understanding of guilt as the property of having committed a crime.[7] These cases have typically to do with whether a pardon serves to expunge one's criminal record or to remove a particular disqualification (such as disbarment, banishment from the trading floor, or denial of veteran's benefits) suffered by the pardonee as a consequence of his being convicted of the crime for which he received a pardon. In holding that *Garland* overstepped in asserting that a pardon blots out guilt because a pardon does not blot out the past conduct leading to the conviction, these courts equate guilt with having carried out the conduct which led to the conviction.

While such an understanding of the word "guilt" may accord with much of ordinary language, a little reflection reveals that, given standard retributive theories of justice, such a conception of guilt has bizarre consequences. For on this view a person's guilt could never be expunged, whether by pardon or punishment. Even if a person has served his full sentence and so satisfied the demands of justice, he remains guilty, since it will be ineradicably and forever the case that once upon a time he did commit the crime.But then on standard theories of retributive justice,[8] he still deserves punishment! For it is an axiom of retributive theories of justice that the guilty deserve punishment. Such an understanding of guilt would thus, in effect, sentence everyone to hell, even for the

[7]See, e.g., *Groseclose v. Plummer* 106 F.2d 311, 313 (9th Cir.1939); *People ex rel. Prisament v. Brophy* 287 N.Y. 132, 137-8 (1941); *State Ex Rel. Wier v. Peterson*, 369 A.2d.1076, 1080, 1081 (Del.1976); *Dixon v. McMullen* 527 F. Supp. 711, 717-18 (N.D.Tex.1981); *In re Abrams*, 689 A.2d 6, 7, 10-11 (D.C. 1997); *R.J.L. v. State*, 887 So.2d 1268, 1280-81(Fla.2004); *Hirschberg v. Commodity Futures Trading Com'n*, 414 F.3d 679, 682, 683 (2005); *Fletcher v. Graham*, 192 S.W.3d 350, 362-363 (Ky.2006); *In re Sang Man Shin*, 125 Nev. 100, 110 (2009); *Robertson v. Shinseki*, 26 Vet. App. 169, 179 (2013)). For discussion of some of these cases see Steiner (1997), who makes the same equation.

[8]Theories of justice may be classified as broadly retributive or consequentialist.Retributive theories of justice hold that punishment is justified because the guilty deserve to be punished.Consequentialist theories of justice hold that punishment is justified because of the extrinsic goods that may be realized thereby, such as deterrence of crime, sequestration of dangerous persons, and reformation of wrongdoers.Retributivism may be either positive ("the guilty deserve punishment") or negative ("the innocent ought not to be punished"). There has been over the last half-century or so a renaissance of theories of retributive justice, accompanied by a fading of consequentialist theories.

most minor of crimes, since guilt could never be eradicated and, hence, the demands of justice satisfied.Indeed, even a divine pardon would not serve to remove guilt and save us from punishment, since even God cannot change the past. But such a conclusion is incoherent, since it is the function of pardon to cancel one's liability to punishment. Therefore, this understanding of guilt is incompatible with standard theories of retributive justice.

The *Garland* court and its progeny should not be thought to consider a pardon to be a sort of judicial time machine, capable of erasing the past.[9] It is logically incoherent to bring it about that an event which has occurred has not occurred, and it would ungracious to attribute to our courts the absurd opinion that a pardon can erase from the past a person's wrongdoing or conviction for a crime. Rather what the *Garland* court was doing, and what its detractors have failed to do, is what contemporary philosophers of time call "taking tense seriously."[10] When the Supreme Court declared that a pardon "blots out of existence the guilt, so that in the eye of the law the offender is as innocent as if he had never committed the offence," it takes seriously the tenses of the verbs involved. It recognizes that the offender *was* guilty, but as a result of his pardon he *is now* innocent in the law's eyes. Moreover, the counterfactual conditional "as if [...]" reveals that the law is not blind to his offense. The law can see his offense, but as a result of the pardon the offender is now as innocent as he would have been if he had never

[9]Incredibly, the Polish logician Jan Łukasiewicz actually proposed a view according to which the past, like the future, has a branching structure, so that the past could be undone and thus guilt expiated. He wrote, "In the life of each of us there occur grievous times of suffering and even more grievous times of guilt. We should be glad to wipe out these times not only from our memories but from reality. Now we are at liberty to believe that when all the consequences of those fatal times are exhausted, even if this happened only after our death, then they too will be erased from the world of reality and pass over to the domain of possibility" (Jan Łukasiewicz, *Z Zagadnien Logiki i Filozofii* [*Problems of Logic and Philosophy*]: "O Determinizmie," p. 126). I am indebted to Per Hasle for this reference. For a critical discussion of Łukasiewicz's view see Ulrich Meyer, "Double Time," paper presented at the conference "The Metaphysics of Time," University of Aalborg, Denmark, March 19-21, 2019.

[10]The phrase was apparently inspired by the great Oxford tense logician A. N. Prior, who, in reaction to W.V. O. Quine's extolling the tenselessness of modern logic, praised medieval logic because it "took tenses far more seriously than our own common logic does" (Prior (1958), 117). I'm grateful to Prior scholar David Jakobsen for alerting me to Prior's article, which was originally Prior's presidential address to the New Zealand Congress of Philosophy in 1954.

committed the offense.

From the beginning courts which held that a pardon expunges a person's guilt recognized the importance of tense. In *Cuddington v. Wilkins*, for example, the court opined that while Cuddington was once rightly called a thief, as a result of the king's pardon he should no longer be called a thief. In Hobart's report on the case, we read, "It was said, that he could no more call him thief, in the present tense, than to say a man hath the pox, or is a villain after he be cured or manumised, but that he had been a thief or villain he might say."[11] The court's decision turns upon taking tense seriously.

Moreover, contrary to the opinions of several lower courts,[12] *Garland* is wholly consistent with the Supreme Court's opinion in *Burdick v. U.S.* that the pardon of an accused person, if accepted, actually implies his guilt (otherwise there would be nothing to be pardoned), for *Garland* has no interest in denying that the offender was guilty, so that the pardon, in taking away his guilt, implies that he was guilty. A pardon does not have an "appellate" function, as the courts have recognized, in that it does not imply a miscarriage of justice; the correctness of the guilty verdict rendered is not undermined. But now the person is pardoned, and so the effect of that verdict is canceled: though once guilty, the pardonee no longer is.[13]

The opinion in *Garland* was properly explicated in *In re Spenser* (1878) as follows:

> This is probably as strong and unqualified a statement of the scope and efficacy of a pardon as can be found in the books.

[11] Hob. 81, 82 (1615), cited in Williston, 1915, p. 652. Williston notes that "The principal case was followed in Leyman v. Latimer, 3 Ex. D. 15 (1877), on very similar facts, and the court upheld the validity of the distinction taken in Cuddington v. Wilkins, between the legality of using the present and the past tense" and yet fails himself to appreciate the importance of this distinction.

[12] *E.g., In re Sang Man Shin*, 125 Nev. 100, 105 (2009).

[13] A number of scholars have noted that pardons differ from other forms of executive clemency in that the latter, unlike pardons, do not negate the criminal's conviction but leave intact the judgement of guilt. For example, President Carter, in proclaiming an amnesty for Vietnam War draft-dodgers, said poignantly that their crimes have been forgotten, not forgiven. Similarly, recipients of commutations and reprieves remain guilty (Kobil, 1991, p. 577; Stacy Caplow, 2013, p. 299: Messing, 2016, p. 672; Schoenburg, 2016, p. 924). This distinction seems to make sense only if a pardon annuls the guilt of the offender.

> And yet I do not suppose the opinion is to be understood as going the length of holding that while the party is to be deemed innocent of the crime by reason of the pardon from and after the taking effect thereof, that it is also to be deemed that he never did commit the crime or was convicted of it. The effect of the pardon is prospective and not retrospective. It removes the guilt and restores the party to a state of innocence. But it does not change the past and cannot annihilate the established fact that he was guilty of the offence.
>
> (*In re Spenser*, 22 F. Cas. 921, 922 (1878))

The opinion in *Garland* is thus fully in accord with the prevailing view that a pardon has no effect upon the criminal conduct and conviction of the person pardoned. *Garland* is thus in accord with the prevailing opinion that a pardon serves to release a person from all the legal consequences of his conviction, including punishment, taken in abstraction from the wrongdoing itself.

It is obvious that the *Garland* court has a very different conception of guilt than lower courts which see themselves as departing from *Garland*. Rather than assume the incoherent understanding which equates guilt with the facticity of a past event, *Garland* assumes that guilt is a property which can be temporarily exemplified and then lost though pardon or appropriate punishment. So what is this property? In criminal law guilt is typically determined by establishing that someone has committed a wrongful act (*actus reus*) while possessing a blameworthy mental state (*mens rea*).[14] Perhaps guilt is the property of being a culpable wrongdoer, a property which can be temporarily exemplified but lost through sufficient punishment or pardon. But wrongdoing and culpability are merely sufficient, not necessary, conditions for guilt. Guilty verdicts in cases of strict liability (in which there may be neither wrongdoing nor culpability) show that guilt cannot be equated merely with being a culpable wrongdoer.[15] So what is guilt? It may be convenient to think of guilt just as *liability to punishment*. A verdict of "Guilty" is plausibly a

[14]These just are the conditions Moore identifies as just desert (1997, pp. 33, 91, 168, 403–4).

[15]On strict liability see L. H. Leigh, Strict and Vicarious Liability: A Study in Administrative Criminal Law, Modern Legal Studies (London: Sweet and Maxwell, 1982); David Ormerod, Smith and Hogan's Criminal Law, 13th ed. (Oxford: Oxford University Press, 2011), chap.7.

declaration that the person is liable to punishment. To be guilty of a crime is to be liable to punishment for that crime. Such an understanding of guilt makes it perspicuous why punishment or pardon serves to expiate guilt. A person who has served his sentence has "paid his debt to society" and so is now no longer guilty, that is to say, no longer liable to punishment. Similarly, a person who has been pardoned is by all accounts no longer liable to punishment for the crime he committed. In any case, however we define guilt, if at all, given a retributive theory of justice, guilt entails liability to punishment. It follows logically the if a pardon removes one's liability to punishment, then it also blots out guilt. It is impossible that a person be pardoned and yet remain guilty.

4 Theological Application

To return, then, to the concerns of theology, it seems to me that *Garland*'s statement of the effects of a pardon is a marvelous description of the effects of a divine pardon of a person's sins. By taking tense seriously, we understand how a person who was once guilty may, in virtue of a pardon, be no longer guilty, despite the ineradicable fact that he did commit the sin for which he was justly condemned. The decisions of certain lower U.S. courts do not compromise *Garland*, for they are assuming a different understanding of guilt which equates guilt with the facticity of the past offense, which *Garland* would not think to deny. Like punishment, pardon expiates a person's legal guilt, so that he is no longer condemned and liable to punishment.

While an advocate of tenseless time might also hold to the insight of those who take tense seriously that guilt is a property that may be temporarily exemplified and then lost, what he cannot say (with A. N. Prior)[16] is "Thank goodness I'm forgiven!" For the relief and gratitude expressed by those words concern a tensed fact which cannot be captured in any tenseless idiom.

These debates over the effects of a pardon provide insight into the nature of divine justification. Our legal pardon by God no more transforms our character and makes us virtuous people than does a human pardon a convicted criminal. Again and again, the courts have insisted

[16]See A.N. Prior: "Thank Goodness That's over", Philosophy, Vol. 34, No. 128, (Jan., 1959), pp. 12-17.

that a person may suffer various disabilities, despite his pardon, because of the flawed character that led to his conviction. The conviction alone, now pardoned, may not serve as grounds of disability, but it may serve as evidence of a corrupt character and conduct that are disabling. So, for example, in the case *In re Abrams* Elliott Abrams was deemed unfit to practice law despite his pardon because a pardon did nothing to restore the moral character necessary for him to continue to practice law. Such cases nicely illustrate Williston's point that "while pardon dispenses with punishment, it cannot change character, and where character is a qualification for an office, a pardoned offence as much as an unpardoned offence is evidence of a lack of the necessary qualification" (Williston, 1915, p. 657).

Similarly, while a divine pardon makes us legally innocent before God, free of liability to punishment, it is powerless of itself to effect moral transformation of character. To that end we need regeneration through the Holy Spirit and His sanctifying influence to make us over time into the men and women that God wants us to be. Sanctification is not a forensic transaction but a moral transformation of character and is not therefore wrought by divine pardon alone.

In conclusion, I think we can see that matters of time and tense have important and perhaps unexpected application in the philosophy of law and theology.

Future Bias and Presentism

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Abstract

Future-biased agents care not only about what experiences they have, but also when they have them. Many believe that A-theories of time justify future bias. Although presentism is an A-theory of time, some argue that it nevertheless negates the justification for future bias. Here, I claim that the alleged discrepancy between presentism and future bias is a special case of the cross-time relations problem. To resolve the discrepancy, I propose an account of future bias as a preference for certain tensed truths properly relativized to the present.

Keywords: time bias, future bias, A-theory, presentism.

1 Introduction

One reason to fear death might be that death is a form of nonexistence. Yet nonexistence is not always so fearsome. After all, people do not usually fear how the world was before they were born. Yet being prenatal is also a form of nonexistence. So what is there to fear in the one but not the other?[1] Here is an intuitive answer: To be deceased is to be a thing of the past, and things of the past no longer exist. But to be prenatal is to be a thing of the future, and things of the future will exist.[2] The value asymmetry between them is thus supposed to correspond to a like metaphysical asymmetry between pastness and futurity.

[1] This question poses Lucretius' Puzzle. See Harman 2011, [13], p. 129.
[2] An answer like this one is implicit in Brueckner and Fischer (1986, [2])

That said, thinking through the difference in this manner takes a certain controversial conception of the world in time for granted: namely, the A-theory of time. A-theory comes from a distinction that J.M.E. McTaggart raised as a way to frame and support his argument that time is unreal.[3] In this connection, McTaggart argued that *when* something happens can be understood in two importantly different ways. According to the "A-series," events instantiate the intrinsic temporal properties of being past, present, or future. According to the "B-series," by contrast, events instantiate the extrinsic temporal relations of being earlier than, later than, or simultaneous with other events.

There is no exact definition of A-theory.[4] But it is safe to say that it stands for a group of doctrines whose common denominator is that the A-series irreducibly represents the temporal dimension and that it is typically associated with the following metaphysical doctrines.

> **Privilege:** There is a metaphysically privileged time that is, in some sense, more real than other times.
>
> **Passage:** Which time has metaphysical privilege changes. In this connection, privilege transitions from earlier times to later times.
>
> **Tense:** There are irreducibly tensed properties intrinsic to their bearers.

What justifies the asymmetry in our attitudes towards being deceased and being prenatal, despite the fact that being deceased and being prenatal are both ways for people *not* to exist, is that being deceased and being prenatal are related to time differently, at least according to the A-theory of time. This metaphysical difference is supposed to correspond to a like difference in the value between being one rather than the other. Consider the fact that the metaphysically privileged time passes from earlier to later times. This may justify attaching greater value to being prenatal because prenatal things have a future into which the privileged time will pass, but deceased things do not. Many philoso-

[3]McTaggart (1908, [19]).

[4]See Cameron (2015 [3], p. 2) and (Skow 2015, [28], p. 18).

phers have arrived at a similar conclusion regarding matters that exemplify some sort of temporal value asymmetry, which are asymmetries in how we evaluate things according to their relationship with time.[5] With respect to the value difference between being deceased and being prenatal, the temporal value asymmetry is that future nonexistence, in the form of being deceased, is worse than nonexistence in the past, in the form of being prenatal. This value asymmetry can be considered a generic version of what some call "future bias," which is a preference for certain things that are present or future rather than past or for certain things that are past rather than present or future. People are most susceptible to engaging in future bias when they evaluate pleasurable and painful experiences. As aforementioned, some philosophers think that future bias is justified by some part of the metaphysics of time, such as the passage of time. Derek Parfit, for instances, writes that:

> Pains matter only because of what they are like when they are in the present, or under the scope of "now." This is why we must care more about our pains when we are *now* in pain. "Now" moves into the future. This is why past pains do not matter.[6]

Similarly, Caspar Hare writes that "if a painful experience is in my future, then it's *going to happen to me* — I *still have to experience it* — it's *yet-to-be-experienced*."[7] As Parfit and Hare gesture towards, there's something about an experience's being *future* which individuates it from being *past*, and it's this difference-maker in virtue of which futurity matters more than pastness. That said, many philosophers, including Hare, think that appealing to the passage of time is insufficient to justify future bias. To say that futurity matters more than pastness with respect to certain goods because time passes into the future is just to say that futurity matters more because it is futurity.[8] Indeed, A-theory might even be inconsistent with certain temporal value asymmetries. In this

[5]See (Prior 1959 [24), Schlesinger (1976 [26]), Craig (1999 [4]), and Deng (2015 [7]).

[6]Parfit (1984, [23], p. 180). In this connection, Elizabeth Harman is sympathetic, but she disagrees with Parfit that past pains do not matter (2011, [13], p. 138).

[7]Hare (2013, [12], p. 510).

[8]Moller (2002, [22], p. 81). For additional criticism, see Suhler and Callender (2012, [30]).

regard, for instance, Caspar Hare has argued that a popular version of the A-theory of time—namely, presentism, according to which only the present moment exists—seems inconsistent with the grounds that some A-theorists give for justifying future bias, that is, the ground that there is some intrinsic difference between pastness and futurity.[9] More recently, Preston Greene and Meghan Sullivan have also argued that presentism doesn't "give us a metaphysical reason to favor future experiences over past ones"[10] For presentism entails that being past and being future are both ways for things not to exist. In that case, what is there more valuable or disvaluable in being one rather than the other?

It would be a remarkable conclusion that presentism entails that an experience or event is no more valuable or disvaluable when it is past than when it is future. A-theory is commonly regarded as a way to justify the intuition that it is rational to value goods when they are present or future more than when they are past. However, as a predominant version of A-theory, presentism seems to defeat that supposed justification. The argument for this position, whose conclusion both Hare as well as Greene and Sullivan seem to endorse, might be ultimately based on something like the following argument. First, Future bias is based on an ontological asymmetry between futurity and pastness. Second, Any justification for future bias must then properly reflect the ontological asymmetry it presupposes in the grounds for why it is rational to be future biased. Otherwise, it would be arbitrary to prefer goods when they are future rather than past and to prefer bads when they are past rather than future. However, presentism implies that there is no ontological asymmetry between pastness and futurity because they are both forms of nonexistence. Therefore, if presentism is true, there would be no non-arbitrary reason to be future biased. Briefly, I think the argument underwriting the supposed conflict between future bias and presentism traffics in a contentious conception of being biased towards the future. In order for the argument to work, one needs to define future bias as an attitude toward experiences *located* in the past, present, or future. But framing future bias in this way guarantees that presentism and the rationality of future bias are incompatible. In order for presentism to be free to accept that future bias is rational, there must be something asymmetry between pastness and futurity that corresponds to a like and proper

[9]Hare (2007 [11], p. 363).

[10]Greene and Sullivan (2015 [10], p. 953).

difference in value between an experience that is either past or future. But the sort of requisite asymmetry needed in order to justify the rationality of future bias need not be between things located in the past or future. That is, with respect to future bias, what grounds the asymmetry between pastness and futurity need not be non-present sorts of things.

2 Future Bias and Presentism

We say there's no time like the present. For presentists, there's also no time but the present. Consider, for example, Ned Markosian's definition:

> According to Presentism, if we were to make an accurate list of all the things that exist –i.e. a list of all the things that our most unrestricted quantifiers range over – there would be not a single non-present object on the list.[11]

Or Kris McDaniel's:

> Presentism [...] the view that there is exactly one metaphysically fundamental sense of "$\exists$" such that "$\sim \exists x$ (x is a past or future object)" is true.[12]

It would be an understatement to say that some people believe that presentism is true; at the very least it is an initially intuitive ontology of time. Many people are probably not going to take seriously the idea that the times at which they were born exist or the times at which they will be dead also exist, but that these other times exist in different regions of spacetime. To be sure, the point is not about what many or most people believe. Rather, the point is that for the many who do believe in presentism, it would be highly counterintuitive for them if presentism entails that they should value an experience when it is in their past to the same extent that they should value the experience when it is in their future.

[11] Markosian (2004, [17], p. 47).
[12] McDaniel (2017, [18], p. 83).

For the same reason one might question our disproportionate fear of death given that being dead and being prenatal are equivalent forms of nonexistence, one might similarly put into question our disproportionate dread for pains when they are future rather than past because being future and being past are equivalent forms of nonexistence according to presentism. This analogy between, on the one hand, questioning the rationality of the value asymmetry between being deceased and being prenatal, and questioning the rationality of the temporal value asymmetry between being future and being past, on the other, helps frame and clarify what Hare as well as Greene and Sullivan mean when they claim that presentism provides no reason to favor futurity over pastness if it is true. Let's call their claim the "Symmetry Objection" against future bias, since the argument for this claim might be framed as a consideration that counts against justifying future bias by appealing to the A-theory of time.

First, I will argue that the Symmetry Objection is just a special case of the cross-time relations problem for presentism that depends on, just as other special cases of the problem seem to depend on, an assumption about the nature of the relevant cross-time relation that is objectionable by the standards of presentism.[13] Roughly, the cross-time relations problem for presentism is the problem of accounting for the fact that entities enter into diachronic relations with each other, e.g., causal relations, which entails the fact that the entities in such relations exist at different times. The standard response to any special case of the cross-time relations problem is to reduce and paraphrase these sorts of relations into synchronic relations between abstract or concrete entities that currently exist. For instance, A. N. Prior responded to a variant of this problem by arguing that we can reduce and paraphrase facts about diachronic comparative relations, such as the fact that Prior is taller than his grandfather, to a complex relation between facts about presently existing entities.[14] First, there is the present-tensed fact that Prior has a certain height *H*. Second, there is the past-tensed fact that his grandfather has a certain height *H**. Finally, there is the present-tensed or perhaps atemporal fact that *H* is a greater height than *H**. Accordingly, the fact that Prior is taller than his grandfather just is the conjunction of the foregoing facts.

[13]Sider (2003, [27], p. 27-8). For further review, see Ciuni and Torrengo (2012, [33]).
[14]Prior (1967 [25], p. 170-1).

Following Prior's lead, one can respond to the Symmetry Objection by arguing that we can reduce and paraphrase the metaphysical difference between past and future experiences that provide a reason to favor certain experiences when they are future rather than past. To demonstrate how this might be possible, I propose that we compare the Symmetry Objection to another special case of the cross-time relations problem according to which presentism and *time travel* are incompatible: namely, the "Nowhere Argument."[15] What the comparison between the Nowhere Argument and the Symmetry Objection is supposed to demonstrate is that, like the Nowhere Argument, the Symmetry Objection relies on an assumption about the nature of certain diachronic relations that is presentists should reject. To that end, I formulate the Nowhere Argument as follows. First, time travel is like spatial travel: there must be some time to go to and some time to come from. But if presentism is true, then there exists neither a past nor a future to go to or to come from. Therefore, time travel is impossible if presentism is true.[16]

What is objectionable about the Nowhere Argument for the incompatibility between time travel and presentism is its implicit assumption that time travel involves a causal relation between events that occur at different times. But there is a conception of time travel that is compatible with presentism if we take Prior's response to the cross-time relations problem seriously. In this connection, Simon Keller and Michael Nelson have argued that presentists are free to accept a conception of time travel according to which it consists in a sequence of tensed truths properly relativized to the present that merely describe causal facts between events that occur at different times. To illustrate their argument, consider the following thought experiment, which is inspired by the thought experiment that Keller and Nelson provide:[17]

> *Jennifer's Journey*. Jennifer is a glum fourteen year old millennial listening to sad music in her room one night and reading articles about the replication crisis in science. Suddenly, out of nowhere, a stranger appears and surprises Jennifer, who tells her how to become a successful physicist whose

[15]Keller and Nelson (2001, [15], p. 334-5).
[16]Cf. Dowe (2000, [8], p. 442), who calls it the "no destinations paradox."
[17]Keller and Nelson (2001, [15], p. 335-338).

> experiments will be applauded for their replicability. The stranger then twiddles with a weird looking device in their hand and vanishes. Jennifer follows the stranger's advice and becomes a Nobel laureate in physics. By the time Jennifer retires, she has forgotten about the prescient stranger from her past and has come to believe that all of her success was due to good luck, effort, innate talent, and friendly assistance. For her retirement project, Jennifer invents a time machine, presumably the first of its kind. Whimsically, Jennifer operates the machine. Because of this, *it was the case* that Jennifer randomly appears as if from nowhere in the room of her younger millennial self, who was listening to sad music and reading articles on the internet. Feeling sorry for herself, *it was the case* that Jennifer surprises her past self, who does not recognize her, and tells her past self how she to become a successful physicist like her. Afterwards, it was the case that Jennifer twiddles with a weird looking device in her hand and vanishes. Because it was the case that the device she twiddles with is a time machine, Jennifer will reappear a second after the moment in which she disappears after operating the time machine in the future. Now, in the present, the second after Jennifer operates the time machine, Jennifer reappears, feeling like more than a second has passed, but with memories of having spoken to her younger self for quite some time, having finally made the connection between herself and the once forgotten prescient stranger from her past.

Jennifer's Journey is supposed to represent a time-travel narrative that is compatible with presentism because putatively no single proposition that the narrative expresses necessarily depends for its truth on the existence of things that do not exist in the present. In other words, the facts in virtue of which Jennifer is a time traveler are all facts made true by presently existing entities. There are the facts that a stranger suddenly appears in front of Jennifer as a young millennial, who has a discussion with her and disappears into the future because it *will* be the case that Jennifer operates the time machine with the intention of having a discussion with her younger self until she reappears. And when that time comes, it *was* the case that Jennifer suddenly appears in front

of her younger self and has a discussion with her until she leaves. Assuming that presentism is compatible with the possibility of *Jennifer's Journey*, then, it seems that time travel is not incompatible with presentism if time travel is reduced and paraphrased in a manner that is not objectionable by the standards of presentism.

I believe that there is a constructive elaboration on the way Keller and Nelson reconcile presentism and time travel that can similarly reconcile presentism and future bias. That is, perhaps presentism is compatible with future bias conceived as a preference for certain sorts of tensed truths that are properly relativized to the present. Rather than ascribing an intentional relation between a preference of mine and an experience of mine located in the past or future, we can ascribe an intentional relation between myself, the preference, and the truth value of a tensed proposition representing an experience that occurs to me. Understood as such, the asymmetry that future bias presupposes is supposed to be grounded in or a function of metaphysical differences between past, present, and future tensed propositions about certain experiences, which corresponds to a like difference in the value between these propositions.

Having sufficiently characterized my proposal, I offer the following definition of future bias with respect to pleasure.[18]

> An agent S is biased towards the future with respect to pleasure iff for two inconsistent propositions about a pleasure that S experiences, P_1 and P_2, where P_1 describes an experience that is at least as pleasurable as the experience that P_2 describes, S prefers the truth of P_2 because it is a present-tensed or future-tensed proposition rather than past-tensed.

Inversely, with respect to pain, the definition is this:

An agent S is biased towards the future with respect to pain iff for two inconsistent propositions about a pain that S experiences, P_1 and P_2, where P_1 describes an experience that is at most as painful as the experience that P_2 describes, S prefers the truth of P_2 is because it is a past-tensed rather than a present-tensed or future-tensed proposition.

According to my proposal, future-biased agents prefer the truth value of certain sorts of tensed propositions about pleasures or pains that

[18]This definition structurally parallels Greene and Sullivan's definition of future bias with respect to pleasures and pains. (2015, [10], p. 949).

they might experience. Of course, it might be immediately objected that it's not clear how past-tensed and future-tensed propositions could be true if the things that they are describing do not currently exist. This is also a worry for Keller and Nelson's argument for the compatibility between presentism and time travel. But there are seemingly viable solutions to variants of this problem, which people call the "grounding objection" or the "truthmaker problem."[19] In general, such solutions issue from what Rognvaldur Ingthorsson calls the "relocation strategy," according to which truths about the past or future are made true by presently existing entities.[20] In this connection, for example, there's John Bigelow's proposal that there are past- and future-directed properties such as "the property of being burdened with a certain sort of past."[21] I presume that presentists can account for their tensed truths by locating whatever makes them true in the way the world currently is. If so, presentists have a way to justify being biased towards the future because they are able to maintain a metaphysical difference between past-tensed and future-tensed propositions, and which putatively corresponds to a like difference in the value between these sorts of tensed propositions.

3 BIAS TOWARDS THE ERSATZ FUTURE

In the previous section, I presented a definition of future bias that appears to be compatible with presentism. In order to frame and motivate my argument, I showed how Keller and Nelson argue for the compatibility between presentism and time travel. Given the structural parallel between my argument and their own, it would stand to reason that my argument is susceptible to structural objections that Keller and Nelson's argument faces. In this connection, Ted Sider has raised such an objection, claiming that Keller and Nelson's argument misrepresents time travel:

> That I will view a dinosaur in my personal future amounts merely to the fact that I once viewed a dinosaur, and moreover that this is caused by my entry into a time machine.

[19] See Davidson (2013, [6]) and Crisp (2007, [5]).
[20] Ingthorsson (2017, [14], p. 88).
[21] Bigelow (1996, [1], p. 46-47).

> Since this fact bears little resemblance to the facts that constitute a normal person's genuine future, I could not enter the time machine with anticipation and excitement at the thought of seeing a dinosaur, for it is not true that I am about to see a dinosaur, nor is the truth much like being about to see a dinosaur. If anything, I should feel fear at the thought of being annihilated by a device misleadingly called a "time machine". The device causes it to be the case that I once viewed a dinosaur, but does not make it the case in any real sense that I will view dinosaurs.[22]

Sider's argument is basically this. Backwards time travel can be future-looking: When someone time travels into the past, they experience that travel as part of their future. But backwards time travel that is recast in presentist-friendly terminology represents a form of time travel that cannot be future-looking. Take *Jennifer's Journey* for example. When Jennifer operates the time machine, it is not that she will experience what was the case. To be sure, her operation of the time machine in the present is that in virtue of which it is true that *it was* the case that she appears as if out of nowhere in front of her past self, among other things. But that is not a future-looking event for Jennifer. Instead, what happens is that Jennifer disappears for a second. And because of this she makes certain past-tensed propositions true. Suddenly, she reappears and acquires certain episodic memories in virtue of which she believes that she had a first-hand experience of time travel. But her experience of time travel was not first-hand, but rather second-handed—or so Sider contends. In sum, we are supposed to believe that Jennifer is a time traveler because three things involving her are the case. First, it is the case that Jennifer operates the time machine and disappears. Second, because of this, many past-tensed truths about events involving Jennifer are arranged and related to each other in the sort of way that one would expect from a time-travel story. Finally, it is the case that Jennifer reappears and acquires certain episodic memories about the past. However, is this really time travel?

A similar sort of critical question can be raised against my argument for the compatibility between presentism and future bias. That is, is it really a form of future bias to prefer the truth of a proposition about

[22]Sider (2005, [28], p. 333).

pleasures when they are in the present or future tense rather than the past tense? What we care about when we care about *when* an experience occurs seems not to be about whether a true proposition about an experience we are having is in the past, present, or future tense. Rather, it is about the very experience that the proposition describes. The objection, then, is that my presentist-friendly account of future bias does not properly reflect the fact that to be future biased is to be biased towards the experiences themselves and not the truth value of the tensed propositions about them.

Basically, the objection states future-tensed propositions about experiences are not made true by experiences located in the future, but only something abstract and in the present. Why would future-biased agents care about such things? One reason to doubt this sort of objection is that, when we think closely about what future-biased agents want of experiences is not their futurity or pastness. Rather, they want a certain relation to the present to obtain. Otherwise, future-biased agents would always get what they want if, for example, there is a pleasure in their future that would never come. Indeed, consider the following thought experiment from Meghan Sullivan (2018, [32], p. 28):

> Suppose Eternal Eddie will live an infinitely long life. And suppose God offers Eddie the promise of a single experience of bliss at one time in his life. Further, God promises that for every day Eddie waits to schedule the bliss, God will make the bliss even better. Poor Eddie; if all he cares about is blissing out as much as possible, he'll never schedule his bliss.

If Eternal Eddie is future-biased, and what future-biased agents care about is merely the timing of their experiences, then Eternal Eddie's future bias does not give him a reason to be frustrated because he will never schedule his bliss. For his bliss will always be future. But of course, what Eternal Eddie should do is schedule his bliss. Reflecting on what Eternal Eddie should do tells us something interesting about what future-biased agents really care about. That is, future-biased agents do not care whether their experiences are past or future *per se*, but whether their experiences are present, will be present, or were present. This is why it would be rational for Eternal Eddie, were he a future-biased agent, to schedule his future bliss for some arbitrary time, because then his future bliss will eventually be present, which is what matters to

future-biased agents. Having made it sufficiently clear that future-biased agents do not care about the pastness or futurity of certain experiences, but whether certain experiences are present, will be present, or were present, we can also clarify why my presentist-friendly account of future bias accords the truth value of a tensed proposition about an agent's experiences its proper role as the object of future-biased preferences. For a true future-tensed proposition about a pleasure represents part of the way the present will be, and a past-tensed proposition about a pain represents part of the way the present neither is nor will be for an agent, and what future-biased agents care about is how the present was, is, or will be. Therefore, such propositions are appropriate objects of concern for future-biased agents.

4 CONCLUSION

I sought to draw more attention to the connection between the metaphysics of time and temporal value asymmetry, especially the metaphysics of presentism and the rationality of future bias. In this connection, I have put into better focus a potentially problematic objection against an approach to justifying future bias that appeals to the A-theory of time. The potential objection is that presentism, a popular form of A-theory, entails that future bias is unjustified because presentism entails that past and future experiences are not importantly different because neither of them exist. In turn, I have framed this objection as a special case of the cross-time relations problem for presentism.

In accordance with the usual sort of response philosophers make to special cases of the cross-time relations problem, I proposed an account of future bias that demonstrates its compatibility with presentism. In turn, I have responded to a potential objection against my account, which is based on a misunderstanding about future bias, or so I argued. Although the argument is beyond the scope of this paper, I also believe that my conception of future bias is compatible with other A-theories of time. Indeed, there are other versions according to whose ontologies, for instance, the past and present exist, but the future doesn't.[23] Or the past, present, and future are ontologically on a par, but meta-

[23]Referred to as the 'Growing Block View," see Miller (2017, [21]) and Forbes (2015, [9]).

physically dissimilar in that the properties of past or future things are non-qualitative.[24] Finally, it is worth making explicit a question implicit in the rich interplay between our temporal value asymmetries and the metaphysics of time. That is, is it not to the A-theorist's dialectical advantage that it accommodates an attitude we regularly summon from our inegalitarian perspective on time?[25] We regularly respect the authority of our shared evaluative or normative dispositions. If displaying a bias towards the future is one of them, we might thereby be tempted into a kind of wishful thinking against metaphysical views that enjoin us to disrespect or abandon such practices. Some metaphysical views have already been accused of paving a road to indifference.[26] In contrast, others have found a metaphysics of time more attractive *because* it respects our practical concerns.[27] In any case, these sorts of questions warrant further discussion and debate.

For example, whereas this paper considers the question, "Does A-theory justify time bias?", Alison Fernandes has considered the converse: "Do time biases justify A-theory?" She aims to show one affirmative argument, the "Normative Argument," is an unsound answer to her question.[28] The argument is this:

> P1. The temporal value asymmetry is best explained by its being justified.
>
> P2. If the temporal value asymmetry is best explained by its being justified, it is justified.
>
> P3. The temporal value asymmetry is justified (P1, P2).
>
> P4. The temporal value asymmetry can only be justified by objective (non-relative) facts about which events are past and future.
>
> C. Therefore there are objective facts about which events are past and future.

[24]Sullivan's "Minimal A-theory" (2012 [31]), for instance, or Cameron's "enriched presentism" (2015, [3], p. 209).

[25]See Yehezkel's "Theories of Time and the Asymmetry in Human Attitudes" (2014, [32]), which argues that our time biases do not help settle the debate between A- and B-theorists.

[26]I am referring to "A Road to Indifference," in David Lewis (1986, [16], p. 123-128).

[27]For instance, see Zimmerman (2008, [33], p. 214).

[28]See Fernandes (2019, [10], forthcoming).

Fernandes provides reasons against P1 and P4. Elsewhere, I have argued for a thesis entailing P4 is false: some time biases, or temporal value asymmetries, are consistent with the B-theory of time.[29] In that same paper, however, I also took into consideration some issues bearing on P1. One such issue is whether the temporal value asymmetry is best explained by a scientific rather than metaphysical explanation, and Fernandes thinks various features of the symmetry suggest the value asymmetry arises from evolutionarily-advantaged emotional biases "generalised through temporal framing and associative mechanisms to produce general temporal asymmetries of emotion and value."[30] Although I have some concerns about Fernandes' arguments, nevertheless it raises several compelling challenges for anyone who thinks temporal value asymmetries are justified for normative rather than merely motivational or descriptive reasons, as the emotional bias account suggests.

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Fatalism for Presentists

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Abstract

The last fifty years have witnessed a renewed and lively philosophical debate over the problem of divine omniscience and human freedom. This debate was largely inspired by Nelson Pike's "Divine Omniscience and Voluntary Action," and most participants in the debate (following Pike's own example) have left unexamined the assumption that there are future contingent truths for an omniscient being to know. This is exactly the assumption challenged in Prior's "The Formalities of Omniscience," published three years before Pike's essay. Prior is concerned with both the futurity and the contingency of future contingents. Since so much attention has already been devoted to Prior's critique from contingency, I focus on the critique from futurity. Prior was a presentist, and presentism offers some obvious grounds for denying divine foreknowledge of future contingents. I argue that they come up short; nevertheless, the recent history of the foreknowledge debate shows how prescient Prior was to insist that future contingent truth not go unchallenged.

Keywords: aporetic problem, fatalism, foreknowledge, future contingency, God, omniscience, Peircean semantics, presentism, Prior.

