

Jerzy Gołosz

In Defence of a Dynamic View of Reality



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Panta Rhei

Heraclitus

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Introduction

This collection of my papers consists of mostly previously published articles which develop a scientific research program designed to defend a dynamic view of reality.¹ Although such a view could seem to be obvious taking into account our everyday experience, we have so many conceptual difficulties with explaining the origin and mechanism of these dynamics and especially those stemming from physics that such a vindication is necessary.

At the outset, it would be useful to supply a reminder of why the flow of time is denied by the majority of both physicists and philosophers and why they stubbornly try to see reality as a four-dimensional *static* block universe. Well, these reasons are well-known:

- 1) There are conceptual problem with explaining what the flow of time consists in;
- 2) Physics, which is supposed to describe all fundamental phenomena in the world, does not provide us with a theory of the flow of time;
- 3) Even worse, if we assume that the flow of time consists in this that an infinity of global layers of *Now* come into existence successively, then it turns out that—according to the theory of relativity—there is no distinguished hypersurface of simultaneity and there are models of general theory of relativity (GTR) in which there are no such global hypersurfaces at all.

In this book, I briefly analyze different aspects of the problem of the flow of time and attempt to show—following Henri Bergson (although I should emphasize

¹ They are arranged in the chronological order as they were written; the reason for this will be explained further.

that I do not agree with the entirety of his view)—that the reasons for the difficulty with the acceptance of its reality may lie in inadequate metaphysics and a confidence in physics which goes too far. The papers are intended to answer such fundamental questions as: What is the origin of dynamics of the world?; What is the origin and nature of time?; Does the flow of time really exist and what it consists in?; Is physics consistent with existence of the flow of time?; Why don't we have a physical theory of the flow of time?

There are two similar yet subtly different approaches to the problem of the dynamics of the world which are analyzed in this book: the first is based on the well-known notion of *becoming*, while the second is based on the notion of *dynamic existence* proposed by the author, a generalization of the notion of becoming. At the beginning of my research, I treated both these notions as complementary (Gołosz 2011b, 2012, 2013 [1]),² later, however, I came to the conclusion that they should not be used simultaneously but rather alternatively because the latter is, as I will explain later, the generalization of the former and is a more fundamental notion. Although both the notions of becoming and dynamic existence are able to show a dynamic world *in statu nascendi*, explanatory values nonetheless favor the latter: only this second one explains in a plausible way what is the origin and nature of time understood as a proper time of individual objects and a way of persistence of things over time.³

The world in which we live shows strong temporal asymmetry: the past is fixed (although it is continually extending) while the future seems to be open; there are traces of the past and no traces of the future; and all effects occur after causes. All of these asymmetries concern time itself and form something which can be called, after Lawrence Sklar (1974, 1993, 1995a, b, 2005), the asymmetry of time. Simultaneously—as I try to demonstrate in essays (Gołosz 2011b, 2017a [2], 2017b, 2021b [8])—there are not enough asymmetries in physics to explain this fundamental temporal asymmetry; all of the asymmetries known in physics have only a form of some processes which are asymmetrical *in* time. Such physical processes would be temporally asymmetrical even if we treated time itself as symmetrical.⁴ The naïve yet correct solution to the problem of the origin of the asymmetry of time is to refer to the idea of the

² Square brackets refer to the sequence of essays in this volume.

³ See especially my (2015b, 2018 [4], 2021a [7]).

⁴ For example, Mehlberg (1980), Horwich (1987), and Huw Price (1997) claim that time is symmetrical because of the temporal symmetry of gravitational, electromagnetic, and strong interactions.

flow of time. In turn, a renowned explanation of the idea of flowing time is the one made with the aid of the notion of becoming.⁵ And, from different approaches to the idea of becoming, C. D. Broad's (1938) notion of *absolute becoming* seems to be the most promising because this notion is primitive, and since it does not involve temporal predicates, it avoids the difficult question of how fast time flows.

Although Broad's notion of absolute becoming is promising, it is not wholly satisfactory; Broad ascribed becoming to point-like events and left us in the dark as to how it can be reconciled with the theory of relativity; how things persist through time; and what is the source of the continuity of the world in consecutive moments of time. In other words, why I can feel to be the *same* person who started to write this essay yesterday or why the computer I am using is precisely the same, not only similar to the one I used yesterday. Broad also failed to explain the origin of time. Therefore, it seems that things and the way they persist over time should be analyzed more precisely and incorporated into our image of the world.

A step in the right direction was made by Wilfrid Sellars who claimed that becoming can be described to things and "whereas both *things* and *events* can become Φ , *only things can become in the sense of come into being*" (Sellars 1962: 556). Such a proposal cannot be accepted in its entirety because a problem immediately arises as to how things can come into being if they *already* existed: for example, my computer and myself already existed yesterday. And what about my conviction about the strict (numerical) identity of myself today with the me of yesterday, that is, about my strong conviction about the endurance of things? In any case, Sellars was right that we should involve things in our dynamic image of the world in some way.

It is also interesting that he tries to explain becoming as *coming into being* which means that the notion of being alone is insufficient for him so that he has to dynamise it in some way and explicate becoming as *coming into being*. Yet then the following question arises: are *becoming* and *being* (or *existence*) two different notions or, rather, is one of them—supposedly the first one—in some way reducible to the other? If so, then the notion of becoming could turn out to be explicable in terms of more primitive notions and dispensable. Such an approach, however, meets a serious obstacle in the form of the static character of the standard notion of existence (it is a fixed existence in a fixed moment of time).

⁵ See e.g. Bergson (1944), Eddington (1929), and Broad (1938).

The relation between becoming and existence appears to be unclear: while the notion of being or existence seems to be, as I see it now, more primitive, the difficult problem consists here in this that this notion alone—as implicitly assumed by Sellars—is insufficient to express the dynamic character of reality: it lacks dynamics and it also does not explain the way we persist over time. This is precisely why I introduced the notion of *dynamic existence*, combining the idea of endurance with existence and an additional factor responsible for dynamics. The notion of the dynamic existence can eliminate the tension between becoming and the standard (static) existence because of the following reasons: firstly, it introduces dynamics—just as becoming—and, secondly, the notion of dynamic existence is supposed to *supersede* the ordinary notion of existence which is standardly used and which has a static character.

Yet how exactly should the notion of dynamic existence be introduced? This is precisely the problem which I have been working on for more than ten years. Over this period of time, I have tried to introduce it in different ways, constantly seeking the best one. What was obvious for me was that it should not involve time: this was a lesson drawn from Broad, namely that to avoid the notoriously difficult question of how fast time flows, or how fast is the present changing, the notion of time must not be involved with the idea of the flow of time.

The earlier book (Gołosz 2011b) and this collection of papers, which are organized in order of their composition, illustrate my struggles with the problem of how the flow of time should be understood and how the notion of dynamic existence should be introduced. In my earlier papers (2011b, 2013 [1]), I started with a combination of rather imprecise properties and metaphors, that is, I wrote about the becoming of events (after Broad) and things (after Sellars), and about dynamic existence of things which consist in “coming into being” (otherwise: “coming into existence”) or alternatively in enduring and “carrying over” their presence in consecutive moments of time toward the future.⁶ Although I used the notions of becoming in parallel with both events and things, at the same time I emphasized the significant difference between becoming of events and becoming of things: the former, if they are instantaneous, *come to pass*, the latter *do not cease to be* but persist by enduring—that is, by being wholly present at each time at which they exist and by keeping their strict identity. Since point-like events (which are acts of acquiring, losing, or changing properties by dynamically existing things and their

⁶ I treated events as secondary point-like objects which consist in acquiring, losing, or changing properties by things.

collections) come to pass, the thesis about the flow of time could be assumed locally and was equivalent to presentism, that is, the view according to which only present objects exist.⁷

I also added that the notion of *dynamic* (and tensed) existence is here used in opposition to the *static* (and detensed or tenseless) existence exploited by eternalists, who assume that the past, the present and future exist on an equal level, and—following Bergson—that our language is not well-adjusted to express the dynamic nature of reality.

It took some time before I realized that:

- 1) It is precisely the notion of dynamic existence which is more primitive than the notion of becoming and as such should be applied to both things and events (since my 2015b);
- 2) Not only does the detensed notion of existence used by eternalists have a static character but so too does the tensed notion of existence used by presentists (since my 2017c [3], and 2018 [4]);
- 3) The notion of dynamic existence as a fundamental and primitive notion should not be understood as either becoming (because it is more primitive) or as coming into being/existence because it would lead to a vicious circle (if we understand existence as dynamic) or contradiction (if we understand existence as static) (since my 2020 [6]).

The problem here lies in the fact that the standard formulation of presentism makes use of the notion of existence at some fixed moment of time and, as such, it has a static character which is not appropriate to express the transitory character of the present.⁸ Although—when we use tensed language—we can say that *the past existed* and that *the future will exist*, nevertheless, this standard notion of existence does not explain whether the present is changing or not, and what is the difference between the future and the past, and between them and fictional characters such as Zeus and Apollo, taking into account the fact that all these objects do not exist. Nor does it explain the origin of the past and the future, so we are left in the dark as to the ontological status of the past and the future, and whether we can say something about them other than that they do not exist. What is also important, in no way does it follow from the notion of static existence that things endure, nor that they are changing.

⁷ Local becoming is also vindicated by Arthur (2019), however, he does not accept point-like events and denies presentism as a view which is—according to him—untenable.

⁸ See my (2018: 398–399, [4]: 72–73).

The notion of dynamic existence—instead of only two *fixed* metaphysical categories of what exists and what does not—introduces six metaphysical categories which are *continuously changing*: the past (things and events that dynamically existed); the present (things and events that dynamically exist); the future (things and events that will dynamically exist); and their complements, that is, the past' (things and events that did not dynamically exist); the present' (things and events that do not dynamically exist); and the future' (things and events that will not dynamically exist). The future defined in such a way is (probably) open, while the past defined in such a way is fixed (it cannot be changed, although it is continually growing) and provides us with a missing ontological basis on which the truth-value of past-tense claims can supervene ([6], 2021a [7]).

In the most recent papers (since my 2020, [6]), I have characterized the idea of the flow of time (which is at the same time an ontological thesis of dynamic presentism) and the notion of dynamic existence in the following way:

Dynamic Reality: All of the objects that our world consists of exist dynamically;

where **Dynamic Reality (DR)** is expressed in tensed language and the notion of *dynamic existence* is a primitive notion (like Broad's absolute becoming) which can be roughly characterized by the following set of postulates:

- i) the notion of dynamic existence is tensed;
- ii) things that dynamically exist endure;
- iii) events (which are acts of acquiring, losing, or changing properties by dynamically existing things and their collections) dynamically exist in the sense of coming to pass.

The term “objects” is here used in such a way that it applies to things and events, however things are treated here as *primary objects*, while events are secondary.

DR is accompanied by three definitions, the first is taken from Arthur Prior (1970), the second and the third one assumed by analogy:

The present \equiv The totality of objects that dynamically exist.

The past \equiv The totality of objects that dynamically existed.

The future \equiv The totality of objects that will dynamically exist.

Although such a characterization of the idea of the flow of time (and—at the same time—of the idea of dynamic presentism) with the aid of the set of

three postulates (i–iii) appears to be the best that I can propose at present, it still seems imperfect because “coming to pass” is unclear. Nevertheless, at this moment I do not know how to improve it. Certainly, the notion of dynamic existence can be formulated in such a way that “coming to pass” is avoided if events, although still secondary objects, are not instantaneous:

- i) the notion of dynamic existence is tensed;
- ii) things that dynamically exist endure;
- iii) events (which are acts of acquiring, losing, or changing properties by dynamically existing things and their collections) perdure.⁹

At first glance, it seems that such a formulation is better because it contains no obscure expressions such as “coming to pass.” The point, however, is that such a formulation is symmetrical under time reversal and thus the notion of dynamic existence introduced in such a way does not distinguish between the past and the future. It also seems that such an approach deprives dynamic existence of its dynamics. For these reasons, I prefer the former.

As I wrote above, the explanatory value favors an approach based on the notion of dynamic existence rather than one based on the notion of becoming because of two reasons:

- 1) It follows from this conception that things endure;
- 2) It explains—as I maintain—the origin of time.

One might claim that every form of presentism leads to endurantism. However, as it was shown by Berit Brogaard (2000), it is not the case: it is possible to reconcile presentism with perdurantism if presentists assume that things perdure in the sense that they have an unfolding temporal dimension in addition to the three spatial ones.

As it concerns the great mystery of the origin of time and my solution to it, which I treat as the most interesting result of my research, I was inspired by Prior. Namely, if what exists is the present, and we add dynamics to existence, it almost automatically solves the problem of the origin of time: the dynamic existence of objects is responsible for the continuous creation of new presents and every new present means a new moment of time. Because it is the individual time of every singular object, it can be identified with a proper time of the theory of relativity.

⁹ Objects perdure if they persist through time by having temporal parts, none of which are strictly identical with one another.

Apart from the struggle with the notion of dynamic existence and the origin of time, my papers try to solve different problems connected with the assumed metaphysical position of presentism in its dynamic version based on the notion of dynamic existence, that is: the triviality problem (2013 [1], 2018 [4]); the problem of how fast time flows (2015b, 2018 [4]); the problem of lacking truthmakers for presentists' claims that refer to the past ([6], 2021a [7]); the problem of asymmetry of time (2011b, 2018 [4], 2020, 2021b [8]); the problem of how to conciliate the flow of time with the theory of relativity (2011b, 2018 [4], 2020); and the problem of why physics does not contain a theory of the flow of time (2018 [4], 2020, 2021b [8]). Simple solutions based on the idea of the dynamic existence to these problems—if one presents them briefly—are the following:

- 1) The main ontological thesis of dynamic presentism is **DR** and not the claim saying that only the present exists;
- 2) The thesis about the passage of time does not refer to time;
- 3) Dynamic presentism introduces a metaphysical category of the past (past things and past facts), which provides the ontological basis for past-tense propositions;
- 4) The notion of dynamic existence is temporally asymmetrical and that is why dynamically existing things carry along traces of past interactions into the future despite of the fact that the strong, electromagnetic, and gravitational forces are time reversal invariant;
- 5) The notion of a point-like present introduced by dynamic presentism is relativistically invariant;
- 6) Dynamics is introduced into scientific research programs by metaphysics because it is metaphysics which analyses the notion of existence, while the empirical sciences only describe what exists and how different systems evolve with the aid of empirical laws.