The increased attention philosophers have paid to the problem of divine foreknowledge v. human freedom during the last fifty years is almost entirely due to Nelson Pike's "Divine Omniscience and Voluntary Action" [17]. Interestingly, Arthur Prior's "The Formalities of Omniscience" [18], published just three years earlier, is not even mentioned by Pike, and figures hardly at all in the extensive debate stirred up by

Pike's essay. At least this was true until quite recently. In a remarkable reversal of fortune, Prior's concerns about the argument for "theological fatalism," once largely ignored, have now moved to the center of the debate, and his relevance is at last being recognized.[1]

Here's one reasonably perspicuous way of laying out the argument for theological fatalism as it has developed over the course of the debate inspired by Pike's paper. (The perspicuity of this formulation rests on its having a distinct premise corresponding to each of the main points at which the argument has been challenged.) The argument is designed to show that certain assumptions about God are incompatible with free agency. There are three such assumptions, which collectively constitute what I'll call the "God Assumption":

(i) God is omniscient (if p, then God knows that p)

(ii) God is essentially inerrant, i.e., infallible (necessarily, if God believes that p, then p)

(iii) God exists "eternally" (there is no time such that the proposition *God exists*, if asserted at that time, would be false)

The argument proceeds as follows. Suppose someone X performs an action A at a time T3. Let T2 be a time prior to X's birth and T1 any time prior to T2. Then

(1) It is true at T1 that X will do A at T3. (The Omnitemporality of Truth)

(2) God knows at T1 that X will do A at T3. (God Assumption (i) and (iii))

(3) God believes at T1 that X will do A at T3. (Analysis of Knowledge: *X knows that p* entails *X believes that p*)

[1] An interesting record of this shift may be found in John Martin Fischer's two edited anthologies on the problem of theological fatalism, published 26 years apart. The first, *God, Foreknowledge, and Freedom* [4], includes only one paper—Alfred J. Freddoso's "Accidental Necessity and Logical Determinism"—that engages Prior's position, which it dismisses in short order. The second, *Freedom, Fatalism, and Foreknowledge* [6], has an entire section on "The Logic of Future Contingents," including Prior's classic "It Was To Be."

(4) It is accidentally necessary at T2 that God believed at T1 that X will do A at T3. (Necessity of the Past)

(5) It is accidentally necessary at T2 that X will do A at T3. (God Assumption (ii), Transfer of Necessity Principle)

(6) X cannot refrain from doing A at T3. (Incompatibilist Analysis of "Can")

(7) X does not do A at T3 *freely*. (Principle of Alternate Possibilities)

The same argument can be given for any agent, action, and time. So no one ever does anything freely, if the God Assumption is granted.[2]

Before turning to the steps Prior rejects, I should comment briefly on some of the other steps in the argument. Step (3) looks like a step backward. But the reason the strongest versions of the argument proceed via (3) rather than the stronger (2) is that (3), given divine infallibility, is *strong enough*, and it's a stronger candidate than (2) for use at step (4). Knowledge entails truth, so the fact set forth in (2) is in part *constituted by* the fact that X will A at T3, and that makes it a "soft fact" relative to T2, to use the terminology employed in contemporary "Ockhamist" critiques of the argument—or, in the terms Prior himself favors, it expresses a "contingent future-infected past" [18:49]. Assuming that (3) fares better on this score, it looks like (4) and (5) are irresistible, for reasons that Prior articulates as follows: God's precognition of the agent's future action would then be "necessary, if only because it's past, and so beyond anyone's power to prevent," in which case "anything that follows from this necessary, i.e. now-unpreventable, truth, must itself be now-unpreventable" [18:45]. Step (6), of course, would be denied by compatibilists, and step (7) by philosophers persuaded by Frankfurt-type counterexamples to the Principle of Alternate Possibilities.[3] But Prior, who takes (5) to establish the argument's no-freedom conclusion, does not get into intramural debates between compatibilists and incompatibilists. His contribution to the argument lies elsewhere.

[2]This formulation is identical to the one I give in [12].

[3]Harry Frankfurt's famous article, published just four years after Pike's, presents us with another case of two conversations whose relevance to each other wasn't recognized until much later. For a defense of a "Frankfurtian" solution to the problem of theological fatalism, see [10], [11], and [13]. I argue that Augustine anticipated this solution in [8] and [9].

Where does Prior believe that the argument goes wrong? It is clear in "The Formalities of Omniscience" that he rejects step (2) of the argument, because he rejects

(8) For all p, if (it is the case that) p, God has always known that it would be the case that p. [18:43]

There are at least two general grounds on which Prior disputes (8). The first belongs to reasons for rejecting (8), and so for rejecting (2), even if one accepts

(9) For all p, if (it is the case that) p then it has always been the case that it would be the case that p. [18:44]

For the sake of contrast, I'll mention two such reasons that Prior does not endorse.

The classic challenge to (2) comes from a Boethian conception of God on which God has not "always known" future events because, being atemporally eternal, he has not *always existed*. But this challenge has fallen out of favor among theistic philosophers, and it's one with which Prior is unsympathetic. Responding to Aquinas's "Boethian" view "that God's knowledge is in some way right outside of time," Prior says: "I want to argue against this view, on the ground that its final effect is to restrict *what God knows* to those truths, if any, which are themselves timeless" [18:42], adding (for considerable rhetorical effect!), "it seems an extraordinary way of affirming God's omniscience if a person, when asked what God knows *now*, must say 'Nothing', and when asked what He knew yesterday, must again say 'Nothing', and must yet again say 'Nothing' when asked what God will know tomorrow" [18:42-43].

Another challenge to (2), also grounded in a rejection of (8) but not resting on a Boethian denial that God exists in time, comes from philosophers like William Hasker [7], Richard Swinburne [27] and Peter van Inwagen [28]. They accept (9) but deny (8) on the grounds that (a) there are future contingent truths, (b) God's infallibly foreknowing them would render them noncontingent, contradicting (a) (for there would then be *no* future contingent truths), so (c) it is impossible for God to know the contingent future. But this result is perfectly compatible with classical theism, Hasker *et al.* argue, since God's failure to know these truths no more compromises his Anselmian perfection than his

failure to perform any other logically impossible task. Insofar as this response frankly affirms the existence of future contingent truths, it's obviously unavailable to Prior.

Prior's reason for rejecting (8)—putting (9) to one side for the moment—is more direct than the two challenges just mentioned. If X's doing A at T3 is, at T1, still contingent, then (he writes): "I cannot see in what way the alleged knowledge, even if it were God's, could be more than correct guessing. For there would be *ex hypothesi* nothing that could *make* it knowledge, no present *ground* for the guess's correctness which a specially penetrating person might perceive" [18:49]. This concern about (2) has attracted increasing attention in the literature. I'll mention just two examples. Ryan Byerly [1] has made it the focus of an entire book, arguing that God's *ordering of times* in primitive earlier-than relations can account for his infallible foreknowledge while leaving human freedom intact. Yet more recently, John Martin Fischer [5] has developed an account of God's foreknowledge on which he "bootstraps" to certainty by combining an (otherwise fallible) knowledge of the contingent future with self-knowledge of his own infallibility. It seems to me that neither of these efforts succeeds and that Prior's worry about how foreknowledge of a contingent future is even possible has not been satisfied, but I don't propose to pursue the matter here.[4] Suffice it to say that this recent flurry of activity suggests that Prior's doubts about how even *God* could have knowledge of future contingents is beginning to be recognized as a serious problem.

But Prior also, and more importantly, rejects (2) because (unlike Hasker *et al.*) he denies (9), and so rejects step (1). The assumption that there are future contingent truths is the opening wedge in arguments for fatalism (theological and nontheological), and denying this assumption allows one to nip the arguments in the bud. One can distinguish, somewhat artificially but nevertheless usefully, between objections to future contingent truths that locate the problem primarily in their *futurity* and those that locate the problem primarily in their *contingency*. The latter are typically developed via a Peircean semantics that assigns maximal causal force to the predictive use of the word 'will'. To say that something *will* happen, given a Peircean tense logic, is to assign it a probability of 1.0, and that's incompatible with its being contingent;

[4] I express some doubts about Fischer's proposal in [14].

so there are no future contingent truths. This is the principal ground on which (1) has been challenged, and it's the principal concern that Prior develops in "The Formalities of Omniscience." But this territory has been well explored in the literature. (In addition to the vast literature on future contingent truth, see Rhoda, Boyd and Belt [23] for an application of Peircean semantics to the problem of theological fatalism. For a response to Rhoda *et al.*, see Craig and Hunt [2].) For this reason I would like to turn instead in another direction.[5]

Prior's interest in logic and semantics was very much in the service of metaphysical issues: "Philosophy, including Logic," he wrote, "is not primarily about language, but about the real world" [20:45]. Regarding the real world, Prior endorsed presentism: "the present simply *is* the real considered in relation to two species of unreality, namely the past and the future" [19:245]. For Prior, then, the futurity of future contingent truths was itself a ground of reproach against them. Not all presentists deny future-contingent truth, and there are grounds for denial other than presentism. But it's presentist resources for avoiding fatalism that I wish to explore in what follows.

I should first say something about why fatalism is a *problem. Logical* or *future-truth* fatalism—the kind that worried Aristotle and the Stoics—*isn't* much of a problem. The simplest versions turn on a modal fallacy—mistaking the necessity of the *consequence* for the necessity of the *consequent*, to use Aquinas's terminology—while versions designed to avoid this defect violate what Trenton Merricks calls the "truism about truth" that truth depends on the world.[6] *Theological* fatalism (*pace* Merricks) is much more formidable, but would seem to pose a problem only for theists, and even then only for some theists (classical rather than open theists, for example, and perhaps not even all classical theists, if the Boethian conception of God as existing in timeless eternity provides an escape from the argument). So the question whether presentism allows one to avoid fatalism may seem to be of limited interest: unless one is committed to the existence of an infallibly omniscient sempiternal being,

[5]It seems to me, following Rosenkranz [24], that rejection of the "thin red line" rests on confusing *fixing* with *determining* (a unique future). But I'm not sure how to make progress on this question with those possessing contrary intuitions—another reason for taking things in another direction.

[6]See, e.g., [16]. Merricks explicitly distinguishes his refutation of logical fatalism from an "Ockhamist" response relying on the soft fact/hard fact distinction.

the fact that presentism might put one in a position to avoid fatalism is a solution looking for a problem.

Why should the relative success of the argument for theological fatalism concern anyone who isn't committed to the full God Assumption (or the assumption of human freedom, for that matter)? The reason is that theological fatalism is arguably not just a theological problem but an *aporetic* problem. An example of an aporetic problem is Zeno's Achilles paradox. The relevant facts about this famous problem are these: (1) An argument is given, starring a tortoise, renowned for its slowness, and Achilles, Homer's "fleetest of the Achaeans." (2) The argument's conclusion is that Achilles can't pass the tortoise. (3) It's surprisingly hard to say exactly where the argument goes wrong. (The details of the argument don't matter, so long as it's hard to say where it goes wrong.) Nevertheless, we're within our epistemic rights in believing that there's something wrong with the argument, even if we don't know, and perhaps have no idea, *what* is wrong with it. Moreover, the problem posed by the argument cannot be solved by revising one's conception of the argument's *dramatis personae*. Achillean revisionism ("perhaps Achilles was a quadriplegic and this 'fleetest of the Achaeans' stuff was Homer's little joke") simply removes Achilles from complicity in the problem; the same goes for testudine revisionism ("maybe this was a super-tortoise"!). The problem is easily reinstated by substituting Hermes (or Usain Bolt) for Achilles, or a snail or glacier for the tortoise. Zeno's argument constitutes a thought-experiment, and its terms can be *stipulated*. In sum, the argument presents a *puzzle*, not a serious brief against the possibility of motion. Understood aporetically, the solution to the problem involves discovering how best to rethink our assumptions or sharpen our conceptual tools so we don't fall prey to the argument.

Consider now the problem of theological fatalism. Here are three facts about this problem that parallel the three salient facts about Zeno's Achilles paradox: (1) An argument is given, starring God, an eternally existent and infallibly omniscient being, and X, an agent who performs a presumptively free action A at time T3. (2) The argument's conclusion is that X doesn't perform A at T3 freely. (3) It isn't easy to see where the argument might go wrong. But why think that this problem, like the Achilles paradox, can be construed aporetically? I cannot defend this judgment fully here, but I can support it with an intuition pump.

Suppose that X's A-ing at T3 satisfies to the highest degree *your* favorite criteria for free agency, whatever they may be. These criteria might include the following, among others: that X does A willingly; that doing A doesn't flout any of X's second-order desires; that X can abstain from A-ing at T3 should he choose to do so; that X doesn't A at T3 under coercion or duress; that X's A-ing at T3 is not causally determined by events prior to the X's birth; that X does not A at T3 in ignorance of relevant circumstances; and so on. Now add one more condition: before X was even born, God infallibly believed that X would A at T3. How could *that* additional condition have as a consequence that X's A-ing at T3 isn't an instance of free agency? There are conditions that clearly *would* warrant such a reassessment—for example, if it were added that X was under the influence of drugs or post-hypnotic suggestion, or controlled by Martians via a chip implanted in his brain. But the idea that the mere presence of an infallible foreknower could make this kind of difference is deeply puzzling. We have good reason to suspect that the argument goes wrong, even if we're unable to determine exactly *where* it goes wrong. Note that our puzzlement has nothing essentially to do with whether the God Assumption is theologically correct. Suppose God doesn't exist, or doesn't know future-contingent truths, or knows them (truths which are future-contingent relative to *us*) *timelessly*. That would remove God from complicity in the problem, just as Achilles could be similarly removed from complicity in Zeno's paradox, but a puzzle would remain. With God out of the picture, we're left with a pure thought-experiment, whose terms can be stipulated. So imagine an infallibly omniprescient being named 'Gob'. It seems that a paradigmatically free action shouldn't lose this status just because Gob exists; yet here's an argument showing otherwise. While it is perhaps possible that the argument gets things right in the end, it isn't unreasonable to approach the argument with the suspicion that it harbors an impropriety somewhere, and treat it aporetically.[7]

That's enough about why I think the argument for theological fatalism should be of interest to all philosophers, theists and nontheists alike. Let's turn now to presentist resources for resisting the argument's fatalistic conclusion. If there are no future-contingent truths, then step (1)

[7] I develop the idea that theological fatalism should be treated as an aporetic problem in [13]. The material in the preceding two paragraphs is based very closely on that source.

of the argument is false, and neither God nor Gob will hold the beliefs that fuel the argument.[8] But if presentism is true, truths about the future must supervene on the present, and there does not appear to be anything in the present on which future-*contingent* truths *could* supervene.

Presentists who take this line (and not all do) must make sure that it doesn't equally jeopardize truths about the past. Take the proposition *Caesar was assassinated in 44 B.C.* The growing block has a truth-maker in 44 B.C. for this proposition, but presentism does not; it needs a present truth-maker. This is already a cost of presentism, in my view, since the content of the proposition has to do only with what happened in 44 B.C.; nothing at all is being said about present conditions from which, e.g., Caesar's assassination in 44 B.C. can be inferred. (I'm tempted to say that *evidence*-makers are being confused here with *truth*-makers.) But a presentist may well question the assumption that the truth-conditions for a proposition must track what it's "about." An assertion about Santa Claus is made true by something else (not Santa, but a story); likewise an assertion about the past can be made true by something else (not the past, but the present).[9] Let's suppose that's right. Still, the intrinsic properties of the present seem compatible with multiple pasts. Suppose God tamped out all causal traces of Caesar's assassination; it shouldn't result from this that the proposition *Caesar was assassinated in 44 B.C.* is no longer true. So it's not clear how all the truths about the past that a good theory needs to accommodate could be grounded in the present, at least if the grounding is supposed to be causally connected to the truths that it grounds. For presentists who wish to deny future-contingent truth, it's natural to look to present causal traces to ground truths about the past because the unidirectionality of the causal arrow ensures that there won't be equivalent causal "anticipations" of the contingent future. But causal traces won't do the job; the presentist will

[8]Since our forebeliever's properties can simply be stipulated, perhaps (1) is unnecessary. Suppose "Gob" is such that, if X A's at T3, then Gob believed at T1 that X will A at T3, even though it was not then (at T1) *true* that X will A at T3 (perhaps because there *are no* future-contingent truths). But Gob's beliefs, whether or not they are true, are *infallible*, in the sense that things cannot turn out otherwise than Gob believes. Then the argument for theological fatalism might be back in business, even though none of Gob's beliefs about future-contingents were *true*. Suitably developed, this might constitute a third "fatalism for presentists," in addition to the two discussed in the paper.

[9]I owe this point to Brian Leftow.

have to look elsewhere.

Here's a quick review of four recent (and probably familiar) proposals for how this problem might be avoided under presentism. Tom Crisp [3] posits an ersatz B-series of times and suggests that the present time is such that Caesar's being assassinated in 44 B.C. is "temporally accessible" to it, the model here being the way that the actual world is such that certain other worlds or possible states of affairs are "logically accessible" to it. This is a fact about the present, and so, on presentism, a fact about reality. But this fact would have to be different if Caesar was not assassinated in 44 B.C. The proposition about Caesar, then, does supervene on reality in a way that is consistent with presentism. That's because such supervention requires there to be no difference in truth without a difference in reality, and that requirement is satisfied by present facts about temporal accessibility.

Michael Rea [21] looks for a model to the grounding problem for modal truths. If true modal propositions are grounded in irreducible modal properties, then truths about the past might be grounded in irreducibly tensed properties. But how can that be, if the past or future object is not present and so not real? Here again a parallel modal problem might help. We want to say that there are worlds in which Donald Trump does not exist; but if Trump does not exist in those worlds, there is nothing real in those worlds to ground our modal claims about him. The trick is to suppose that we're really talking about Trump's individual essence. It's the same thing when we refer to Julius Caesar now, when he no longer exists: we're really talking about his individual essence, and that essence now has the tensed property *was assassinated in 44 B.C.*[10]

Dean Zimmerman [29] notes how a defender of brute powers, dispositions, or liabilities can appeal to "brute facts" to ground her claims. The opponent will doubtless object to such a move, but "[u]nless the opponent can say a good deal more, specifically, about why it is wrong to take dispositions as primitive or brute features of things, the truthmaker objection amounts to little more than dissatisfied grumbling" [29:217]. Zimmerman then suggests that a presentist can make a similar response to the demand for present facts to ground truths about the past: "There are 'backward-looking' properties that objects really have, properties

[10]Rea is not a presentist, but he offers his proposal on behalf of presentism; his own objection to presentism lies elsewhere.

like having been occupied by a dinosaur 150,000,000 years ago; and there are real facts about which objects have these properties, facts that make propositions about the past true." Zimmerman adds: "The opponents of presentism have attempted to answer this challenge; but, by my lights, they are still in the dissatisfied grumbling stage" [29:218].

Finally, Dean Zimmerman [30] and Alan Rhoda [22] have suggested independently that, if an omniscient deity exists, then God's present beliefs about the past can ground truths about the past. If God now believes that Caesar was assassinated in 44 B.C., this present fact entails that Caesar was assassinated in 44 B.C. Zimmerman refers to this as "a literal *deus ex machina*," ready at hand to resolve presentists' difficulties with grounding.

It seems to me that all four of these proposals get the explanatory order wrong. Crisp's temporal accessibility, like logical accessibility, should itself be a supervenient property: no difference in accessibility relations without a difference in other properties. I have a similar concern about Rea's proposal: even irreducibly modal properties should supervene on nonmodal properties; there can't be two worlds which differ *only* in their modal properties. *Places* are presently endowed with Zimmerman's backward-looking properties only *because* those places *were* once endowed with the corresponding present-tense properties. As for the Zimmerman-Rhoda suggestion that truths about the past can be grounded in God's present beliefs, God surely believes that Caesar was assassinated in 44 B.C. *because* Caesar was assassinated in 44 B.C.; but if the truth of the latter is grounded in the former, we have a pernicious circle of explanatory dependence.

This is no more than a gesture in the direction of an objection. Rather than pressing it against such formidable opponents, which would in any case add little to what others have already said (e.g., Sanson and Caplan [25]), I want to ask instead how any of this helps the presentist to reject step (1) of the argument for theological fatalism. Let's take up this question with regard to Zimmerman's proposal that truths about the past, including those that are causally underdetermined by the present, supervene on brute backward-looking properties, like *having been occupied by a dinosaur 150 million years ago*, that presently existing things really have. And let's suppose that an adequate response is available to the objection that these backward-looking properties are surely explanatorily dependent on something which, according to presentism, isn't real and thus is

unavailable for explanation: *the way things were*. Now consider the parallel proposal that truths about the future, including truths about the causally contingent future, supervene on brute forward-looking properties, like *going to be occupied by an agent X performing an action A at a time T3*, that presently existing things really have. One wants to object that these forward-looking properties are surely explanatorily dependent on something which, according to presentism, isn't real and thus is unavailable for explanation: *the way things will be*. But it isn't easy to see how this objection could be available to a presentist attracted to Zimmerman's line.

Such a presentist will need to explain why present objects can have backward-looking properties but not the corresponding forward-looking properties. How would such an explanation go? Try the following:

> The past was once present, and when it was, the present-tense proposition *There are dinosaurs* was unproblematically true. Its truth supervened on the world, in particular, on the properties some region of the world had at that time. Having exemplified the property *being occupied by a dinosaur* 150 million years ago, that region then came to exemplify the property *having been occupied by a dinosaur* at a later time, when the dinosaur had left, and this property is one that that region still has today. In sum, the past, to which backward-looking properties point, was once present and real; not so for the future. That is why there are present backward-looking properties but no present forward-looking properties.

But this reply won't do the job. A parallel justification can be offered for future-contingent truths, indicating that the proferred explanation simply presupposes that there are truths about the past but not truths about the future. Here's the parallel explanation:

> The future will one day be present, and when it is, the present-tense proposition *X A's at T3* will be unproblematically true. Its truth will supervene on the world, in particular, on the properties some region of the world will have at that time. Since it is going to exemplify the property *being occupied by an agent X performing an action A* at T3, that region then exemplified the property *going to be occupied by an agent*

> *X performing an action A* at earlier times, before X began A-ing, and this property is one that that region already has today. In sum, the future, to which forward-looking properties point, will one day be present and real, and that is why there are present forward-looking properties.

I'm not asking whether this is an adequate presentism-friendly justification of future-contingent truth *full stop*; I'm asking whether it is an adequate justification *on the assumption that the presentism-friendly justification of truths about the past that immediately preceded it is adequate*. I might hazard that any presentist who swallows the first justification but balks at the second is just engaged in dissatisfied grumbling!

A similar response can be made to the other three proposals we reviewed. A defender of future-contingent truth might follow Crisp's lead by claiming that X's A-ing at T3 is "temporally accessible" to T1 and maintaining that this fact grounds the future-contingent truth *X will A at T3* when T1 is present. If the temporal accessibility of a past time to the present time is just a brute fact about the present, then it's hard to see why the temporal accessibility of a future time to the present time couldn't also be a brute fact about the present. Rea, who is not a presentist, allows that the irreducibly tensed properties grounding truths about the past could also ground truths about the future. Reference to X at T1, when X does not yet exist, should be construed as talk about X's individual essence, which at T1 has the tensed property *will A at T3*, a property which grounds at T1 the future-contingent truth *X will A at T3*. Finally, Zimmerman's and Rhoda's appeals to God's omniscience with respect to the past would seem to be of equal use to a defender of God's knowledge of the future. Open theists like Zimmerman and Rhoda hold that God can be omniscient despite his ignorance of the contingent future because, given presentism, *there are no truths there to be known*; but it's not clear how they can maintain this position against an advocate of future-contingent truth who contends that such truths are grounded in God's present foreknowledge, since that is exactly how they defend their own commitment to truths about the past in the face of the objection that, given presentism, *there are no truths there to be known*.

In sum, either presentism cannot accommodate truths about the past, in which case it must surely be rejected, or it can accommodate them, in which case it has no principled grounds for denying truths about the

contingent future. So that's the first reason why I think that presentists cannot escape the argument for theological fatalism at step (1). But suppose I'm wrong about this. Presentist opponents of future-contingent truth are a wily bunch, and it's impossible to anticipate all the stratagems they might employ for countenancing truths about the past but not about the contingent future. Unfortunately for them, the argument for theological fatalism might not require the literal truth of (1).

Here's why. Suppose that there is nothing in the present on which the propositions about the past and future endorsed by commonsense can supervene. Then, on presentism, those propositions are literally untrue. Commonsense might nevertheless be accommodated if such propositions are "close enough" to the literal truth, differing from literal truth only on technical or theoretical grounds: close enough that it's understandable how commonsense might confuse them for literal truth, and close enough that the interests of commonsense are satisfied despite their literal untruth. Ted Sider [26] has coined the term 'quasi-truths' for such propositions endorsed by commonsense. Sider's "working idea of a quasi-true sentence is one that, *philosophical niceties aside*, is true" [26:332], and Ned Markosian offers this definition: "S is quasi-true =df. S is not literally true, but only in virtue of certain nonempirical or philosophical facts" [15:69]. These are just the sorts of facts that presentism brings to the table. So if presentism does undermine the literal truth of (1), it does so in such a way that (1) remains *quasi-true*.[11]

This doesn't give us (1), but it appears to give us something close enough to (1) that the argument for theological fatalism is back in business. Arguably, an omniscient being must also know all quasi-truths. That's because, for any quasi-truth, it is true, and not just quasi-true, that it is a quasi-truth. God therefore knows that it is quasi-true. But if X A's at T3, presentism is either compatible with (1)'s literal truth, or it is incompatible with (1)'s literal truth—in which case (1) is quasi-true, since it falls short of literal truth "only in virtue of certain nonempirical or philosophical facts," namely, those constituting presentism. That means that the argument for theological fatalism can be restarted with the notion of quasi-truth:

(1#) It is true at T1 that it is quasi-true that X will do A at T3.

[11] Including future contingents among the quasi-truths would accommodate, among other things, a straightforward acceptance of the commonsense practice of *prediction*.

The following steps are justified in exactly the same ways as the corresponding steps in the original argument:

(2#) God knows at T1 that it is quasi-true that X will do A at T3.

(3#) God believes at T1 that it is quasi-true that X will do A at T3.

(4#) It is accidentally necessary at T2 that God believed at T1 that it is quasi-true that X will do A at T3.

(5#) It is accidentally necessary at T2 that it is quasi-true that X will do A at T3.

At this point the notion of quasi-truth is dropped and the argument continues as in the original:

(6) X cannot refrain from doing A at T3.

(7) X does not do A at T3 *freely*.

Why suppose that (5#), in which accidental necessity governs a proposition that is only quasi-true, is sufficient for (6)? Suppose that (6) is false. If X were to refrain from A-ing at T3, it wouldn't have been quasi-true at any earlier time that X will A at T3. But then it can't have been accidentally necessary at T2 that it was quasi-true that X will A at T3. Since the falsity of (6) is sufficient for the falsity of (5#), (5#) is sufficient for (6). So the argument for theological fatalism based on quasi-truth appears to be just as effective as the one based on truth.

I conclude that the aporetic problem posed by the argument for theological fatalism cannot be resolved on presentist grounds. If step (1) is where the argument goes wrong, it must be for some reason other than a presentist commitment to the unreality of the future.

Of course Prior's principal objection to (1) in "The Formalities of Omniscience" is grounded in his preference for a Peircean semantics, and that preference is defensible apart from his endorsement of presentism. I haven't done anything in this paper to address that objection. My narrower purpose in this essay has been to argue that if the assumption of future contingent truth is theological fatalism's original sin, it's a mistake to assign the greater blame to futurity rather than contingency. Hence the attention paid to presentism. But my general purpose has

been simply to appreciate Prior's focus on steps (1) and (2) of the argument, and especially the support provided to (2) by (1). The debate stirred up by Nelson Pike's paper slighted these steps, treating them largely as prologue to the main event: the clash between divine foreknowledge and human freedom. But once divine foreknowledge of future contingents is in place, it's too late: freedom is unrecoverable, at least on the standard view of 'freedom' that's been assumed in the debate. It's the belated recognition of this fact that accounts for the recent shift in the debate toward the question of future contingent truth. In focusing his own examination of the argument on this question, Prior proved to be ahead of his time.[12]

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A Defence of Presentism Against the Rietdijk-Putnam-Penrose Argument

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Abstract

The Rietdijk-Putnam-Penrose argument is a critique of presentism and argues from the relativity of simultaneity in the theory of relativity to a block universe. This article argues that the argument is imprecisely formulated, and can be refuted by considering its implications more precisely.

Keywords: Presentism · eternalism · Rietdijk-Putnam-Penrose argument.

1 Introduction

Presentism is here understood as the view that the present moment is unique in the sense that only what is actualized in the present moment exists, while the block universe (or eternalist) view is understood as the view that all times are on a par, without there being something that makes a point of time uniquely past, present or future. Presentism is the common view among laypeople. A classic argument for presentism, offered by Arthur Prior, is that there is a great difference between

a headache we have now and a headache that is past or waiting. Presentism is needed to make sense of the fact that we can say "Thank goodness that's over" [1].

However, the majority of philosophers of time defend the block universe view instead [2]. There is a famous argument against presentism made by several philosophers but often referred to as the Rietdijk-Putnam-Penrose argument, which argues from the relativity of simultaneity in the theory of relativity to a block universe [3]. Roger Penrose describes this argument in the following way: Imagine a car driving along the street in a direction which is also in the direction towards the galaxy Andromeda. As the car passes a man standing on the street, the man in the car and the man on the street will have different simultaneity lines with what happens at Andromeda. Simultaneous to the man standing on the street, the Andromedans may consider whether to invade earth, but simultaneous to the man in the car, the Andromedans may already have chosen to invade us and be on their way towards earth. Penrose writes that if what is future to one person is past to another, the event is an inevitability [4].

The argument is used by many physicists to argue in favor of a block universe, for example Brian Greene, Max Tegmark, and Sean Carroll [5]. Hilary Putnam says that the problem of the reality of future events has been solved by physics, and not by philosophy [2], [6]. Craig Callender calls the argument "utterly convincing" [3]. Arthur Prior discusses the objection that the theory of relativity makes simultaneity relative and responds that time in relativity theory "is just part of an artificial framework which the scientists have constructed to link together observed facts in the simplest way possible" [7]. In this article, I will be unpacking and defending a response which is similar to this response by Prior.

2 Discussion

In order to consider the Rietdijk-Putnam-Penrose-argument carefully, we shall first consider more closely what we do when we measure time. Time can be measured by an individual in his or her reference frame, and this is called coordinate time. Time can also be measured as wristwatch time by a clock travelling between two events, and this is called

proper time, which is a quantity all observers can agree on. Since this proper time is a common measurement of time for all, and independent of reference frame, it is a very useful way to measure time, which allows the same laws to be used in all frames of reference, and which is therefore adopted by physics. In addition, it allows us to easily calculate real phenomena like time dilation.

Such measurements of time are made by ideal clocks which use light to measure time. This is a sensible choice, since all measure the same speed of light, and again, since it even matches with physical processes like biological aging. Rocket Rocky could leave his twin brother Stationary Steve travelling at 0.8 c in one direction before moving and returning to find Steve having aged ten years biologically and Rocky having aged only six years biologically. It is worth saying explicitly that if travelling twin brother Rocky had left Steve travelling at 0.8 c as in this example, he would measure three years on his *ideal* clock while Steve measured five years. But if Rocky were to have a *regular* clock on his arm, e.g. bought at a gas station before leaving, this clock would show five years just as the clock on Steve's arm [8]. After all, Rocky would presumably - like all of us - be moving his arm in all sorts of directions all the time, and so this mechanical clock would not have been an idealized inertial frame of reference.

This means that Rocky could easily have measured the same time as Steve on his whole journey. For example, we could imagine clocks along his journey hanging outside synchronized with Steve's clock, so that Rocky could always look outside his window to see what time it is for Steve. Alternatively, he could have brought a watch which had been corrected for the speed effects, such as the GPS watches [9].

How we choose to measure time is then a choice we make, where different choices have different advantages. The ideal clocks and reference frames are very useful coordinate systems for physics, but we need to be very precise on exactly what they tell us about time, passage, simultaneity, future and past, and this is what we are now digging into. In the twin paradox, ten years pass for Steve and six years for Rocky, and this is natural to say because Steve has aged biologically four years more than Rocky. However, it would be wrong to say (even if many examples do, as anyone can see by writing "twin paradox" and searching google images) that if Rocky leaves in 2019, it will be 2025 for Rocky and 2029 for Steve when they meet.

It will be 2029 since the earth will have orbited the sun ten times since Rocky left, but if Rocky were to measure these orbits, he would measure the earth as orbiting the sun faster compared to Steve. If he were to look at it with his eyes (as opposed to measuring with his ideal watch), he would see the earth going slower when he was moving away from the light, and then faster when he was moving towards the light, since the light would travel longer or shorter before reaching his eyes. As measured in Rocky's frame of reference (if he travels at 0.8 c), there is only 0.6 years between each Christmas. But Steve and Rocky will agree on when it is Christmas, namely when the earth has a certain position relative to the sun and the other planets - and there are Christmas trees for sale. They will just disagree on how long the period is between each Christmas if they use light to measure this time period, but they will not disagree on how many months it is between each Christmas, if they measure months not in seconds, but as 1/12 of the time earth takes to orbit the sun, and roughly one period of the moon orbiting the earth. If they measure time not by means of light but by means of the earth orbiting the sun, they will of course agree that it is one year between each Christmas.

It is useful then to distinguish between one the one hand events happening and the order in which they occur, and on the other hand how we can use different coordinate systems and different means of measuring *when* these events occur. There is an important distinction in SR and GR between what happens within the past light cone of an event and what happens outside of it. Your past light cone is the region of events that could have influenced your present moment since they are within light speed distance. You could have been influenced now by things that were less than one light-year away one year ago, and less than two light-years away two years ago, etc., since this could have reached you now, and so this within your past light cone. But if something was more than a light-year away a year ago, or more than two light-years away two years ago, etc., it could not have influenced you now, since it could not in any way have reached you, and then it was outside your past light cone.

Events that in your coordinate system is considered by you to be past and within your past light cone, is called the absolute past, whereas events outside of your past light cone is not. The reason is that different observers will disagree on what is past and future outside of your past

light cone, and even in which order they occurred. But all observers will agree on the order of events in your past light cone [10]. These events follow a world line, and all observers can agree on the order of events on a world line, although they will disagree on what happened first of two disconnected events with a great spatial distance between them.

This has a very interesting consequence. Different observers will measure different time orders of random events that are far from each other, but in fact, there is a time order of events that are causally connectible (within a light cone). All events in the universe can be placed in the light cones of particles from the big bang, so in principle, all observers should be able to agree on the order of events in the universe, if they could have communicated with each other. Relative to their own frames, they would disagree on when the events happened and how long they took, but they would agree on the order of events.

On the one hand then, we have the order of all the events in the universe. On the other hand, we have different coordinate systems that can be used to sort these events into past, present and future. This can be done in many ways, and it is not the case that something becomes fixed past by being designated as past by us in a coordinate system we choose to use. Imagine a photon leaving the big bang. In a space-time diagram it can be seen as travelling at 45 degrees to the right, with a simultaneity line of 45 degrees, so that the big bang is always simultaneous with it. After 13.8 billion years in the reference frame of the universe, for this photon the big bang is still happening at the present moment, and the 13.8 billion years of universe history is future relative to the reference frame of this photon. If the photon a second later (in the universe frame) starts travelling in the opposite direction, then its simultaneity line gets tilted 45 degrees upwards to the left, and now the 13.8 billion years that the universe has lasted and the next 13.8 billion years of the future of the universe, will all be 27.6 billion years of past relative to the reference frame of this photon. In one second, 27.6 billion years of future becomes 27.6 billion years of past to this photon.

The good thing about using reference frames this way, is that we learn something right about photons and how they do not seem to age since they travel at the speed of light. On the other hand, it does not make sense to say that a photon can gain 27.6 billion years of history in one second. The reference frame of the photon is not useful for discussing the age of the universe. If we want to say something interesting

about the age of the universe, we need a reference frame for the whole universe, and this can be defined. Even if the *geometry* of space and time does not prefer a special frame, the *content* of space and time makes some reference frames special [2]. Not in the sense that different laws apply to these reference frames, but in the sense that they stand out as special. There is a frame of reference for the universe as a whole, where the background radiation from the big bang is similar in all directions, and this is the reference frame for the universe as a whole. It is used to define the age of the universe, as being ca 13.8 billion years [3].

A notable attempt at defining global simultaneity has been offered by William Lane Craig. Craig has both argued in favour of a Lorentz interpretation of relativity with an absolute space, and that there is a preferred foliation of space-time which gives us global simultaneity. It is possible to define a reference frame for the universe as a whole where the galaxies are fundamental observers at rest with one another, which gives you a space-time metric called Friedman-Lemaitre-Robertson-Walker [11], [9]. Craig Callender has criticized these attempts at a solution. While the Lorentz interpretation of special relativity is equivalent to the standard interpretation, this is not the case when it comes to general relativity. According to Callender, general relativity is overwhelmingly better than Lorentz both theoretically and empirically when it comes to interpreting gravity [3].

When it comes to the preferred foliation of the Friedman-Lemaitre-Robertson-Walker space-time metric, Callender offers four counterarguments. 1) It depends on making average calculations for the universe as a whole which are not accurate descriptions of what happens locally. It is found by different global averaging techniques and cannot be used to define a global now that all can agree on at specific local places. It seems strange that metaphysical time should behave according to an average and less accurate description of specific events. 2) We are not fundamental observers, but rather in motion relative to the galaxies, and even galaxies collide. 3) The selection of this reference frame is still a random selection since the theory of relativity does not support that it is special. What is so special about the fundamental observers? 4) Why should we believe that the time we experience is connected to this artificial definition of time? It is useful for several purposes, but not for others [3].

Even if Callender makes these objections in 2017, Craig offers an

answer to these critiques in an article from 2003. His response is that the cosmic time of the universe coincides from its creation with metaphysical time, but that there are local disturbances in our physical time due to motion and gravity [12]. Against this response, Callender could ask what accounts for this disturbance and argue that we should use GR instead of Lorentz to account for it; and he could ask whether local disturbance also implies that there must be different experiences of the present moment existing at the same time.

I shall not enter the discussion between Craig and Callender, but suggest another solution instead, which seems to be an easier way to the same goal as Craig has. Even if it is true that the geometry of GR does not give us a way to define a global simultaneity slice through the whole universe, we can nevertheless make sense of the idea of a global simultaneity slice. We can understand what it means by reflection even if we cannot perform an experiment to measure it. How? Imagine the reference frame of the universe as a lattice work of synchronized cameras permeating the whole universe, and then taking a picture at one point of time, as defined by this frame. The pictures could be combined into one big snapshot of the universe, where one could see some objects being contracted. This cannot be done in practice, and black holes would disturb parts of it, and it is a definition of universal simultaneity which physics has no need for, but it is a definition of universal simultaneity that makes sense, contra those who say that no such concept can make sense.

Why should we believe that a definition of time which gives global simultaneity should be connected to our experience of time? It is common to believe that the physical state of the universe (which includes the physical states of the brains in the universe) causes the conscious experiences there are of the universe, and so this creates a link between the actualized configuration of a universe at a point of time and how the universe is consciously experienced. The brain causes us to experience the universe at it was about 80 milliseconds ago [13]. This means that while the now of the conscious experience is simultaneous with the present moment of the universe, the *content* of the conscious experience is the universe as it was about 80 milliseconds ago.

Some have also used quantum mechanics to support the idea of global simultaneity, but Callender argues that the simultaneity of quantum mechanics need not correspond to the simultaneity defined by meta-

physics [3]. But it does suggest global simultaneity, and if the entangled particle can be anywhere in the universe, and there is only one universe existing at a time, and if the entanglement is due to laws governing the whole universe, the most natural assumption to make is that they coincide. Different lines of reasoning can thus support each other and the belief in one global simultaneity.

Against my point that the configuration of the brains of the universe causes the content of consciousness, Callender argues that all conscious experiences of it being now in the past and the future exist at the same time [3]. The problem with this view is that then all these configurations of the universe at every moment must exist at different places. If a door is closed one second and open the next second, you cannot have an open and a closed door at the same place, so it must be two different places, which gives you a very complicated ontology.

The big choice to make is whether to believe with the presentists that what exists at such a universal slice of simultaneity is all that exists, or whether to believe with the eternalists that all simultaneity slices exist at the same time. The question is whether to believe that there is one three-dimensional world that changes through time or whether to believe that there exists a four-dimensional block universe where every event exists in the same way, with no interesting ontological difference between past and future.

We have seen some of the advantages that make physicists choose no reference frame as special, but what is actually the ontology that is being presupposed if you make this physics into an ontology of a block universe? What does it mean to live in a block universe? To consider this, imagine moving your hand slowly towards your face. At first, the hand is 20 centimeters away, then 15 centimeters, then 10 centimeters, etc. If these moments all exist in the same way, there must exist forever a states of affairs where your hand is localized 20 centimeters from your face, and a state of affairs where your hand is localized 10 centimeters from your face, but this must then happen at two different places. There is a you that sees the hand 20 centimeters away and a you that sees it 10 centimeters away, and these two events cannot be happening at the same time and place, but if both exist in the same way forever, they must be happening at two different places in order to be understandable as something existing.

If the universe is a four-dimensional block universe, then "time" and

"dimension" must be something unknown which exists and where things can be located. And there must be an infinity of states of affairs existing at the same time: a whole universe where my hand is 20 centimeters from my face, a whole universe where my hand is 15 centimeters from my face, a whole universe where my hand is 10 centimeters from my face, etc.

Or maybe one has another strange theory about objects as four-dimensional objects with time parts, but this will also be something unknown and mystical. The point I am trying to make is that a four-dimensional universe is a quite bizarre ontology which takes on board a lot of problems in order to win a few advantages in how physics is done. William Lane Craig makes the same point, that the block universe implies a bizarre ontology [9]. You can get rid of a preferred frame of reference, but have to take on an infinite number of universes and a strange spacetime substance with an unknown kind of dimension – in addition to other problems: How did this massive block come into existence all at once, or how could it be like this forever? It makes so much more sense with a three-dimensional universe that has changed and developed over time. We understand how evolution can select those who are best fit to survive over time, but if everything has always existed in a giant frozen now, how does evolution make sense? How should we understand the advantages that have selected some species if all have just existed forever anyway?

The defender of a four-dimensional universe could still argue that physics have taught us that we live in a four-dimensional world, and that we need the geometry of spacetime to explain why things move as they do. Minkowski famously said that space and time must fade away and spacetime take its place [14]. An important choice must here be made: should we believe that spacetime and its geometry explains motion in the world, or should we think instead that motion in the world happens according to certain rules, which are best described by a certain geometry?

We already know that motion in the world happens according to certain rules, so it would be a simpler theory if we could remove four-dimensional spacetime as an additional entity with a certain structure and a capacity for influencing objects. Harvey Brown argues this in his book *Physical relativity*. It is not the geometry of space that makes objects contract or move slower, rather there are physical explanations for

this, which are then well described by use of the Lorentz-factor and the geometries of SR and GR [15].

Brown argues that we have no idea what a geometrical explanation for contraction would be, and that we have no reason to believe that the geometry of spacetime should explain anything. A common example is that spacetime geometry explains inertia in the way that objects naturally follow geodesics, but Brown points out that spinning objects do not follow geodesics, and argues instead that it is the field equations that explain inertia. Clock and rods do not know what kind of spacetime they are in. It is the laws of nature that explains why the geometry of GR is useful to describe the universe, it is not the geometry that explains how the universe works [15].

There are many possibilities within GR geometry that are obviously not physically possible [3], [16]. This supports the view that GR geometry should be understood as a theoretical framework which is helpful in describing the world, but not that it is a description of an entity existing in the world. Instead of thinking that spacetime has a geometry we can discover, I would say instead that we can discover the rules that nature follows, and use geometry to describe systematic relations in the motion that results.

3 Conclusion

In this article I have discussed the Rietdijk-Putnam-Penrose argument, which argues from the relativity of simultaneity in the theory of relativity to a block universe. Arthur Prior responded to a similar argument by saying that time in relativity was an artificial framework. In this article I have tried to spell out in more detail the response offered by Prior, by showing how different theoretical frameworks of time work, and how they have different advantages and disadvantages. Because of their difference, lack of global simultaneity in general relativity does not show that the future must already be fixed. Instead, we have many reasons to prefer the theoretical framework of presentism.

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Eternalism, Hybrid Models and Strong Change

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Abstract

My main purpose in this paper is to argue that eternalism in the block universe conception is compatible with change, in a specific sense. After introducing some restrictions and relinquishing some aspects of eternalistic models (such as, for instance, the Parmenidean character sometimes associated with them), we will be able to preserve everything that is relevant to that end. The chance to introduce such restrictions will occur in the context of a possible answer to Niall Shanks (1994), who argues that the classical block universe is incompatible with free will. After rejecting the author's arguments, we will introduce hybrid models, which, despite being eternalistic, can accommodate the passage of time and what we call "strong change". The original contribution of this paper is, mostly, to bring to light the conditions in which a strong change can be introduced in an eternalistic model, and presenting what is gained and what is lost with such a move.

Keywords: Eternalism, Parmenidean world, change, free-will, hybrid models.

1 Introduction

One of the most intriguing texts making a connection between eternalism and determinism was written by Niall Shanks (1994). Here, we

try to tackle the determinist challenges raised by that author. My main purpose is to make an argument for the compatibility between eternalism and change, in a specific sense, which I shall designate "strong change". Shanks's argument depends on a certain interpretation of eternalism, which is as a classical model of a fixed or static world. I shall interpret what Shanks calls S-theory as the union of eternalism, Four-Dimensionalism and B-series, thus resulting in the so-called Parmenidean block universe.[1]

Shanks presents at least two requirements that are supposedly incompatible with eternalism, and without which there is no free will, because some sort of determinism cannot be avoided.[2] These are: a) that parts of the world can be modified by the intervention of free agents and b) that there are many occurrence possibilities for each point in space-time (cf. Oaklander, 1998, p. 196). Shanks also attempts to discern a nomological criterion, which he stops short of endorsing. In what follows, I shall present a version of the argument that assumes the impossibility of change, in a specific sense, as long as eternalism is concerned.

2 Is the change of parts possible in an eternalistic world?

There is a clear sense in which eternalistic worlds allow for change: a change in such a world would be just the difference of properties between stages in a B-series (cf. Rea, 2003; Russell, 1915). When we move from one position to another in the series, we find different properties in the different temporal stages of an object and, in that sense, properties change. But will that "change" help us to solve the problem pointed out by Shanks? Oaklander thinks that for there to be change it suffices that there are different properties, instantiated at different times (cf. Oaklander, 1998). If Oaklander is right about this, the differences available to the S-theorist put him in a position to adequately deal with contexts in which there is change without generation or corruption.

[1] S-theory is a term used by Shanks to refer to a classical Parmenindean block universe. In this context, "S-theory" can be interpreted to mean something like "The Static Theory of Time" or even "The Theory of a Static World".

[2] Assuming a libertarian point of view.

We can show how the S-theorist can explain the beginning and end of a headache. The explanation will be satisfactory if it can indicate when the headache occurs and when it does not, and which events (beginning and end of a headache) can be indicated relative to other events, i.e. in McTaggartian type-B relationships (McTaggart, 1908), as in the examples "I have a headache now, while I'm watching the game (present)", or "my headache started before I saw the hill (past)".

Part of the difficulty lies in thinking that only a temporal difference could avoid some confusion between the beginning and the end of a headache. But we can resort to an indexical strategy, which is very common among eternalist and non-temporalist theorists. In that strategy, T1 is the time at which I become aware that I have a headache. The non-temporalised treatment is given by indexation to that time in the following manner: I have a headache now, in that "now" refers to my realisation (my awareness) that I have a headache. For T2, the moment in which I no longer have a headache, a similar process applies, in terms of "my headache started before this [...]" in that "this" refers to some sense data. The important thing is that there is a translation of temporalised (tensed) sentences into non-temporalised (tenseless) sentences. Naturally, the fact that T1 and T2 are ontologically on par (they both exist) does not make them co-existent in any problematic sense; that is, it does not make them simultaneous, as if present and past were the same. What makes it seem so is merely a misunderstanding of non-temporalism, when similarity with space is ascribed to it.

Meanwhile, for the sake of the argument, let us assume that there is a more challenging version of the problem, in which it is required that parts change in a different way. Let us call that state "strong change". Peter Geach considers that the sense in which things change, often suggested by eternalists, does not consist of any change in the proper sense of the term. The sense envisaged by Geach is precisely what I call "strong change":

> On this view, the variation of a poker's temperature with time would simply mean that there were different temperatures at different positions along the poker's time axis. But this [...] would no more be a change in temperature than a variation in temperature along a poker's length would be [...] We thus have a view that really abolishes change, by

> reducing change to a mere variation of attributes between different parts of a whole. (Geach, 1972, pp. 304-305)

Strong change is, theoretically, incompatible with S-theory. Zimmerman (1998, p. 212), for instance, argues that doing justice to our pre-theoretical intuition that the past "is over" and the future "is yet to come" is a motivation to take the doctrine of presentism seriously. The reason for this is related to the fact that, according to the doctrine of eternalism, there is no "absolute becoming", since that notion is incompatible with the idea that the future and the past are ontologically on the same footing as the present. Let us assume that the kind of change Shanks is after coincides with that second kind, and that such a concept presupposes a non-static world, typically represented by presentism (although it should be noted that there are non-presentist models that apply as well). So, in order to explore the author's argument, we may ask: is there free will, given that the world of the S-theorist has no change in that sense? Let us consider a specific and simple version of Shanks's argument:

a) The world is an S-type world;
b) If the world is an S-type world, then there is no strong change;
c) Without strong change, there is no causally efficacious action;
d) In order for there to be free will, our actions must be causally efficacious;
e) Therefore, there is no free will.

The main premise is based upon the idea that an action is causally efficacious if it changes something in the world. The second is based upon the impossibility of instancing strong change in a classic block universe, i.e. an S-world. The conclusion is that there is no free will in such a world. In response to this argument, I will mostly try to show that: 1) free will is not threatened by the absence of change, as long as there is contingency and 2) eternalism is compatible with hybrid models in which strong change can be instantiated. We will see that it is not eternalism we lose after to introduce a strong change, but rather some aspects that make up the block universe when conceived in the classical manner.

Supposedly, the point is that if something is unchangeable, then it

is, in some sense relevant to the consideration of some version of determinism, necessary. But "being changeable" allows for a counterfactual reading. In the end, even a block universe can have "changeable" parts, i.e. a point in space-time that has the configuration XYZ could very well not have had it, at least if we think of the possibility of a different occurrence, *prima facie*. The correct understanding of fixidity in an S-world is the following: an S-type world is a world where all facts exist and all events occur, hence, it is "complete". But such completeness, which is configured in a certain way, could have been different. This view is close to that held by Plantinga, whose aim is to illustrate a particular solution to the problem of future contingents (cf. Plantinga, 1974). One can interpret it as an answer to Shanks's challenge. It suffices that things that are a certain way could have been different, that is, to have contingency is sufficient in order to avoid determinism. The question I pose to Shanks is this: In order to avoid determinism, is it sufficient that there is a counterfactual reading, which can be applied to at least a few facts in the world?

If we answer "no" to the above question, then we can further inquire whether, for the same reasons, non-eternalistic models evade determinism. In a presentistic world, the objects that exist now could only exhibit different properties in a counterfactual situation. But that is not contrary to the fact that the world is eternalistic. In the end, the spell turns against the sorcerer. It would hardly be possible to refuse the counterfactual answer without charging different theories, even presentism. The counterfactual solution, inspired by Plantinga, can be successfully adopted by anyone who endorses the so-called S-theory and wishes to claim that the existence of free will remains intact, without any underlying or implied determinism.

3 Are there multiple possibilities of occurrence for each point in space-time, in an eternalistic world?

The kind of questions Shanks raises exhibits a pattern: the fixidity of an S-world makes us think of the absence of free will. The fixidity of the world means that each point of space-time has definite properties. That fixidity, which we cannot call determinism in the classical sense

(in the author's vocabulary, classical determinism is referred to as "dynamic determinism"), can be designated as "ontological determinism" (Shanks, 1994, p. 56). But does that entail that something must be necessary, in a relevant sense to argue in favor of determinism? Shanks thinks it does, since any change that was brought about by a free agent would be just a particular case of "strong change" (Shanks, 1994, p. 57). The author is not alone in this reasoning, as there are at least some scholars who discuss it quite seriously. Torretti mentions, while speaking of the consequences of relativity of simultaneity for ontology, an alleged "chronogeometrical determinism" (Torretti, 1983, p. 29), while Savitt prefers the term "chronogeometrical fatalism" (Savitt, 2017).[3] Both are considering the consequence of the world's fixidity, which is supposedly implied by relativity. But does the fixidity of the world have any component that bears a commitment to any form of determinism?

There is at least one eternalist version that does not establish a relation between fixidity and necessity. That version is ockhamist eternalism, proposed by Rea and Finch (2008). It is an interpretation of ockhamism as a solution to the problem of future contingents. In that version, the "thin red line" is marked over the actual future. The "actual future" is understood in the non-temporalised manner, that is, as a sequence of events in a B-series. As is usual in that kind of solution, the thin red line is marked over a future that, despite being actual, possesses non-necessary events and objects. If that version is efficient in dispelling fatalism for those who accept logical principles like bivalence, it is also effective in avoiding the challenge set by Shanks.

One difficulty with ockhamist eternalism is the impossibility of distinguishing a tree of time from a more orthodox interpretation, according to which the many futures are not parts of one and the same world (or universe), but rather multiple possible worlds, of which one would be real (or actual) and the others mere possibilities. In effect, if the future marked out by a red line is actual, what can we say of those that are not actual? The difference between both seems to be modal, giving rise to the question: what criterion would we need if we wanted to know if a model was a tree model or a multiple worlds model? It is a question to which I have no answer. Meanwhile, I note that question could also

[3]In referring to those consequences, whether they are determinists or fatalists, the authors are not necessarily declaring that they are convinced that our world functions in this way.

have the reverse meaning: we could ask the theorist who considers the differences between the several futures to be differences between possible worlds why he thinks this is the case, rather than considering these to be differences between possible futures in a temporal tree. If there is not an objective criterion, there is no way to avoid that question. In another example: someone who travelled in time into the past could pose himself the question: how do I know I have not travelled to another world, one which has the same past (or, at least, a past indistinguishable from my world of origin)? Again, one could also ask the reverse: If someone who travelled between worlds came to a world whose past was identical, how could he be sure whether, by some chance, he had not made a journey into the past (of his world of origin)?

Perhaps the fact that we can raise the question in different ways contributes to the view that there is no substantial difference between these models. If that is the case, then there is no problem in adopting either interpretation. Ockhamist eternalism can perhaps be interpreted as a tree model — a structure of many worlds with a common past — or even as an everettian multiverse (Everett, 1957).

4 Can an eternalistic world have nomological contingency?

Nomological (or causal) determinism has not been abundantly mentioned in this argument thus far. Shanks, does not recognise it as directly implied by S-theory. But is it that obvious that there is no version of nomological determinism possible for someone that accepts S-theory? At least it is not difficult to imagine an argument to the contrary, which could likewise be assessed. Here is how we could conceive a challenge involving the nomological notion of determinism:

a) If the world is a block universe, then there must be unity between its spatio-temporal parts;

b) Unity between parts cannot have gaps, i.e. parts that are not compatible with others or not explainable from others, sequentially;

c) Nomological contingency demands gaps;

d) Therefore, nothing in a block universe is nomologically contingent.[4]

Which premise would we reject in order to avoid the above conclusion? The argument rests on the idea that parts in an eternalistic world are connected. Moreover, if that world is governed by laws, then having nomological contingency means not being connected. To reject that argument is sufficient to present a case in which parts are connected and governed by laws, and yet, determinism fails. Worlds with probabilistic laws are an example. None of the parts in a world whose laws are probabilistic is disconnected. The rejected premise is the third, the one stating that contingency in phenomena requires gaps. In fact, if the laws of nature plus the initial conditions do not lead to one single possible future, it is not because there are gaps between parts, but because parts of space-time are related in accordance with, for instance, probabilistic laws.

5 Hybrid models and temporalised eternalisms

I can continue by exploring some solutions inspired by Oaklander (1998). Among his arguments, I wish to point out the confusion that results from attributing a complete similarity to time and space, i.e. it is because time and space are the same that we do not have strong change. Meanwhile, I shall advance the discussion of the separation of time and space a little more so as to challenge S-theory itself and its supposed entailment by special relativity.

In any case, I can deny that time and space are completely similar. That seems to be an important premise of Shanks's reasoning when he argues that S-theory entails the fixidity of the world. The point here arises from the understanding that there are differences between time and space, which some philosophers have captured, e.g. Russell (1915), Broad (1921), Clifford Williams (1994) and Oaklander (1998). The spatialisation of time, in which the eternalist theorist would be incurring, would make it seem that all events exist eternally, without change, generation or corruption. These aspects be not compatible with non-tempo-

[4] "Nomological contingency" means only that the laws of nature, or some other element capable of describing the occurrence of phenomena in succession, do not have or do not entail a single state of affairs in each point of space-time.

ralised theories, because they would introduce an undeniably temporal element to the McTaggartian B-series.

An eternalist theorist does not believe in ontological differences between events and objects that are in the past, present and future. However, he may believe in important differences, such as the phenomenological difference between "past, present and future" beyond the irreducibility between the many different "times" in which temporal parts of objects exist, i.e. no part being reducible to another. The association between time and space is strongly suggestive of the Parmenidean character of eternalism, often claimed for philosophers (cf. Rea, 2003; Gödel, 1949). But is this, necessarily, the case? I would like to radicalise the non-spatialisation of time, even if for that purpose I have to reject S-theory. I think we can do it without losing eternalism, which will remain set.[5] But what do we lose, if anything, when introducing one change (or two, or many) to an eternalistic model of the world? What do we lose if such a model is subject to corruption (being destroyed); what do we lose if we consider that this world was created by God (did it come to existence at some point)? The answer does not present any loss relative to its eternalistic aspect.

Eternalism can be understood as guaranteed, as long as there is ontological equality between past, present and future. Naturally, that does not mean that the properties "to be in the past, to be in the present and to be in the future" exist. It means only that eternalism will be guaranteed if those things (objects and events) that I would call past, present and future exist. However, if in an eternalistic model there is change in a strong sense, that is, if there is generation, corruption or transformation, it may be difficult to establish a concrete difference between it and non-eternalistic models. For instance, what difference would a changeable eternalism (one in which the change involved would imply growth) make for a growing block universe? As is known, a growing block universe has a past and a present without ontological distinction; however, relative to the future, there is a distinction to be made (cf. Broad, 1923). I should offer a criterion by which the eternalistic world, one allowing

[5]This model can be, for instance, a more A-series eternalistic type model, as in the so-called theory of the moving light focus (cf. Skow, 2015, Deasy, 2015; Ross Cameron 2015). Furthermore, a different model could also be proposed — something that eschews the previously defined scheme, which divides models and theories into A-series and B-series.

for strong change, could be shown to be different from it. Unlike the classical block universe, that eternalism would not differ from the growing model on account of it being unmovable or unchangeable. How to tell them apart, then? My proposal is: both models would differ by the criterion relative to growth or de-growth. When a change is introduced, in an eternalistic world, this should be such that there is no increment in the existent whole — it may remain the same or decrease, but never grow. As such, it will never be mistaken for Broad's growing block model.

That can be the case if I introduce some restrictions. For instance, to such a model of a world one should not attribute more properties than it had (before the introduction of a change), nor should it have more relations between the properties. A growing block universe necessarily has new properties, more properties or relations between properties. This model also necessarily preserves every property that comes to existence. But is there any model that corresponds to such criteria? The answer is yes. The McCall model (1994) is a competent one when it comes to unifying things that seem to be in conflict, such as, for instance, strong change and eternalism. In that model, the world is a time tree, time passes and, at each interval of time, some branches, representing the many possible futures, disappear. In the end, when only one branch remains, one has something very close to what the ockhamist would understand to be the "actual future". The actual future is only one of many, not being, indeed, necessary:

For it to be considered a model similar to McCall's, the time tree represented above must slowly lose its branches. One always prevails while another one perishes. An interesting aspect of this model is that, in it, the passage of time is a phenomenon with the following dynamics: in one moment T0, the tree of time exists fully, as in a common eternalistic model. In T1, it does not have the same properties, for it lost objects and, with them, relations and properties. That process continues until the end, when one single state of affairs prevails, eternalistic as in the beginning, but smaller. Furthermore, that tree of time is eternalistic because, in it, there are events that are non-present. Naturally, in saying that certain points in that tree are the "past", I are not attributing any properties to those points . Furthermore, it is for that reason that such a model can be accepted as eternalistic. The "past" and the "future", in the model above, can be understood in the following manner: there are

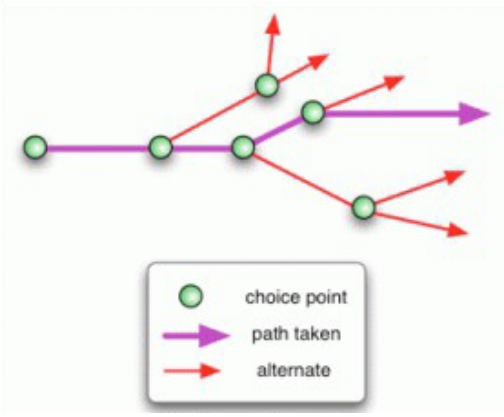

Figure 1
6

at least some "nodes" (the green points in the picture) that represent objects and events in a relationship of anteriority or posteriority. Any node located to the left of any other represents its past. The same applies for the future relationship (any node located to the right of any other represents its future).

But why do I say that such a model is an example of the abovementioned criteria? In effect, after a time interval, properties cease to exist, altering the global state of the tree. However, since no new object was introduced, and no relation or property was added to the whole, I have precisely the result I want. Those were my criteria, perfectly perceptible in McCall's model.

In any case, there is still one other possibility. Consider eternalistic models of worlds that are very simple, whose only objects consist of indiscernible, though numerically different, particles. Let us call those particles "quarks". Thanks to the property of "isomorphism",[7]

[7]In mathematics, isomorphism is a bijective correspondence between all the elements of two structures. That correspondence preserves the operations of both. The concept of "isomorphism" is used in more than one context. In linguistics, isomorphism is considered to exist between structures of two different orders of facts when both present the same kind of combinatorial relations; thus, if the combinatorial laws of morphemes are identical to the combinatorial laws of semes (syntax = semantics), there is isomorphism between both. In our use of the concept, two structures with objects change through the replacement of the objects, or of the order those subjects have in a series.

those models can accommodate strong change without falling short of the criteria that was mentioned. A quark can be replaced by another quark without altering, globally, the number of objects and relations, i.e. assuming isomorphism between relations and objects. The result of change will always be a new model, which will be isomorphic, relative to the first one. If those models fit my criteria, they show the intelligibility of eternalism with strong change.

There is yet another question that remains: What losses would result if, in a block universe, a change was introduced? I claim that eternalism remains, despite the fact that, in such a case, we no longer have a classical model. Indeed, the only loss is that eternalism is distanced from the picture of a Parmenidean universe. But that loss is not difficult to incorporate. Today it is a common belief among theorists that eternalism is compatible with A-series temporalism (Rea, 2003; Fischer, 2016). One loses, in that case, the S-theory as understood by the Shanks. However, that is another point I wish to raise: Shanks seems to understand that contemporary physics implies the so-called S-theory, which I interpret as the union between eternalism, Four-Dimensionalism and McTaggartian B-series, in a Parmenidean block universe. But contemporary physics, particularly special relativity, does not entail S-theory, but only (theoretically) the non-existence of an ontologically privileged present. As such, even those who accept that implication can avoid the rigidity of S-theory.

6 Conclusion

Even assuming S-theory, it is not necessary that some version of determinism is a consequence. There is a modal solution in which determinism does not follow, where the world's fixidity is compatible with non-actualised states of affairs. Thus, the world could be different in some point of space-time. If the world could be different in some respect, does not follow what Shanks says about the impossibility of a strong change to occur, resulting from the act of some autonomous agent. To complete that answer, I seek to show that the supposed problem, relative to the fixidity of everything and its implications for free will, would apply to any doctrine, presentism included. It would apply, at least, as long as the answer in terms of contingency, inspired by Plantinga, was not accepted.

Finally, I show where Shanks makes an error of assuming S-theory and I explain the misleading reasoning involved. My latter response denies that eternalism, allegedly entailed by contemporary physics according to classic interpretations of special relativity, must be understood to include all the elements making up S-theory. The illusion that a static theory is the only possible eternalistic model occurs because, often, it is thought that introducing some strong change in the world entails having to ontologically distinguish between the past, present and future via the introduction of a privileged present, compatible only with theories such as presentism or the model of the growing universe (Broad, 1923). I seek to show that it is not quite the case, and claim that eternalism can be entailed by modern physics without some of the associations making up S-theory. In the process of this argumentation, I show how to accommodate eternalism and strong change in models. My main point here (which is also the most original contribution) clarifies the conditions that allow us to have models with such properties.

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Living in a World of Possibilities: Real Possibility, Possible Worlds, and Branching Time

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Abstract

We live in a world of possibilities, and there are many kinds of possibility. One popular way to conceive of possibilities is to view them as modal alternatives to actuality. Different kinds of possibility can then be distinguished in terms of their modal strength. However, not all kinds of possibility fit into this general scheme. In this paper, I will introduce the notion of *real possibility* into the vast landscape of possibilities and show that it requires a fundamental shift in perspective with respect to how actuality and possibility can be related: real possibilities constitute *temporal alternatives for actuality* rather than *modal alternatives to actuality*. I will discuss how this distinction bears on the formal representation of possibilities. The upshot is this: while possible worlds provide a perspicuous framework for modeling possibilities as modal alternatives to actuality, real possibilities—as temporal alternatives for actuality—are most adequately represented in Prior's theory of branching time.

Keywords: (Real) Possibility, Actuality, Open Future, Possible Worlds, Branching Time.

*This paper is partly based on my PhD thesis (Rumberg 2016, [16]).

1 Introduction

Today is Sunday, March 31, 2019. It is half past two in the afternoon. I am in Stockholm, sitting at my desk typing these sentences. Outside the sun is shining. It is a mild spring day. At this very moment, in the stadium Galgenwaard in Utrecht, the referee blows the whistle, signaling the kick-off for the soccer match between FC Utrecht and Feyenoord Rotterdam.

There is a sense in which it is possible that I am in Utrecht now, standing in the stadium Galgenwaard cheering for FC Utrecht. In the very same sense, it is also possible that I am right now enjoying a stroll through the old town of Stockholm. And there are many more possibilities. My desk could, for example, be black rather than white. It could be cloudy rather than sunny. And staring out of the window, I wonder whether there could be giant trees on Earth growing more than 200 meters into the sky or birds flying by faster than the speed of light.

Any of the above scenarios is possible in a certain respect. None of them constitutes a real possibility, however. What is really possible, on the other hand, is that I now take a break from writing and follow the soccer match on the radio. It is likewise really possible that I skip the match and continue writing for another few hours. In either case, I may go for a walk in the old town later on, or I may just as well spend the evening at home.

We live in a world of possibilities, and there are many kinds of possibility. One popular way to conceive of possibilities is to view them as modal alternatives to actuality. Different kinds of possibility can then be distinguished in terms of their modal strength. However, not all kinds of possibility fit into this general scheme. In this paper, I will introduce the notion of *real possibility* into the vast landscape of possibilities and show that it requires a fundamental shift in perspective with respect to how actuality and possibility can be related. In order to bring out the relevant difference, I draw a distinction between *modal alternatives to actuality* and *temporal alternatives for actuality*. Real possibilities fall into the second class. Whereas modal alternatives to actuality capture what could be actual but is not, temporal alternatives for actuality represent what can become actual as the future unfolds. I will discuss how this distinction bears on the formal representation of possibilities. The upshot is this: while possible worlds provide a perspicuous framework

for modeling possibilities as modal alternatives to actuality, real possibilities—as temporal alternatives for actuality—are most adequately represented in Prior's theory of branching time.

The paper is structured as follows: section 2 is devoted to the conception of possibilities as modal alternatives to actuality, and I briefly review the most prominent kinds of possibility that are standardly discussed in the literature. Section 3 provides an explication of real possibilities as temporal alternatives for actuality. In section 4, I turn to the formal representation of possibilities. I will highlight crucial differences between possible worlds and the theory of branching time and reveal the prospects of Prior's framework for modeling real possibilities.

2 Possibilities as Modal Alternatives to Actuality

The conception of possibilities as modal alternatives to actuality is firmly rooted in the idea that things could be different—in ever so many ways—from what they actually are. Actuality is deemed to be but one of many possibilities. At the moment, I am actually sitting here in Stockholm at my desk typing these sentences. But there are alternative possibilities: modal alternatives to this actuality.

Suppose you are ignorant about my weekend's activities. Then, for all you know, it is possible that I went to Utrecht this weekend and am now standing in the stadium Galgenwaard cheering for FC Utrecht, and your imperfect state of knowledge also renders it possible that I am presently enjoying a stroll through the old town of Stockholm. On the basis of your knowledge, you cannot rule out either of these possibilities. Given what you know, any of them could be actual. The notion of possibility at stake here is *epistemic possibility*. Epistemic possibilities reflect our epistemic uncertainty as to what actually is the case. They are modal alternatives to actuality in virtue of an agent's state of knowledge. The less you know, the more epistemic possibilities there are.

However, epistemic possibilities by no means exhaust the space of possibility. Alongside epistemic possibilities, there is a whole variety of different kinds of possibility that constitute modal alternatives to actuality in virtue of some ontic aspect of the world. In order to distinguish them from epistemic possibilities, the latter are commonly referred to as *alethic possibilities*. Alethic possibilities themselves are often divided into *logical*, *metaphysical*, and *physical* possibilities, and the distinctions

between these notions are explained as differences in modal strength: when moving from logical to metaphysical to physical possibility, the link with the world becomes stronger and stronger, or so the idea goes. Hence, what is physically possible is also metaphysically possible, and what is metaphysically possible is also logically possible, but not *vice versa*.

The general scheme underlying the notions of logical, metaphysical, and physical possibility is fairly straightforward: in each case, some ontic aspect of the world takes center stage, and in determining the relevant range of possibilities, we keep this aspect fixed while we allow others to vary. All configurations of things that can be consistently obtained this way—that is, which are compatible with the given aspect of the world—constitute salient modal alternatives in the relevant respect. One rather common and intuitive way to fill in this general scheme is to say that the ontic aspect that is at the core of the notion of logical possibility is the *logical form*, whereas metaphysical possibility is based on the *nature of things* and physical possibility on the *laws of nature*. But let us have a more detailed look at the traditional kinds of alethic possibility and their intuitive classification.

Logical possibility is alethic possibility in the broadest possible sense, and it is a rather abstract notion, if the link with the world only comes in via the weak notion of logical form. We can think of the latter as the most general form of combination of things: the logical form invokes a classification of things into objects and properties, and it determines how objects and properties can be combined with each other to form a state of affairs, and how different states of affairs can be combined to form larger and larger configurations—abstracting away from the very nature of things.[1]

This logical way of combining things is generous: not only is it logically possible that I am in the stadium Galgenwaard in Utrecht right now or that I am presently enjoying a walk through the old town of Stockholm, but we may even say that it is logically possible that I am both in Utrecht and in the old town of Stockholm at the very same time; just as it is logically possible that my desk is simultaneously both black all over and white all over. Note that the contradictions arising here are

[1]The account of logical possibility outlined here is, of course, very much in line with the account of possibility that Wittgenstein developed in his *Tractatus* (Wittgenstein 1922, [19]).

not due to the logical form. By way of contrast, what is logically impossible is me being in Utrecht and not being in Utrecht at the very same time; just as it is logically impossible for my desk to be simultaneously both white all over and not white all over. Nothing can have a property and at the same time lack it.

Metaphysical possibility is far stronger than this: here the link with the world is established not merely via the abstract notion of logical form but also through the nature of things. By their very nature, objects have some properties necessarily, others contingently. Some properties exclude each other, others invariably co-occur—simply by virtue of being the properties they are.

It is certainly not only logically but also metaphysically possible that I am in the stadium Galgenwaard in Utrecht at this very moment, and it is likewise metaphysically possible that I am having a stroll through the old town of Stockholm right now—while, actually, I am sitting here at my desk typing these sentences. Neither of the alternative scenarios is in conflict with the nature of things. Also, there is the metaphysical possibility of my desk being black rather than white; after all, being white is not an essential property of my desk. However, many logical possibilities are ruled out by the nature of things: for example, we said that it is logically possible that I am both in Utrecht and in the old town of Stockholm at the very same time, but this is arguably not a metaphysical possibility. In the same vein, it is metaphysically impossible that my desk is simultaneously both black all over and white all over. These configurations are in conflict with the very nature of the objects and properties involved.

Finally, physical possibility is where—in addition to the logical form and the nature of things—the laws of nature enter the picture: what is physically possible is what is in accordance with the laws of nature that govern our world. Now, neither me attending today's soccer match in Utrecht nor me presently strolling through the old town of Stockholm is incompatible with the prevailing laws of nature: the laws of nature do not rule out a course of events in which I took a flight to the Netherlands yesterday and went to the stadium today, nor did they preclude me from leaving the house this afternoon to go for a walk in the old town. Both scenarios constitute physically possible alternatives to the actual course of events. And the laws of nature do not impinge on the color of my desk either: they allow it to be black or white. Yet, one

may think that the laws of nature impose more constraints than the logical form or the nature of things. It is definitely physically impossible for there to be giant trees on Earth growing more than 200 meters into the sky or birds flying faster than the speed of light. These scenarios would violate our prevailing laws of nature. From a logical point of view, on the other hand, these scenarios are perfectly possible. But are they metaphysically possible as well? This depends on whether it is metaphysically possible for the laws of nature to be different from what they actually are—and this again depends on our profound philosophical assumptions concerning the fundamental structure of the world.

While the intuitive ideas behind the notions of logical, metaphysical, and physical possibility are very clear, the devil is in the details. Metaphysical possibility is certainly one of the most employed modal concepts in contemporary analytic philosophy, but it is a vague one, as are logical and physical possibility. The point is simply this: even if we agree on the general scheme sketched above, what we consider logically, metaphysically, or physically possible crucially depends on what we consider the logical form, the nature of things, and the laws of nature to be. Do things have a primitive modal nature? What exactly is their nature? Do the laws of nature derive from the nature of things, or are they mere systematizations of the regularities we find in the world?[2]

We here set aside these questions and focus on the big picture. Engaging in a discussion of the subtleties and intricacies of specific accounts would lead us astray. The point I wish to make is a very fundamental one, which is brought out most distinctly on the abstract level of the general scheme. Here we see that epistemic possibility as well as the traditional kinds of alethic possibility hinge on the idea of modal alternatives. Drawing on the idea of compatibility with the epistemic state of an agent or some ontic aspect of the world, they capture in a rather general way what could be the case in a certain respect even though it actually is not. That is, epistemic, logical, metaphysical, and physical possibilities are uniformly conceptualized as *modal alternatives to actual-*

[2]Just to give an impression of the variety of views we find here: while Fine (1994, [3]) assumes that things have a primitive modal nature and derives metaphysical possibility from there, Lewis (1986, [7]) reduces the nature of things to a primitive totality of metaphysically possible configurations. Bird (2007, [2]) grounds the laws in the nature of dispositional properties, Lewis (1986, [7]) considers them to be mere systematizations of regularities, and Maudlin (2007, [8]) takes them to be primitive entities in their own right.

ity, and the differences between these notions are explicated solely in terms of modal strength.

3 Real Possibilities as Temporal Alternatives for Actuality

Let us now turn to the notion of real possibility and see how real possibilities fit into the landscape of possibilities. What distinguishes real possibility from the traditional kinds of possibility that we have discussed so far—to wit, epistemic, logical, metaphysical, and physical possibility? There clearly is a difference between the possibility of me standing in the stadium Galgenwaard in Utrecht at this very moment and the real possibility that I may now take a break from writing and follow the soccer match on the radio. But what exactly is the difference? What are real possibilities?[3]

To put it in a nutshell, *real possibilities* are alternative possibilities for the future in an indeterministic world. That is, unlike the traditional kinds of possibility, real possibilities bear an intimate relation not only to the world but to time as well: they are future possibilities. In fact, here the notion of time takes center stage, and the way in which time enters the picture does not only make for a difference in modal strength, but, as we shall see, it also affects the relation between actuality and possibility: real possibilities are temporal alternatives for a dynamic actuality to evolve rather than modal alternatives to a given actuality.

In our discussion of the traditional kinds of possibility in the previous section, time did not really play a role. Of course, we may conceive of actuality as being extended in time, and possibilities that represent modal alternatives to actuality will then obviously be extended in time as well. But, in the case of real possibilities, time plays a much more fundamental role: by virtue of being future possibilities, real possibilities are indexically anchored in time. For without a present, there is no future; and once there is a present, there is of course also a past.

[3]Real possibility is a central theme in Prior's work, and it has been further promoted by, for example, Nuel Belnap (see e.g. Belnap et al. 2001, [1]) and Thomas Müller (e.g. Müller 2012, [9]), though the notion is seldom explicitly defined. For a detailed discussion of real possibility, see Rumberg (2016, [16]).

At the very heart of the notion of real possibility lies the asymmetry between the past and the future, which enters with the local standpoint in time. While the past has happened and is fixed, the future is still to come, and real possibilities depict the future as open: they represent alternative possibilities for the future given the past course of events up to now.

The relativization to the past makes real possibilities *historical possibilities*: what is really possible at one point in time may not be really possible at a later time anymore. The passage of time constrains the range of possibilities, so to say. Yesterday, it was still really possible that I would be standing in the stadium Galgenwaard in Utrecht right now, watching the soccer match: I could have taken a flight to the Netherlands yesterday and gone to the stadium today. And an hour ago, it was still really possible that I would presently enjoy a stroll through the old town of Stockholm: I could have escaped from writing and set out for the old town instead. However, as it happens, I did not, and now these possibilities have vanished. In contradistinction to the traditional kinds of possibility, which are first and foremost atemporal notions, real possibilities—as historical possibilities—are essentially time-dependent.