Different reductionist approaches are critically analyzed in consecutive chapters of this book. So, various causal theories of time are criticized in (2017a [2], 2021b [8]). A special part of this collection is a critical examination of the “purely” physical attempts to explain the asymmetry of time. In (2017a [2]), I argued that weak interactions are unable to explain this asymmetry; and in (2021b [8]), I showed that the same can be claimed about an entropic approach. I wrote about “purely” physical solutions to the problem of the asymmetry of time because we have known that metaphysical ideas can be introduced into scientific research programs (or traditions or disciplinary matrixes) since the works of Thomas Kuhn (1996), Joseph Agassi (1964), Imre Lakatos (1970),

and Larry Laudan (1977), and because of this it is impossible to make a clear distinction between metaphysics and science.¹⁰

Yet if so, what is the difference between the proposed approach to the relation between metaphysics and science and the standard approach which also includes metaphysical ideas into science as well? The answer lies, I think, in the fundamentality of the notion of existence. Atomism would be an example of a metaphysical idea which has driven the development of science before becoming a truly scientific one because physics was able to answer whether (or not) matter could be divided into smaller and smaller parts. Whether the world is deterministic or not can be examined by means of the analysis of the properties of our scientific theories. However, it seems impossible to analyze the notion of existence with the aid of science. We can observe and investigate *what* exists, how different physical or biological systems have evolved in a scientific way, that is, the *effects* of a special kind of existence of our world, but it seems impossible to analyze the way these systems exist and the notion of existence itself in a similar manner. The answer, which is proposed to the problem of the origin of the dynamics of the world, lies just in the way of existence of all objects which our world consists of: in their *dynamic existence* (see my 2018 [4], 2020).

Crucially, I *never* appealed to time itself when I introduced the notion of dynamic existence, that is, I did not claim that future objects and future moments of time are somewhere *waiting* to be fulfilled by dynamically existing objects. I could not have done this because it would lead to the old problem of how fast time flows and additionally it would mean introducing the four-dimensional static block universe into the presentist image of the world. What I chose instead was to introduce without using time the notion of dynamic existence as a primitive notion which has the intrinsic property of directionality. This property means that dynamic existence distinguishes only one direction—toward the future.

Thus, according to this proposal, time is only a consequence of the way we and other inhabitants of the world exist, that is, it is a *derivative of the dynamic existence* of objects: time—that is, the consecutive moments of time—are *created* by dynamically existing objects, each of which constitutes its momentary present. As a consequence of this, time is a parameter which can be used to mark or label consecutive stages of the dynamic existence of objects and can be identified with the proper time of the theory of relativity.

¹⁰ See also my (2011a).

In this way, time is essentially connected with existence; this connection is much deeper than in the case of other tensed expressions: dynamic existence is just responsible for the tense structure of our language. It is enough to recall that not only the verb “exist,” but other verbs such as, for example, “walk,” “write,” or “read” have tenses as well. In the case of the notion of existence, however, this connection is quite different and—what is more—of a fundamental sort. If I say that I read (or walked or wrote), and now I am reading (walking, writing), it only means that time is treated here as something external to this activity which determines the tense used. However, according to the proposed approach, if something dynamically exists (in the tensed way), its dynamic existence constitutes its dynamically changing present; if something dynamically existed, it constituted its dynamically changing past; and if some object will dynamically exist, it will constitute its dynamically changing future—therefore time is essentially connected with existence as its derivative. And that is why we need to dynamise existence. As an effect, we receive a continuously changing present, a fixed—although continually growing—past which provides the ontological grounding for past-tensed sentences, and an open future.

According to the proposed conception, the future does not dynamically exist, nor did it dynamically exist, but *it is just about to dynamically exist*. As a consequence of this, the proposed approach to the origin of future time provides us with a rationale to potentially treat the future as open while the past is fixed (although it is continually growing), and it explains why we should not look for truthmakers for future-tense contingent propositions: the future—contrary to the past—*is just to be constituted* by the dynamically existing objects and this is why contingent propositions about the future lack truth value ([6], 2021a [7]).

In opposition to the more widely accepted naturalist view, according to which metaphysics should be motivated exclusively by contemporary science and not the other way round, it is maintained in this book that metaphysics and physics should be considered on a par, that is, they are motivated by one another and neither should be treated as a primary source of knowledge.¹¹ Naturalism is only rejected in the proposed approach if naturalism is interpreted in a shallow way, namely, as a unidirectional metaphysical interpretation

¹¹ That metaphysics can influence science was emphasized by, for example, Agassi (1964) and Lakatos (1970). See also my (2011a), where I distinguished between a basic metaphysics and an interpretative metaphysics to express these two ways in which metaphysics can be applied: it can influence science or can be used to interpret its results.

of scientific theories. However, if naturalism is interpreted in a broader sense according to which:

- i) metaphysical ideas can be included into scientific research programs as their leading heuristic ideas that are assessed by their fruitfulness, and
- ii) scientific theories can be metaphysically interpreted,

then it would be precisely the program which is realized in this book. Thus if we pose the question of whether the proposed metaphysical approach is naturalistic or rather antinaturalistic, the somewhat paradoxical answer is that it is neither. It is not naturalistic because it emphasizes the role of metaphysics in the creation of scientific theories (as, for example, in the case of atomic theory of matter), nor antinaturalistic because it demands that metaphysics be informed by science for its results to be interpreted in the proper way. So—on the one hand—it should take into account the verdict of quantum mechanics (QM) in the debate between determinism and indeterminism, or scientific results concerning symmetry of physical laws in the problem of the asymmetry of time, but—on the other hand—*without ignoring these results*, it should propose alternative ways of making research, that is, alternative ways of looking for the truth. They cannot be arbitrary: they can and should be verified by their fertility in the creation of new theories and their explanatory worth for our image of the world.

Although all of the essays in this collection try to describe different aspects of the dynamical world, nevertheless each of them is a self-contained unit and can be read separately; each tries to outline in a more or less developed way the basis of the proposed approach. Some of the material contained herein was presented or has its origin in one or more of the following papers (all of them in revised versions) and talks given at scientific conferences. Thus, I analyzed the problem of the asymmetry of time in the paper “The Asymmetry of Time: A Philosopher’s Reflections,” *Acta Physica Polonica B.*, 48, no. 10 (2017): 1935–1946, <http://dx.doi.org/10.5506/APhysPolB.48.1935>, based on the invited talk under the same title given at the *2nd Jagiellonian Symposium of Fundamental and Applied Subatomic Physics* (10.06.2017 Kraków).

In turn, the title, introduction and some other parts of this book are based on “In Defence of a Dynamic View of Reality,” published in Patricia Hanna (ed.), *An Anthology of Philosophical Studies*, vol. 14, Athens Institute for Education and Research, Athens 2010, pp. 35–47, and talks given at the scientific conferences on 28 May 2019 in Athens, Greece, “In Defence of a Dynamic View of Reality,” *14th Annual International Conference on Philosophy*;

and on 6 December 2019 in Zagreb, Croatia, “In Defence of a Dynamic View of Reality,” *Philosophical Method(s)?*.

The first chapter is a revised version of “Presentism, Eternalism, and the Triviality Problem,” *Logic and Logical Philosophy*, 22 (2013): 45–61, <http://dx.doi.org/10.12775/LLP.2013.003>.

The second chapter is a revised version of “Weak Interactions: Asymmetry of Time or Asymmetry in Time?,” *Journal for General Philosophy of Science*, 48 (2017): 19–33, <https://doi.org/10.1007/s10838-016-9342-z>.

The third chapter is a revised version of “Presentism and the Flow of Time,” *Axiomathes*, 27 (2017): 285–294, <http://dx.doi.org/10.1007/s10516-016-9305-3>.

The fourth chapter is a revised version of “Presentism and the Notion of Existence,” *Axiomathes*, 28 (2018): 395–417, <http://dx.doi.org/10.1007/s10516-018-9373-7>.

The fifth chapter is a revised version of “Meyer’s Struggle with Presentism or How We Can Understand the Debate between Presentism and Eternalism,” *Logic and Logical Philosophy*, 28 (2019): 731–751, <http://dx.doi.org/10.12775/LLP.2019.018>.

The sixth chapter is an extended version of the talk “Dynamic Presentism and the Grounding Objection” given (online) at Utrecht, Netherlands, at the *10th European Congress of Analytic Philosophy* (23 August 2020) and it has not been published before.

The seventh chapter is a revised version of “Brute Past Presentism, Dynamic Presentism, and the Objection from Being-Supervenience,” *Axiomathes*, 31 (2021): 211–223, <https://doi.org/10.1007/s10516-020-09489-5>.

The eighth chapter is a revised version of “Entropy and the Direction of Time,” *Entropy*, 23, no. 4 (2021): 388, <https://doi.org/10.3390/e23040388>.

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I. Presentism, Eternalism, and the Triviality Problem

It is often claimed that the debate between presentism and eternalism is merely verbal, because when we use tensed, detensed, or tenseless notions of existence, there is no difference in the accepted metaphysical statements between the adherents of both views. On the contrary, it is shown in this chapter that when we express their positions making use, in accordance with intentions of the presentists and the eternalists, of the tensed notion of existence (in the case of the presentists) and the detensed or tenseless notion (in the case of the eternalists), the controversy remains deep and very important for us, because both ontological claims express a different attitude to the existence of the flow of time. It is demonstrated that not only does the proposed approach to presentism and eternalism exactly express the intentions of the adherents of both views but it also offers a better understanding of them and explains at the same time the dynamism of the presentists' ontology. The chapter takes for granted that we should assess metaphysical theories in a similar way as we assess scientific theories, that is on the basis of their explanatory value.

I. Introduction

The relation between existence and time seems to be one of the most difficult problems we face in metaphysics: the existence of the past, the present, and the future; the existence of the flow of time; the nature of persistence of physical objects over time; and the way timeless abstract objects exist are still being discussed. In addition, these are far from being wholly understood. The first of these problems, which is the central topic of this chapter, seems to be especially far from being solved in spite of the growing interest in it. Not only

is it unresolved, it also looks as if we do not understand what we are arguing about. When we examine the main ontological theses of presentism and eternalism—saying that only the present thing exists, in the first case, or that the past, present, and future things exist in the same way (ontologically on a par), in the second—it is easy to get suspicious that both these ontological theses are trivially true or trivially false, according to how we understand the verb “exist”: in the tensed or in the detensed (or tenseless) way.¹ However, the tensed and the detensed (or tenseless) notions of existence seem to perfectly fit the presentists’ and the eternalists’ views (respectively), and this is why I would like to explore the strategy of resolving the triviality problem not by resigning from these notions, but rather by reinterpreting both views in such a way that they become contradictory. But first, I shall begin with recalling what the problem consists in. This problem is often discussed as a threat to presentism only,² but it is, in fact, the threat to both competing views and I will discuss it as such.

2. What does “to exist” mean?

The controversy between presentism and eternalism will be real, and not obscure and merely verbal, only if we are able to formulate both views in such a way that:

- i) both views are truthfully presented;
- ii) they have a clear sense;
- iii) they are in contradiction.

To examine whether it is possible to satisfy these conditions, let us start with a familiar way of expressing both views. The presentists’ ontological thesis usually is presented in the form:

¹ See, for example, Merricks (1995: 523), Zimmerman (1998: 208–210), Sider (1999: 325–327), Lombard (1999: 254–255; 2010); Crisp (2004a); Ludlow (2004); and Savitt (2006). Because we are interested in the way of existence of the real world in this debate, I will ignore the problem of *timeless* (or *atemporal*) existence of abstract objects in my analysis. I will also pay no attention (except for one remark) to the Growing Block Universe Theory, according to which the past and the present are equally real (see Tooley 1997), since what is crucial to the triviality problem is best seen in the debate between presentism and eternalism.

² For example in Lombard (1999), Crisp (2004a) and Ludlow (2004) the triviality objection is only discussed as a threat to presentism.

(P) Only present things exist.³

The eternalists' thesis usually has one of the following two forms:

(E) Past, present, and future things exist.⁴

(E') All times exist or are on an ontological par.⁵

The problem begins, as it is well known, when we start to consider what the meaning of the verb "to exist" is (and other verbs like, for example, "to be," which are used in (E')). If we assume the usual *tensed* meaning from the natural language, then we have:

(P₀) Only present things exist (in the tensed way).

(E₀) Past, present, and future things exist (in the tensed way).

(E₀') All times exist (in a tensed way) or are (in the tensed way) on an ontological par.

Now (P₀) is trivially true and (E₀/E₀') is obviously false for both the presentists and eternalists. Thus, there is no real controversy and condition (iii) is not satisfied.

Let us suppose the *detensed* meaning:

x exists (in the detensed way) $\equiv x$ existed or x exists or x will exist,⁶

then, we get:

(P₁) Only present things exist (in the detensed way).

(E₁) Past, present, and future things exist (in the detensed way).

(E₁') All times exist (in the detensed way).

Now (P₁) is evidently false, (E₁/E₁') is trivially true for both the presentists and the eternalists and again condition (iii) is not satisfied. Nothing changes

³ See, for example, Merricks (1995: 523), Hinchliff (1996: 123), Zimmerman (1998: 209), Sider (1999: 325; 2006: 75), Crisp (2004a), Markosian (2004: 47, fn.1), and Lombard (2010). The possibility of defining presentism and eternalism with the aid of "being real" will be examined later.

⁴ See, for example, Sider (1999: 326; 2006: 75) and Rea (2003: 246–247).