But there is a yet more fundamental difference that sets real possibility apart from the traditional landscape of possibilities: real possibilities are *temporal alternatives for actuality*—rather than modal alternatives to actuality. Capturing the openness of the future, they do not represent what could be actual but is not. Instead, they represent what can become actual as the future unfolds. The notion of actuality involved here is a temporal one. It is rooted in the profound asymmetry between the past and the future, which is at the core of the notion of real possibility. This asymmetry naturally induces a partition of the temporal realm into actuality and possibility: actuality comprises what has happened so far and thus is fixed, possibility spans what is open. Hence, on the picture evoked here, only the present and the past are actual, whereas the future is a pure realm of possibility: real possibilities for actuality to evolve. None of these possibilities is actual yet, but any of them can become actual as the future unfolds.

Building on the asymmetry between the past and the future, real possibilities are thus open possibilities in a very genuine sense: they can still be actualized. While there may be modal alternatives to what

has happened so far, there is no real possibility for the present and the past to be any different from what they actually are. What has happened has happened. Hence, there is no real possibility for me to be in the stadium Galgenwaard in Utrecht right now, nor is it really possible that I am currently taking a walk through the old town of Stockholm. However, there is a wealth of real possibilities for the future. For, unlike the present and the past, the future is not actual. Rather, the future is still to come, and in the presence of more than one real possibility, the future is truly open. I can now take a break from writing and follow the soccer match on the radio, and I can just as well skip the match and continue writing for another few hours. Either way, I can go for a walk in the old town later on, or I can simply spend the evening at home. Each of these possibilities can be actualized, and, as time progresses, one of them will be actualized, ruling out the remainder. What will happen? You have to wait and see.

Note that the indeterminacy at stake here is not just a matter of ignorance. Real possibilities are not mere epistemic possibilities that reflect our uncertainty as to what the future will bring. They are genuine possibilities for the future in an indeterministic world. That is, like logical, metaphysical, and physical possibilities, real possibilities are alethic possibilities: they are possibilities in an ontic rather than in an epistemic sense. Unlike the traditional kinds of alethic possibility, however, real possibilities do not solely capture which configurations of things are compatible with one or another ontic aspect of the world and hence are in principle possible. Rather, being future possibilities, real possibilities capture which configurations of things can temporally evolve from the concrete situation at hand, and, in accordance with the idea of indeterminism, there can be more than one possible future continuation.

Certainly, given a concrete situation in time, not just anything can happen. Real possibility is based on a limited kind of indeterminism rather than on sheer randomness. What is really possible in a concrete situation is what can temporally evolve from that situation by virtue of what the world is like—logically, metaphysically, and physically. Real possibilities are thus far more strongly tied to the world than any of the other kinds of alethic possibility that we have discussed so far: not only must they conform to the logical form, the nature of things, and the laws of nature, but they must also conform to the concrete momentary circumstance at hand. Their indexical nature—their intrinsically histor-

ical nature—is another determining factor that counts toward modal strength.

In order to illustrate the modal strength of real possibilities, let us consider a concrete example. As said, given that I am actually sitting in Stockholm at my desk at this very moment, it is not really possible that I am in the stadium Galgenwaard in Utrecht right now for the kick-off of the soccer match. But while I will certainly have to miss out on the opening of that match, we might wonder whether it is really possible for me to make it to the stadium before the onset of the second half: this starts only in one hour, and Utrecht is just about 1200 kilometers away.

Being in the stadium Galgenwaard in Utrecht a nanosecond from now would require traveling faster than the speed of light and is hence excluded by the prevailing laws of nature. While it is in principle physically possible to be there at that time, given my current location, it is not a real possibility. If I traveled at the speed of light, I could reach the stadium in less than a second, but that is not a real possibility either: there is no available technological means that would allow me to accelerate that fast. With the fastest airplane in the world, I could make it to Utrecht in less than 20 minutes, but here another caveat comes into play: as it happens, this plane is not parked next to my desk but at the NASA headquarters in Washington. It would take at least one and a half hours for the plane to pick me up, and thus by the time we reached Utrecht, the match would already have finished. So this drops out as a real possibility as well. Neither is a scheduled flight an option. Such a flight takes approximately two hours, and hence I could at best make it to Utrecht at dinnertime—and indeed, whether even this is really possible depends on whether there is an appropriate flight scheduled for this afternoon, whether the flight, if any, is not already fully booked, and so on. Naturally, the options discussed here do not exhaust the entire range of possibilities for getting from Stockholm to Utrecht. However, they should suffice to make clear how closely the notion of real possibility is bound to the world. Since real possibilities are indexically anchored in time, they crucially depend on the concrete situation, and thereby they surpass all of the traditional kinds of alethic possibility in terms of modal strength.

In conclusion: real possibilities are alternative possibilities for the future in an indeterministic world, and, as such, they are alethic possibilities. Yet, they do not fit into the traditional hierarchy of the stan-

dard kinds of alethic possibility discussed in the previous section. As future possibilities, real possibilities are indexically anchored in time, and while it is true that this results in a strengthening of the link with the world, the difference between real possibility and the traditional kinds of alethic possibility is not a mere difference in modal strength. Time is not just a further dimension on a par with the logical form, the nature of things, and the laws of nature. Rather, the indexical nature of real possibilities also impacts how actuality and possibility are interrelated. In the case of real possibility, this interrelation is not a purely modal one, but derives from the asymmetry between the past and the future: instead of being modal alternatives to actuality, real possibilities are temporal alternatives for actuality to evolve. Real possibilities thus require us to extend the traditional picture, revealing that the realm of possibility is both modally and temporally structured.

4 Possible Worlds and Branching Time

In the previous two sections, we have mapped the vast landscape of possibilities and have located the notion of real possibility within this landscape. We have seen that the notion of real possibility introduces a fundamental distinction into the realm of possibility: while the traditional kinds of possibility are commonly conceived of as representing modal alternatives to actuality, real possibilities constitute temporal alternatives for actuality. In this section, we will discuss the consequences of this distinction for the formal representation of possibilities, contrasting the idea of possible worlds with the theory of branching time pioneered by Prior (1967, [14]).

The possible worlds framework enjoys great popularity—not only in logic, but also in philosophy and in linguistics. It seems to have established itself as the standard modal framework, one that is supposed to capture all different kinds of possibility in a uniform way. Sometimes one may even get the impression that the term 'possible world' is just a synonym for 'possibility'. While the idea of a possible world is at least as old as Leibniz's dictum that ours is the best of all possible worlds, the significant role that possible worlds nowadays play in our theoretical toolbox is doubtlessly not least due to Kripke and Lewis. By turning the idea of possible worlds into a rigorous formal framework, Kripke famously laid the semantic foundation of modern modal logic (e.g. Kripke 1959,

[5]; 1963, [6]), and Lewis's metaphysical account of possible worlds, which he himself describes as "a philosophers' paradise" (Lewis 1986, [7]), constitutes a cornerstone of our theorizing about all kinds of modal notions, in philosophy and beyond.

The basic idea underlying the possible worlds framework is fairly simple: the space of possibilities is viewed as a huge pluriverse of distinct possible worlds. Each possible world stands in for some possibility. One of the possible worlds is the actual world, viz. the world we actually live in. The remaining possible worlds represent ways our world could be in a certain respect but actually is not. In other words, they represent modal alternatives to the actual world.

In the actual world, I am now sitting in Stockholm at my desk, typing into my laptop. But, in another possible world, I am standing in the stadium Galgenwaard in Utrecht right now, watching the soccer match, and in yet another possible world, I am currently enjoying a stroll through the old town of Stockholm, as illustrated in Figure 1. There is also a possible world in which my desk is black rather than white, one in which it is cloudy rather than sunny, one in which trees grow more than 200 meters into the sky, and one in which birds fly faster than the speed of light, and so forth. Whatever is possible is the case in some possible world or another.

Figure 1: Actuality and possibility in the possible worlds framework. The thick circle marks the actual world. The remaining possible worlds represent modal alternatives to the actual world. Icons by Icons8: https://icons8.com.

As outlined above, on the traditional account of possibilities as modal alternatives to actuality, different kinds of possibility are distinguished solely in terms of modal strength, and we can straightforwardly accommodate this idea into the possible worlds pluriverse by drawing on a central feature of Kripke semantics, viz. on the idea of an accessibility relation between possible worlds. We simply associate each kind of possibility with an accessibility relation that reflects its modal

strength, so that, in each case, the set of possible worlds that are accessible from the actual world comprises all and only those worlds that constitute modal alternatives in the relevant respect. Differences in modal strength then translate into properties of the underlying accessibility relations. For instance, the traditional hierarchy of logical, metaphysical, and physical possibility can be captured by the formal requirement that what is physically accessible is also metaphysically accessible, and that what is metaphysically accessible is also logically accessible, but not *vice versa*.

As it treats actuality and possibility in parallel, the possible worlds framework is perfectly tailored to the idea of possibilities as modal alternatives to actuality, and time plays only a secondary role. To be sure, we can conceive of possible worlds as being extended in time—and, in fact, this is what is commonly done. Possible worlds are often thought of as spanning entire possible temporal developments of the world, from the beginning till the end of time. In addition, possible worlds are often viewed as being complete in yet another respect: they are considered maximally specific in the very details they represent. It is important to realize, however, that the relative degree of completeness does not interfere with the general picture underlying the pluriverse: possible worlds—whether complete or incomplete—represent modal alternatives to a given actuality, viz. to the possible world that is singled out as the actual one.

From a historical point of view, the modern tendency to think of possibilities exclusively as modal alternatives to actuality is a surprising development. After all, the conception of possibilities as modal alternatives only came up in the Middle Ages, where it is most vividly articulated in the writings of Duns Scotus (cf. Knuuttila 1993, [4]). In antiquity, on the other hand, the notion of possibility was naturally interwoven with time. Indeed, in those days, possibilities received a purely temporal interpretation: possibility was primarily understood in terms of quantification over a linear series of times. Along those lines, Diodorus Chronus, for example, defined the possible as what is or will be the case.

And this brings us to Arthur Prior. He resurrected these ancient ideas and developed them further, making room for human freedom against the background of an open future. Intrigued by the famous master argument of Diodorus Chronus, Prior set out to make formally

precise the assumptions leading to the argument's fatalistic conclusion. His ideas not only formed the beginning of modern temporal logic, but they also gave rise to a new formal framework for representing possibilities, one that was suggested to him in a letter by Kripke; namely, the *theory of branching time*.[4]

In the theory of branching time, possibility is no longer 'outsourced' to other possible worlds. Rather, possibility becomes a feature of our world: it is incorporated into the modal-temporal structure of the world, which is depicted as a tree of moments that is linear toward the past and branches toward the future. An example of a branching time structure, illustrating the temporal dimension of the Stockholm-Utrecht scenario, is provided in Figure 2.

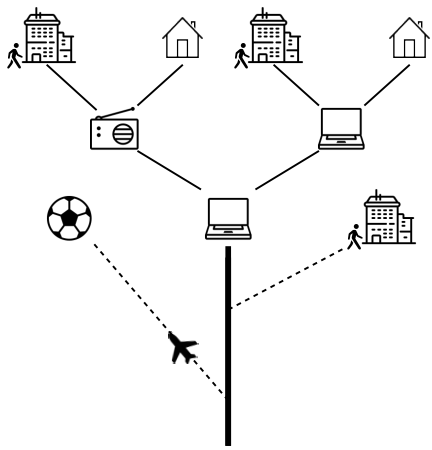


Figure 2: Actuality and possibility in the theory of branching time. The thick line marks actuality. Branches leading toward the future represent possibilities. The dashed lines depict counterfactualities. Icons by Icons8: https://icons8.com.

Crucially, whereas in the possible worlds pluriverse, our standpoint is that of the actual world, in the theory of branching time, our standpoint is that of the present moment, and with the present, not only past and future enter the stage, but actuality and possibility do so as

[4]See Ploug and Øhrstrøm (2012, [13]), for the Prior-Kripke letters of 1958, and Øhrstrøm and Hasle (1995, [11]), for a broader overview of the historical development of temporal logic.

well. Due to the absence of backward branching, the present moment uniquely determines the past, and together present and past provide a notion of actuality. They capture what has actually happened so far and hence is fixed. The branches leading toward the future, on the other hand, represent possibilities: temporal alternatives for actuality to evolve. While each of these branches can become actual as the future unfolds, none of them is actual yet. There is no actual future. Rather, actuality stands *vis-à-vis* a plurality of future possibilities, rendering the future genuinely open.

Note that in this setting, where actuality and possibility are temporally opposed rather than modally aligned, it is less natural to think of possibilities as complete possible courses of events, from the beginning till the end of time. A more natural way to conceptualize possibilities in the branching time framework is to view them as *transitions*, which are local future possibilities that—like little arrows—each specify a possible direction at a branching point. Transitions highlight the dynamic nature of actuality: as the future unfolds, actuality evolves, and at each branching point, one of the local future possibilities is actualized, while the remainder fade away.[5]

Branching time structures allow for a perspicuous representation of real possibilities. Since the distinction of actuality and possibility is drawn in the temporal realm, they are perfectly suited for capturing the idea that real possibilities are temporal alternatives for actuality, and they appropriately accommodate the historical, time-dependent nature of real possibilities as well. To illustrate, in the picture provided in Figure 2, the moment in the middle corresponds to my present situation: it represents me as sitting in Stockholm at my desk, typing into my laptop. This present moment and its linear past make up actuality. The branches spreading out into the future, on the other hand, capture the real possibilities available to me right now: follow the soccer match on the radio or continue writing for a while, take an evening stroll through the old town or, alternatively, spend the evening at home. Whereas each of these future branches constitutes a genuine temporal alternative for actuality to evolve, the branches splitting off in the past are mere counterfactualities. They were once real possibilities but have gone unactual-

[5]For a detailed discussion of the interrelation of actuality and possibility in the theory of branching time and the notion of a transition, see Rumberg (2019, [17]). The formal details of the transition approach are worked out in Rumberg (2016, [15]).

ized: I could have traveled to Utrecht for the soccer match, and I could have escaped from writing this afternoon and enjoyed a walk in the old town instead. But I actually did not, and these possibilities disappeared.

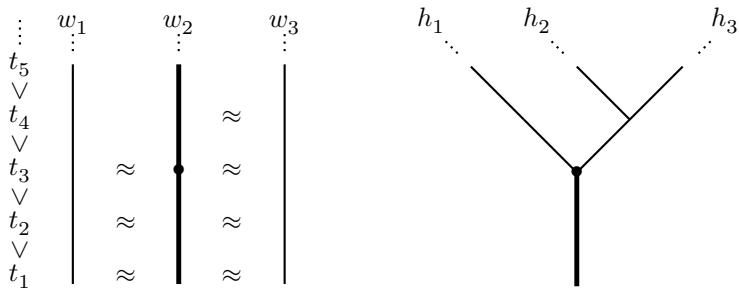
The picture that emerges is the following: building on a modal distinction between actuality and possibility, the possible worlds framework is perfectly tailored to the idea of possibilities as modal alternatives to actuality. The theory of branching time, on the other hand, which invokes a temporal distinction between actuality and possibility, is perfectly tailored to the idea of possibilities as temporal alternatives for actuality. But, of course, we would like a formal framework that allows us to capture all kinds of possibility: epistemic, logical, metaphysical, physical, and real.

We might try to squeeze modal alternatives to actuality into the theory of branching time—but this seems pointless. After all, we have seen that the traditional kinds of possibility are essentially atemporal notions whereas the theory of branching time renders possibilities inevitably time-dependent, and although the tree of moments allows for unactualized alternatives, it would be absurd to assume that all possibilities are historically connected. So the theory of branching time is ruled out as a unifying account.

What about aligning real possibilities with the traditional kinds of possibility? As already mentioned, it is common to conceive of possible worlds as linearly extended in time. We can then introduce a time-dependent accessibility relation that relates two possible worlds at a time if, and only if, they are physical alternatives that share the same initial segment up to that time and diverge only later. On the formal level, this amounts to moving to a so-called $T \times W$ *frame* (Thomason 1984, [18]).

But note: relativizing the accessibility relation to times does not make the actual world—with its actual future—disappear. That is, while this maneuver allows us to straightforwardly capture the idea that real possibilities are time-dependent, historical possibilities, it does not allow us to faithfully capture the idea that real possibilities are temporal alternatives for actuality. To be sure, adding a temporal dimension introduces a local standpoint in time. The local standpoint, however, merely determines which of the possible worlds are historical alternatives at that time. But the relevant worlds still constitute modal alternatives to the actual world—with its actual future. Figure 3 illustrates the differ-

ence with the theory of branching time: in the theory of branching time, where actuality and possibility are temporally opposed, future possibilities are open for actualization, whereas in the $T \times W$ framework, where actuality and possibility are parallelly aligned, one of the future possibilities is already actual. Once we have singled out one of the possible worlds as the actual one, the only way to hold firm to the conviction that it is indeterminate which of the historical possibilities will be actualized in the end is by denying that it is settled which possible world we are actually located in. But this amounts to giving the open future a merely epistemic reading. The picture we end up with by moving to a $T \times W$ frame is tantamount to the theory of branching time with a Thin Red Line added (cf. e.g. Øhrstrøm 2009, [12]); for in the presence of a Thin Red Line, which captures the actual course of events, the interrelation of actuality and possibility changes, and possibilities again boil down to mere modal alternatives to the overarching actuality.



(a) $T \times W$ frame. (b) Branching time structure.

Figure 3: Actuality and possibility in the $T \times W$ framework and the theory of branching time, respectively. In each case, the thick line highlights actuality.

The upshot is this: there is no uniformity in the space of possibilities, and there is no uniformity in their formal representation either. Possible worlds and the theory of branching time constitute different formal means, fit for different purposes. If we wish for a unifying account, we need to combine the merits of both frameworks into a single picture. One way to do so would be to move from a single tree to a forest of trees, allowing for a temporal distinction between actuality and possibility within each tree and a modal distinction between actuality and

possibility in the forest. In such a framework, each tree corresponds to a possible world that represents a way our world could be—epistemically, logically, metaphysically, or physically. The branches within a tree, on the other hand, represent real possibilities for the future. That is, while the forest constitutes a unifying framework, it does not represent modal and temporal alternatives uniformly, but instead makes use of different formal resources in each case. This is as it should be, for modal alternatives to actuality and temporal alternatives for actuality are two fundamentally different kinds of possibility.

5 Conclusion

In this paper, we have introduced the notion of real possibility into the landscape of possibilities. Real possibilities are alternative possibilities for the future in an indeterministic world. In contradistinction to epistemic, logical, metaphysical, and physical possibilities, real possibilities are not only closely tied up with the world, but they are inextricably interwoven with time as well, and their interrelation with time affects the relation between actuality and possibility: real possibilities are temporal alternatives for a dynamic actuality to evolve rather than modal alternatives to a given actuality. The notion of real possibility thus crucially differs from the traditional kinds of possibility, which are uniformly conceptualized as modal alternatives to actuality, distinguished solely in terms of modal strength.

The distinction between modal alternatives to actuality and temporal alternatives for actuality established here marks a fundamental distinction in the realm of possibility, a distinction that needs to be reflected in the formal representation of possibilities. While the possible worlds framework allows for a straightforward representation of modal alternatives to actuality, the tree-like structures emerging from Prior's theory of branching time afford a perspicuous treatment of real possibilities, as temporal alternatives for actuality. Neither of the two frameworks is suited to capture the entire variety of different kinds of possibility in a uniform way.

However, the distinction between modal alternatives and temporal alternatives does not only have consequences for our choice of formal models. Indeed, the distinction seems so fundamental that one might reasonably expect it to prove useful in many debates where possibilities

are involved. The distinction may, for instance, be fruitfully applied in the debate concerning determinism and indeterminism in the philosophy of science, for temporal alternatives for actuality lend themselves to a novel understanding of indeterminism, where indeterminism is defined by the existence of more than one real possibility for the future. Relatedly, the distinction may shed new light on the debate concerning free agency and moral responsibility, where often a principle of alternative possibilities is invoked, demanding that the agent could have acted otherwise. Does this principle refer to mere modal alternatives to actuality, or does it require that the agent had a real possibility of acting differently?[6] But the distinction may also be of interest in linguistics. After all, is it not the case that the antecedents of the following two counterfactual conditionals—"If trees on Earth grew more than 200 meters into the sky ..." and "If I had traveled to Utrecht yesterday ..."—do not only differ in their tenses but trade on fundamentally different kinds of possibility?

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Perspectival Semantics and the Open Future

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Abstract

In the first part of this paper, we analyze the concept of open future. Our main thesis is that the indeterminateness of the future crucially depends on the perspective from which the propositions containing the future operator are evaluated. For this reason, we offer a *perspectival* temporal semantics, in which propositions are evaluated with respect to two indexes: the time of evaluation and the time of the perspective. This demonstrates the compatibility of this semantics with both a tensed and a tenseless metaphysics of time. In the second part, we apply the theoretical device of perspectival semantics to the problem of divine foreknowledge, demonstrating that this semantics proves to be promising in the solution of the foreknowledge problem. Finally, we discuss this solution from the point of view of both a tenseless and a tensed conception of the universe.

Keywords: open future, perspectival semantics, divine foreknowledge, tensed/tenseless theories of time.

1 The Future is Open

Think about the future. Think about your projects, your desires, your fears. There is one very common intuition concerning the world that will be; or better, it is a sort of feeling, a piece of pre-theoretical evidence: the future is largely unknown. Certainly, there are future features of the world about which we are very confident: we are ready to bet on the fact that tomorrow the Sun will rise or that a pot of water heated to 100 °C will start boiling. We are certain that we are going to get old and that we will die. We have very good reasons to believe that within a century there will still be life on Earth and that technological progress will deeply transform our environment. Nevertheless, many other traits of the future world are obfuscated by a sort of epistemic fog: we do not know if next summer will be hot, if my daughter Emma will marry and have children, if her children will have children of their own, and what football team my great-grandchildren will be supporters of.

The epistemic openness of the future seems undeniable: it is included in our more general ignorance about many aspects of reality. According to some, the openness of the future is *just* epistemic, whereas, from the ontological point of view, the universe is deterministic. In Pierre de Laplace's famous words:

> We may regard the present state of the universe as the effect of its past and the cause of its future. An intellect which at a certain moment would know all forces that set nature in motion, and all positions of all items of which nature is composed, if this intellect were also vast enough to submit these data to analysis, it would embrace in a single formula the movements of the greatest bodies of the universe and those of the tiniest atom; for such an intellect nothing would be uncertain and the future just like the past would be present before its eyes. (see [12])

According to Laplace's determinism, the epistemic openness of the future is a mere byproduct of our ignorance. If we did not consider this cognitive constraint (as in the case of Laplace's demon), we would have a perfect and complete knowledge of any event in the future (and in the past).

However, for many philosophers, the epistemic openness of the future is actually a reflex of a deeper ontological openness: we don't know what football team my great-grandchildren will be supporters of *because* it is ontologically undetermined what football team they will be supporters of. The future reality is open because it has, so to speak, ontological holes, that is, indeterminate regions in which there are no facts. Those who advocates an ontological conception of the open future usually assume the asymmetry between past and future: the future is open, but the past is closed. There is no way to change or affect what was the case. It is part of the standard terminology in the debate to say that the past is *historically* (or *accidentally*) necessary: *Titanic*'s sinking is not a necessary event tout court: it might not have happened. Unfortunately, it did happen, and *since then* it is no longer possible that it did not happen. On the other hand, the obtaining of a certain future state of affairs seems to be – by virtue of the very openness of the future – contingent. Another way to characterize the ontological asymmetry between past and future exploits the notion of causality: whereas the past is beyond the reach of our possible causal manipulation, it seems that we are able to determine – partially – what will happen in the future. In other words, at least from an intuitive standpoint, our free actions can bring about certain states of affairs and can therefore exclude others.

So far, so good. There is another feature of the openness of the future that it is worth analyzing.[1] Let us consider the following sentence:

(1) Emma is going to drink a beer at the tonight's party.

According the open future assumption, the truth value of (1) is genuinely undetermined. Emma will be able to make up her mind and to get a beer or a Coke or whatever. However, the future does not *remain* always open. At the party, Emma will make a choice: either she will drink a beer or she will not. Something must happen and therefore, what was undetermined in the past becomes determined; of course, with respect to the time of the party, there remain other future tense sentences whose truth value is indeterminate. For instance, either Emma will catch a cab to return home or not. And so on.

[1] Note that we did not provide any argument *for* the openness of the future; of course, there many accounts of ontology of time according to which the future is closed and determinate. In this paper, we simply *assume* that the future is ontologically open.

But let us reflect on the just-described situation and add some details. It is 6 p.m. and Emma is getting ready for the party. It is, by assumption, ontologically indeterminate whether Emma will drink a beer at the party. At 10 p.m., halfway through the party, Emma is thirsty and decides to have a beer and therefore, the sentence whose truth value had been undetermined now becomes (so to speak) true. Now, the question whether (1) is a sentence with a determinate or indeterminate truth value. Well, *prima facie* the answer might be that it depends on the instant at which we evaluate it. (1) is indeterminate at 6 p.m., but it is true at 10 p.m.. But this answer is troublesome. In fact, *because* Emma decides to have a beer at 10 p.m., it is true at 10 p.m. that it was *already* true at 6 p.m. that Emma *would* decide to have a beer. Therefore, its truth value seems perfectly determinate.

In order to realize how much the intuition of the retrogradation of truth is deeply-rooted, let us suppose that Paul and George make a bet at 6 p.m.: Paul bets on the truth of (1), that is, on the fact that Emma is going to have a beer at the party. George bets against (1). If Emma drinks her beer, Paul can ask for the payment of the bet by saying that he *was right* and he *stated* the truth when he said that Emma would have a beer. If George replied that, after all, it was indeterminate at 6 p.m. what Emma was going to do and that, therefore, what Paul said was neither true nor false, so that he has no right to request the payment of the bet, his argument would seem totally captious. Therefore, from the 10 p.m. perspective, (1) is true at 6 p.m. But, on the other hand, Emma is still undecided at 6 p.m., and it is plausible to regard, from the 6 p.m. perspective, the future tense sentence as indeterminate. Then, the ascription of indeterminateness to a future tense sentence depends not only on the instant at which it is evaluated but also on the *perspective* from which it is evaluated. This fact is deeply connected with the question of the open future; the future is open when we put ourselves, so to speak, in the present. But, retrospectively – when we look at the future of a certain moment from the future of that moment – the future appears to be determinate.

This intuitive description represents the conceptual core of our article. According to us, once one has characterized in a rigorous way the notion of *temporal perspective*, one is in possession of a powerful theoretical device by means of which an answer to the well-known *conundrum* of divine foreknowledge and human free will can be given. In a nut-

shell, the conundrum is that if God already knew what Emma would choose, Emma is not really free to do otherwise – and then, according to a libertarian conception of freedom, Emma is not free. The structure of the paper is then as follows. In the next section, we present the logical framework of a temporal perspectival semantics. Section 3 presents, very briefly, the conundrum, and section 4 shows how to apply the perspectival analysis of the open future to the dilemma.

2 Perspectives on Branching Time Semantics

FUTURE IN BRANCHING TIME

In the previous section, we refer to the openness of the future as a deeply rooted intuition. This can be logically characterized by a branching time semantics.[2]

A branching time structure (BT) is a couple $\mathfrak{B} = \langle T, < \rangle$, where T is a nonempty set of instants and $<$ is a relation defined on T. 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 it satisfies (at least) the conditions of *Backward Linearity* (**BL**) and *Historical Connectedness* (**HC**):

(BL) $\forall t, t_1, t_2 (t_1 < t \wedge t_2 < t) \Rightarrow (t_1 = t_2 \vee t_1 < t_2 \vee t_2 < t_1)$

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) $\forall t_1 \forall t_2 \exists t (t \leq t_1 \wedge t \leq t_2)$

(**HC**) asserts that all the instants are connected in the past; the maximal subsets of instants linearly ordered in T are referred to as *histories* – the possible courses of events in the world. Ours is a propositional language that includes a possible infinite set of propositional variables (Var) and two temporal operators **P** and **F**. We can define an evaluation function $V : Var \longmapsto \wp(T)$ that maps every propositional letter p onto a set of instants at which p is true. A model BT is, then, a couple $\langle \mathfrak{B}, V \rangle$.

[2]See, for instance, [3], [26], [20], [21], [1], and [11].

According to the indeterminist intuition, there is only one past history, but there are many possible future histories. This situation is illustrated in figure 1:

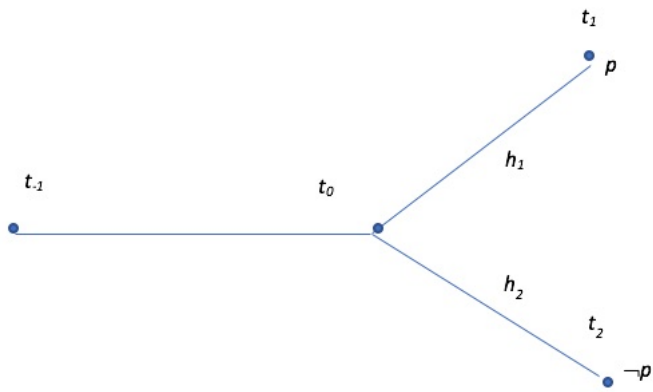

Figure 1: A branching framework

The evaluation of the formulas are, then, with respect to an instant (viz., the instant of evaluation):

$$
\begin{array}{lcl}
M,t \vDash p & \Leftrightarrow & t \in V(p) \\
M,t \vDash \neg\varphi & \Leftrightarrow & M,t \nvDash \varphi \\
M,t \vDash \varphi \wedge \psi & \Leftrightarrow & M,t \vDash \varphi \textit{ and } M,t \vDash \psi \\
M,t \vDash \mathbf{P}\varphi & \Leftrightarrow & \exists t'(t' < t \wedge M,t' \vDash \varphi) \\
M,t \vDash \mathbf{H}\varphi & \Leftrightarrow & \forall t'(t' < t \wedge M,t' \vDash \varphi)
\end{array}
$$

Regarding the sentences with no future tense operators, our semantics is straightforward. Things get more complicated when we must evaluate future tense sentences. Of course, we cannot mirror the clause about the past, because, given the branching, there can be two (or more) instants (t_1 and t_2) which satisfy the condition of following t.

There are many ways to provide a semantics for the future.[3] In what follows, we will present just the so-called *indeterminist* or *Aristotelian*

[3]For an overview, see, for instance, [9] and [17]

model.[4] According to this interpretation, we have that

$$\begin{array}{lcl} M,t \vDash \mathbf{F}\varphi & \Leftrightarrow & \forall h \exists t'(t' > t \wedge t' \in h \wedge M,t' \vDash \varphi) \\ M,t \vDash \mathbf{F}\neg\varphi & \Leftrightarrow & \forall h \exists t'(t' > t \wedge t' \in h \wedge M,t' \vDash \neg\varphi) \end{array}$$

Now, it is easy to understand that in the indeterminist model, we can have semantically indeterminate future tense sentences ($M,t \nvDash \mathbf{F}\varphi$ and $M,t \nvDash \mathbf{F}\neg\varphi$). One might believe, then, that the branching semantics with an Aristotelian conception of the future is a good formal account of our intuitions about the open future. However, things are not so easy.

Let us hypothesize that we are in the following situation: φ is true at t_1 in history h_1, whereas it is false at t_2 in history h_2. According to the previous semantics, this means that at t_0, $\mathbf{F}\varphi$ is neither true nor false. But let us hypothesize that time flows and that φ obtains (the world "takes" the road h_1). We have that at t_1 it is true that φ. But then we must claim that *because* at t_1 it is true that φ, then it has always been the case that it would be true that φ. In other words, since Emma, at the end of the day, decided to have a beer, it has always been true that Emma would have her beer. In formal terms, the conditional $\varphi \rightarrow \mathbf{HF}\varphi$ must hold. However, in the indeterminist framework we just presented, that *does not* hold, and it is not difficult to see why:

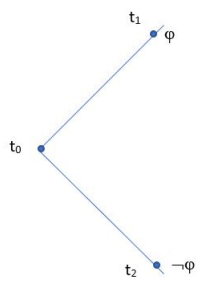

Figure 2: $\varphi \rightarrow \mathbf{HF}\varphi$ does not hold at t_1

[4]We are not committed to the view that this model reflects the actual theory held by Aristotle; in this context *Aristotelian* refers to a quite common interpretation of Aristotle's solution to the riddle of future contingents in chapter IX of *De Interpretatione*. For a detailed analysis, see, for instance, [6].

Clearly, φ holds at t_1. Now, let us determine whether $\mathbf{HF}\varphi$ holds. Accordingly, $\mathbf{F}\varphi$ must always be true in the past of t_1. So, the question is whether $M, t_0 \vDash \mathbf{F}\varphi$ holds. However, as we have seen, the existence of a history in which $\neg\varphi$ is true entails that $\mathbf{F}\varphi$ is untrue at t_0.

We arrived at a sort of stalemate. On one hand, the principle at issue seems to be absolutely plausible. On the other hand, it is not valid within the Aristotelian framework, which, in turn, is supposed to catch our intuitions about the open future. There are, of course, many answers to this problem[5]. One can decide to give up the principle $\varphi \to \mathbf{HF}\varphi$ in the name of the open future; or, alternatively, one can modify the branching semantics in order to preserve the principle (see [25], [17], and [27]). In the following section, we present a framework for perspectival semantics. It allows us to pursue a twofold aim: on one side, it accounts for the principle of retrogradation of the truth in an intuitive way, and, on the other side, it provides a new interpretative setting for the problem of divine foreknowledge and human freedom.

PERSPECTIVAL SEMANTICS

The basic idea of perspectival semantics is that formulas are evaluated in a model, at a time t, from a certain perspective or context.[6]

Let us take into account the closed formula φ. φ has a certain truth value at t. As noted above, our semantic framework introduces another ingredient: we evaluate φ at t from the temporal perspective t' (which, of course, might coincide with t). Roughly, the idea is to consider the perspective t' as the point at which the world has arrived, that is, the present moment. As we will see shortly, the advocates of a dynamic and realist metaphysics of time could construe the idea of perspective we are presenting in a strong sense. However, our semantic also allows

[5] [22] raises this question for the Local Thin Red Line models ([21]). In [9], we show that this criticism applies to nondeterministic systems as well

[6] The idea of a perspective or context of evaluation circulates in the branching time semantics in very different forms. The model of Belnap, Perloff, Xu ([1]) uses the parameter of the context, and that of Waver ([17]) employs the parameter of the context of use. Here we adopt a notion of perspective close to that of MacFarlane ([14], [15]). According to MacFarlane, every proposition must be evaluated at two different times, which he calls the context of assessment and the context of evaluation. In our proposal as well, the evaluation occurs at two different times. In ([9]), we consider the differences between these approaches and ours.

for an indexical reading according to which the perspective indicates the instant we consider as our "now", without any metaphysical privilege.

Let $H_t = \{h | t \in h\}$ be the bundle of histories at t, that is, the set of histories which pass through t. Our model is, then, constituted by the structure BT, the evaluation function V, and two temporal indexes: the instant of evaluation and the perspective from which one evaluates. We sharply distinguish two kinds of propositions: *factual* propositions, which concern things that happen at the present, in the past, and in the future of a given perspective, and *counterfactual* propositions, which concern not what is happening, what happened, or what will happen from the given perspective, but what could or could have happen from another perspective.[7]

The evaluations of factual propositions in our model are always relativized to the *intersection* of the (bundle of) histories which pass through the moment of evaluation t and the histories which pass through the perspective t'. As we are evaluating factual propositions, we suppose that this intersection is never empty, that is that the moment of evaluation is connected with the temporal perspective. This seems a reasonable condition, because factual propositions concern what happens at a certain time or in the past or in the possible futures of that time. Because the histories on which we evaluate must pass through the perspective, certain branches are *pruned*. Let us consider an example:

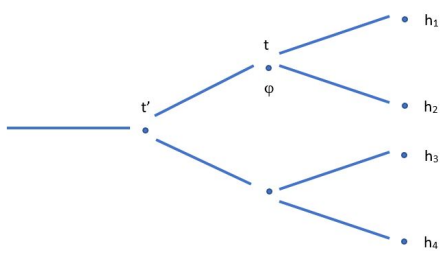

Figure 3: Evaluation of φ at t from the perspective t'

[7]Developing this interpretation of counterfactual propositions seems to be a very fecund path of inquiry. However, in this paper, we do not take that into account. See ([9]) for a proposal for the treatment of counterfactual propositions.

In this schema we have four histories; let us suppose we evaluate the formula φ at t, from the perspective t': $M,t,t' \vDash \varphi$. We consequently have the following truth conditions:

$$M,t,t' \vDash p \Leftrightarrow \forall h \in H_t \cap H_{t'}, t \in V(p)$$

$$M,t,t' \vDash \neg\varphi \Leftrightarrow \exists h \in H_t \cap H_{t'}, M,t,t' \nvDash \varphi$$

$$M,t,t' \vDash \varphi \wedge \psi \Leftrightarrow \forall h \in H_t \cap H_{t'}, M,\ t,t' \vDash \varphi \text{ and } M,t,t' \vDash \psi$$

$$M,t,t' \vDash \mathbf{P}\varphi \Leftrightarrow \forall\ h \in H_t \cap H_{t'}, \exists\ t'' < t, M,t'',t' \vDash \varphi$$

$$M,t,t' \vDash \mathbf{H}\varphi \Leftrightarrow \forall\ h \in H_t \cap H_{t'}, \forall\ t'' < t, M,t'',t' \vDash \varphi$$

Notice that our evaluation at times and perspectives is analogous to a standard evaluation as far as evaluations not regarding the future are concerned. Things change when we consider the evaluation of future tense. The idea is, in a nutshell, the following:

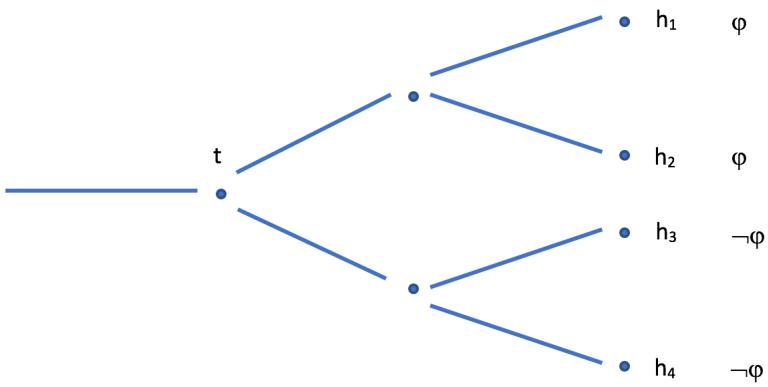

Figure 4: Evaluation of $\mathbf{F}\varphi$ at t from the perspective t

Here, we have a branching structure in which there are four histories: in the first two, it is true that φ; in the second pair, it is true that $\neg\varphi$. Now, let us hypothesize that we want to evaluate $\mathbf{F}\varphi$ at t from the perspective t. We then have

$M, t, t \vDash \mathbf{F}\varphi \quad \Leftrightarrow \forall h \in H_t \cap H_t \exists t' > t, M, t', t \vDash \varphi$

Obviously, this does not hold, because there exist two histories in the intersection in which $\neg\varphi$ is true. But let us now suppose that the perspective changes (i.e., that time flows); the schema becomes:

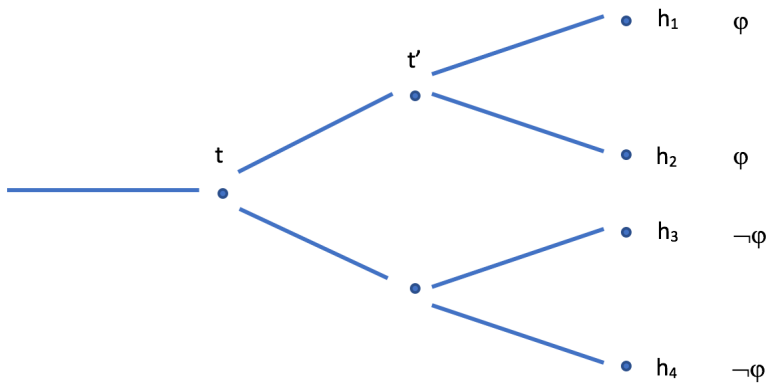

Figure 5: Evaluation of $\mathbf{F}\varphi$ at t from the perspective t'

This schema is identical to the previous one, except for the perspective of the evaluation, which is now t'.

$M, t, t' \vDash \mathbf{F}\varphi \Leftrightarrow \forall\ h \in H_{t'} \cap H_t \exists t'' > t, M, t'', t' \vDash \varphi$

Time flowed – so to speak – and the histories into the intersection decreased. From the perspective of t', therefore, φ will happen in the future of t. So, for example, whereas from the perspective of 6 p.m., it is not true that Emma will drink a beer at the party, from the perspective of 10 p.m., when Emma has already decided to drink a beer, it was true at 6 p.m. that Emma would drink a beer. So, our framework incorporates MacFarlane's intuition that the evaluation at a certain time of a formula containing a future operator changes depending on the perspective that is assumed.

Let now observe what happens to the crucial principle $\varphi \rightarrow \mathbf{HF}\varphi$. Let us assume to evaluate at t' from the perspective of t'; we have, then, that

$M, t', t' \vDash \varphi \rightarrow \mathbf{HF}\varphi$

So, let us assume $M, t', t' \vDash \varphi$; hence, it must always have been true in the past that $\mathbf{F}\varphi$. Let us consider the instant t previous to t':

$$M, t, t' \vDash \mathbf{F}\varphi \Rightarrow \forall h \in H_{t'} \cap H_t \exists t'' > t, M, t'', t' \vDash \varphi$$

Of course, this holds because φ holds in every history that passes through t' at a moment subsequent to t. In particular, it holds at t' itself. Because the evaluation is always restricted to the histories in the intersection $H_{t'} \cap H_t$, if φ holds at t', then it is true at every moment in the past of t' that φ will hold in the future. Thus, the principle $\varphi \rightarrow \mathbf{HF}\varphi$ is vindicated in our perspectival semantics.

3 Divine Foreknowledge, and the Openness of the Future

In the previous section, we provided a sketch of perspectival semantics. As noted, this system is interesting for several reasons, but, here, we explore a possible application to a classical topic in philosophy of religion, that is, the problem of compatibility between divine foreknowledge and human free will. We present the argument against the compatibility between foreknowledge and freedom in Linda Zagzebski's clear version ([28] cap. I; [29]: 46–47). Let B be a free action the agent is going to perform tomorrow:

1. Yesterday God believed that B (divine foreknowledge)
2. If an event e occurred in the past, then it is accidentally necessary that e occurred then (necessity of the past)
3. It is now necessary that yesterday God believed B (1,2, *modus ponens*)
4. Necessarily, if yesterday God believed B, then B (infallibility of divine foreknowledge)
5. If s is accidentally necessary and if $\Box(s \rightarrow p)$, then it is accidentally necessary that p (principle of transfer of necessity)
6. So it is now necessary that B (3, 4, 5)

7. If it is now necessary that B, then you cannot do otherwise than B (definition of necessary)

8. Therefore, you cannot do otherwise than B (6,7, *modus ponens*)

9. If you cannot do otherwise when you perform an act, you do not perform it freely (principle of alternate possibilities)

10. Therefore, when you perform B, you will not perform it freely (8,9, *modus ponens*)

The crucial premises on which the argument hinges are (1), (2), and (9), that is, the definition of divine foreknowledge, the necessity of the past, and the libertarian definition of free will. The timeless solution to this dilemma denies premise (1): since God is out of time, it is meaningless to say that God yesterday *knew* that Emma will drink a beer. God timelessly knows that Emma drinks a beer at a certain time. So, premise (1) is false and the argument does not conclude. In this paper, we will take into account the prospects of the timeless solution in light of the need to postulate a temporal perspective in order to account for our intuitions on truth values of future sentences.

Let us consider the proposition that describes Emma's free act of drinking a beer (let us call it, as usual, φ). This proposition, from a logical point of view, must satisfy two opposed semantic constraints:

i. On one hand, its truth value has to be *determinate*;

ii. On the other hand, its truth value has to be *indeterminate*.

Let us see why. (i) has to be satisfied because φ is the object of divine knowledge and it is not possible to know something that is neither true nor false. But, at the same time, (ii) has to be satisfied as well because if φ is true tout court, then it is true also *before* Emma's choice and this blocks her effective freedom of choice. In order to preserve Emma's freedom, the truth value of φ must be indeterminate.

Actually, this happens also in the (much less troublesome) case of the human knowledge of free actions; we can safely say that yesterday Emma was free to drink a beer at the party and that she then decided to drink it. It is therefore true both that it was indeterminate whether Emma would drink a beer and that she drank it. So, the *natural* way to

keep both requirements together is that of *relativizing* them to an instant: the day before yesterday, it was indeterminate whether Emma would drink a beer, but today it is no longer indeterminate. The problem with divine knowledge is that given God's omniscience, the possibility of relativization to instants is blocked: God *must* be able to know in the past what will happen in the future. But this entails that future contingents *must* have a determinate truth value, and again, we end in the negation of free will.

Our perspectival framework can help. By means of it, we have understood how to talk coherently about the truth value of future tense propositions with respect to the assumed perspective; recall that $\mathbf{F}\varphi$ is true at t_1 from the perspective of the future. And it is indeterminate from the perspective of the present. In fact, one could say that it is by virtue of the fact that the future has been in this way that *retrospectively* the truth value of future tense sentences is determinate. And this is perfectly analogous to what happens with the human knowledge, directed to the past: because Emma decided to drink a beer at the party, it is now true that it was true that Emma would drink a beer at the party. However, when we evaluate on instants that are contemporary with or subsequent to the perspective, then the future is really indeterminate and open.

Our proposal is the following: God is omniscient not only because He timelessly knows the truth value[8] of each proposition at each time but, crucially, because He also timelessly knows the truth value of each proposition at each time from each perspective. Omniscience is, then, omni-perspectival knowledge. Looking back at our example, we have that God knows that at t_0 from the perspective t_0, it is indeterminate whether Emma will drink a beer at the party – thus, Emma is free in a genuine sense to drink a beer or not. However, God also knows that at t_0 but from the perspective t_1, it is true that Emma will drink a beer at the party. All these sentences are formally coherent, and one could say that both God's omniscience and Emma's free will are preserved.

Now, this solution has some theoretical costs. First, we have to take a stand on the nature of perspectives. So far, we have reasoned from model-theoretic considerations, but what is the ontological import of this framework? In other words, are perspectives actual? And what

[8]Obviously, one can know only what is true. So, if ψ is false, then God knows that it is true that ψ is false.

are they? Second, even if one accepts the idea that God's knowledge is omni-perspectival, does it make sense to ask the following question *at face value*: is Emma *actually* free? That is, is there a description of reality which is *absolute* and therefore not perspectival? In that case, it is plausible to think that there is a true description of reality and the perspectives are a mere reflex of this absolute vision. To provide some tentative answers, we have to make some conjectures about the nature of temporal perspectives and about how they play an essential role in characterizing the epistemic relation between God and the world.

4 Metaphysics of Time and God's Knowledge

Since the publication of McTaggart's seminal paper ([16]), it has been *de rigueur* in the philosophy of time to distinguish the most important metaphysical views in terms of A-theories and B-theories. In a nutshell, the A-views claim that the dynamic dimension of time is *actual*; this entails that becoming is an objective feature of the world. There exists, in other words, a privileged time (the present), and this changes. What has been future yesterday will be present today and what is present today will be past tomorrow. The A-views are realist about tense: there are irreducible tensed features that entities possess. More soberly, B-views state that the only temporal relations are the B-relations, that is, the relations of order among instants. There is no privileged instant; by consequence, "now" behaves as a spatial indexical term (an argument cited very often by the B-theorists is the structural analogy between space and time): just as there is no privileged "here", so there is no special "now". Temporal becoming is a cognitive illusion; properly speaking, time does not flow.

A classical A-theoretic metaphysics is *Presentism*: there exist only present entities and the content of presentness changes over time. At the opposite end of the spectrum, a metaphysical view often advocated by B-theorists is *Eternalism*: all the temporal entities exist on a par with one another, exactly as do all the points of a space.[9]

The previous section showed that God has an omni-perspectival form of knowledge. The point is to provide an explanatory account of it.[10]

[9]For an overview, see [19].

[10]See, for a more detailed view, [7] and [9]

There are essentially two general options about the metaphysics of the perspectival knowledge: according to the first, which we call *tenseless*, the perspectives are points of view on the temporal series; the second, the *tensed* view, regards the perspectives as actual. Let us investigate both of them in turn.

The tenseless approach is usually matched with a general eternalist metaphysics.[11] According to this view, the perspectives are mere standpoints on the temporal series; their nature is, thus, purely indexical. God, as omniscient, has every perspective at His cognitive disposal. The analogy with the spatial case could be illuminating; "here" is, clearly, an indexical to which no privileged place corresponds. At the same time, however, we cannot be in every possible "here"; this limitation does not affect God, who is, so to speak, as we are when we look at a map and are able – at least in the representation – to locate ourselves in whatever position.

Metaphors aside, God knows that Emma is free at t_1 from the perspective of t_1, because two possible histories stem from t_1, one in which Emma drinks a beer at the party and the other in which she does not. At the same time, God sees that at t_2 Emma drinks a beer *because* she made up her mind (and thus she is responsible for her action). So, from the perspective t_2, it is true at t_1 that Emma would have a beer at the party. It is important to underline two points. First, the cause of the fact that God knows that at t_2 Emma is at the party, is Emma's free decision. This entails that there is a sort of interaction between what happens in time and God's knowledge. Second, the eternalist ontology of the universe does not undermine free will because this has to do with branching time, namely with the openness of the future. Even though the whole series of Emma's choices exists eternally, it is nonetheless true that Emma could have made choices different from the ones she made. It is clear how the concept of omni-perspectival knowledge plays a central role: human knowledge of the temporal aspects is given through a particular perspective, whereas the divine standpoint includes any possible point of view. What we usually say about the past – i.e., that it was indeterminate whether Emma would drink a beer but it is now determinate, because Emma made up her mind – is true for God with respect

[11] But it would be interesting to investigate the entanglements between the perspectival tenselessness and nonstandard eternalist theories of time such as the moving spotlight theory.

to the whole temporal series. After all, metaphysical eternalism agrees with the idea of a tenseless God: the only temporal features of reality, for the eternalist, are the B-relations, and God is able to observe the entire temporal sequence from every possible perspective in a single act of knowledge.[12]

We believe that the main cost of this solution lies in the acceptance of a B-theory of time.[13] If we are persuaded by the criticisms moved against the B-theories of time and if we decide to embrace an A-view of time, the ontological weight of the perspectives becomes crucial. A possibility explored in [8] – although using different formal frameworks – is to connect the perspective with the ontologically privileged *now*.[14] The perspectival index of the semantic framework is interpreted as the metaphysical now: it is the instant of time at which the world has arrived. Obviously, nothing prevents us from changing perspective, that is, from imagining how thing would be if the world had arrived at another time t.

If the various perspectives are the "nows", we have a problem: the perspectives are incompatible. And this is plausible: if t_1 is today, tomorrow t_2 will be today. But two different times t_1 and t_2 cannot both be today simultaneously. Therefore, the two perspectives on reality are clearly incompatible: the property of being present cannot apply to two different instants at the same time. But, plausibly, this is not a problem *for us*: in a tensed theory of time, the perspectives follow one another in time and they are never in conflict.[15] The problem is more pressing if we postulate the existence of an agent whose knowledge is omni-perspectival: God timelessly knows that at $\mathtt{now}(t_1)$ Emma is free, that is, that $\mathbf{F}\varphi$ is indeterminate at t_1, but He also timelessly knows that

[12]A very similar position is advocated by Katherine Rogers. See [23], and [24].

[13]This is not the place to discuss the arguments against this view of time. See, for instance, [2], and [5]. Note that there might also be *derived* costs, such as the problem of conciliating a tenseless metaphysics with the features of classical theism. See [18].

[14]As is well-known, the A-theories of time ascribe to the present an ontological priority. Presentism construes this priority as the very existence: the present is privileged because it is the only "thing" that exists. But other A-theories as well ascribe to the present a special status: according to the advocates of the growing block theory, the now is the edge of the block, where we are. Analogously, the moving spotlight theory characterizes the now through the metaphor of a light that progressively illuminates the various instants of the temporal series.

[15]Of course, McTaggart did not agree; based on a similar train of thought, he argued that the A-series is incoherent.

at $\texttt{now}(t_2)$ it *is* determinate at t_1 that $\mathbf{F}\varphi$. But the two states of knowledge are not compatible, because $\texttt{now}(t_1)$ and $\texttt{now}(t_2)$ are incompatible perspectives. If $\texttt{now}(t_1)$ and $\texttt{now}(t_2)$ are two robust stages of the world following one another (and not mere indexicals), it does not seem that God can know at the same time the truth value of the propositions both from the point of view of $\texttt{now}(t_1)$ and from the point of view of $\texttt{now}(t_2)$, because these stages are not compatible.

A possible way out is to adopt a form of Fine's *fragmentalist* A-view of time.[16] In Fine's view, Fragmentalism is the only possible realism in relation to tensed facts. The argument of [16] against the reality of time has four premises: (1) there are tensed facts; (2) no time is privileged over the other times; (3) the constitution of reality is absolute and not relative to time or temporal perspectives; (4) reality is coherent. These four premises lead to a contradiction. The standard answer of the realist regarding tensed facts is to reject premise (2) and claim that the present is a privileged time over the others. The problem of this response is that every time becomes present sooner or later, and from this point of view, none is privileged. If one retorts that the instants are not privileged *at the same time*, but *one by one*, then McTaggart would respond that this rebuttal presupposes the existence of a hypertime, for which the same problem arises again. Fine, therefore, prefers to accept a nonstandard form of realism of tense and rejects premise (4). Every fragment has a present time and contains tensed facts, but the fragments contain different tensed facts, and the present is not the same in every fragment but changes from fragment to fragment. The present is a privileged time over the others in any fragment, but there is no absolute present in reality: one instant is privileged only with respect to a fragment, because, if an instant is present in a fragment, it is not present in the other fragments. In addition, the fragments are all on par, and there is no fragment that is privileged over the others.

We believe that Fragmentalism is a viable metaphysics with which to understand perspectival semantics. Any fragment is constituted by a present and by a bunch of tensional facts which "refer" to that present. Obviously, the fragments are intrinsically coherent but they are incompatible; therefore, reality is made of fragments which cannot be "combined". It is natural enough to understand a perspective as the present

[16]See [10], [4], and [13].

of a fragment and all the true propositions from that perspective as descriptions of the tensional facts of that fragment. Given this semantic framework and this metaphysics, a timeless God can be omniscient, since He can retain a constant epistemic relationship with all the fragments, thus knowing all the propositions that are true in them. Even God's knowledge is fragmented, but it cannot be otherwise, because the reality He knows is fragmented too.

5 Conclusion

In this paper, we have presented a perspectival semantics which accounts for the variation over time of the truth value of future tensed sentence. We have then applied this framework to the problem of divine foreknowledge and human free will. This framework can, in principle, provide a solution to the problem, but it has been shown that the underlying ontology is crucial. If the assumed metaphysics is a B-theory of time (and if the perspectives are just indexicals), God's knowledge and human free will are compatible. However, if the assumed metaphysics is tensed and if the perspective coincides with the "now", then the solution works only if we are ready to adopt nonstandard A-views such as Fragmentalism.

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History relativism as extreme assessment relativism: A note on Prior's Ockhamism

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Abstract

Since the early days of Ockhamist semantics, it has been recognized that the history-relative notion of truth which the theory postulates is problematic: it is unclear what it means that a sentence is true relative to a possible course of events; it is also unclear how such a notion of relative truth relates to the everyday notion of truth *simpliciter*. To rationalize the Ockhamist notion of truth I compare two relativistic theories: the assessment relativism of John MacFarlane and the history relativism of Belnap et al. In the end, I suggest that we may understand the history-relative notion of truth as the truth assessed relative to an end of time. On the formal level, I introduce a doomsday extension of a branching model and prove that history-relative truth in any given model is equivalent to doomsday-relative truth in the extended model. It turns out that this equivalence holds in general only if the end of time is also, in a sense, beyond time.

Keywords: Ockhamism, assessment relativism, branching time.

1 Introduction

With the publication of "Past, Present and Future" the branching-time model was incorporated into the mainstream of temporal logic. The

model introduced an important modal dimension to the discussion of time as it is based on the insight that the future, as opposed to the past, is open to multiple realizations. Nonetheless, Prior himself did not dwell on the metaphysical significance of the model because his main objective was to understand (and undermine) the main arguments for logical determinism. Thus, he immediately put the branching model to *semantic* work to show that some assumptiomps postulated by determinists are questionable and can be falsified in certain semantic theories. One of these theories is Ockhamism (this model helped Prior to show that not every sentence in the past tense truly concerns the settled past).

Ockhamist semantics is a simple and formally appealing theory that smoothly blends past, present, and future tenses with temporal possibility. However, there is certain controversy surrounding this semantics, as the basic Ockhamist notion of truth eludes clear comprehension [this concern was first clearly articulated in 11, pp. 270–1]. A few definitions are required to understand this problematic issue.

Definition 1 (Branching Structure)**.** Branching structure $\mathfrak{B}$ is an ordered pair $\langle M, < \rangle$, where $M \neq \emptyset$ and $\leq$ is a partial order on M that satisfies the following conditions:

Backward linearity
$\forall_{m_1, m_2, m_3}((m_1 \leq m_3 \,\&\, m_2 \leq m_3) \Rightarrow (m_1 \leq m_2 \textit{ or } m_2 \leq m_1))$;

Connectedness $\forall m_1, m_2 \exists m_3\ (m_3 \leq m_1 \,\&\, m_3 \leq m_2)$.

The structure represents all the possible ways the system (e.g. our world) might develop. Any one of the possible paths is called *a history* (it is a maximal, linearly ordered subset of M, sometimes also described as a "chronicle" or a "branch").

To define an Ockhamist model based on a branching strucute we use a very simple, sentential language containing operators of classical logic, two temporal operators, ('it will be the case that'—F—and 'it was the case that'—P), and an operator of historical modality ('It is settled that'—$\Box$)[1] .

Branching model $\mathfrak{M}$, based on a structure $\mathfrak{B}$, is a pair $\mathfrak{M} := \langle \mathfrak{B}, V \rangle$, where V is a valuation function which assigns a set of moments to every sentential constant, $V\colon Atom \mapsto \wp(M)$. In Ockhamism, sentences

[1]The necessity operator is sometimes read as "it is inevitable that," or "it is unpreventable that."

are evaluated in a branching model at an *index* which contains two parameters: a *moment* parameter (shifted by temporal operators) and a *history* parameter (shifted by the modal operator). Consequently, sentences are evaluated at triples $\langle \mathfrak{M}, m/h \rangle$. The Ockhamist truth ($\vDash$) of a sentence in a model at an index is inductively defined as follows:

Definition 2 (Sentence ϕ is true in model $\mathfrak{M}$, at index m/h)**.**

1. For $p \in Atom$, $\mathfrak{M}, m/h \vDash p$ iff $m \in V(p)$;
2. $\mathfrak{M}, m/h \vDash \neg\phi$ iff it is not the case that $\mathfrak{M}, m/h \vDash \phi$;
3. $\mathfrak{M}, m/h \vDash \phi \wedge \psi$ iff $\mathfrak{M}, m/h \vDash \phi \,\&\, \mathfrak{M}, m/h \vDash \psi$;
4. $\mathfrak{M}, m/h \vDash P\phi$ iff $\exists m'(m' < m \,\&\, \mathfrak{M}, m'/h \vDash \phi)$;
5. $\mathfrak{M}, m/h \vDash F\phi$ iff $\exists m'(m < m' \,\&\, m' \in h \,\&\, \mathfrak{M}, m'/h \vDash \phi)$;
6. $\mathfrak{M}, m/h \vDash \Box\phi$ iff $\forall h'(m \in h' \Rightarrow \mathfrak{M}, m/h' \vDash \phi)$.

Importantly, in Ockhamist semantics the truth value of a sentence is relative to a modal parameter—a history. There is formally nothing wrong with such a relativization, but it creates an obstacle to the application of Ockhamism to its original purpose—analysis of future contingents. Let us take the sentence (S), "There will be a space battle in the 21st century," (Fp) as used during the NATO 2018 Summit in Brussels. How should we use Ockhamist semantics to evaluate this sentence? Well, we need to check if it is true at a moment/history pair. So far so good, but which exact moment and, more importantly, which history to use? After all, the Brussels Summit has many possible continuations. And so the trouble begins.

> Our Ockhamist semantics gives us a definition of truth at a context and index (world/time pair) for arbitrary sentences in our language. But how can we move from this to the pragmatically relevant notion of truth at a context?
>
> [6, pp. 207–208]

Thus, to apply Ockhamism, we need to somehow relate the pragmatically relevant notion of the truth of a sentence used at a particular

context to the technically relevant notion of the truth of a sentence evaluated at a semantic index. I use the symbol $||\!\vdash$ to stand for the former notion of truth, and I use $\vDash$ to stand for the latter. MacFarlane coined the term *postsemantics* to designate the theory whose job is to link the two notions of truth.

The easiest postsemantics simply identifies the truth at the context with the truth at the unique semantic index initialized by the context (we advocated this solution in Wawer and Malpass [12]; it is independently defended by Gallina [4]). Nonetheless, many branching theorists reject the easy solution. They argue that the context *does* designate a moment, but it *does not* designate a history [see especially 2, pp. 151–2, 231–3]. In their view, since the act of utterance is a part of many distinct histories, we cannot distinguish *the* history in which the utterance takes place and they conclude that the history parameter is not initialized by the context of use (see e.g. Belnap et al. [2, pp. 151–152, 163–164, 232–233]; John MacFarlane [5, p. 232]; [6, p. 208]; Tomasz Placek [9, p. 756]; or Thomas Müller [8, p. 350]). Therefore, they face what I call *an initialization failure*. Ockhamist semantics requires that the process of semantic evaluation begins at some specific index, but the context does not initialize the relevant index.[2]

Hence, the simple procedure does not work. According to many theorists the context of a sentence is not sufficient to designate the appropriate circumstance for the evaluation of the sentence. The content of the sentence does not seem to do the job either. The meaning of, "There will be a space battle in the 21st century," does not indicate which history is being referred to. However, if neither the context nor the content initializes a history, then how shall one apply Ockhamist semantics?

Since the immediate route from the truth at a context to the truth at a semantic index is blocked, the authors need to find another, less direct way to relate the two notions of truth. Several postsemantic strategies have been proposed and I shall focus on two of them, both of whose distinctive feature is that they embrace a *relative* notion of truth. That is, I focus on the theories in which the meaning of the sentence supplemented by information provided by the context of use is not sufficient to assess the truth status of a sentence used at the context. According

[2] I believe that the refusal to accept *the* history of the context partly results from specific metaphysical assumptions regarding the nature of the branching structure, but I set this issue aside (the issue is discussed in 12).

to these theories, the truth value of the sentence is *relative* to some extra factor.

2 Assessment relativism

MacFarlane thinks that the relevant additional factor is the context of assessment. He argues that the truth value of a sentence used at a given context can be determined only if we also take into account the context from which the truth value of the sentence is being assessed. A premonition of such an idea can be traced back to [11], in which it is suggested that:

> [R]ather than making formulas true or false with respect only to the times at which they are true or false, we make their being true or false relative to subsequent times as well.
> [11, p. 268]

The idea was later revived by Nuel Belnap [1] under the name of "double-time reference." (However, Belnap used the technique not to assess the truth value of a sentence, but to provide satisfaction conditions for assertions and other speech acts.) Finally, John MacFarlane used Belnap's technical apparatus to formalize the double-relativized notion of truth in the form of "double-time reference postsemantics" [5, p. 331]. This postsemantics was later incorporated into a more general theory of assessment relativism [6].

The formal idea of assessment relativism, as applied to branching, is that when we assess the truth value of a sentence used at one context from the perspective of another context, we should check if the sentence assessed is true at the *context of use* with respect to the histories passing through *the context of assessment*. To state relativist postsemantics, we need an auxiliary notion of the set of histories passing through a moment:

Definition 3. $H_m = \{h | m \in h\}$

and the set of histories passing through a pair of moments:

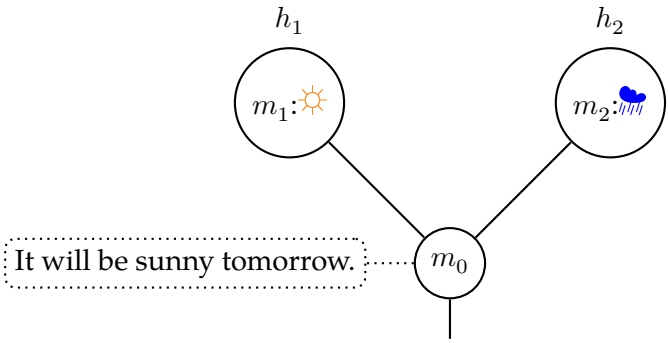
Definition 4. $H_{m_1|m_2} = \begin{cases} H_{m_1} \cap H_{m_2}, \textit{ if } m_1 \leq m_2, \\ \\ H_{m_1}, \textit{ otherwise.} \end{cases}$

We can now define assessment relativism as follows

Definition 5. $m_u, m_a \Vdash^R \phi$ iff $\mathfrak{M}, m_u/h \vDash \phi$ for every history $h \in H_{m_u|m_a}$.

A sentence is true at a pair of contexts m_u, m_a iff it is true at moment m_u in all histories passing through m_a (or all histories passing through m_u if $m_u \not\leq m_a$). Assessment relativism truly deserves its name, since the very same sentence used in a single context can be true when assessed from one perspective, false when assessed from another perspective, and neither true nor false when assessed from still another perspective.

Let us study relativist postsemantics with a particular example:



In such a model:

- $m_0, m_0 \nVdash^R F_1(sunny)$
- $m_0, m_0 \nVdash^R \neg F_1(sunny)$
- $m_0, m_1 \Vdash^R F_1(sunny)$
- $m_0, m_2 \Vdash^R \neg F_1(sunny)$

So, at the pair of contexts m_0 and m_0, the sentence "It will be sunny tomorrow" is neither true nor false: at m_0, m_1 it is true, and at m_0, m_2 it is false. MacFarlane is happy with these results as he believes that the relative truth fits well with our intuitive ascriptions of accuracy to assertions. He claims that each assertion of a future contingent should be judged to be inaccurate when assessed from the perspective of the context of use. Nonetheless, when the flow of time resolves the matter and confirms the previous prediction (i.e. the context of assessment changes), then the initial assertion should be judged accurate. Thus, MacFarlane finds intuitive support for his relative notion of truth.[3]

[3] I have my doubts with regard to MacFarlane's postsemantic solution, but I set them aside as I am currently working on a paper focused uniquely on criticism of relativism.

3 History relativism

History relativism agrees with assessment relativism that the truth status of a sentence used in a context cannot be determined based solely on the meaning of the sentence and the features of the context of use. However, in history relativism we need to assume the point of view of the entire history to assess the truth status of a sentence used at a context. In Richmond Thomason's words, we are "adopting a whole possible future for α as our perspective, rather than a single time in the future of α" [11, p. 269].

Such an attitude is characteristic of Belnap et al. [2]. In their view, unless a specific possible history is specified, a future contingent cannot be evaluated at a given context.[4] The authors express their attitude in the following words:

> Then the truth of that sentence (given indeterminism) depends not only on the moment at which the sentence is uttered. It depends in addition on which future course of events—which history—is being considered. [2, p. 225]

Nonetheless, we noticed that the authors ferociously argue against the idea that the context indicates which history *should* be considered (after all, an utterance is a part of many different courses of events). As a result, it is simply meaningless to call a future contingent true or false at the context of its use m_c. As the authors put it:

> "$\mathfrak{M}, m_c \vDash Will$: *the coin lands heads*" does not make sense. [2, p. 155]

Only when a continuation of the moment of utterance is independently specified can one ask about the truth value of the uttered sentence. Therefore, the history relativists' answer to the question whether the sentence "there is going to be a sea battle tomorrow" is true is somewhat evasive. They claim that the sentence is true relative to the continuation in which the sea battle takes place, but it is false relative to the alternative continuation. This is as much as can be said regarding the truth value of a sentence at a context.

[4] Their terminology differs from mine. When I write about a sentence being true at a context, Belnap et al. [2] write about a stand-alone sentence being true at a context-initialized point of evaluation.

We may say that history relativists simply capitulate in face of the initialization failure. Given the evident indispensability of the history parameter in Ockhamist semantics, they simply duplicate the history parameter on the level of postsemantics. We end up with a theory according to which the truth value not only of a sentence-at-index but also of a sentence-at-context is relative to a history.

Definition 6 (History relativism postsemantics)**.** $m/h \Vdash^{H} \phi$ iff $m/h \vDash \phi$.

When we apply history relativism to future contingents it becomes clear that their truth value (at context) is highly arbitrary—it depends on something as whimsical as an entirely unmotivated choice of a history parameter. This is a rather controversial consequence. One could argue that the truth value of a sentence used in a context should be grounded in something more solid than an *ad hoc* decision of a semanticist who needs one history or another to do her job.

It is also not entirely clear of what this decision should consist. When relativists talk in terms of abstract Ockhamist semantics, they say that a possible future needs to be "posited" [11, p. 271] or "supplied" [2, p. 156]. However, when they try to give a more down-to-earth description of the procedure, they often help themselves with intentional vocabulary. For example, Burgess writes that "The truth value of a future tense statement depends on which branch we *think of* as representing the course of events which is actually going to turn out to happen" [3, p. 575, emphasis mine] and Müller [8] echoes that "we normally need to specify which of the equally possible futures we *mean to* refer to" [8, p. 354, emphasis mine]. However, if all that is required to specify a possible history is an intention of a speaker (this procedure is called "inner baptism in [7]), then making predictions true or false would be all too easy. Such a procedure has very little in common with everyday usage. When Themistocles said to Eurybiadeds, "There will be a sea battle tomorrow," no one could make this sentence true or false just by thinking of a specific possible future.[5]

[5]Let me note that Belnap et al. [2] have their own ways of domesticating their proposal. Specifically, they argue that the "bare" truth value of a sentence at a context is *irrelevant* to the linguistic practice. What really matters in their view is the *settled* truth value. They notice that it is often settled that future contingents will have had a settled truth value and explain how this feature is sufficient to explain linguistic practice. A sketch of their proposal can be found in [2, sec. 6E]; the view is developed in [1].

In what follows, I will argue that there is another way to rationalize history relativism. In my proposal, the truth value of a sentence used at a context is still relative, but the choice of a specific history is neither arbitrary nor does it depend on a subject's intentions. I claim that the choice of the history becomes well motivated when we understand a history as a special context of assessment.

4 History relativism as extreme assessment relativism

In this section, I argue that history relativism can be understood as an extreme version of MacFarlane's assessment relativism; some inspiration for this approach can be found in a short passage by Prior:

> [T]he Ockhamist seems to treat what is still future in a way in which it would only be proper to treat what *has been* future—he views it as it would be proper to view it from the end of time. [10, pp. 130–131]

This line of thinking about Ockhamism seems to have been discarded in the later development of the theory, but it might be used to establish a new understanding of the history-relative notion of truth. I intend to develop the idea that when history relativists relativize the truth value of a sentence at context to a history, they metaphorically situate themselves at the transcendent end of the history. Then, they indeed view a course of events "as it would be proper to view it from the end of time."

In the spirit of Prior's philosophy, let me elucidate the insight above by giving it a formal reconstruction. I intend to apply MacFarlane's assessment relativism to demonstrate that the notion of truth at a context relative to a history can be understood as truth at a pair of contexts. We shall see that—in accordance with Prior's insight—the context of assessment needs to be situated at the end of time.

Let me begin the investigations with a simple example. Consider a branching model $\mathfrak{M}$ in which there is a maximal element in every history—"the end of time"—in this history (there is at most one such element, given that histories are linearly ordered). If we symbolize the maximal moment in history h as m_h, it is easy to observe that:

Lemma 1. If $\mathfrak{M}$ is a model in which there is a maximal element m_h in every history h, then $\forall_h(H_{m_h} = \{h\})$

Proof. Take an arbitrary history $h \in \mathfrak{M}$, $m_h \in h$, so $h \in H_{m_h}$, therefore, $\{h\} \subseteq H_{m_h}$. To prove that $H_{m_h} \subseteq \{h\}$, assume for reduction that $\exists_{h'} h' \neq h \,\&\, m_h \in h'$. Since $h \neq h'$, $\exists_{m' \in h'} m' \in h' \,\&\, m' \notin h$. As $m_h, m' \in h'$ and h' is linearly ordered, there are two options:

1. If $m' < m_h$, then (by no-backward-branching and maximality of h) $m' \in h$, which contradicts our assumption.

2. If $m_h \leq m'$, then (since m_h is the maximal element of h and h is a maximal, linearly ordered subset of M) $m_h \not< m'$. Thus, $m' = m_h$, but then $m' \in h$, which contradicts our assumption.

A simple proof is sufficient to establish that for any m in model $\mathfrak{M}$ described above, a sentence is true relative to a history h iff it is assessed as true from the perspective of moment m_h, i.e. from the end of time in history h:

Fact 1. $m/h \,||\!\vdash^H \phi$ iff $m, m_h ||\!\vdash^R \phi$

Proof. Since $m, m_h \in h$ and m_h is the maximal element of h, then $m \leq m_h$. From this we can conclude that $H_{m|m_h} = (H_m \cap H_{m_h}) = H_{m_h}$. Hence, $H_{m|m_h} = H_{m_h}$. By lemma 1, $H_{m_h} = \{h\}$. Therefore, $H_{m|m_h} = \{h\}$.

1. $m, m_h ||\!\vdash^R \phi$ iff

2. $m/h' \vDash \phi$, for every $h' \in H_{m|m_h}$ iff (since $H_{m|m_h} = \{h\}$)

3. $m/h \vDash \phi$ iff (by def. 6)

4. $m/h ||\!\vdash^H \phi$.

Thus, in the "upper-bounded" model it is easy to substantiate Prior's claim; however, application of Ockhamism is not limited to such models. It might well be that some (or even all) of the histories in a model have no end. In such a case, what would it mean for an Ockhamist to view the future "as it would be proper to view it from the end of time?" I propose to read it along the following lines: an Ockhamist views the future as it would be proper to view it from a *transcendent* end of time.

To give formal meaning to the maxim, I construct what I call a *doomsday extension* of a branching model. Let $\mathfrak{M} := \langle M, < \rangle$ be a branching model. We extend the model $\mathfrak{M}$ with a set M_D such that:

(i) $\forall_h \exists!_{m_h \in M_D} \forall_{m \in h} m < m_h$

(ii) $\forall_{m_h \in M_D} \exists!_h \forall_{m \in h} (m < m_h \Leftrightarrow m \in h)$

This means that we attach a single extra moment on top of every history in the original model $\mathfrak{M}$. I will call such an extended structure $\mathfrak{M}^{\mathfrak{D}}$, and m_h is the moment which is attached on top of history h. Let me pause to show that model $\mathfrak{M}^{\mathfrak{D}}$ is still a model of branching. Its ordering relation is evidently a partial order, so let me just check if it is a connected order without backward branching.

Fact 2 ($\mathfrak{M}^D$ is a BT model)**.**

Connectedness $\forall_{m,n \in M} \exists_{o \in M} o \leq m \,\&\, o \leq n$

Proof. The only interesting case is when we pick $m_{h_1}, m_{h_2} \in M^D$. In this case, we just need to choose any moment $m \in h_1$ and $n \in h_2$. By definition of $\mathfrak{M}^{\mathfrak{D}}$, $m < m_{h_1}$ and $n < m_{h_2}$, and since m and n are connected and $\leq$ is transitive, m_{h_1} and m_{h_2} are also connected.

No-Backward-Branching
$\forall_{m_1, m_2, m_3} (m_1 \leq m_3 \,\&\, m_2 \leq m_3) \Rightarrow (m_1 \leq m_2 \vee m_2 \leq m_1)$

Proof. We just need to check if it is satisfied for every $m_3 = m_h \in M_D$. Take an arbitrary $m_h \in M_D$, then by condition (ii) we have that all the moments below m_h are in a single history. And since every history is linearly ordered, there is no danger of backward branching.

Before I proceed, let me observe that the construction of $\mathfrak{M}^{\mathfrak{D}}$ guarantees that there is a maximal element in every history. Therefore, lemma 1 applies, and we have that in $\mathfrak{M}^{\mathfrak{D}}$, $\forall_h H_{m_h} = \{h\}$.

Let us investigate the relations between history relativism and assessment relativism in the doomsday model.

Observe first that there is $\mathfrak{M}$ and ϕ such that:

$$\mathfrak{M}, m/h \Vdash^{H} \phi \;\&\; \mathfrak{M}^{\mathfrak{D}}, m, m_h \nVdash^{R} \phi$$

There are two kinds of reasons for the failure.

"Material" There may be ϕ which is false everywhere in h, but true at m_h. ("Four horsemen of the Apocalypse are riding their horses" is a good candidate for ϕ). Then $G\neg p$ is true at any moment in h in the base model, but false in the doomsday extension of the model.

"Structural" The addition of doomsday significantly modifies the structure of the histories. Most evidently, seriality no longer holds and thus $G\phi \to F\phi$ is not valid in the extended model.