⁵ See, for example, Lombard (2010) and Merricks (1995: 524).

⁶ I call this meaning "detensed" (because it does not have past and future forms) following Savitt (2006: 112). Crisp (2004a: 16) calls this meaning "disjunctive."

if we, following Willard Van Orman Quine,⁷ take into account *tenseless* verbs in which they are stripped of all temporal information; we can truly say in this way, for example, that “The trial of Socrates takes place in 399 BC” or that “Socrates exists.” If we assume such tenseless meanings of verbs, (P_1) is obviously false, (E_1) and (E_1') are trivially true for both opponents, and condition (iii) is once again not satisfied.

Let us try another possibility of defining both views, that can sometimes be found in the literature:

(P_2) Only the present is real.

(E_2) Past, present, and future things are equally real.

(E_2') All times are equally real.⁸

The problem we are now faced with is again the copulas “is” and “are” that are used in these sentences, and the ambiguity of “real.” As noted by J. L. Austin and recalled by Steven Savitt, “the function of ‘real’ is not to contribute positively to the characterization of anything, but to exclude possible ways of being *not* real—and these ways are both numerous for particular kinds of things and liable to be quite different for things of different kind.”⁹ Thus, if we, following Prior,¹⁰ ascribe unreality to the past and the future, (P_2) becomes trivially true and (E_2/E_2') is obviously false for both the eternalists and presentists, irrespective of which, the tensed, the detensed, or the tenseless, meaning of “is” and “are” we assume. On the other hand, if we try, for example, to determine “being real” in opposition to “being imaginary” and assume the detensed or tenseless meaning of “is” and “are” (in accordance with the intentions of the eternalists), then (P_2) becomes obviously false and (E_2/E_2') trivially true for both opponents. It can be added that omitting the copulas “is” and “are” in (P_2) and (E_2/E_2') and saying simply about reality of the present or reality of all times (respectively) changes nothing because the ambiguity of “real” suffices to make both theses trivial. So, this way, we receive again the violation of condition (iii).

⁷ “We can conveniently hold to the grammatical present as a form but treat it as temporally neutral.” (Quine 1960: 169).

⁸ See, for example, Hinchliff (1996: 122–123), Sider (1999: 325), Davidson (2002: 77), Crisp (2003: 211), and Lombard (2010). In the ontology of things, we could say, for example, “Only present things are real” and “Things at all times are equally real.”

⁹ Austin (1962: 70). See also Savitt (2006: 118–119).

¹⁰ “(...) the present simply *is* the real considered in relation to two peculiar species of unreality, namely the past and the future.” (Prior 1970: 245).

There remained two possibilities—which are sometimes combined—of making theses (P) and (E/E') nontrivial: the first makes use of the notion of “the most unrestricted quantifiers” (or “the most inclusive”) and the second has recourse to the notion of “existence *simpliciter*.” Using the first notion, we could express, for example, the ontological theses of presentism and eternalism in the following way:

- (P₃) The domain of our most unrestricted quantifiers only includes the present objects.
- (E₃) The domain of our most unrestricted quantifiers includes the past, present, and future objects.
- (E₃') The domain of our most unrestricted quantifiers includes all temporal objects.¹¹

The difficulty we have with such a formulation, as was pointed out by Savitt, is that “[d]espite the widespread use of the notion of unrestricted quantifiers in this literature, there is good reason for doubting its utility in the present context” (Savitt 2006: 117). The problem is that while the notion of restricted quantifiers has a precise meaning, it is hard to see how such a precise meaning can be given to the notion of unrestricted quantifiers. To be sure, similarly to the problem of “being real” pointed out earlier, such a precise meaning can be given to the notion of quantification if we specify a contrast class of objects not belonging to the domain of quantification. However, if we do this by, for example, the condition of being future or past, or by being purely imaginary, the problem of triviality returns.

I tried to emphasize above—and this is exactly the point made by Savitt—that unintelligibility of the notion of unrestricted quantifiers should not be understood in the way that we cannot use them in precise manner. The point is rather that when we do this, we must specify the domain of quantification and this means exactly specification of the domain of the objects about which we assume that they *exist*, which immediately revives the triviality problem. To put it another way, because we quantify objects from some domain about which we assume that they *exist*, this is the notion of existence that is primary for us.¹² So, for example, historians and archeologists include past objects in

¹¹ See e.g. Lewis (2004: 3–4); Sider (1999: 327); Crisp (2004a: 19–20); and Markosian (2004: 47, 48).

¹² Sider seems to be close to this idea when he claims: “There is a notion of existence that is central to inquiry about the world. A claim is genuinely quantified iff it is expressed by some sentence

the domain of their discourse, but when they do this, they perfectly know that they speak about objects that did exist but do not exist and this is precisely why they are interested in these objects. The obvious consequence of this is that *before* we quantify, we should decide which notion of existence, detensed (tenseless) or tensed, we apply in the theses (P) and (E/E'), and this way we come back to the beginning of our discussion: if we do not specify the notion of existence, condition (ii) is not satisfied, but if we choose one of these meanings of "existence," this choice will determine the logical values of (P) and (E/E') for the presentists and the eternalists—exactly in the same way as in the case of (P₀), (P₁), (E₀/E₀'), and (E₁/E₁'), and thus the triviality problem revives.

One of the possible ways of overcoming this difficulty is to apply a primitive notion of existence, *common* for both views. And indeed, such a strategy using the notion of existence *simpliciter* is exploited, for example, by David Lewis (1986) and Theodore Sider (2006).¹³ But because the strategy of making use of the notion of existence *simpliciter* is sometimes employed independently of the unrestricted quantifiers,¹⁴ I will analyze it separately below.

Thus, it seems that by the notion of unrestricted quantifiers we can easily satisfy, at least sometimes, conditions (i) and (ii) if we determine the contrast class of objects not belonging to the domain of quantification or—what is equivalent—the notion of existence which is exploited; but then we cannot satisfy condition (iii). On the contrary, if we do not specify the contrast class for "our most inclusive domain of quantification" and our notion of existence, then we cannot satisfy condition (ii) and, therefore, should be suspicious about the possibility of fulfilling conditions (i) and (iii).

I tried to show above that the discussion of the notion of existence is inescapable for the solution of the triviality problem, and what kind of troubles results from the application of the tensed, detensed, and tenseless notions of existence. There remains, however, yet the above mentioned possibility of making use of the notion of existence common for the adherents of both views, the notion of primitive, "genuine" existence—"existence *simpliciter*."

whose major connective is a syntactic quantifier that means this notion of existence. Example: "There are electrons" (2006: 79). I could add that if, for example, astronomers and biologists look for life on other planets, then they do not look for objects that they can quantify over, but rather for objects that *exist*.

¹³ According to Lewis, the unactualized possibilities exist *simpliciter* as well. The second motivation for introducing the notion of existence *simpliciter* is that the adherents of unbridled ontologies, like Lewis or Sider, find our everyday notion of existence simply too modest for their purposes.

¹⁴ For example, Hestevold and Carter (2002: 499) make use of "existence *simpliciter*" without the notion of the most inclusive quantifier in their explication of the presentists' view: "Necessary, if *x* exists *simpliciter*, then *x* presently exists."

Such a strategy, at first sight, seems to be the most promising for the prospect for the fulfillment of condition (iii). Using this notion, we can express the ontological theses of presentism and eternalism in the following way:

- (P₄) Only present things exist *simpliciter*.
- (E₄) Past, present, and future things exist *simpliciter*.
- (E₄') All temporal objects exist *simpliciter*.

It could seem that now, at last, everything is in proper shape; condition (iii) seems to be satisfied, presentists have an existence *simpliciter* just of present things, whereas eternalists also of past and future things. But is everything really in proper order? What could presentists say about (E₄/E₄') and eternalists about (P₄)? I am afraid that the estimations would be equally difficult as in the case of Lewis's claim that possible worlds exist *simpliciter*, because we are not given an explanation of what "to exist *simpliciter*" means and all the three theses are simply obscure.¹⁵ Let us take as an example the sentence:

- (D) There exist *simpliciter* dinosaurs.

An eternalist will, of course, accept such a sentence but what about a presentist? Sider claims that the presentist will deny (D),¹⁶ but whether s/he really will? First of all, s/he will maintain that the eternalist who accepts such a sentence is probably using the notion of existence *simpliciter* differently than him/her, because although this notion is obscure, one thing is sure for him/her: whenever the eternalist utters or could utter (D), its logical value does not change for the uttering person in time, and this means that the notion of the existence *simpliciter* in the eternalist's usage is devoid of future and past forms, and is *detensed* (or *tenseless*).

In consequence, s/he will claim that because she accepted (E₁) and (E₁') with detensed (or tenseless) meanings of "existence," s/he cannot deny (D) in a responsible way if s/he has to ascribe the same meaning to the notion of existence *simpliciter* as the eternalist does. If s/he wants to fulfill condition (i), she could only deny (D) with the tensed notion of existence *simpliciter*, but in this case s/he denies, in fact, a different statement (because of the different

¹⁵ I would join here the appeal of Savitt (2006: 121) to those who say about existence *simpliciter* of unicorns or dinosaurs for an explanation of what they are talking about.

¹⁶ "Well, 'exists' could mean *exists*. Eternalists think that dinosaurs exist—exist *simpliciter*. Presentists disagree." (Sider 2006: 76).

meaning of the notion of existence) than the eternalist. So, it seems that with the notion of existence *simpliciter* we cannot satisfy condition (iii) as well.

Is it at all possible to satisfy all three conditions? I would like to explore such a possibility. It seems to be difficult to satisfy condition (i) and (ii) with the notions of “the most unrestricted quantifier” and “exist *simpliciter*,” as I tried to show earlier, and this is why I am inclined to return to the notions of existence which are clear, familiar, and most preferable for adherents of *both* views; to the well-known from natural language tensed notion of existence (in the case of the presentists) and to the detensed or tenseless notion of existence (in the case of the eternalists). Thus, we get (P_0) —with the tensed meaning of “exist”—as the thesis of the presentists and (E_1/E_1') —with the detensed or tenseless meaning of “exist”—for the eternalists. Conditions (i) and (ii) are now satisfied, but condition (iii) does not seem to be fulfilled again. But does such a resolution really trivialize the debate on presentism-eternalism as merely verbal, as suggested, for example, by Lawrence Brian Lombard (2010), or does this make both views not contradictory, but complementary, which, in turn, is proposed by Savitt (2006)?¹⁷ I maintain that not at all, and to show this, let us begin with the thesis (P_0) of the presentists. What does it really mean if somebody claims “only present things exist (in the tensed way)?” It means, first of all, that they accept *the tensed notion of existence*, which makes it possible to say that some entities exist although they did not exist, some other existed but no longer exist, and yet another will exist although they do not exist. However, such a claim is only possible if somebody accepts the objectivity (or mind-independence) of the flow of time, and this means that when a presentist states (P_0) , s/he, as a matter of fact, maintains the conjunction of (P_0) and the second thesis, speaking about existence of the (objective) flow of time:

(FT) The flow of time exists.¹⁸

And it is, in fact, the conjunction of (P_0) and (FT), and not (P_0) alone, that should be discussed as the ontological view of the presentists, and which should be accepted or rejected *as a whole*. Such a formulation of the presentists’

¹⁷ Savitt (2006: 122–126) puts forward something like a doctrine of two truths. According to this proposal, eternalism and presentism provide us with two different perspectives: external—having the resources needed to tackle the (external) question as to the structure of spacetime itself—and internal—making it possible to explain our experience of time. I prefer to believe, however, that truth is only one.

¹⁸ The presentist uses here the tensed meaning of “exist” but s/he also accepts (FT) with the detensed (or tenseless) meanings of “exist.”

position makes use only of tensed verbs, has a clear sense, remains in agreement with the intentions of the presentists, and therefore it cannot be accepted by the eternalists; thus, it satisfies all three posited conditions (i–iii).

To explain the status of (P_0) and some notions used in (P_0) and (FT), I would like to remind here that the presentists make use of the tensed notion of existence to introduce (or explain) the notion of the present. Here I recall some examples:

Before directly discussing the notion of the present, I want to discuss the notion of the real. These two concepts are closely connected; indeed on my view they are one and the same concept, and the present simply *is* the real considered in relation to two peculiar species of unreality, namely the past and the future. (Prior 1970: 245)

(...) the presentness of an event *is* just the event. The presentness of my lecturing, for instance, is just my lecturing. (Prior 1970: 247)

To be present is simply to be, to exist, and to be present at a given time is just to exist at that time—no less and no more. (Christensen 1993: 168)

On a presentist ontology, to exist temporally is to be present. Since presentness is identical with temporal existence (or occurrence) and existence is not a property, neither is presentness a property. Presentness is the act of temporal being. (Craig 1997: 37)

In a similar way, the presentists (and, in fact, we all) understand the *past* as something that *existed* and the *future* as something that *will exist*. This could indeed suggest that the ontological thesis (P_0) of the presentists is trivially true due to the meanings of the words used in it, and that there is no real controversy between the presentists and the eternalists. However, I tried to show that this objection is not justified. The point is that presentists' metaphysical theses (P_0) and (FT) nicely fit to what Quine and others wrote about holistic confirmation of our theories:¹⁹ the meaning of (P_0) and of the terms “present” and “exist” used in it depends strongly on acceptance (or rejection) of (FT). The acceptance of (FT) means the acceptance of the fact that the tensed structure of our language (and especially of the notions of existence

¹⁹ See e.g. Duhem (1906), and Quine (1961).

and the present) reflects the real structure of the world, while its rejection means that we should treat the tensed notions of existence and the present as notions corresponding to our subjective knowledge only. In the case of the presentists, this means that the assumed notion of existence used in (P_0) —the tensed notion of existence—is a consequence of the acceptance of (FT), and it makes no sense to assess (P_0) without (FT). To repeat the main point once again: this is the conjunction of (P_0) and (FT) which should be accepted or rejected *as a whole*.