It is then a valid question whether we can give formal credit to Prior's insight in the general case. I propose a relatively easy solution: limit the range of the future operator such that it does not reach all the way to doomsday. In this sense, doomsday is truly a transcendent end of time as it cannot be reached by the "mundane" future operator. The new definition of F in the doomsday model should be modified as follows:

Definition 7.

$$\mathfrak{M}^{\mathfrak{D}}, m/h \vDash F\phi \text{ iff } \exists_{m'}(m' \in h \,\&\, m' > m \,\&\, m' \neq m_h \,\&\, \mathfrak{M}^{\mathfrak{D}}, m'/h \vDash \phi).$$

By the duality of F and G, we obtain that
$\mathfrak{M}^{\mathfrak{D}}, m/h \vDash G\phi$ iff $\forall_{m'}(m' \in h \,\&\, m' > m \,\&\, m' \neq m_h) \Rightarrow \mathfrak{M}^{\mathfrak{D}}, m'/h \vDash \phi$.

Therefore, we end up with a model which has an extra element on top of every history, but the element is not attainable by the connective "it will be the case that." So, doomsday is in one sense at the end of time, but in another it is outside of time. I am not sufficiently versed in theology to give a convincing account of this idea, but I am quite confident that it has been entertained at some point in the history of human thought. Importantly for us, this modification makes it possible to prove an analogue of fact 1 in full generality:

Fact 3. Let $\mathfrak{M}$ be an arbitrary branching model and $\mathfrak{M}^{\mathfrak{D}}$ its doomsday extension, and let $m \in \mathfrak{M}$, then:

$$\mathfrak{M}, m/h \Vdash^{H} \phi \text{ iff } \mathfrak{M}^{\mathfrak{D}}, m, m_h \Vdash^{R} \phi$$

Proof. By induction on complexity of ϕ, in particular:

1. $\mathfrak{M}, m/h \Vdash^{H} F\phi$ if (by def. 6)
2. $\mathfrak{M}, m/h \vDash F\phi$ iff (by def. of F)
3. $\exists_{m'|m' \in h \,\&\, m' > m} \mathfrak{M}, m'/h \vDash \phi$ iff (by def. 6)
4. $\exists_{m'|m' \in h \,\&\, m' > m} \mathfrak{M}, m'/h \Vdash^{H} \phi$ iff (by inductive assumption)
5. $\exists_{m'|m' \in h \,\&\, m' > m} \mathfrak{M}^{\mathfrak{D}}, m', m_h \Vdash^{R} \phi$ iff (by def. 5)
6. $\exists_{m'|m' \in h \,\&\, m' > m} \forall_{h' \in H_{m'|m_h}} \mathfrak{M}^{\mathfrak{D}}, m'/h' \vDash \phi$ iff (since $m' < m_h$, by def. 4)
7. $\exists_{m'|m' \in h \,\&\, m' > m} \forall_{h' \in H_{m_h}} \mathfrak{M}^{\mathfrak{D}}, m'/h' \vDash \phi$ iff (by Lemma 1)
8. $\exists_{m'|m' \in h \,\&\, m' > m} \mathfrak{M}^{\mathfrak{D}}, m'/h \vDash \phi$ iff ($m' \in h$, so $m' \neq m_h$)
9. $\exists_{m'} (m' \in h \,\&\, m' > m \,\&\, m' \neq m_h \,\&\, \mathfrak{M}^{\mathfrak{D}}, m'/h \vDash \phi)$ iff (by def. 7)
10. $\mathfrak{M}^{\mathfrak{D}}, m/h \vDash F\phi$ iff (by Lemma 1)
11. $\forall_{h \in H_{m_h}} \mathfrak{M}^{\mathfrak{D}}, m/h \vDash F\phi$ iff (since $m < m_h$, by def. 4)
12. $\forall_{h \in H_{m|m_h}} \mathfrak{M}^{\mathfrak{D}}, m/h \vDash F\phi$ iff (be def. 5)
13. $\mathfrak{M}^{\mathfrak{D}}, m, m_h \Vdash^{R} F\phi$

Thanks to the modification of the truth clause of F in the doomsday model, we can give full credit to Prior's insight. The Ockhamist looks at the future as if it has been future, that is, from the perspective of the end of time. A necessary addition to vindicate this insight is that in the models in which time has no end, the end of time is "beyond time."

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Remarks on Hybrid Modal Logic with Propositional Quantifiers

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Abstract

Arthur Prior invented hybrid logic, and sometimes defined nominals with his Q operator, which he in turn defined using propositional quantifiers. Nowadays there are two well-known approaches to propositional quantification: the standard (or set-theoretical) approach and the general (or Henkin) approach. As we shall see, these give rise to two different 'species' of nominals. Working in a version of hybrid logic which contains *both* standard nominals and propositional quantifiers we shall see that these two 'species' behave differently with respect to the rule of universal instantiation. We then suggest that this formally-defined 'species division' corresponds rather well with two intuitions about nominals that can be detected in Prior's writing: the 'index' view and the 'content' view.

Keywords: Arthur Prior, hybrid logic, nominals, propositional quantifiers, general models, tableau systems.

1 Introduction

In the familiar Kripke semantics for modal logic, the truth-value of a formula is defined relative to the points in a set; that is, a formula is evaluated 'locally', at a point, where points are usually taken to represent possible worlds, times, locations, persons, or computational states. Contemporary hybrid logics are extended modal logics in which it is possible to directly refer to such points in the logical object-language using *nominals*, propositional symbols of a new sort; nominals are typically written as i, j, and k to distinguish them from the ordinary propositional symbols, which are usually written as p, q, and r. Nominals are interpreted in a restricted way: they are guaranteed to be true at exactly one point in any model. Thus, in contemporary hybrid logic, a nominal can be considered to be an atomic 'propositional term' that names a world or a time, and in what follows we shall often call such symbols *standard nominals*. The history of what is now known as hybrid logic traces back to Arthur Prior's pioneering work on modal and tense logic from the 1950s and 60s; see [6] for background.

Sometimes, however, Arthur Prior introduced nominals not as a second sort of propositional symbol, but as an ordinary propositional symbol (p say) preceded by the Q operator, and he spelt out what Qp meant using propositional quantifiers. For example in [10], page 237 he says:

> For 'p is an individual' (or an instant, or a possible total world-state) we write Qp. If we have propositional quantifiers, we can define Qp thus:
>
> $$Qp = \Diamond p \wedge \forall q(\Box(p \to q) \vee \Box(p \to \neg q))$$

Prior defines Qp in this way in other places as well (see, for example, [10], page 129). For a discussion of the origin of the Q operator, see [9].

In this definition, Prior uses the $\Box$ and $\Diamond$ operators to mean *true at all worlds* and *true at some world* respectively — that is, they are the Box and Diamond forms of an S5 modality that nowadays is often called the *universal modality*.[1] With this noted, it is clear that Qp says that p is both

[1]The modal logic $S5$ is one of simplest and most important modal logics. In terms of Kripke semantics, S5 can be thought of as the modal logic of models in which every world is related to every world (that is: models bearing the universal relation).

possible and *maximal*: p is true *somewhere* (the $\Diamond p$ conjunct secures this) and in addition p strictly implies *every* proposition q or its negation;[2] this is secured by the conjunct:

$$\forall q(\Box(p \to q) \vee \Box(p \to \neg q)).$$

Note the crucial role played by the propositional quantifier $\forall q$.

In the present paper we shall take a closer look at the nominals defined using propositional quantifiers. We shall do so by working with a basic hybrid language enriched with propositional quantifiers. To spell this out a little: the language that we define will contain ordinary propositional symbols, a single modality $\Box$ (and its dual $\Diamond$), which we will interpret universally, plus standard nominals i, j, k and so on, together with a *satisfaction operator* $@_i$, $@_j$, $@_i$ for each nominal;[3] these are the syntactic elements of what nowadays is called the *basic hybrid language*. To this we shall add propositional quantifiers: for each ordinary propositional symbol p, q, r we shall allow ourselves to form expressions of the form $\forall p\varphi$, $\forall q\varphi$, $\forall r\varphi$ and so on. Thus in the enriched language we will have both standard nominals (like i, j, k) and — because we have propositional quantifiers and a universally interpreted modality — we will be able to define Prior's Q operator and use it to define a second species of nominals. Having both in the same object language will make it easier to explore their similarities and differences.

Now, it is straightforward to extend basic hybrid logical *syntax* to cover propositional quantifiers, but the formal semantics brings us face-to-face with a much-studied choice point: should we simply say that propositional quantifiers range over *all* subsets of worlds — that is, *all* propositions — in which case we are working with what is called the *standard*, or *full*, or *set-theoretic* semantics? Or should we view the propositional quantifiers as ranging over a *pre-selected set of subsets of worlds* (usually called the *admissible subsets* or the *admissible propositions*)? This second choice traces back to Leon Henkin's pioneering work on higher-order logic in the 1950s, and is often called the *general* semantics; note that the standard semantics is the special case of the general semantics

[2]We say p strictly implies q iff at every world where p is true, q is true too; $\Box(p \to q)$ says precisely this (given that $\Box$ is the universal modality).

[3]A formula of the form $@_i\varphi$ says that φ is true at one particular point, namely the point the standard nominal i refers to, and similarly for j, k and so on.

in which the admissible subsets are *all* subsets of worlds.

The distinction between the standard and the general semantics is of direct relevance to Prior's definition of the Q operator. As we will see, under the standard semantics for propositional quantification, $Q\varphi$ says that the denotation of the formula φ is a singleton, thus the standard semantics yields standard nominals.[4] However, as we will also see, under the general semantics for propositional quantification, $Q\varphi$ says something rather different. As before, Qp says that p is both possible and maximal, but the sense of maximality has shifted subtly: the conjunct $\forall q(\Box(p \to q) \vee \Box(p \to \neg q))$ now tells us that p strictly implies every *admissible* proposition q or its negation. Under the general interpretation $\forall q$ only ranges over all admissible propositions, and as we will see, this has logical consequences. We will soon dig deeper into these, but for now let's highlight the key points we wish to make:

> *Viewed formally, Prior's definition of a nominal as Qp gives rise to two distinct species of nominals: if we adopt standard semantics, the nominals obtained are identical to those used today; if we use the general semantics we obtain something interestingly different. Moreover, we shall also see that this formally-defined species division corresponds rather well with two intuitions about nominals that can be detected in Prior's writing: his 'index' view and his 'content' view.*

We shall make these points via a series of four observations — three technical, one historical. The first is this: the unrestricted *universal instantiation rule* (the familiar inference rule that allows us to replace universal quantifiers by specific instances) says that a universally quantified propositional symbol can be replaced by *any* formula. As we shall see, however, the soundness of this rule depends on which species of formula we are allowed to substitute. If we allow a propositional symbol to be replaced by any formula at all, including standard nominals, then the rule is *not* sound with respect to the general semantics. However, the (unrestricted) universal instantiation rule *is* sound with respect to the standard semantics where quantifiers range over all subsets of worlds.

[4]That is, under the standard semantics, if $Q\varphi$ is true, then φ is true at a *unique* world (say w). Here's another way of saying the same thing: under the standard semantics, if $Q\varphi$ is true, then the proposition that φ expresses is $\{w\}$, the set of worlds consisting of only the single world w where φ is true. Either way, this is the semantics for nominals standardly used in contemporary hybrid logic.

The second observation is this: if we add a side-condition to the universal instantiation rule stating that the only formulas which can be substituted for propositional symbols are those *not* containing nominals as atomic formulas, then the rule becomes sound with respect to the general semantics.

The third observation is this: if we *do not* want to restrict which formulas are substitutable when using this rule, but we *do* want to work with the general semantics, then, to ensure soundness, we should work with general models satisfying the *discreteness* property: the domain of the propositional quantifiers (that is, the collection of admissible propositions) should contain every *singleton* set of worlds. That is, if w is a world, then $\{w\}$ should be an admissible proposition.

These technical observations lead naturally to our fourth — historical — observation. Prior seems to have thought about nominals in (at least) two distinct ways, and his two conceptions align neatly with the species distinction we have drawn. In particular, what we might call Prior's 'index' view of nominals matches the Qp definition under the standard interpretation of propositional quantifiers, but Prior also had a 'content' view, and this fits rather well with the Qp definition when viewed via the general interpretation. We note some of the issues involved, and point towards future work, in the paper's conclusion.

2 Syntax

We first present the syntax of L_{BHPQ}, the language we shall use in this paper. As we said above, syntactically L_{BHPQ} is just the basic hybrid language augmented with propositional quantifiers. Let $SYM = \{p, q, r, ...\}$ be a countably infinite set of propositional symbols and $NOM = \{i, j, k, ...\}$ be a set of (standard, contemporary) nominals; *SYM* and *NOM* are chosen to be disjoint. Then the formulas of L_{BHPQ} are:

$$\varphi \ ::= \ p \mid i \mid \neg\varphi \mid \varphi \wedge \varphi \mid \Box\varphi \mid @_i\varphi \mid \forall p\varphi$$

where $p \in SYM$ and $i \in NOM$. Other Boolean connectives are defined in the standard way, and $\Diamond\varphi$ and $\exists p\varphi$ are defined as $\neg\Box\neg\varphi$ and $\neg\forall p\neg\varphi$ respectively. Note that standard nominals can appear in two syntactically distinct ways: if i appears as a subscript to $@$, then we say it occurs in *operator position* and if it occurs as an atomic symbol, then we say it

occurs in *formula position*.

This is simple syntax, but we need to be careful. The propositional quantifiers *bind* the propositional symbols, and the symbols they bind mark positions that are available for substitution by other formulas. As the distinctions we wish to draw will be reflected by restrictions on which symbols can and cannot legitimately be substituted into these positions, we need to be precise here. As a first step, we draw the usual distinction between free and bound symbols. For example, in

$$\forall p \forall q(q \to \Box(\Diamond q \vee p))$$

there are two propositional symbols (p and q) but all occurrences of either symbol are *bound* (either by $\forall p$ or by $\forall q$). On the other hand, in

$$\forall p \forall q(q \to \Box(\Diamond r \vee p))$$

we also have a *free* propositional symbol (namely r), a symbol not bound by any quantifier. We shall write $FS(\varphi)$ to denote the free propositional symbols that a formula φ contains — thus to return to our two examples, we have that

$$FS(\forall p \forall q(q \to \Box(\Diamond q \vee p))) = \{\} \text{ and } FS(\forall p \forall q(q \to \Box(\Diamond r \vee p))) = \{r\}.$$

The idea should now be clear; we inductively define $FS(\varphi)$ as follows:

Definition 1. The set of *free propositional symbols* in a formula φ is denoted $FS(\varphi)$ and is defined by:

- for any $p \in SYM$, $FS(p) = \{p\}$
- for any $i \in NOM$, $FS(i) = \{\}$
- $FS(\neg\varphi) = FS(\varphi)$
- $FS(\varphi \wedge \psi) = FS(\varphi) \cup FS(\psi)$
- $FS(\Box\varphi) = FS(\varphi)$
- $FS(@_i\varphi) = FS(\varphi)$
- $FS(\forall p\varphi) = FS(\varphi) - \{p\}$

There is another (slightly trickier) syntactic definition we shall need in what follows: the result of substituting a formula ψ for free occurrences of a propositional symbol q in a formula φ, which we shall write

as $\varphi[\psi/q]$. First, why do we need this concept? Because it is a fundamental deductive operation for the propositional quantifiers. Here is the intuition. A formula of the form $\forall q\varphi$ is a claim that for *any* proposition q, φ holds. Thus, given any formula ψ — after all, formulas express propositions! — we should be able to discard the $\forall q$ in front of the φ, substitute ψ for the newly-freed occurrences of q in φ, thereby deducing $\varphi[\psi/q]$. Here's a simple example: given

$$\forall q \forall p(q \wedge \neg p)$$

then we should be able to throw away the $\forall q$ and substitute ψ for the newly-freed occurrence of q resulting in

$$\forall p(\psi \wedge \neg p).$$

In essence, all we are saying is that the rule of universal instantiation is a legitimate deductive rule for propositional quantifiers.

Well — the basic intuition is certainly correct, but much of this paper is about exploring its nuances. For a start, just as in classical logic we need to beware of *accidental binding* ruining the process. Consider another example. Once again, suppose we are given

$$\forall q \forall p(q \wedge \neg p)$$

but that this time we substitute p for the newly-freed q resulting in

$$\forall p(p \wedge \neg p).$$

This *cannot* be right — the substituted symbol p has been 'accidentally captured' by $\forall p$. We have changed the meaning — a free slot in the formula has become a bound slot — and (even worse) we have managed to convert the formula to one that is guaranteed to be false!

But there is a standard remedy: the following inductive definition pins down the safe substitutions that we will use when we define the rule of universal instantiation in Section 5:

Definition 2. The formula ψ is free for q in φ if and only if

- $\varphi = p$ for some $p \in SYM$
- $\varphi = i$ for some $i \in NOM$

- $\varphi = \chi \wedge \sigma$ and ψ is free for q in χ and in σ
- $\varphi = \Box\chi$ and ψ is free for q in χ
- $\varphi = @_i\chi$ and ψ is free for q in χ
- $\varphi = \forall r\chi$, ψ is free for q in χ and if $q \in FS(\chi)$, then $r \notin FS(\psi)$

Note the crucial role played by the last clause in ruling out accidental binding. Spelling it out, this says that if we want to substitute ψ for q in χ then (i) ψ has to be free for q in χ as in the previous clauses, and (ii) if the substitution really can be carried out (that is, if $q \in FS(\chi)$, so there really is an open q-slot to substitute into) then r must *not* be free in ψ, since it will be grabbed and bound by $\forall r$. As usual, however, by changing bound variables appropriately we can always bypass such problems. To return to our example: if instead of (foolishly) insisting on substituting p for the newly-freed q in $\forall p(q \wedge \neg p)$ we had first changed this formula to (say) the formula $\forall s(q \wedge \neg s)$, which says exactly the same thing, then we would obtain a correct result: $\forall s(p \wedge \neg s)$. In short, the basic *syntactical* properties of L_{BHPQ} are much like those familiar from first-order logic.

3 Semantics

Now for the semantics — and this brings us face-to-face with a fundamental divide: the chasm separating first- and second-order logic. As propositional quantification is a form of second-order quantification, this chasm is directly relevant to our discussion, so let's begin with a little background.

At first glance, the first-order/second-order divide isn't obviously dangerous. Compare the following two arguments:

All logicians are mortal	All logicians are humble
Arthur is a logician	Arthur is all a logician is
Therefore Arthur is mortal	Therefore Arthur is humble

Here they are in first-order and second-order notation:

$$\begin{array}{c} \forall x(Lx \to Mx) \\ La \\ \hline \therefore Ma \end{array} \qquad \begin{array}{c} \forall x(Lx \to Hx) \\ \forall P(\forall x(Lx \to Px) \to Pa) \\ \hline \therefore Ha \end{array}$$

The left is first-order notation: quantifiers only bind symbols in term position: $\forall \boldsymbol{x}(L\boldsymbol{x} \to M\boldsymbol{x})$. The right is second-order notation: quantifiers can bind predicate positions: $\forall \boldsymbol{P}(\forall x(Lx \to \boldsymbol{P}x) \to \boldsymbol{P}a)$. This distinction looks rather trivial syntactically — but semantically it leads to a vast *increase* in expressive power and a vast *decrease* in logical tractability. For example, second-order logic is *not* axiomatisable and lacks many other properties (such as compactness) that make first-order logic technically attractive; see Chapter 4 of [7] for a short and clear exposition.

But there is an elegant cure: in 1950 Leon Henkin showed us how to 'tame' second-order (and, more generally, higher-order) logic; see [11]. His basic insight was simple: instead of interpreting second-order (or higher-order) quantifiers as ranging across *all* subsets of the domain of quantification, view them as ranging across a pre-selected set of admissible subsets. As he showed, if these subsets satisfied certain intuitive constraints, natural completeness results could be proved.[5]

Now, propositional quantification is a form of second-order quantification: after all, in Kripke semantics, propositions are interpreted as sets of possible worlds or times — thus, viewed standardly, our innocent looking formulas $\forall p\varphi$ are attempting something potentially dangerous, namely to quantify across *all* subsets of these entities! And indeed, in 1972, S. K. Thomason showed that the danger was not merely potential but actual: he proved a frame *incompleteness* result for Priorean tense logic; see [12].[6] Fortunately, Thomason simultaneously showed that a Henkin-style second-order logic-taming approach could be applied to modal logic, and this gave rise to what is now called the *general frame* semantics for modal logic, which we shall use here.[7]

[5]One way of looking at Henkin's ideas and results is to say that he showed how to reduce higher-order logic to (sorted) first-order logic by working with deliberately pre-structured models rather than with the menu of pre-packaged models automatically provided by set theory.

[6]Thomason's results were stated in terms of frame validity (that is: via universal propositional quantification in the meta-language) rather than for an object-language containing propositional quantifiers, but the danger is the same, as is the cure.

[7]General frame approaches to modal semantics are nowadays a fundamental item in the toolbox of modal logic; see pages 28–31 and pages 303–318 of [3] for a detailed introduction; general semantics is intimately linked to the algebraic semantics for modal logic. Moreover, the fact that simple propositional modal and tense logics offer a vast amount of second-order expressive power when it comes to pinning down frame structure has been a central topic in modal logic since 1972; much of Chapter 3 of [3] is devoted to this second-order perspective, which was first systematically explored by

Definition 3. A *general frame* is a triple $\langle W, R, \Pi \rangle$ where W is a non-empty set (worlds), R is a binary relation on W (the accessibility relation) and Π is a non-empty collection of subsets of W (the admissible subsets) closed under the following operations:

- relative complement: if $X \in \Pi$, then $W - X \in \Pi$
- intersection: if $X, Y \in \Pi$, then $X \cap Y \in \Pi$
- modal projection: if $X \in \Pi$, then $\{w \in W : \forall v(wRv \to v \in X)\} \in \Pi$

The intuition here is that propositions are sets of possible worlds. In the special case of a general frame with $\Pi = \mathcal{P}(W)$ — that is, when *all* possible subsets of the set of possible worlds are propositions — then we say we have a *standard* general frame (or more simply: a *standard* frame).[8] However (and this is the key Henkin insight that Thomason put to work) we do not need to work with all possible subsets, just with collections of subsets of worlds with 'enough logical structure'. This is what the three conditions achieve: relative complement gives us the structure needed to cope with negated propositions, intersection gives us the structure needed to cope with conjunctive propositions, and modal projection gives us what is required to cope with modalities (for further motivation and discussion, we refer the reader to [3], particularly pages 28–31).

Now for the definition of a general model: the interpretation of the standard nominals will be taken care of by a naming function N assigning a world to each standard nominal, while the interpretation of the propositional symbols will be given by a valuation function V:

Definition 4. A general model $\mathfrak{M}$ based on a general frame $\langle W, R, \Pi \rangle$ is a tuple $\langle W, R, \Pi, N, V \rangle$ where $N : NOM \to W$ and $V : SYM \to \Pi$. The

Johan van Benthem in his PhD thesis, later published as [1].

[8]Standard frames are often called *full* frames to emphasize that Π contains *all* elements of $\mathcal{P}(W)$. Incidentally, later in the paper we will discuss discrete general frames and atomic general frames; we will usually keep it simple and just call them discrete frames and atomic frames.

truth conditions are as follows:

$$
\begin{array}{rcl}
\mathfrak{M}, w \vDash p & \textit{iff} & w \in V(p) \textit{ where } p \in \textit{SYM} \\
\mathfrak{M}, w \vDash i & \textit{iff} & w = N(i) \\
\mathfrak{M}, w \vDash \neg\varphi & \textit{iff} & \textit{it is not the case that } \mathfrak{M}, w \vDash \varphi \\
\mathfrak{M}, w \vDash \varphi \wedge \psi & \textit{iff} & \mathfrak{M}, w \vDash \varphi \textit{ and } \mathfrak{M}, w \vDash \psi \\
\mathfrak{M}, w \vDash \Box\varphi & \textit{iff} & \textit{for all } v \in W \textit{ such that } wRv, \textit{we have } \mathfrak{M}, v \vDash \varphi \\
\mathfrak{M}, w \vDash @_i\varphi & \textit{iff} & \mathfrak{M}, N(i) \vDash \varphi \\
\mathfrak{M}, w \vDash \forall p\varphi & \textit{iff} & \textit{for all } \mathfrak{M}' = \langle W, R, \Pi, N, V' \rangle \textit{such that } V'(q) = V(q) \\
 & & \textit{whenever } q \neq p, \textit{ we have } \mathfrak{M}', w \vDash \varphi
\end{array}
$$

Note how the last clause works: V' is essentially a way of 'trying out' the effect of every admissible proposition in the newly-freed p-slot (and note that it *only* changes what is assigned to the p-slot; that is what the restriction $V'(q) = V(q)$ whenever $q \neq p$ secures). That is: we are able to 'try out' every admissible choice for p from Π, and only if they *all* lead to truth do we conclude that $\forall p\varphi$ itself is true.

Apart from occasional side remarks, in what follows we shall confine our attention to universally related general frames, that is, to general frames $\langle W, R, \Pi \rangle$ where $R = W \times W$. Thus we are assuming that every world is related to every other world (and itself). This is because, as mentioned earlier, Prior interprets $\Box$ and $\Diamond$ universally in his definition of Q. We will say that a formula φ is a *general validity* on a general (universally related) frame $\langle W, R, \Pi \rangle$ iff for any model $\langle W, R, \Pi, N, V \rangle$ and any $w \in W$ we have that $\langle W, R, \Pi, N, V \rangle, w \vDash \varphi$, and we will say it is a *general validity* iff it is valid on all such frames. Similarly, we will say that a formula φ is a *standard validity* on a standard (universally related) frame $\langle W, R, \Pi \rangle$ iff for any model $\langle W, R, \Pi, N, V \rangle$ and any $w \in W$ we have that $\langle W, R, \Pi, N, V \rangle, w \vDash \varphi$, and we will say it is a *standard validity* iff it is valid on all such frames.

4 Fine's formula

In a pioneering paper on modal logic with propositional quantifiers [8], Kit Fine drew attention to the following formula:

$$(*) \qquad \exists p(p \wedge \forall q(q \to \Box(p \to q))).$$

Why is it interesting here? Well — because (1) it is a standard validity, (2) it is not a general validity, (3) it is a general validity on any general frame satisfying the discreteness property mentioned earlier, (4) is also generally valid on any general frame satisfying an *atomicity* property and (5) it is closely related to the formula Prior used to define Q. Let's look a little closer at all five claims.

First, it is easy to check that Fine's formula (*) is true at any world in any standard model at all (whether universally related or not). To see this, let w be the world of evaluation. Let the outermost existential quantifier pick out the singleton set $\{w\}$; the truth of the formula follows immediately. As w was an arbitrary evaluation point, it follows we can never falsify this formula on (any) standard model.

Second, Fine's formula *can* be falsified on some general models (so it is not a general validity). We won't prove this, but point the reader to the second general frame in Example 5.67, page 307 in [3], which falsifies (*) on a general frame when we interpret $\Box$ and $\Diamond$ using $W \times W$.

Third, Fine's formula is valid on any *discrete* general frame, that is, on any general frame where all singleton sets of worlds are admissible propositions (that is, where for any $w \in W$, we have $\{w\} \in \Pi$).[9] This is easy to see — just use the argument used in our first observation above.

Fourth — and more interestingly — as Fine points out in his paper, (*) says that the set of propositions must be *atomic* over the set of worlds; we won't prove this here, but we will explain the terminology. A general frame is *atomic* when every $w \in W$ belongs to some minimal non-empty element of Π. Clearly standard frames and discrete frames are atomic — trivially $\{w\}$ is the required minimal non-empty element of Π in both! The more interesting point is that in some atomic frames *atoms may contain multiple worlds*, and such atomic frames are *not* discrete.[10]

[9] Obviously any standard frame is discrete — but there are also plenty of discrete frames that are *not* standard. This is not so obvious — any discrete non-standard frame must be infinite. This is because, if we have all singleton sets of a finite set, then we can generate *all* of its subsets simply by taking intersections and complements, which means that finite discrete frames are standard. However if we try to generate all subsets of an infinite set in this way, we end up with a general frame in which Π contains just the *finite* and *co-finite* sets, rather than all elements of $\mathcal{P}(W)$; see page 30 of [3] for the relevant definitions.

[10] So to sum up: $\mathsf{STANDARD} \subset \mathsf{DISCRETE} \subset \mathsf{ATOMIC}$. The class of standard frames is included in the class of discrete frames, which in turn is included in the class of atomic frames. Both inclusions are proper: there are discrete frames which are not standard

Lastly, Fine's formula is reminiscent of the formula Prior used to define Qp:

$$(**) \qquad \Diamond p \wedge \forall q(\Box(p \to q) \vee \Box(p \to \neg q))$$

but whereas Fine's formula (*) says that the world of evaluation belongs to an atom in Π, Prior's formula $(**)$ says that the denotation of p is an atom in Π. If we are working with a standard model (or a discrete model) then condition $(**)$ obviously boils down to the denotation of p being a singleton set, which seems to be what Prior often intended Qp to mean (recall the quotation in the introduction). And in fact, Kit Fine on pages 339–340 of [8], considers the Q operator in connection with the formula

$$(***) \qquad \exists p(p \wedge Qp).$$

It is straightforward to show that the formulas $(***)$ and $(*)$ are equivalent in any (universally related) general frame. That is: Fine's formula can be defined using Prior's Q; both say something about atomicity.

5 A tableau system

To make the differences between our two species of nominals concrete, it will help to have a proof system. There are several we could have used for this purpose (see [5] for a general introduction to the proof-theory of hybrid logic) but here we will use a tableau system, as it is easy to use and the reader can easily find illustrative examples in the literature (see the Appendix for references).

The basic idea driving the system is this: given a L_{BHPQ} formula φ whose validity you want to establish, choose a nominal i that does *not* occur in φ and attempt to build a tableau for $\neg @_i \varphi$. Tableau systems are essentially model building systems, so by starting with the formula $\neg @_i \varphi$ we are asking: is it possible that there is some model containing a world, which we have arbitrarily called i, at which φ is *false*? We then attempt to build a tableau for $\neg @_i \varphi$; this is a step-by-step process that uses rules that directly mimic the semantics of L_{BHPQ}. During this process, more and more information about potential models for $\neg @_i \varphi$ is obtained, and at some stage it may become clear that no model for $\neg @_i \varphi$ exists (this

(see Footnote 9) and there are also atomic frames which are not discrete (we will see a simple example in Section 6).

happens when all the branches on the tableau *close*, that is, contain contradictory information). When (and if) this happens, we have proved that the formula φ was valid after all. In short: the tableau method allows us to prove the validity of L_{BHPQ} formulas by trying — *and failing* — to falsify them at an arbitrary world. This works because the tableau system is systematic in its search for models. Tableau systems for hybrid logic were first introduced in [13] and [2], and the system we shall use here is the second of these systems augmented with rules for the propositional quantifiers.

The rules for our system are given in the Appendix, and we discuss some of them there. Here in the main text, however, we shall confine our discussion to how the new propositional quantifier rules work. The $\forall$ and $\neg\forall$ rules are shown in Figure 1; let's discuss each of these in turn.

$$\begin{array}{c} @_i \forall p\varphi \\ \downarrow \\ @_i \varphi[\psi/p]\dagger \end{array} \qquad\qquad \begin{array}{c} \neg @_i \forall p\varphi \\ \downarrow \\ \neg @_i \varphi[q/p]* \end{array}$$

$\dagger$: *where ψ is free for p in φ and ψ does not contain any standard nominal in formula position.*
$*$: *where q is a new propositional symbol.*

Figure 1: The $\forall$ and $\neg\forall$ rules

The $\neg\forall$ rule is easily dealt with. Suppose we have the following piece of information: $\neg @_i \forall p\varphi$. This says that it is *false* at the world named i that $\forall p\varphi$. But if this is false, then there is *some* proposition — let's call it q — which witnesses this falsehood. Thus, throwing away the quantifier, and substituting the new symbol q for the newly-freed occurrence of p, we deduce that it is false at the world named i that $\varphi[q/p]$, or to put it another way, we deduce $\neg @_i \varphi[q/p]$. The $*$ side-condition on this rule — which insists that q be new — is what ensures that q acts as the desired falsifying witness.

And now for the crucial $\forall$ rule, the universal instantiation rule. The basic idea is straightforward: suppose we are given the information

$@_i \forall p\varphi$. This is a universal claim: it says that at the world named i, $\forall p\varphi$ is true. Hence we should be able to pick any formula ψ, throw away the $\forall p$, and substitute ψ inside φ. Now, the first part of the † side-condition deals with an issue we have already discussed: "where ψ is free for p in φ" simply prevents accidental symbol binding. But what about the second part of the restriction † side-condition? This is where the distinction between the two species of nominals kicks in, and we will discuss this in the following section.

Before doing so, however, let's look at a couple of proofs to see how the tableau system works in practice. We will prove the *propositional Barcan formula*, that is, $\forall p\Box\varphi \to \Box\forall p\varphi$, and the *converse propositional Barcan formula*, that is, $\Box\forall p\varphi \to \forall p\Box\varphi$.[11] The proofs can be found in Figure 2. We have placed numbers next to each formula, and markings next to the arrows for guidance: the markings by the arrows say which rule was applied to which numbered formula. As you can see, both the $\forall$ rule and the $\neg\forall$ rule are used in each proof; the other rules used are all listed in the Appendix. The $\times$: 6,8 at the end of both proofs signals that each tableau closed because two conflicting formulas were found (coincidentally, in both proofs these were formulas number 6 and 8).

6 Two observations about universal instantiation

It is time to examine the second part of the side-condition on the universal instantiation rule, namely the part of † that forbids the substitution of formulas ψ containing nominals in formula position. Why is this there? This brings us to the first observation listed at the start of the paper:

> ***Observation 1:*** *If the universal instantiation rule is not restricted in this way — that is, if we allow a bound propositional symbol to be replaced by any formula at all, and in particular, by those containing standard nominals in formula position — then the rule*

[11] These formulas mirror the first-order modal Barcan formula $\forall x\Box\varphi \to \Box\forall x\varphi$, and the first-order converse modal Barcan formula $\Box\forall x\varphi \to \forall x\Box\varphi$. In first-order modal logic, the Barcan formula says that the domain of quantification cannot get bigger as one moves from world to world, while the converse Barcan formula says that domains of quantification cannot shrink. Thus, taken together, they force *constant* domains of quantification in first-order modal logic. Thus it should be be no surprise that both forms are provable for the propositional quantifiers. After all, our propositional quantifiers range over a constant domain in any model, namely the elements of Π.

$$\begin{array}{c}
\neg @_i(\forall p\Box\varphi \to \Box\forall p\varphi) : 1 \\
\downarrow \neg \to : 1 \\
@_i \forall p\Box\varphi : 2 \\
\neg @_i \Box\forall p\varphi : 3 \\
\downarrow \neg\Box : 3 \\
@_i \Diamond j : 4 \\
\neg @_j \forall p\varphi : 5 \\
\downarrow \neg\forall, [q/p] : 5 \\
\neg @_j \varphi[q/p] : 6 \\
\downarrow \forall, [q/p] : 2 \\
@_i \Box\varphi[q/p] : 7 \\
\downarrow \Box : 4,7 \\
@_j \varphi[q/p] : 8 \\
\times : 6,8
\end{array}
\qquad
\begin{array}{c}
\neg @_i(\Box\forall p\varphi \to \forall p\Box\varphi) : 1 \\
\downarrow \neg \to : 1 \\
@_i \Box\forall p\varphi : 2 \\
\neg @_i \forall p\Box\varphi : 3 \\
\downarrow \neg\forall, [q/p] : 3 \\
\neg @_i \Box\varphi[q/p] : 4 \\
\downarrow \neg\Box : 4 \\
@_i \Diamond j : 5 \\
\neg @_j \varphi[q/p] : 6 \\
\downarrow \Box : 2,5 \\
@_j \forall p\varphi : 7 \\
\downarrow \forall, [q/p] : 7 \\
@_j \varphi[q/p] : 8 \\
\times : 6,8
\end{array}$$

Figure 2: Two propositional Barcan formulas

is not sound with respect to the general semantics. However, the (unrestricted) universal instantiation rule is sound with respect to the standard semantics in which quantifiers range over all subsets of worlds.

The second part of this observation — that (unrestricted) universal instantiation is sound with respect to the standard semantics — is both unsurprising, and easy to check, and we leave this to the reader.[12] On the other hand, that (unrestricted) universal instantiation is *not* sound with respect to the general semantics is less clear. But we can see this as follows. Consider the general frame where $W = \{a, b\}$, $R = W \times W$ and $\Pi = \{\emptyset, W\}$. It is straightforward to check that Π satisfies the closure properties: the relative complement and intersection properties are immediate, and as for the modal projection condition, we have that:

$$\{w \in W : \forall v(wRv \to v \in W)\} = W$$
$$\{w \in W : \forall v(wRv \to v \in \emptyset)\} = \{w \in W : \neg\exists v(wRv)\} = \emptyset$$

[12]Needless to say, although we say *unrestricted* universal instantiation, substitutions that lead to accidental binding are not allowed. We're really talking about universal instantiation that is unrestricted — up to obvious syntactic stupidity!

So: Π has propositional structure and thus we have a genuine general frame. Now, extend the general frame to a general model by choosing some valuation V, letting $N(i) = a$. Then the formula $@_i \forall q(q \to \Box q)$ is *true*: if $V'(q) = \emptyset$, then the implication $q \to \Box q$ is trivially true at a, and if $V'(q) = W$, then the implication is true at a since q is true at both a and b. On the other hand, if the rule $\forall$ is applied to $@_i \forall q(q \to \Box q)$ with the substitution $[i/q]$, then the resulting formula $@_i(i \to \Box i)$ is *false* at a since i is not true at b. So we have falsified an instance of unrestricted universal instantiation on a general model, and shown that the (unrestricted) rule is *not* sound for the general semantics. Indeed, we have done something a little stronger. The model just defined is *atomic* — note that W is a minimal non-empty set for both worlds a and b, thus W itself is a (rather unusual!) atom. Thus we have also shown that the (unrestricted) rule is unsound on the class of atomic general frames.[13] We return to this example — it's a useful one — near the end of the paper.

But for now, let's turn to our second observation:

> ***Observation 2:*** *If we add an extra side-condition to the universal instantiation rule stating that only formulas without standard nominals in formula position can be substituted for propositional symbols, then the rule becomes sound with respect to the general semantics, and gives rise to a sound tableau system for the general semantics.*

This is precisely what the second part of the † side-condition does. It is straightforward to check that the side-condition yields soundness: if there are no nominals in formula position, then all formulas are either propositional symbols or of the form $\neg\varphi$, $\varphi \wedge \psi$, $\Box\varphi$, $\forall p\varphi$ or $@_i\varphi$. The denotation of all such formulas (with the exception of those of the form $@_i\varphi$) are guaranteed to be in Π because of the way valuations are defined and the three properties imposed on Π. What about formulas of the form $@_i\varphi$? Well — first note that all such formulas are either true everywhere (that is, have denotation W), or false everywhere (that is, have denotation $\emptyset$). But both $\emptyset$ and W are admissible sets in any general

[13] Incidentally, it's worth explicitly noting that while this frame is atomic, it is *not* discrete, as neither $\{a\}$ nor $\{b\}$ is a proposition. Thus this example also shows that the class inclusion $\mathsf{DISCRETE} \subset \mathsf{ATOMIC}$ is proper, as claimed in Footnote 10.

model,[14] so these are fine too. It is easy to check that the rules listed in the Appendix are sound, so helped by the † side-condition, we indeed have a sound proof system for the general semantics.