As regards the notion of the flow of time referred to in (FT), I would like to remind shortly that although there are still raised objections to presentism concerning an allegedly unexplained nature of the flow of time, we have Broad's remarkable idea of the flow of time as *absolute becoming*, that describes the passage of time as *coming into being* or simply as a *successive happening of events*.²⁰

To "become present" is, in fact, just to "become," in an absolute sense; i.e., to "come to pass" in the Biblical phraseology, or, most simply, to "happen." Sentences like "This water became hot" or "This noise became louder" record facts of *qualitative change*. Sentences like "This event became present" record facts of *absolute becoming*. (Broad 1938: 280–281)

Such an approach to the flow of time does not invoke the idea of moving now and does not demand the second dimension of time to explain the dynamical character of it. And what is important here, there is no reason to deny the primitiveness of Broad's absolute becoming: Broad understands it as *happening* or *coming into existence* of events and it seems that there is no more primitive concept for us than the notion of *existence* or *coming into existence*.

If we apply the notion of becoming of events as their coming into existence and Prior's (inter alia) idea of the present as totality of what tensedly exists, we can alternatively transform the presentists' position into the form:

(FT' + P_0) Events that we call present become or come into existence.

Alternatively, we can, following Sellars, who claimed that "*only things can become in the sense of come into being*" (1962: 556), ascribe becoming to things and express the metaphysical position of the presentists in the following way:

²⁰ Broad's notion of absolute becoming was revived and supported by Savitt in his papers, e.g. (1996, 2001).

$(FT'' + P_0)$ Things that we call present become or dynamically exist.

In both cases $(FT' + P_0)$ and $(FT'' + P_0)$, verbs are used in the tensed way.

I added in the last sentence that things *dynamically exist* to emphasize the significant difference between becoming of events and becoming of things: the former *come to pass*, the latter *do not cease to be* but persist by enduring, that is by being wholly present at each time at which they exist.²¹ The *dynamical* (and tensed) existence is here used in opposition to the *static* (and detensed or tenseless) existence exploited by eternalists. The relation between $(FT' + P_0)$ and $(FT'' + P_0)$ is quite simple: we can treat events as consisting in acquiring, losing, or changing properties by things.

Both these formulations of the presentism ($(FT' + P_0)$ and $(FT'' + P_0)$) make this doctrine and the idea of the flow of time more precise than the conjunction (FT) and (P_0) and—like this conjunction—cannot be accepted by the eternalists.

What is also essential for the proposed approach to presentism is that all three formulations of the presentists' ontological position ((FT) and (P_0) , $(FT' + P_0)$, $(FT'' + P_0)$) emphasize the dynamic character of this view, which is lacking in the case of (P_i) for all i ; in the traditional formulation of the presentists' ontological thesis "Only the present exists," the present has a static character. Thanks to the dynamic character of the proposed interpretation of presentism, its adherents can easily defend it against attacks such as that of Lewis (1986):

Consider the philosophers who say that the future is unreal. If ever anyone is right that there is no future, then that very moment is his last, and what's more is the end of everything. Yet when these philosophers teach that there is no more time to come, they show no trace of terror or despair! (Lewis 1986: 207)

Due to the dynamic character of becoming and existence, what exists, that is the present, is continually changing, and future will come, so there is no reason to despair for the presentists.

Another very important merit of the presented approach to the metaphysical theory of presentism is that due to it, both theses (FT) and (P_0) , which presentism consists of, are no longer only loosely related: they form, as a matter of fact, one *homogeneous* metaphysical doctrine. This is the acceptance of the

²¹ The idea of the flow of time as dynamical existence of all things (and other objects which our world consists of, as, for example, space) is developed in my (2011b).

flow of time, understood as dynamical existence of things or coming into existence of events, which constitutes the core of the ontological position of the presentist.

To sum up the above reflections concerning the metaphysics of presentism, what I claim is that it is not the single (P_i) with $i = 0, 1, 2, 3, 4$, but rather the conjunction of (P_0) and (FT) , or $(FT' + P_0)$, or $(FT'' + P_0)$ *considered as a whole* that expresses the ontological view of the presentists, and always when they say something like (P) they, in fact, mean the conjunction of (P_0) and (FT) , or $(FT' + P_0)$, or $(FT'' + P_0)$. These formulations make use only of tensed verbs, have a clear sense, remain in agreement with the intentions of presentists, and therefore they cannot be accepted by the eternalists; thus, they satisfy all three conditions (i–iii).

And what with the eternalists? Well, they, of course, do not agree to existence of the flow of time and the objectivity of the distinction between the past, the present, and the future for a number of reasons, both physical and philosophical. Namely, according to the eternalists, there are some serious problems presentism faces:

- 1) There is no flow of time in physics;
- 2) There are some difficulties with metaphysical explanations of what the flow of time is;²²
- 3) The tensed notion of existence is questionable because:
 - a) according to the special theory of relativity, the relation of simultaneity (and, consequently, the present) is relative²³ and;
 - b) it is not clear which propositions about the nonpresent objects are referred to.²⁴

As a result, the eternalists do not accept the tensed notion of existence, which we use in the natural language, as describing the metaphysical structure of the world.²⁵ Instead, they introduce the detensed or the tenseless notion of existence, and use sentences like (E_1) and (E_1') to introduce (or explain) this

²² There is, for example, persistently repeated objection “How fast does time flow?” (e.g. Price 1997: 13).

²³ See e.g. Davies (2002), who denies the possibility of reconciliation of the idea of objective flow of time with the theory of relativity, Dorato (2002) and Gołosz (2011b) take an opposite route.

²⁴ See e.g. Markosian (2004) and Gołosz (2011) for an analysis of the problem and some trials of a defence of presentism.

²⁵ They can only accept pragmatical usefulness of the tensed language for *us* agents that act on our beliefs about what is happening *now* (see, for example, Mellor 1981: 73–88; 1998: 3–4, 58–62, 64–66).

special notion of existence—these sentences are basic assumptions and a kind of metaphysical axioms of eternalism. Furthermore, it seems that the eternalists should prefer (E_1') to (E_1) because this first sentence does not introduce the notions “past,” “present,” and “future,” which are metaphysically suspicious for them. We should remember, however, that (E_1) (or (E_1')) does not express the whole view of the eternalists, because in this way they only introduce their notion of existence that is assumed to justify metaphysically their conviction about the *subjectivity* (or *mind-dependence*—to use Grünbaum’s words) of the flow of time and—what is the consequence—about subjectivity of the distinction between the past, the present, and the future. Thus, the theses (E_1) and (E_1') should be completed by the second thesis speaking that the objective flow of time does not exist:

(SFT) There is no objective flow of time.²⁶

In consequence, this is the conjunction of (SFT) and (E_1/E_1') , with the de-tensed or tenseless verbs in them, which expresses the ontological position of the eternalist,²⁷ and it should be accepted (or rejected) together *as a whole*, exactly as in the case of presentism. And because (SFT) is rejected by the presentists, the ontological theses of the eternalists are not trivially true. Thus the conjunction of (SFT) and (E_1/E_1') remains in agreement with the intentions of the eternalists, has a clear sense and cannot be accepted by the presentists, so it satisfies all three posited conditions (i–iii). It should be also added that, as in the case of presentism, due to the introduced strict bond between (SFT) and (E_1/E_1') , the proposed approach to eternalism makes this metaphysical theory a *homogeneous* metaphysical doctrine.