7 Soundness on discrete general frames

Now, we have just pointed out that the rule for universal instantiation is not sound on general models without the extra † side-condition. But we might be tempted to say something like this "Look, standard nominals just *are* propositions! We should be able to use them with the universal instantiation rule — even when working with general models! If their use is ruled out, we must be missing something interesting!"

Here's an analogy. We can't prove $FFp \to Fp$ in the minimal Priorean tense logic K_t. This is because $FFp \to Fp$ reflects an important fact about *time*, namely the transitive nature of its flow. The minimal tense logic K_t, on the other hand, consists of just the formulas that are valid when we make no assumptions whatsover about time's structure. Kripke semantics is useful precisely because it is good at drawing our attention to the different ways in which validities arise. The validity of $FFp \to Fp$ rests on an intuition about *temporal structure*; its validity does *not* rest on the same kinds of assumption that the validity $p \vee \neg p$ does, or the validity of $p \to GPp$ for that matter.

Perhaps we face a similar situation with the (unrestricted) universal instantiation rule? Perhaps the loss of its soundness on *arbitrary* general frames means we have thrown away too much structure? Standard models may be overly precise — too much dictated by set theory — but perhaps arbitrary general frames take us too far in the other direction? Maybe (unrestricted) universal instantiation is sound on an interesting class of general frames (not just the standard ones) in much the same way that $FFp \to Fp$ is valid on an interesting class of Kripke models (the transitive ones) though not on all of them? This brings us to our third observation:

Observation 3: *If we do not want to restrict which formulas are*

[14] Why? Because of the relative complement and intersection closure conditions. For any $X \in \Pi$, these guarantee that $X \cap (W - X) = \emptyset$ is in Π, and thus its complement W must be in Π as well.

substitutable in the universal instantiation rule, but we do want to work with the general semantics, then, to ensure soundness, we should work with discrete general frames.

So: discreteness guarantees the soundness of (unrestricted) universal instantiation. This is easy to check, and we leave it to the reader.

8 Index versus content

So far, the paper has focussed on observations about propositional quantifiers and universal instantiation. Our fourth and final observation has a different flavour:

> ***Observation 4:*** *Prior thought about nominals in (at least) two distinct ways. His two conceptions align rather well with the two technically defined species of nominals we have been discussing in this paper. In particular, what we might call Prior's 'index' view of nominals matches the Qp definition under the standard interpretation of propositional quantifiers, whereas his 'content' view seems to fit well with the Qp definition under the general interpretation.*

This quotation from "Tense Logic and the Logic of Earlier and Later" (see [10], page 124) expresses both conceptions in a single sentence:

> We might ... equate the instant a with a conjunction of all those propositions which would ordinarily be said to be true at that instant, or we might equate it with some proposition which would ordinarily be said to be true at that instant only, and so could serve as an index of it.

The second option here is strikingly close — *identical?* — to the standard contemporary interpretation: nominals are labels, uniquely true at one world or time and hence able to "serve as an index of it". It seems close in spirit to the quotation given at the start of the paper; recall in particular the words "For 'p is an individual' (or an instant, or a possible total world-state) we write Qp", which emphasizes *individuating* something — whether it be a person, a world, or a time — using a single proposition. This is the essence of what the standard interpretation gives us.

The first part of the sentence, on the other hand, takes us in another direction: it identifies nominals as the *conjunction* of all the propositions

that would (ordinarily) be taken to be true at an instant. That is: instead of individuating entities of interest using a single labelling proposition, it attempts to identify them via their content — it holds together "all those propositions which would ordinarily be said to be true" at that world, time or individual. In the quotation just given, Prior suggests conjunction as the way of holding all this information together, but it is clear that often infinite conjunctions will be needed, thus it is natural to think of content in terms of sets of relevant propositions instead. But this, of course, is precisely what we do when we work with general frames. We select those subsets of worlds — those *propositions* — that we think are of interest. So the general semantics framework gives us a natural way of thinking about Prior's content view of nominals: under this conception they seem to be sets of "all those propositions which would ordinarily be said to be true", and thus Qp read in this way can be thought of identifying worlds, times and individuals via descriptions, via content.

We have seen in this paper that the distinction that Prior appears to be drawing points towards an issue that is interesting both technically and conceptually: *Should we view propositional quantifiers as ranging over 'what is normally said to be true' or should we view them as ranging over 'indexes' as well?* As we have seen, there is a genuine choice here. On the one hand, we might want to dissolve this distinction. As we remarked above, we might be tempted to say "Look, standard nominals just *are* propositions! We should be able to use them with the universal instantiation rule — even when working with general models!". On the other hand, we might want to insist that propositional quantifiers should not range over indexes (that is, standard nominals) only over ordinary propositions. We might say: indexes enable us to draw distinctions *arbitrarily*. Labelling is useful, but the symbols (standard nominals) that express them are not something normally said to be true and so should not count as propositions. They add something extra, something more abstract.

To make this more concrete, let us return once again to the general frame $W = \{a, b\}$, $R = W \times W$ and $\Pi = \{\emptyset, W\}$. Recall that we used this to show that the (unrestricted) rule was not sound for the general semantics — but we also remarked that although it is not *discrete*, it is *atomic*, as $W = \{a, b\}$ is a minimal proposition containing both a and b. So W is a (pretty weird!) atom. Now, choose some propositional sym-

bol, say p. In this general frame, there are only two ways to interpret it: as W or as $\emptyset$. Suppose we interpret it as W. Then is is easy to check that at both worlds a and b, Qp is true. So we have created a 'nominal', namely p, that 'names two worlds'! This makes absolutely no sense under the 'index' interpretation, but it makes perfect sense under the 'content' interpretation. It is clear that we simply *can't* distinguish the two worlds on the basis of admissible propositions, that is, on the basis of 'what is normally said to be true'. On the other hand, we certainly *can* distinguish them if we have access to standard nominals — we can slice W apart with their help! — but is this stepping outside the bounds of 'normal truth'?

We will make no attempt to decide this issue here — in this paper we merely wished to note some interesting technical, conceptual and historical issues that deserve further exploration. On the technical side, we have many questions concerning completeness and expressivity, and we hope to soon provide proof systems that can be adapted to the various classes of general frames of interest (not just universally related frames). On the conceptual side, we would like to have a clearer picture of the interplay of the 'index' and 'content' views of nominals in the work of Prior. It is not clear to us how firmly he drew this distinction, or exactly what role it played for him at various stages of his work; but there are interesting philosophical issues at play here. It would also be interesting to know what Arthur Prior knew about Henkin's work on higher-order logic. The Henkin approach to second-order logic provides a natural setting for exploring Priorean themes related to propositional quantification, and it would be nice to know how much impact such ideas had on his own work.

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Appendix: A tableau system for $\mathcal{L}_{BHPQ}$

This Appendix lists the tableau rules for $\mathcal{L}_{BHPQ}$. Figure 3 shows the rules for each primitive connective, operator and quantifier: for each we have a pair of rules, one governing the primitive symbol itself, the other governing its negation. We refer to these rules in the obvious way: for example, the two rules for conjunction are the $\wedge$ and the $\neg\wedge$ rules. Note that each rule specifies an inference that can be drawn with respect to a named world: the main premiss in each rule is labelled with either $@_i$ or $\neg@_i$. The crucial † side-condition on the $\forall p$-rule is discussed in detail in the main text.

The rules *Ref*, *Sym* and *Nom* are shown in Figure 4. These rules govern world *equality*. The *Ref* rule tells us that if we have already encountered a nominal i somewhere in the proof so far, then we are free to infer that $@_i i$ (that is: the nominal i is true at the world named i). The *Sym* rule expresses an informational symmetry: given the information that $@_i j$ (that is: at the world named i, the nominal j is true), we are free to flip the nominals in operator and formula position and infer that $@_j i$ (that is: at the world named j, the nominal j is true). Finally, the *Nom* rules tells us that if we know that at the world named i the nominal j is true, and we also know that at the world named j the proposition φ is true, then we can infer that at the world named i the proposition φ is true too.

The *Bridge* rule in Figure 4 relates worlds. Note its form: it mirrors the *Nom* inference, but for accessible worlds. This time, from the information that nominal j is true at some world accessible from the world named i, together with the information that at the world named j the proposition φ is true, then we can infer that at the world named i the proposition $\Diamond\varphi$ is true.

To complete the picture, Figure 6 contains the rules for four commonly use defined operators/connectives: $\vee$, $\rightarrow$, $\Diamond$ and $\exists$.

It only remains to add one more rule, namely the rule required to deal with the *universality* of $\Box$ and $\Diamond$. The required rule is simple:

> *At any stage of the tableau construction process, if i and j are any two nominals on a branch, then we are free to add $@_i\neg\Box\neg j$ or $@_i\Diamond j$ to the same branch.*

This rule simply reflects the fact that, because R is universal, then no

$$\begin{array}{c} @_i\neg\varphi \\ \downarrow \\ \neg @_i\varphi \end{array} \qquad \begin{array}{c} \neg @_i\neg\varphi \\ \downarrow \\ @_i\varphi \end{array}$$

$$\begin{array}{c} @_i(\varphi \wedge \psi) \\ \downarrow \\ @_i\varphi \\ @_i\psi \end{array} \qquad \begin{array}{c} \neg @_i(\varphi \wedge \psi) \\ \swarrow \quad \searrow \\ \neg @_i\varphi \quad \neg @_i\psi \end{array}$$

$$\begin{array}{c} @_i\Box\varphi \\ @_i\Diamond k \\ \downarrow \\ @_k\varphi \end{array} \qquad \begin{array}{c} \neg @_i\Box\varphi \\ \downarrow \\ @_i\Diamond j* \\ \neg @_j\varphi \end{array}$$

$$\begin{array}{c} @_i @_j\varphi \\ \downarrow \\ @_j\varphi \end{array} \qquad \begin{array}{c} \neg @_i @_j\varphi \\ \downarrow \\ \neg @_j\varphi \end{array}$$

$$\begin{array}{c} @_i\forall p\varphi \\ \downarrow \\ @_i\varphi[\psi/p]\dagger \end{array} \qquad \begin{array}{c} \neg @_i\forall p\varphi \\ \downarrow \\ \neg @_i\varphi[q/p]* \end{array}$$

$*$ where j is a new standard nominal
$\dagger$ where ψ is free for p in φ and ψ does not contain any standard nominal in formula position
$*$ where q is a new propositional symbol

Figure 3: Rules for primitive operators and connectives

matter what worlds i and j name, the i-world will be related to the j-world. For numerous examples of tableau proofs using essentially the above system (minus the propositional quantifier rules) the reader can consult [4]. For a deeper look, consult [2].

	i occurs on the branch
Ref	$\downarrow$
	$@_i i$
	$@_i j$
Sym	$\downarrow$
	$@_j i$
	$@_i j$
	$@_j \varphi$
Nom	$\downarrow$
	$@_i \varphi$

Figure 4: Equating worlds

	$@_i \Diamond j$
Bridge	$@_j \varphi$
	$\downarrow$
	$@_i \Diamond \varphi$

Figure 5: Relating worlds

$$\begin{array}{c} @_i(\varphi \vee \psi) \\ \swarrow \quad \searrow \\ @_i\varphi \quad @_i\psi \end{array} \qquad \begin{array}{c} \neg @_i(\varphi \vee \psi) \\ \downarrow \\ \neg @_i\varphi \\ \neg @_i\psi \end{array}$$

$$\begin{array}{c} @_i(\varphi \to \psi) \\ \swarrow \quad \searrow \\ \neg @_i\varphi \quad @_i\psi \end{array} \qquad \begin{array}{c} \neg @_i(\varphi \to \psi) \\ \downarrow \\ @_i\varphi \\ \neg @_i\psi \end{array}$$

$$\begin{array}{c} @_i\Diamond\varphi \\ \downarrow \\ @_i\Diamond j* \\ @_j\varphi \end{array} \qquad \begin{array}{c} \neg @_i\Diamond\varphi \\ @_i\Diamond k \\ \downarrow \\ \neg @_k\varphi \end{array}$$

$$\begin{array}{c} @_i\exists p \\ \downarrow \\ @_i\varphi[q/p]** \end{array} \qquad \begin{array}{c} \neg @_i\exists p \\ \downarrow \\ \neg @_i\varphi[\psi/p]\dagger \end{array}$$

$*$ where j is a new standard nominal.
$\dagger$ where ψ is free for p in φ and ψ does not contain any standard nominal in formula position.
$**$ where q is a new propositional symbol

Figure 6: Rules for defined operators and connectives

Modeling Decision in a Temporal Context: Analysis of a Famous Example Suggested by Blaise Pascal

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Abstract

In this paper we study the temporal aspect of the decision between two mutually exclusive alternatives C and N, where N is the default state and C is an offer that is available for an unknown period of time. The primary example we have in mind, due to Blaise Pascal [1], is when C corresponds to the option of becoming a Christian, whereas N is short for not taking this step. It is assumed that the decision maker or agent bases his decision on his rational belief in whether C is true, and his willingness to accept the offer. To this end we take a Bayesian approach [2] and quantify degrees of belief as posterior probabilities based on prior beliefs and evidence. [3] Two temporal aspects of the decision are highlighted. First, we use Bayesian sequential decision theory in order to give conditions under which it is preferable to postpone the decision or not. Second, we specify the way in which the agent is able to influence his decision. To this end, we divide rewards and degrees of belief into the following three components: 1) a foundational part, 2) circumstances, and 3) subjective preferences. Component 1 is identical for all humans, 2 is individual-specific and only caused by external influences, whereas 3 is also individual, and caused by internal influences from the agent himself. We conclude by discussing whether 1-3 have a deeper spiritual meaning and the connection between component 3 and free will. [4]

Keywords: Bayes' Theorem, free will, optimal stopping, Pascal's Wager, rewards, sequential decision theory, subjective interpretation of evidence.

1 Introduction

Blaise Pascal (1623-1662) was a French scientist, inventor, writer, philosopher, and theologian who made important contributions to a number of disciplines. Many of Pascal's theological ideas can be found in Pensées, a book that appeared in 1669, after his death, based on the scraps of paper he left behind [1,5-6]. The most well known part of Pensées is the Wager model [7-8], where Pascal describes the decision to become a Christian or not as wagering against the truth. The objective of the decision-maker or agent of the Wager is to choose between Christianity C and Non-Christianity N. In order to formalize this decision Pascal uses probabilities to define degrees of beliefs, rewards to quantify priorities, and expected values to combine the rewards when Christianity and Non-Christianity is true, for each possible choice [1-2,7,9-12].

The Wager model is in fact an early application of statistical decision theory. A modern version of this theory was developed by Abraham Wald [13], see also [14]. As pointed out in [3,12], it is preferable to use the Bayesian version [2] of statistical decision theory for the Wager, since subjective probabilities are employed in order to assess degrees of beliefs, and these are gradually updated as more evidence is acquired, in accordance with Bayes' Theorem.

In this paper we look at the Wager more broadly as a choice between two mutually exclusive alternatives; the default state N and an offer C which is available for an unknown period of time. The task of the decision maker is to decide if and when to accept C, using evidence up to the time point of the decision.[15] We will focus on the temporal aspect of this decision and frame it as a problem of sequential decision theory [16-18], in particular the Bayesian version [2,19] of sequential decision theory.

First, we discuss when the agent should make the decision. This is a problem of optimal stopping, where the cost of waiting (i.e. the risk that the offer disappears) is balanced against the benefits of postponing the decision in order to collect new evidence, and thereby hopefully

make the decision more informed. In this context we introduce two decision rules; one look-ahead procedure that makes predictions about the way in which degrees of beliefs and rewards might change in the future, and another one which focuses on the present degrees of beliefs and rewards. In particular, we give conditions, for both procedures, under which the agent delays his or her decision. In this context we also introduce another kind of evidence, which is only available if the agent receives C, and the claimed benefits associated with this offer turn out to be true. For the decision to become a Christian, this is the kind of evidence one obtains when God responds to the decision to become a Christian in terms of a revelation. It gives the agent not only rational belief, but also belief by heart. We show that the decision to become a Christian might occur earlier, if the agent predicts that belief by heart will increase his degree of belief in C.

Second, we look at the time-dynamics of the decision and decompose degrees of beliefs and rewards into three parts; a foundational component implanted from birth, a second component of circumstances, which is individual and caused by external influences, outside the agent, and finally a third component of individual preferences, corresponding to the agent's free will. In this context we discuss whether the subjective preferences component is compatible or not with God having foreknowledge of our decisions. [4]

The paper is organized as follows: In Section 2 we define the Bayesian and sequential extension of Pascal's Wager, then in Section 3 we address the problem of when to make the decision, in Section 4 we decompose the decision process into the abovementioned three components, and finally, in Section 5 we conclude with a discussion.

2 A Bayesian and Time-Dynamic Extension of Pascal's Wager

DEFINING THE DECISION PROBLEM AND STOPPING TIMES

Consider an agent who chooses between two alternatives N and C. It is assumed that N is the default state, whereas C is an offer that is available for a limited and unknown period of time $t = 0, 1, \ldots D$, where $D \leq t_{max}$ is the time point after which the offer disappears, and t_{max} is the finite time horizon. There are some claimed benefits associated with the offer.

These claimed benefits are either true or false, and the only way for the agent to find out which, is to receive the offer. That is, in order to receive the promised benefits the agent must first of all receive the offer, and secondly the claims associated with the offer have to be true. The task of the agent is to make a decision $d \in \{C, N\}$ based on his prior beliefs in whether the claimed benefits of the offer are valid (truth=C) or not (truth=N), and all evidence of relevance for the decision. The problem can formulated in terms of a stopping time T such that the agent either stops collecting more evidence at time $T \leq D$, and then chooses C (i.e. $d = C$), or he does not receive the offer as long as it is available (i.e. $d = N$), which corresponds to stopping the process at time $T = D + 1$. Since the stopping rule T uniquely defines the decision rule, we will use these two words interchangeably.

A TIME-DYNAMIC EXTENSION OF PASCAL'S WAGER

As mentioned in Section 1, the main application we have in mind is the Wager model of Blaise Pascal, where C and N correspond to Christianity and Non-Christianity respectively, $t = 0$ is the time when the agent first becomes responsible to make a decision (the time of moral accountability), D is the time when the agent dies, t_{max} is his maximal possible life length after acquiring moral accountability, whereas T is the moment when the agent either becomes a Christian ($T \leq D$) or has died without becoming a Christian ($T = D + 1$). In particular, a person who becomes a Christian does not necessarily have a large degree of belief in Christianity at the time of the decision, although this is typically the case. It is rather an active step to ask God for forgiveness because of wrongdoings, acknowledging that Jesus died on Calvary, as a payment for the sins of humanity, and then resurrected from death. The decision to become a Christian also includes a commitment to follow Jesus for the rest of one's life. The claimed benefits of C, which are valid if Christianity is true, is a personal relationship with Jesus and a promise to spend eternity in heaven with God. On the other hand, becoming a Christian means living on a myth if C is not true, since then the agent gets no relation with Jesus, neither in this life nor in afterlife (when N includes the possibility of afterlife).

Our stopping time approach for the decision to become a Christian follows [15]. That is, we assume that the decision is a commitment for

life, whereby the agent stops collecting more evidence after the decision for the purpose of altering his own decision. However, the agent may still collect more evidence after the decision to become a Christian for other purposes, like doing apologetics or understanding more about his own beliefs.

BAYESIAN APPROACH, DEGREES OF BELIEFS AND REWARDS

Denote evidence at time point t as e_t, and let $E_t = \{e_0, \dots, e_t\}$ refer to all evidence up to time t. We will use a Bayesian approach to quantify degrees of beliefs in C and N at time t, that is, beliefs in whether the claimed benefits of the offer are true or not, based on evidence up to time t. These degrees of belief are expressed in terms of the conditional probabilities $P(C|E_t)$ and $P(N|E_t) = 1 - P(C|E_t)$ of each alternative C and N, given evidence, also referred to as the posterior probabilities of C and N. Let $P(C)$ and $P(N) = 1 - P(C)$ denote the prior probabilities of C and N. They reflect the agent's belief in each alternative before any evidence has been collected. According to Bayes' Theorem, we have that $P(C|E_t) = P(C)P(E_t|C)/P(E_t)$ and $P(N|E_t) = P(N)P(E_t|N)/P(E_t)$ respectively. From this it follows that the agent's degrees of belief at time t, expressed as his posterior probabilities of C and N, involves not only the prior probabilities of C and N, but also $P(E_t|x)$, his interpretation of evidence up to time t, under both alternatives $x \in \{C, N\}$.

Consider a time point $t \leq T$ when the decision has not yet been made. In order to decide whether or not to accept the offer at time t (that is, whether $T = t$ or $T > t$), the agent defines the reward table $R_t = \{R_{xyt}; x, y \in \{C, N\}\}$ at time t, where R_{xyt} is the reward of choosing y at time t when x is true, for all four combinations $x, y \in \{C, N\}$. The larger R_{xyt} is, the more inclined the agent is to act and choose y when x is true. For the decision to become a Christian, these rewards quantify whether we want to become Christians or not, and hence they reflect our goals in life.

Recall that if the agent chooses C at time t, the process stops ($d = C$, $T = t$), whereas if the agent chooses to hold on to N at time t, it is still possible for him (if $t < D$) to choose C later on. That is, if the agent chooses N at time t and if $t < D$, the decision is postponed ($T > t$), making it possible for him to continue and look for more evidence. We will assume that the decision rule is a function of the rewards and

all known evidence at the time point of the decision. That is, we will assume that $d = d(E_T, R_T)$ is a function of evidence up to time T and rewards at time T. Equivalently, if $T = t$, the decision to stop at this time point makes use of E_t and R_t.

EXPECTED REWARDS AND VALUE FUNCTIONS

In order to quantify how well a stopping time T performs we use a value-function. It is defined as the expected reward

$$\begin{aligned} V(T) &= \varepsilon[R_{Xd(E_T,R_T)T}] \\ &= P(N)\varepsilon[R_{Nd(E_T,R_T)T}|N] + P(C)\varepsilon[R_{Cd(E_T,R_T)T}|C] \end{aligned} \tag{1a}$$

at the time point T of the decision. In equation (1a) we introduced the random variable $X \in \{C, N\}$. This is a random quantity reflecting an agent's prior belief in which alternative is true, so that X equals C with probability $P(C)$ and N with probability $P(N)$. We also introduced $\varepsilon[\cdot] = \varepsilon_T[\cdot]$, the expected value of the random quantity within the squared brackets, when this quantity is evaluated at time T. In equation (1a), this random quantity $R_{Xd(E_T,R_T)T}$ is the reward at time T when X is true, based on the agent's decision $d(E_T, R_T)$. In this paper we will omit time index T of an expected value when all known evidence E_T up to this time point is used for calculating the expected value.

As a preparation for the next section we will rewrite the value function in (1a). To this end, we introduce the expected rewards of choosing C and N respectively, conditional on evidence E_t up to time t and the rewards R_t at time t. These expected rewards are defined as

$$ER_t(C) = P(C|E_t)R_{CCt} + P(N|E_t)R_{NCt}$$

and

$$ER_t(N) = P(C|E_t)R_{CNt} + P(N|E_t)R_{NNt}$$

respectively. Then we condition on T, E_T, and R_T in (1a), and rewrite the value function as an expectation

$$V(T) = \varepsilon[ER_T(d(E_T, R_T))], \tag{1b}$$

of the expected reward $ER_T(d(E_T, R_T))$ at the time of the decision.

SUBJECTIVE DEGREES OF BELIEFS AND INTERPRETATION OF EVIDENCE

We will assume that interpretation of evidence is subjective, so that interpretation $P(E_t|x)$ of evidence up to time t varies between individuals. It may also happen that the agent modifies his own interpretation of evidence over time. Suppose for instance that $t \leq t_1 < t_2$. It is possible then that the agent interprets evidence E_t up to time t differently at time points t_1 and t_2, so that $P_{t_1}(E_t|x) \neq P_{t_2}(E_t|x)$, where P_{t_1} and P_{t_2} refer probabilities evaluated at time t_1 and t_2. Due to Bayes' Theorem, the agent's degrees of beliefs will therefore typically change between t_1 and t_2 as well, so that $P_{t_1}(x|E_t) \neq P_{t_2}(x|E_t)$. In these formulas, the time index of a probability is written out. Whenever the time index of a conditional probability $P(x|E_t) = P_t(x|E_t)$ is omitted, it is tacitly understood that the probability is evaluated at the time point t up to which evidence E_t has been registered. Whenever the so called martingale property

$$\varepsilon_{t_2}\left[P(C|E_{t_2})|E_{t_1}\right] = P(C|E_{t_1}) \tag{2}$$

holds holds for degrees of beliefs $P(C|E_t)$, we say that these degrees of beliefs evolve neutrally (as a martingale) between time points t_1 and t_2. Notice though that (2) fails in general, either because the agent a) actively gathers new evidence, b) reevaluates old evidence, or c) is exposed to evidence, in a way that either favors C or N.

3 When to Stop and Make the Decision

OPTIMAL STOPPING

The task of Bayesian sequential decision theory is to find a stopping time T that maximizes the value function, defined in equations (1a)-(1b). Such a stopping time T is referred to as an optimal sequential decision rule [2]. In order to find an optimal sequential decision rule, we have to find expressions for the value function. This requires a model for how evidence is interpreted under each alternative C and N, and how the rewards change over time. If the reward function is time-invariant

$$R_{xyt} = R_{xy}, \quad x, y \in \{C, N\}, \tag{3}$$

and if interpretation of evidence evolves over time as a Markov (or memoryless) process, it is possible to maximize (1b) and find the optimal T through backward recursion [2,17,20-21]. This is an instance of dynamic programming or Bellman recursions, where the optimal decision, whether to accept the offer or continue looking for more evidence, is found recursively over time horizons $\{t, \dots, t_{max}\}$, starting with $t = t_{max}$ and then working backwards until $t = 0$ and the final solution for time horizon $\{0, \dots, t_{max}\}$ is reached. Although it might be complicated to solve this backward recursion, it is still a general procedure for deriving the optimal stopping time T. On the other hand, when (3) is violated and the rewards are time-varying, we get a challenging time-inconsistent optimal stopping problem ([22,23]), which requires a model for how rewards evolve over time.

In this paper we will only consider optimal stopping for an idealized scenario where the agent knows the time point D when the offer C last appears (Model 1). For the more realistic scenario where D is unknown (Models 2 and 3), we will not look at optimal stopping, but rather consider two simplified stopping rules.

MODEL 1: OFFER DISAPPEARS AT A KNOWN TIME POINT

The first model is ideal, since it requires knowledge of the time point D after which the offer to choose C disappears. In order to make use of this knowledge, we define a stopping rule T_1 which incorporates all evidence E_D up to time D. Equation (1b) suggests that in order to maximize the value function we should choose C (that is, $T_1 = D$) or N (that is, $T_1 = D+1$) depending on which of the two expected rewards at time D is the largest. This so called expectation rule ([7,15]) can be phrased as

$$ER_D(C) > ER_D(N) \Longrightarrow T_1 = D, \tag{4a}$$

and

$$ER_D(C) \leq ER_D(N) \Longrightarrow T_1 = D+1. \tag{4b}$$

In order to simplify the analysis of this stopping rule, we will assume that no new evidence after time D is used when calculating expected

rewards and moreover that the that the rewards of turning down the offer remain unchanged after the offer disappears,

$$R_{xND} = R_{xN,D+1}, \tag{5}$$

regardless of whether the claimed benefits of the offer are true or not ($x \in \{C, N\}$). It then follows from (4) and (5) that the quantity inside the brackets of (1b), for the stopping rule T_1, equals the maximal expected reward (MER) at time D, i.e.

$$ER_{T_1} \cdot (d(E_{T_1}, R_{T_1})) = MER_D = max\,(ER_D(C), ER_D(N)). \tag{6}$$

We may also express (4) in terms of the reward advantages $\Delta R_{CD} = R_{CCD} - R_{CND}$ and $\Delta R_{ND} = R_{NND} - R_{NCD}$ of choosing a true alternative compared to choosing a false one, at time D, when C and N is true respectively. A little algebra reveals that (4) is equivalent to

$$P(C|E_D)\Delta R_{CD} > P(N|E_D)\Delta R_{ND}, \tag{7}$$

so that the agent chooses C whenever the reward advantage of C, weighted by the degree of belief $P(C|E_D)$ in C, exceeds the reward advantage of N, weighted by the degree of belief $P(N|E_D)$ in N.

As noted in [3,12], there are three qualitatively different scenarios for the reward table R_D at time D. They correspond to the following values of the two reward gains:

(i) $\Delta R_{CD} > 0$, $\Delta R_{ND} \leq 0$: The agent is better off with C regardless of whether C or N is true.

(ii) $\Delta R_{CD} > 0$, $\Delta R_{ND} > 0$: The agent prefers a true alternative over a false one.

(iii) $\Delta R_{CD} \leq 0$, $\Delta R_{ND} > 0$: The agent advocates N regardless of whether C or N is true.

For the decision to become a Christian, scenario i) favors C. It may reflect an attitude of having nothing to lose by becoming a Christian, or desiring meaning with life. Scenario iii), on the other hand, favors N. It

could be caused by a desire to keep control of life, being afraid of others' opinions or being self-sufficient, regarding God as a crutch for weak people to use. Scenario ii) is a somewhat more neutral attitude of letting one's belief in what is true to a larger extent influence the decision.

It follows from (7) that evidence does not influence the decision for scenarios i) and iii). Indeed, the agent will always choose C for scenario i) and N for scenario iii), regardless of evidence. On the other hand, when both reward differences are positive (scenario ii), evidence does have an impact. In this case it is possible to rewrite (7) as

$$P(C|E_D) > \frac{\Delta R_{ND}}{\Delta R_{CD}+\Delta R_{ND}}, \tag{8}$$

so that the agent chooses C whenever his degree of belief in C exceeds the right hand side of (8). A special case of scenario ii) is a neutral reward table R_D, whose reward gains ΔR_{CD} and ΔR_{ND} are equal and positive, so that neither C nor N is favored at time D. The threshold on the right of (8) then equals 0.5, and consequently the agent will choose C at time D whenever he believes that C is more likely than N, i.e. when $P(C|E_D) > 0.5$. The three reward scenarios i)-iii) are illustrated in Figure 1 as three quadrants of a coordinate system, where ΔR_{CD} is plotted against ΔR_{ND}.

The stopping rule T_1 is such that the decision is postponed as long as possible, since the agent either chooses $d = C$ at time D or $d = N$ at time $D+1$, making use of all evidence E_D up to time D. It is straightforward to see that T_1 is optimal among all stopping rules that delay the decision as long as possible, since it maximizes, among such stopping rules, the expression inside the expectation of the value function (1b). If there is no cost involved in postponing the decision, one would expect that it is beneficial to collect as much evidence E_D as possible before making the decision, cf. [24]. This would make T_1 optimal among all decision rules. Proposition 1 gives conditions under which this is indeed true (see Section A.1). These conditions include a) that evidence is important for the decision, corresponding to scenario ii) above, b) that the agent's interest in making decision increases over time, and finally c) that degrees of beliefs evolve neutrally (2) over time.

However, if some of the conditions of Proposition 1 fail, it might not be preferable to delay the decision of choosing $d = C$, until the time point D when the offer disappears. For instance, condition b) fails if

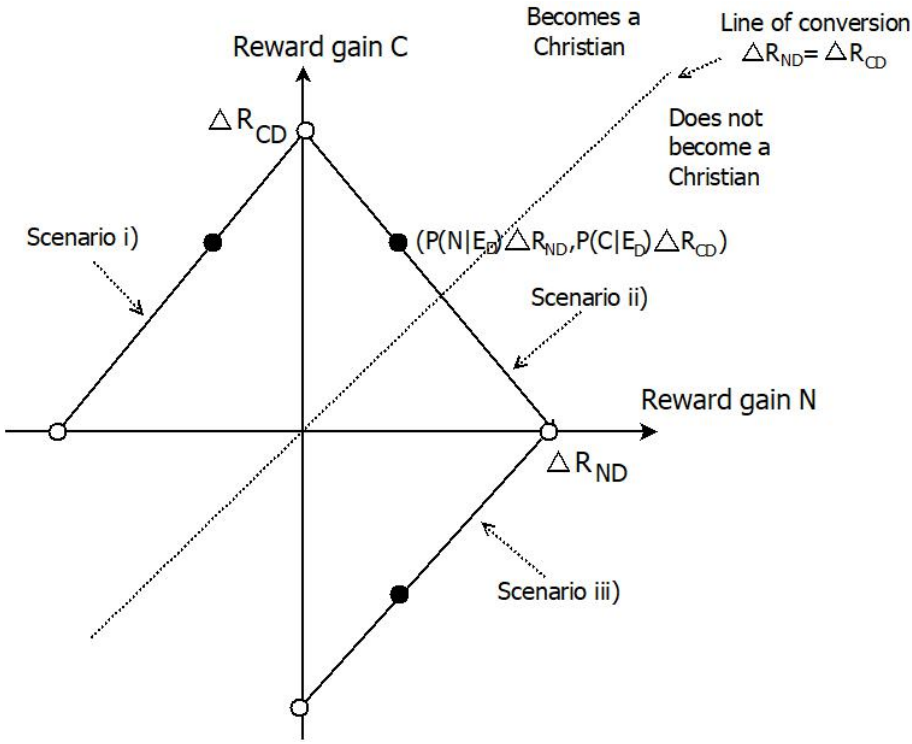

Figure 1: The agent's reward gain ΔR_{CD} of C at time D is depicted as a circle along the vertical axis, whereas his reward gain ΔR_{ND} of N at time D is drawn as a circle along the horizontal axis. The agent will accept the offer C if the point $(P(N|E_D)\Delta R_{ND}, P(C|E_D)\Delta R_{CD})$, marked as a filled circle, is located above the dotted diagonal line of conversion $(\Delta R_{CD} = \Delta R_{ND})$. This filled circle is located somewhere along the line between the two unfilled circles, depending on the agent's degree of belief $P(C|E_D)$ in C. Evidence will only impact the decision when both reward gains are positive, corresponding to scenario ii), since it is only then that the line between the two unfilled circles will cross the line of conversion. For scenario i), the agent will choose to receive C regardless of evidence, since all parts of the line between the two unfilled circles are located above the line of conversion, whereas for scenario iii), the agent will never choose C, regardless of evidence, since all parts of the line between the two unfilled circles are located below the line of conversion.

the agent is particularly interested in making the decision early in life. It might then be better not to postpone the decision, even if D is known. Likewise, condition c) fails if the agent is inclined to choose $d = C$ early

in life, but then the strong childhood evidence in favor of C diminishes. It might then be suboptimal to postpone the decision, if the agent's degree of belief in C gets smaller over time and thereby causes the overall expected reward, at the time of the decision, to decrease.

MODEL 2: OFFER DISAPPEARS AT AN UNKNOWN TIME POINT

Let us turn to the more realistic model where D is not known, and give sufficient conditions for when it is preferable or not to postpone the decision to choose C. To this end, we will consider two stopping rules T_2 and T_3, where an agent who uses T_2 makes no predictions about the future, whereas the one who employs T_3 also guesses what might happen one time point ahead. We will refer to these two stopping times as decision rules 2 and 3.

Starting with T_2, it is defined as the first time point when the expected reward of C exceeds that of N, i.e.

$$T_2 = \min\left(\min\{t; ER_t(C) > ER_t(N)\}, D+1\right), \tag{9}$$

interpreting the minimum of an empty set as ∞. Because of (8), we may rewrite (9) as

$$T_2 = \min\Big(\min\{t; P(C|E_t) > \tfrac{\Delta R_{Nt}}{\Delta R_{Ct}+\Delta R_{Nt}}\}, D+1\Big), \tag{10}$$

whenever scenario ii) of Section 3.2 holds. An agent who employs rule 2 in (9)-(10) makes no predictions about the way in which future evidence might change his degrees of beliefs. For this reason, T_2 has a simple form, the first time point when the agent's degrees of beliefs $P(C|E_t)$ in C exceeds the threshold $\Delta R_{Nt}/(\Delta R_{Ct} + \Delta R_{Nt})$. In particular, this threshold does not change over time for time-invariant rewards.

The other stopping rule T_3 is such that the agent at each time point $t \leq T_3$ compares the expected reward $ER_t(C)$ of C at time t with a prediction $\widehat{MER}_{t+1}$ of the maximal expected reward MER_{t+1} in (6), one time point ahead. The decision is postponed ($T_3 > t$) if the predicted maximal reward exceeds the expected reward of C at time t. Since D is unknown there is a cost involved in postponing the decision; the possibility that the offer is removed between time points t and $t+1$. We will assume that the agent knows the probability $\mu_t = P(D = t|D \geq t)$ for this to happen. The predicted maximal reward takes the form

$$\widehat{MER}_{t+1} = \mu_t ER_t(N) + (1-\mu_t)\varepsilon_t(MER_{t+1}|E_t), \tag{11}$$

where $\varepsilon_t(\cdot|E_t)$ is a conditional expectation, given evidence E_t up to time t and rewards R_t at time t. It is evaluated based on how the agent predicts that his degrees of beliefs will change until the next time point. When the agent looks one time point ahead, from t to $t+1$, and evaluates $\widehat{MER}_{t+1}$, he takes into account that with probability μ_t he is forced to accept N, whereas with probability $1-\mu_t$ it is still possible for him to choose between N and C. The one-step look ahead rule T_3 can more compactly be expressed as

$$T_3 = \min\Big(\min\{t; ER_t(C) > \widehat{MER}_{t+1}\}, D+1\Big). \tag{12}$$

Equation (12) can be generalized to a k-step look ahead procedure for any positive integer k (see Section 7.4.6 of [2]). For time-consistent stopping problems, the larger k is, the better the k-step stopping rule approximates the optimal solution discussed in the previous subsection.

Theorem 1 of Section A.2 deals with a model whose rewards are time-invariant (3). It gives sufficient conditions under which rule 3 postpones the decision from time point t to $t+1$ for a reward function such that evidence is important (scenario ii). This condition involves the rewards, the probability μ_t that the offer to receive C is removed between t and $t+1$, the agent's degree of belief $P(C|E_t)$ in C at time t, and finally, his predicted degree of belief

$$\hat{P}(C|E_{t+1}) = \varepsilon_t[P(C|E_{t+1})|E_t] \tag{13}$$

in C at time $t+1$. If the mortality rate μ_t is small, it is more likely that an agent who uses rule 3 will postpone the decision. This will happen when $\hat{P}(C|E_{t+1})$ is sufficiently close to 0 or 1, that is, if the agent believes the decision at time point $t+1$ will be more informed. For instance, for the decision to become a Christian or not, if the agent plans to read the Bible and/or Richard Dawkin's "The God Delusion", if he expects this will increase his certainty as to whether C or N is true, and if the risk of dying before finishing these books is small, he might want to postpone the decision. But rule 3 may also imply that the agent never postpones the decision, regardless of the value of $\hat{P}(C|E_{t+1})$. This is the case, for instance, if the agent would choose C at time t with rule 2, and if the risk

μ_t of loosing the offer is sufficiently large. The predicted future degree of belief in C is then less relevant, since the risk of loosing the offer is too high.

The mortality rate μ_t represents a cost of postponing the decision from time t to $t+1$. This cost is accounted for by rule 3, but not by rule 2. When there is no such cost involved ($\mu_t = 0$), and rule 2 leads to a decision for C at time t, the agent will still postpone the decision according to rule 3 whenever he believes his certainty about C will increase, i.e. when $\hat{P}(C|E_{t+1}) \geq P(C|E_t)$, and possibly also if $\hat{P}(C|E_{t+1})$ is very close to 0. Notice however that the rewards of Theorem 1 are time-invariant. If, on the contrary, the agent predicts that his rewards will change in such a way that his interest in making the decision will decrease in the future, it might be better not to postpone the decision, even if $\mu_t = 0$ and even if the agent predicts that his certainty about C will increase.

MODEL 3: OFFER DISAPPEARS AT AN UNKNOWN TIME POINT, AND BELIEF BY HEART IS ACCOUNTED FOR

In this section we will add a twist to the decision problem of Section 2. Recall that N is the default choice, whereas C is an offer available at time $t = 0, \dots, D$, an offer that is associated with some claimed benefits. The only way for the agent to know for sure whether these claimed benefits are true or false, is to receive the offer.

Suppose that if the benefits associated with C are true and the agent receives the offer at some time T, he will still not get *full* assurance about the truthfulness of C until after time D, the last time point at which the offer to receive C is still available. The agent will still, however, get some *partial* assurance that the claimed benefits of C are true (if they are indeed true) during the time period $t \in \{T+1, \dots, D\}$. This partial assurance typically increases over time, although it does not increase to full assurance until $t = D+1$. We may picture this as a waiting room, in which the agent is placed if he accepts C. Then, *if* the claimed benefits of C are true, more evidence is available in the waiting room, evidence that increases his belief in these benefits being true.

For the decision to become a Christian we will interpret this partial assurance about the truthfulness of C as *belief by heart*. This belief by heart grows out from a relationship with Jesus, as *revealed* from God

through his Holy Spirit, whereas full assurance occurs after death when the agent meets Jesus face to face (if C is true).

We will assume, as in the previous subsection, that D is unknown, but add belief by heart to the model. The resulting framework is referred to as Model 3. In order to formalize belief by heart, assume that the agent has chosen to receive C at time T, and consider a later time point $t \in \{T+1, \dots, D\}$. We let $E^*_{Tt} = \{e_0, \dots, e_T, e^*_{T+1}, \dots, e^*_t\}$ refer to the evidence at time t that is relevant for the decision. The first part $e_0, \dots, e_T$ of E^*_{Tt} represents *ordinary* evidence up to time T. The second part $e^*_{T+1}, \dots, e^*_t$ of E^*_{Tt} corresponds to *revealed* evidence about the truthfulness of C, if C is true, whereas $e^*_{T+1}, \dots, e^*_t$ is empty if C is false. Ordinary evidence $e_{T+1}, \dots, e_t$, that arrived after the agent's decision, is still available to him, but it is not used in order to influence the decision. It is rather used in order to strengthen his beliefs in the decision he already made. In contrast, $e^*_{T+1}, \dots, e^*_t$ is part of the decision that was made at time T, although it arrives later. Therefore, the agent stops *seeking* new evidence as part of the decision, after he has chosen C, although he may still have such new evidence revealed to him after the decision.

We will incorporate revealed evidence and belief by heart into decision rules 2 and 3. Let T^*_2 and T^*_3 refer to the versions of T_2 and T_3 that are modified in this way. To this end, we introduce

$$\hat{P}(C|E^*_{t,t+1}) = \varepsilon_t[P(C|E^*_{t,t+1})], \tag{14}$$

the agent's prediction at time t of his degree of belief in C at time $t+1$, which adds revealed (but not natural) evidence to the degree of belief $P(C|E_t)$ in C he has at time t. The corresponding forecast

$$\widehat{ER}^*_{t+1}(C) = \hat{P}(C|E^*_{t,t+1})R_{CCt} + (1 - \hat{P}(C|E^*_{t,t+1}))R_{NCt} \tag{15}$$

of the expected reward of C at time $t+1$, incorporates a prediction of future revealed evidence one time step ahead from t. Then we modify decision rule 2 in (9), as

$$T^*_2 = \min\Big(\min\{t; \widehat{ER}^*_{t+1}(C) > ER_t(N)\}, D+1\Big). \tag{16}$$

After some calculations, it can be seen that this is equivalent to choosing C the first time point when a weighted average of the agent's degree of

belief in C, and his predicted degree of belief in C based on revealed evidence, exceeds a threshold. This threshold is the same as the one that was used for stopping rule T_2 in (10). In more detail, we rewrite (16) as

$$T_2^* = \min\Big(\min\{t; w_1 \hat{P}(C|E^*_{t,t+1}) + w_2 P(C|E_t) > \tfrac{\Delta R_{Nt}}{\Delta R_{Ct} + \Delta R_{Nt}}\}, D+1\Big),$$

with weights $w_1 = (R_{CCt} - R_{NCt})/(\Delta R_{Ct} + \Delta R_{Nt})$ and $w_2 = 1 - w_1$ respectively. It is reasonable to assume that the agent expects his degree of belief in C to increase because of revealed evidence, i.e. $\hat{P}(C|E^*_{t,t+1}) \geq P(C|E_t)$. From this it follows that the agent decides for C at least as quickly, according to rule 2, when future revealed evidence is incorporated in the model, i.e. $T_2^* \leq T_2$. Prediction of revealed evidence will therefore never delay his decision, but sometimes speed it up.

As a next step, we will generalize decision rule 3 in order to incorporate a prediction of future revealed evidence. That is, we replace the stopping rule T_3 in (12) by

$$T_3^* = \min\Big(\min\{t; \widehat{ER}^*_{t+1}(C) > \widehat{MER}_{t+1}\}, D+1\Big). \tag{17}$$

Theorem 2 of Section A.3 gives sufficient conditions under which the agent postpones the decision according to rule 3 when revealed evidence is taken into account. Recall that Theorem 1 of Section A.2 analyzes decision rule 3 without revealed evidence. When these two theorems are compared, the same patterns as for rule 2 emerges: When $\hat{P}(C|E^*_{t,t+1}) \geq P(C|E_t)$, the agent will decide for C at least as quickly according to rule 3, when future revealed evidence is part of the model, i.e. $T_3^* \leq T_3$.

There is some ambiguity though whether predicted revealed evidence should be used in order to modify degrees of belief or whether it should be part of the reward function. In the latter case, the agent will regard the prospect of having new revealed evidence as part of the reward R_{CCt} of C when it is true. For time-invariant rewards (3), it can easily be seen that instead of replacing $P(C|E_t)$ by $\hat{P}(C|E^*_{t,t+1})$, in the definitions (16) and (17) of the two decision rules T_2^* and T_3^*, one may proceed as follows: First, keep a degree of belief $P(C|E_t)$ in C instead of introducing predicted revealed evidence. Second, change the reward of choosing C, when C is true, from R_{CC} to

$$R^*_{CCt} = R_{NC} + \frac{\hat{P}(C|E^*_{t,t+1})}{P(C|E_t)}(R_{CC} - R_{NC}),$$

whereas the other three rewards R_{NN}, R_{NC}, and R_{CN} are the same as for stopping rules T_2 and T_3 in (9) and (12).

4 External and Internal Influences of the Decision

In this section we will focus on the decision to become a Christian, as outlined in in Section 2, when the time-dynamic extension of Pascal's Wager was introduced. We will look more closely into the time dynamics of the decision process, and divide degrees of beliefs and rewards into three components. The first foundational component of the decision process is implanted from birth, and it is possibly the same for all humans. The second component of circumstances is individual and caused by external influences during life. The third component of subjective preferences is also individual, but caused by internal influences, from the agent himself.

For simplicity, we will only consider the simplest don't look ahead rule T_2, as defined in equation (9) of Section 3. Since this decision rule is formulated solely in terms of $ER_t(C)$ and $ER_t(N)$, the expected rewards of C and N, it suffices to analyze the time dynamics of these two quantities. We therefore split the two-dimensional vector

$$ER_t = (ER_t(N), ER_t(C)) = ER^1 + ER^2_t + ER^3_t \tag{18}$$

of expected rewards into a foundational component (ER^1), which is constant, independent of time, a time-varying circumstances component (ER^2_t), and a time-varying individual preferences component (ER^3_t). Since $t = 0$ is the time point of the agent's moral accountability it may happen that ER^2_0 and ER^3_0 differ from (0,0). Indeed, since the foundational component corresponds to the time of birth, ER^2_0 and ER^3_0 will include circumstances faced by the agent and individual preferences made by the agent up to the time point of moral accountability.

It is not obvious whether the subjective preferences component ER^3_t exists at all. Assuming that God has foreknowledge, the existence of ER^3_t hinges on whether free will is compatible with this assumption or not [4]. According to the fatalistic view, there is no free will if God has

foreknowledge. The individual preferences component must then vanish ($ER_t^3 = (0,0)$) at all time points t. With some conceptual model of foreknowledge, on the other hand, it is possible for ER_t^3 to be nonzero, since it is possible then to combine free will of the agent with divine foreknowledge. The perhaps most well-known model of this kind is Molinism ([4,25]), whereby God first has knowledge of all necessary truths, such as the laws of logic, then God has middle knowledge of what every possible individual would do under any set of circumstances, and finally God has knowledge (including foreknowledge) of the actual world that He creates. In order to illustrate the foundational, circumstances and subjective preferences components of the decision to become a Christian, we depict in Figure 2 the time dynamics of these three components for a monozygotic twin pair, Ben and Jerry, of which Ben becomes a Christian whereas Jerry does not. At some time point $t = t_1$, the twins' expected rewards of C and N start to differ. It is assumed in this figure that this split is due to Ben and Jerry's different free choices. With a fatalistic approach, on the other hand, there is no free will. The different trajectories of Ben and Jerry, after the time of split, must then be explained solely in terms differing circumstances.

In the special case (3) of time-invariant rewards, the two-dimensional expected reward-vector

$$ER_t = (R_{NN}, R_{NC}) + P(C|E_t)(R_{CN} - R_{NN}, R_{CC} - R_{NC}) \tag{19}$$

must be located along a one-dimensional line, as illustrated with a dashed line in Figure 2 when $R_{NC} = R_{CN} = 0$. In particular, if degrees of beliefs evolve neutrally according to (2), it follows from (19) that

$$\varepsilon_{t_2}(ER_{t_2}|E_{t_1}) = ER_{t_1}, \tag{20}$$

for any pair of time points $t_1 < t_2$. This implies that ER_t will vary over time, without any systematic drift. However, as mentioned in Section 2, (20) may fail if the agent a) decides to gather new evidence in a way that favors C or N, because of his subjective preferences (free will), b) reinterprets old evidence in way that favors C or N because of his subjective preferences (free will), c) is exposed to external circumstances that favor C or N (in the former case due to a revelation from God, for instance).

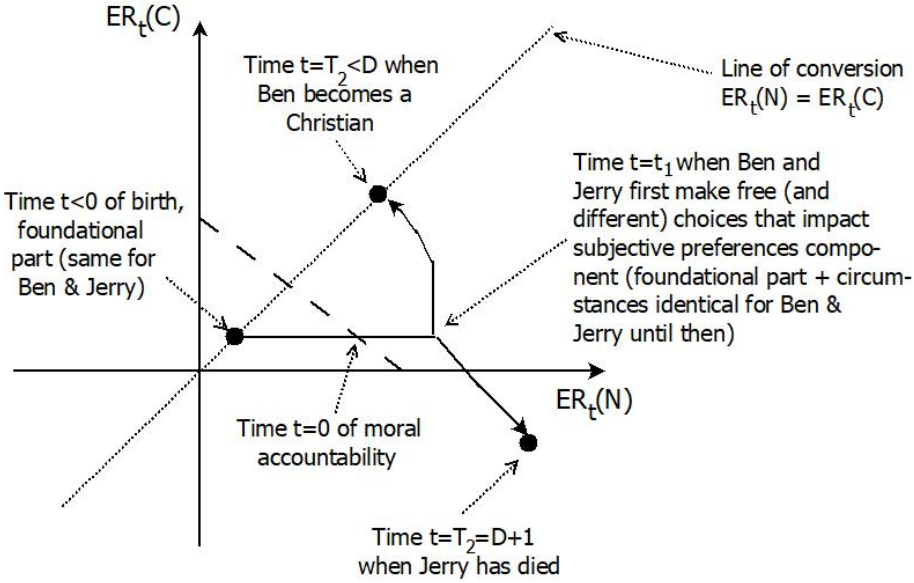

Figure 2: Time dynamics of the expected rewards vector ER_t for the monozygotic twin pair Ben and Jerry, of which Ben becomes a Christian whereas Jerry does not. Up to time t_1, (i.e. $0 \leq t \leq t_1$) the components of circumstances (ER_t^2) and subjective preferences (ER_t^3) are the same for both twins, with $ER_t^3 = (0,0)$. After this time point t_1 (i.e. $t > t_1$), the subjective preferences components (and possibly also circumstances) of Ben and Jerry differ. The figure therefore presupposes existence of free will. If all rewards remain the same from the time point of moral accountability ($t = 0$) and onwards, and if $R_{NC} = R_{CN} = 0$, ER_t is restricted to the dashed line for all $t \geq 0$.

5 Discussion

In this paper we applied sequential Bayesian decision theory to an extension of Pascal's Wager, for the decision to become a Christian (C) or not (N). In particular, we discussed when the decision maker should make his or her decision. We also divided the temporal variation of degrees of beliefs and rewards into three parts; a foundational part implanted from birth, a component of external influences, and a third component that represents free will.

An important aspect of our work is the fact that not only are the prior degrees of beliefs in C and N subjective, but (even more) interpretation and collection of evidence, the so called likelihood. This is very different

from ordinary probability calculus, for which degrees of beliefs evolve neutrally, as in (2). It seems as if our model, with subjective collection and interpretation of evidence, is able to capture in a better and more general way how people actually become Christians. We have emphasized that degrees of beliefs may evolve in a non-neutral manner due to free choices of the decision maker, or due to external influence from God or some other external agent. In philosophy, epistemic rationality reflects a desire to believe true things [26, 27]. With this in mind one may ask whether it is non-rational to gather and interpret evidence in violation of (2), so that either C or N is favored. The answer to this question is not necessarily affirmative. Indeed, degrees of beliefs for the decision to become a Christian are not formed through repeated designed experiments, as in much of natural science, where neither the decision maker nor some external agent is supposed to interfere with the outcomes of the experiments. On the contrary, beliefs are either acquired through a process reminiscent of historical science, where much of the evidence already exists when the investigation starts, or it is possibly also revealed from an external agent. Since the task of the decision maker is to find this relevant evidence, it is inherently difficult to even define a neutral strategy of how to collect evidence and then interpret it. In particular, if God exists, it is not irrational to let him influence the decision, if this might help the decision maker to find the truth.

Our results can be extended in different ways. First, it would be of interest to find the optimal stopping rule T for a simple model with time invariant rewards and some explicit model for how evidence is distributed under each alternative C and N in such a way that degrees of beliefs evolve neutrally, as in equation (2). Then the decision gets more informed, on average, when more evidence is collected. Second, one may define a model for which degrees of beliefs do not evolve neutrally, for instance by quantifying how free will and external influences vary over time. A first attempt in this direction was made in Appendix E of [3] in terms of spiritual awareness variables. These variables determine how our free will is used in order to interpret evidence. Third, it is possible to impose a more explicit model for how rewards evolve over time. Fourth, for the decision to become a Christian it would be possible to divide Non-Christianity N into several components, for instance $N_1 =$ atheist, $N_2 =$ agnostic, and $N_3 =$ seeker, in such a way that the agent will take different actions (in terms of which evidence to seek) be-

fore the time point T of the decision to become a Christian. Markovian decision processes [28], stochastic control theory [20], and reinforcement leaning [29] could possibly be used in order to formulate such a model.

Appendix

A.1 OPTIMALITY OF DECISION RULE 1

In this section we will give conditions under which decision rule T_1 in (4) is optimal:

Proposition 1. *Suppose the reward table at time t has the form $R_t = f_t R$, where $t \to f_t \geq 0$ is a non-negative and non-decreasing function, whereas $R = \{R_{xy}\}$ is a time-invariant reward table satisfying $R_{CN} = R_{NC} = 0$, $R_{CC} > 0$, and $R_{NN} > 0$. If also the degrees of beliefs evolve neutrally (2), the stopping rule T_1 in (4) maximizes the value function $V(T)$ among all stopping rules $T \leq T_1$.*

Proof. Let $T \leq T_1$ be an arbitrary stopping rule. It then follows that

$$\begin{aligned}
V(T) &= \varepsilon_T[R_{Xd(E_T,R_T)T}] \\
&= \varepsilon_T[f_T R_{Xd(E_T,R_T)}] \\
&= \varepsilon_T[f_T E R_T(d(E_T,R_T))|E_T] \\
&= \varepsilon_{T_1}[f_T(P(C|E_{T_1})R_{Cd(E_T,R_T)} \\
&\quad +P(N|E_{T_1})R_{Nd(E_T,R_T)})|E_{T_1}] \\
&\leq \varepsilon_{T_1}[f_T E R_{T_1}(d(E_{T_1},R_{T_1}))] \\
&= \varepsilon_{T_1}[f_T R_{Xd(E_{T_1},R_{T_1})}] \\
&\leq \varepsilon_{T_1}[f_{T_1} R_{Xd(E_{T_1},R_{T_1})}] \\
&= V(T_1),
\end{aligned}$$

where in the first step we used the definition (1a) of the value function for T, in the second step we invoked the definition $R_t = f_t R$ of the reward function, in the third step we used (1b), in the fourth step we used that degrees of beliefs evolve neutrally (2) between time point T and T_1,

in the fifth step we employed the definition (4) and (6) of stopping rule T_1, in the sixth step we invoked (1b), in the seventh step used the fact that f_t is non-decreasing, and in the last step we employed the definition (1a) of the value function for T_1. □

A.2 WHEN TO CONTINUE SEEKING MORE EVIDENCE ACCORDING TO DECISION RULE 3

In this section we will analyze the stopping rule T_3, defined in (12), and give sufficient conditions under which it postpones the decision to accept C from time point t to $t+1$. We will assume that rewards are time invariant (3), and introduce the two functions $f(p) = pR_{CC} + (1-p)R_{NC}$ and $g(p) = pR_{CN} + (1-p)R_{NN}$, both of which depend linearly on the probability $0 \leq p \leq 1$. Notice that $ER_t(C) = f(P(C|E_t))$, $ER_t(N) = g(P(C|E_t))$, and $MER_t = h(P(C|E_t))$, where $h(p) = \max[f(p), g(p)]$. Figure 3 illustrates the three functions $f(p)$, $g(p)$ and $h(p)$.

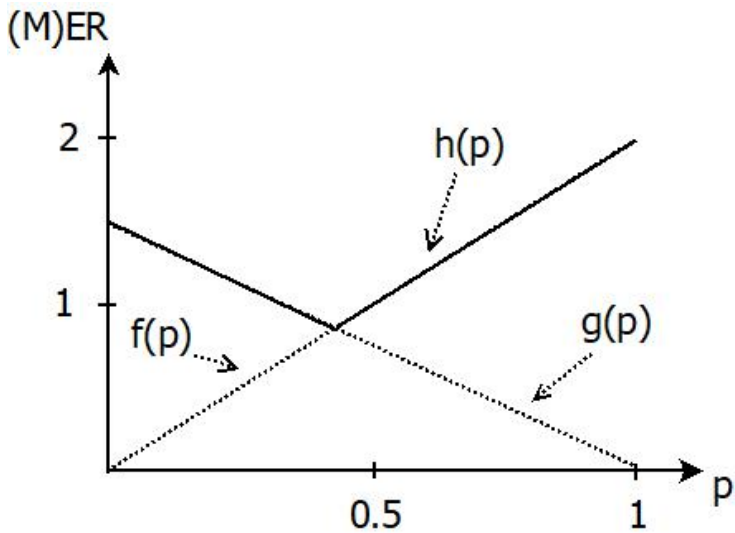

Figure 3: The two dotted lines illustrate how the expected rewards $ER_t(C) = f(p)$ and $ER_t(N) = g(p)$ vary with the degree of belief $p = P(C|E_t)$ in C, when the time-invariant rewards satisfy $R_{CC} = 2$, $R_{NN} = 1.5$, and $R_{NC} = R_{CN} = 0$. The solid curve $MER_t = h(p)$ illustrates how the maximal expected reward varies with p.

The rewards of Figure 3 satisfy

$$R_{CC} > R_{NC}, \quad R_{NN} > R_{CN}. \tag{21}$$

We will show that when (21) holds, the agent postpones the decision of accepting C when $h[\hat{P}(C|E_{t+1})]$ exceeds a certain threshold, where $\hat{P}(C|E_{t+1})$ was defined in (13) as the predicted degree of belief in C one time point ahead. Since h is a decreasing function of p for small p and an increasing of p for large p, when (21) is satisfied, the agent will either postpone his decision according to rule 3 when $\hat{P}(C|E_{t+1})$ is sufficiently close to 0 or 1, or he might never postpone the decision, regardless of the value of $\hat{P}(C|E_{t+1})$, whenever the threshold of $h[\hat{P}(C|E_{t+1})]$ is too large. The latter scenario happens, for instance, if the degrees of beliefs $P(C|E_t)$ in C is high at time t and the risk μ_t of loosing the offer C between time points t and $t+1$ is high as well. The following result makes this more precise:

Theorem 1 *Consider a fixed time point $t \leq \min(T_3, D)$ such that the decision between C and N (according to rule 3) has not been made at earlier time points. Suppose that the reward function is time invariant (3) and satisfies (21). Then $T_3 > t$ holds whenever*

$$\begin{aligned} h[\hat{P}(C|E_{t+1})] \quad &\geq f[P(C|E_t)] \\ &+\{f[P(C|E_t)] - g[P(C|E_t)]\} \cdot \mu_t/(1-\mu_t). \end{aligned} \tag{22}$$

Proof. We need to prove that (22) is a sufficient condition for $T_3 > t$ to hold. From the definition of T_3 in (12), this is equivalent to showing that equation (22) implies

$$f[P(C|E_t)] = ER_t(C) \leq \widehat{MER}_{t+1}. \tag{23}$$

But this follows, since

$$\begin{aligned} \widehat{MER}_{t+1} &= \mu_t ER_t(N) + (1-\mu_t)\varepsilon_t[h(P(C|E_{t+1}))] \\ &\geq \mu_t ER_t(N) + (1-\mu_t)h[\varepsilon_t[P(C|E_{t+1})]] \\ &= \mu_t g[P(C|E_t)] + (1-\mu_t)h[\hat{P}(C|E_{t+1})] \\ &\geq f[P(C|E_t)], \end{aligned}$$

where in the second step we used the convexity of h and Jensen's Inequality, in the third step we inserted the definition (13) of $\hat{P}(C_t|E_{t+1})$, and in the last step we invoked (22). □

A.3 IMPACT OF BELIEF BY HEART ON DECISION RULE 3

In this section we will analyze how decision rule 3 is impacted when belief by heart is taken into account. This corresponds to the stopping rule T_3^* of Section 3. Our result below will parallel Theorem 1, but when studying T_3^* we also have to incorporate the agent's predicted degree of belief $\hat{P}(C|E^*_{t,t+1})$ in C, due to revealed evidence, as defined in (14). When comparing T_3 with T_3^*, that is, comparing rule 3 without and with revealed evidence, it turns out that more is required to postpone the decision of accepting C, for the model with revealed evidence, whenever $\hat{P}(C|E^*_{t,t+1}) \geq P(C|E_t)$. This is specified in the following theorem:

Theorem 2 *Consider a fixed time point $t \leq \min(T_3^*, D)$ such that the decision between C and N has not been made at earlier time points, according to rule 3. Suppose the reward function is time invariant* (3) *and satisfies* (21)*. Then $T_3^* > t$ holds whenever*

$$\begin{aligned} h[\hat{P}(C|E_{t+1})] &\geq f[P(C|E_t)] \\ &+ \{f[\hat{P}(C|E^*_{t,t+1})] - f[P(C|E_t)]\}/(1-\mu_t) \\ &+ \{f[P(C|E_t)] - g[P(C|E_t)]\} \cdot \mu_t/(1-\mu_t). \end{aligned} \tag{24}$$

Proof. We need to verify that (24) is a sufficient condition for $T_3^* > t$, which is equivalent to showing that (24) implies

$$\widehat{MER}_{t+1} \geq \widehat{ER}^*_{t+1}(C) = f[\hat{P}(C|E^*_{t,t+1})], \tag{25}$$

where $f(p)$ is the linear function introduced in Section A.2. As in the proof of Theorem 1 we also make use of the other two functions $g(p)$ and $h(p)$ defined in Section A.2, and notice that

$$
\begin{aligned}
\widehat{MER}_{t+1} &= \mu_t ER_t(N) + (1-\mu_t)\varepsilon_t[h(P(C|E_{t+1}))] \\
&\geq \mu_t ER_t(N) + (1-\mu_t)h[\varepsilon_t[P(C|E_{t+1})] \\
&= \mu_t g[P(C|E_t)] + (1-\mu_t)h[\hat{P}(C|E_{t+1})] \\
&\geq f[\hat{P}(C|E^*_{t,t+1})],
\end{aligned}
$$

where in the second step we used Jensen's Inequality, since is $h(p)$ is convex, and in the last step we invoked (24). Hence (25) is proved. □

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Counterfactuals and Irrelevant Semifactuals

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Abstract

Would you have read the first sentence of this paper if some Brazilian butterfly had had an extra nectar for breakfast? According to orthodox semantics you would. Yet, compelling arguments suggest that you wouldn't. In this paper I argue that you both would and wouldn't. That is, I argue that the question is ambiguous. The inherent counterfactual may express either an irrelevant semifactual or a traditional counterfactual and these two kinds of factuals ought no to be treated alike semantically.

Keywords: Morgenbesser's coin, counterfactuals, irrelevant semifactuals.

1 Introduction

You've just read the first sentence of this paper. *Would* you have read it if some butterfly in Brazil had had an extra nectar for breakfast? You — and most other sensible people — probably think you would. True, small digressions to the actual course of events may bring about more widespread and dramatic changes.[1] So, lots of things may be affected by

[1] As witnessed by the so-called butterfly effects.

that extra nectar intake. But not *everything*. Lots of other things would remain unaffected — including the fact that you just read the first sentence of this paper.[2] However, this trivial observation apparently has very dramatic consequences. For instance, it apparently implies that you would have read the sentence *no matter what* — even if someone had offered you $ 1.000.000 not to do so.

In this paper I offer a solution to this unpleasant dilemma (§3). First, however, I will elaborate on the intuitions underlying each horn. Thus, in (§1) it is explained why you *would* have read the sentence even if our butterfly had an extra breakfast, and then in (§2) why it follows that you would have read it *no matter what*.

2 Why you would

Why, then, is it that you would have read the initial sentence of this paper even if some Brazilian butterfly had had a bit more nectar? As hinted at above, the intuitive answer is that the behavior of the butterfly does not influence your reading in any relevant way. Your reading — and a whole lot of other things, for that matter — would still have taken place if the butterfly had feasted. As they would if the butterfly had *not* feasted. The eating habits of the butterfly is simply *irrelevant* to your reading.

In a slightly more technical parlour, let 'irrelevant semifactuals' be counterfactuals with true consequents (hence *semi*factuals) where the antecedent is irrelevant to the truth of the consequent (hence *irrelevant* semifactuals). Suppose C is true and A is completely unrelated and hence irrelevant to the truth of C. Then, we may reason, that when we consider the truth of the irrelevant semifactuals $A > C$ and $\neg A > C$, we consider the antecedent but hold fixed as much as possible about the rest of the world (to stay as close as possible to the actual world). (Kvart 1986, p.44). Since, by hypothesis, $C$is unrelated to A, the assumption of A or $\neg A$ will not change anything with respect to C. Hence, if $C$is true in the actual world, C is also true in the closest A-worlds, and also in the closest $\neg A$-worlds. Thus, if A is irrelevant to some true C, this ensures

[2]If you are sceptic, feel free to tighten up the time index for the consequent until you feel confident (the butterfly had the extra nectar 14 min/3 min/7 sec prior to your reading).

the truth of both $(A > C)$ and $(\neg A > C)$.[3]

In support of this line of thinking, we may cite the example of Morgenbesser's coin (from Slote 1978). Someone tosses an indeterministic coin and, while the coin is in mid-air, offers you good odds that it will land heads. You refuse, and the coin lands heads. It is now intuitively true that

(1) If you had bet heads, you would have won

And (1) owes its truth to the following irrelevant semifactual:

(2) If you had bet heads, the coin would still have landed heads.

The idea is, again, that the antecedent (your betting) is irrelevant to the de facto true consequent (the coin landing heads), and so, the semifactual (2) should be evaluated as true. So should

(3) If you had *not* bet heads, the coin would still have landed heads,

as your betting behaviour does not influence the trajectory of the coin. In short, semifactuals with irrelevant antecedents are always true:

(4) $(C \wedge (A \text{ is irrelevant to } C)) \rightarrow (A > C)$[4]

In particular, if you did in fact read the first sentence of this paper, and the eating habits of some Brazilian butterfly is irrelevant to your reading, then you would have read the first sentence if that Brazilian butterfly had had an extra breakfast.

3 Why you would not

The key intuition why you would have read the first sentence despite the butterfly's feasting is thus captured in the claim that irrelevant semifactuals are always true, that is (4). But now consider the question: what

[3]Cf. standard possible world semantics for counterfactuals. The same line of reasoning is easily adapted to a semantics modelled on branching time framework as the one developed by Jacek Wawer and Leszek Wro´nski.

[4]The first conjunct in the antecedent ensures that $A > C$ is a semifactual, and the second conjunct, that it is an irrelevant semifactual. And the consequent then affirms its truth.

does it mean, in (4), that ' A is irrelevant to C'? One very natural way of characterising what it is for A to be *irrelevant*to the truth of C is captured in the claim that the occurrence of A is *causally* independent of the occurrence of C. In Schaffer (2004), Edgington (2004) and Bennett (2003, pp. 234-37) ideas very similar to this are proposed, where 'irrelevance' is understood as causal independence in this sense. Schaffer furthermore suggests that the relevant notion of causal dependence is spelled out in the manner proposed by Lewis (1986):

(5) $A\ causes\ C\ iff\ (A > C) \wedge (\neg A > \neg C)$

If 'relevance' is interpreted as causal dependence in this Lewisian sense, *irrelevance* should be expressed as the negation of (5):

(6) $\neg((A > C) \wedge (\neg A > \neg C))) \rightarrow (A > C)$

And (4) can then be rephrased as:

(4 *) $(C \wedge \neg((A > C) \wedge (\neg A > \neg C))) \rightarrow (A > C)$

However, (4*) entails *Strengthened Conjunction Conditionalization* (*SCC*):

(5) $C \rightarrow (A > C)$

Proof:[5]

(1)	$(C \wedge \neg((A > C)) \wedge (\neg A > \neg C))) \rightarrow (A > C)$	A	1
(2)	$C \wedge \neg(A > C)$	A	2
(3)	C	$2 \wedge E$	2
(4)	$\neg(A > C)$	$2 \wedge E$	2
(5)	$(A > C) \wedge (\neg A > \neg C)$	A	5
(6)	$A > C$	$5 \wedge E$	5
(7)	$(A > C) \wedge (\neg A > \neg C)$	$4, 6 \wedge l$	$2, 5$
(8)	$\neg((A > C) \wedge (\neg A > \neg C))$	$5, 7 \neg l$	2
(9)	$C \wedge \neg((A > C) \wedge (\neg A > \neg C)$	$3, 8 \wedge l$	2
(10)	$A > C$	$1, 9 \rightarrow E$	$1, 2$

[5]Extracted from Gundersen, L. B. and E. B. Gundersen (2018). "Conjunction Conditionalization and Irrelevant Semifactuals." *Thought-a Journal of Philosophy* **7**(4): 284-295.

(11)	$(A > C) \wedge \neg(A > C)$	$4, 10 \wedge l$	$1, 2$
(12)	$\neg(C \wedge \neg(A > C))$	$2, 11 \neg l$	1
(13)	C	A	13
(14)	$\neg(A > C)$	A	14
(15)	$C \wedge \neg(A > C)$	$13, 14 \wedge l$	$13, 14$
(16)	$(C \wedge \neg(A > C)) \wedge \neg(C \wedge \neg(A > C))$	$12, 15 \wedge l$	$1, 13, 14$
(17)	$\neg\neg(A > C)$	$14, 16 \neg l$	$1, 13$
(18)	$A > C$	$17 \neg E$	$1, 13$
(19)	$C \rightarrow (A > C)$	$13, 18 \rightarrow l$	1

Hence, if 'irrelevance' is interpreted as causal independence, endorsement of (4) amounts to an oblique endorsement of SCC.

SCC is highly implausible[6] and adopting it nearly collapses the entire semantics for counterfactuals to the truth-functional semantics characterizing the material conditional; counterfactuals with true consequents and counterfactuals with false consequent and true antecedent will all receive the same truth value as their material cousins do.

Therefore, given that C as matter of fact is the case, according to SCC, C would have been the case *no matter what*. For instance, given that you did read the first sentence of this paper, it is now correct to say that you would have read it no matter what. Apart from a somehow deterministic flavor, this claim faces you with the pragmatic glitch that you would have read the first sentence even if you were offered 1.000.000$ not to do so.

These considerations put (4*) — and thus (4) — under a fair amount of pressure.[7] But (4) is, recall, the driving thought behind the intuitions

[6] And besides, *SCC* threatens — like *Conditional Conditionalisation* $((A \wedge C) \rightarrow (A > C))$ does — to render counterfactuals infelicitous for their numerous theoretical tasks in conditional theories of knowledge, disposition, minds, aesthetics ... and whatnot. See Gundersen, L. (2002). "In Defence of the Conditional Account of Dispositions." *Synthese* **130**: 389-411.

, Gundersen, L. (2010). "Tracking, Epistemic Dispositions and the Conditional Analysis." *Erkenntnis* **72**(3): 353-364.

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[7] Actually, they come very close to a knockdown argument against (4). It should be mentioned, though, that they presuppose i) that causal independence is the right reading of 'irrelevant' and ii) that the Lewesian account of counterfactual dependence — what remains the most widely accepted account — is also correct.

that you *would* have read the sentence, if the butterfly had feasted (§1). Hence, giving up (4) now seems to imply that you wouldn't — after all — have read that sentence, if the butterfly had had an extra nectar.

4 Why you both would and wouldn't

There is, in fact, a clear sense in which it is false that you would have read the sentence, if the butterfly had feasted. To see this, consider:

(7) If I had told you a joke, I would have done something illegal.

(7) is clearly false (in most countries). It is false because there is no relevant connection between antecedent and consequent — telling a joke does not in any way enhance the risk of criminal behavior. However, we could argue, as we did in (§1), that since the consequent is as a matter of fact true (due to a snappy parking) and since the truth of the antecedent would have done nothing by way of changing that fact, I would still have done something illegal, if I had told you a joke:

(7 *) If I had told you a joke, I would *still* have done something illegal.

The same seems to be true of the pair:

(8) If some Brazilian butterfly had had an extra nectar for breakfast, you would have read the first sentence of this paper, and

(8 *) If some Brazilian butterfly had had an extra nectar for breakfast, you would *still* have read the first sentence of this paper.

In §1 we argued from the apparent truth of counterfactuals such as (7*) and (8*) to the truth of (7) ad (8). And in §2 we then argued from the apparent falsehood of (7) and (8) to the falsehood of (7*) and (8*). But maybe the correct lesson to draw from these cases is rather to grant the truth of (7*) and (8*) but then to point out that these irrelevant semifactuals differ in content from (7) and (8). In particular, the truth of (8) and (9) does not follow from the truth of (7*) and (8*). Counterfactuals and semifactuals represents two asymmetrical modes of thinking; insisting that they are equivalent, apt to be treated in a semantically identical way, is counterintuitive. Counterfactuals such as (7) and

(8) *affirm* a counterfactual dependence between antecedent and consequent whereas the corresponding semifactuals (7*) and (8*) somehow cast doubt on the counterfactual dependence between the antecedent and the *negated* consequent. They suggest that the antecedent would not have *prevented* the consequent.

Similar thoughts have been aired by other philosophers of modality such as Goodman with the explicit proposal that:

(8) $A > C \leftrightarrow \neg(A > \neg C)$

where '$A' > C'$ is the semifactual, (Goodman 1954) pp. 5-6.[8] In the same spirit, Pollock (1976) has proposed that counterfactuals have two distinct sets of truth conditions; one where there is a counterfactual *dependence* between antecedent and consequent and one where there is a *lack* of such a dependence. Pollock does, though, subsumes both sets of conditions under *one* unifying (disjunctive) semantics, but it would be much more natural, as suggested above, to base *two* distinct semantics, one on each set, such that counterfactuals and semifactuals each are assigned their own distinctive semantics.[9]

In any case, the counterfactual $A > C$ is not inferable from the semifactual $A > C$. In particular, the truth of (8) and (9) does not follow from the truth of (8*) and (9*) and so the solution to our conundrum appears to be that you both would and wouldn't have read the initial sentence of this paper. You would in the sense of (8*); but you wouldn't in the sense of (8).

5 Conclusion

By way of conclusion, you would have read this last sentence in any case.

[8]One difficulty with this particular proposal is that $A > C$ then is given the same semantical treatment as might counterfactuals; which appears implausible under the assumption of interdefinability between might- and would counterfactuals.

[9]Such a division also seems to be obligatory for any probability based semantics since only the former, counterfactual *dependence*, can be modelled probabilistically. See eg. Leitgeb (2012), Gundersen (2004) and Gundersen & Olesen (2018).

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This book contains papers discussing topics concerning the metaphysics of time. Many of them draw inspiration from A.N. Prior's rich and varied contributions to the logic of time. Most of the papers have been presented at the conference on the metaphysics of time held in Aalborg, 19th - 21st March, 2019. This conference was organized as part of the Danish Research Council project, The Primacy of Tense: A.N. Prior Now and Then.