This way, the debate between the presentists and the eternalists becomes a controversy between the positions regarding two *inseparable* problems, which

²⁶ Some examples of such eternalists’ theses: “Therefore it appears that that flow of time is subjective, not objective.” (Davies 2002: 47); “In the form of tensed belief, it is the psychological reality behind the myth of tense, the myth of the flow of time.” (Mellor 1981: 116); “From now on I shall simply take for granted the main tenets of the block universe view. In particular, I’ll assume that the present has no special objective status, instead being perspectival in the way that the notion of here is. And I’ll take it for granted that there is no objective flow of time.” (Price 1997: 15); “One can easily get the idea that the notions of past, present and future apply objectively to the universe. In contrast, I shall argue that the concepts of past, present and the future have significance relative only to human thought and utterance and do not apply to the universe as such.” (Smart 1963: 132).

²⁷ Such a formulation of eternalism resembles the doctrine of *Static Time* of Hestevold and Carter (1994: 270).

must be tackled together: whether the flow of time exists and which notion of existence—tensed or rather detensed (tenseless)—is metaphysically justified. Such a controversy can be estimated on the basis of how the competing metaphysical theories can explain our everyday experience with its fundamental phenomenon of flow of time, whether they can be harmonized with science, and which notion of existence is acceptable metaphysically because it is able, among other things, to help us to understand the problem of persistence of things over time and to resolve the problem of change. They can stand these tests for better or for worse—that remains to be seen—but the problem of whether time really passes and what really exists, which they try to resolve, is by no means trivial. On the contrary, the controversy between presentism and eternalism, seen as such, is very deep and serious, and equally important for us as the debate on whether the world really exists or rather is merely a subjective illusion.

I am not going to analyze the Growing Block Universe Theory in this study, and what I would only like to do is notice that, from the point of view presented in this analysis, this is a position that is especially difficult to vindicate. The reasons for this are quite simple: it assumes objectivity of the flow of time and the specific notion of existence in which the past exists in the same way as the present, and this way it inherits difficulties of both presentism and eternalism. Therefore adherents of this view should explain to us—exactly as the presentists should do—what the flow of time really consists in; how we can harmonize it with science; and—as the eternalists—are obliged to explain why they assume that the past exists and what it really means.

3. Final remarks

It was not my aim to solve the controversy between presentism and eternalism, but rather to show what it is really about. I tried to show that it concerns the fundamental metaphysical problem of whether the flow of time exists, and what we should assume as existing. Both discussed positions are founded on different notions of existence—tensed, in the first case, and detensed or tenseless, in the second—and we can estimate them by examining whether they can be harmonized with science and which notion of existence is acceptable metaphysically.

I tried to show that the controversy seen as such is a real controversy; if we understand both ontological positions in the proposed way, then both views

will be truthfully presented, will have a clear sense, and will be in contradiction. I also emphasized that such a formulation of both views has two other merits: firstly, both views become homogenous metaphysical doctrines which cannot be split into two separated theses, and secondly, it explains why the present, as it is seen by the presentists, is continually and dynamically changing. This way the proposed solution of the triviality problem gives us something more than a solution of a single metaphysical problem—it also gives us a deeper insight in the ontological controversy between the presentists and eternalists explaining to us why the adherents of both views join together two allegedly different theses and why the presentists can treat the present as dynamically changing. And if we believe in the old methodological principle saying that the better a theory is, the more problems it explains, then we should accept such a solution.

2. Weak Interactions: Asymmetry of Time or Asymmetry in Time?

This chapter analyzes the philosophical consequences of the recent discovery of direct violations of the time reversal symmetry of weak interactions. It shows that although we have here an important case of the time asymmetry of one of the fundamental physical forces which could have had a great impact on the form of our world with an excess of matter over antimatter, this asymmetry cannot be treated as the asymmetry of time itself but rather as an asymmetry of some specific physical process in time. The chapter also analyzes the consequences of the new discovery for the general problem of the possible connections between direction (arrow) of time and time-asymmetric laws of nature. These problems are analyzed in the context of Horwich's (1987) argumentation, trying to show that existence of a time-asymmetric law of nature is a sufficient condition for time to be anisotropic. Instead of Horwich's sufficient condition for anisotropy of time, it is stressed that for a theory of asymmetry of time to be acceptable it should explain all fundamental time asymmetries: the asymmetry of traces, the asymmetry of causation (which holds although the electrodynamic, strong, and gravitational interactions are invariant under time reversal), and the asymmetry between the fixed past and open future. It is so because the problem of the direction of time has originated from our attempts to understand these asymmetries and every plausible theory of the direction of time should explain them.

1. Introduction

The asymmetry of time, that is possessing a distinguished direction (its "arrow"), seems to be one of the fundamental properties of time: we have many traces of the past—both in our memory and in the external world—but no traces of the future; events from the past influence those in the future, but we have no

evidence of backward causation; the future seems to be open and we cannot definitely change the past. The problem of the asymmetry *of* time consists in examining the question of whether time really has a distinguished direction and, if it has, in explaining what is the origin of this direction, and especially of the three aforementioned asymmetries.

We trust in physics and believe that it is able to explain all physical phenomena; so if the asymmetry of time is real and objective and does not depend on accidental initial and boundary conditions, then it seems that it should be manifested in some time asymmetry within our laws of nature. This chapter analyzes the general problem of the existence of such connections, and a special case of this problem related to the law governing weak interactions because it is at present the only known physical law which is temporally asymmetric and—what is more—physicists have recently attained direct experimental confirmation of the time reversal violation of weak interactions. The second section of this chapter briefly recalls physicists' struggles with the time-asymmetry of weak interactions ending with the recent discovery. The third analyses the philosophical consequences of recent experiments with weak interactions concerning the asymmetry of time and the general problem of possible connections between the direction (arrow) of time and time-asymmetric laws of nature. The last section contains conclusions.

2. The direct evidence for time reversal violation of weak interactions

A plausible test of time reversal symmetry violation needs an asymmetry under the interchange of initial and final states in the dynamical evolution of a physical system. Thanks to a recent search performed at SLAC (the Stanford Linear Accelerator Center) we have at last achieved an unequivocal *direct* confirmation of the time reversal violation of weak interactions (see Lees *et al.* 2012). “Direct” here means “without relying on assumed relationships with other fundamental symmetries.” This is an important fact as we have known since 1964 that weak interactions violate a combination of parity inversion with charge conjugation CP ,¹ and using CPT theorem (see Lüders 1957), according

¹ See Christenson *et al.* (1964) and recent experimental measurements of CP violation in Abouzaid *et al.* (2011) and Beringer *et al.* (2012). In the operation of charge conjugation C , particles

to which all local Lorentz invariant quantum field theories are invariant under the simultaneous operations of charge conjugation C , parity inversion P , and time reversal T , we could from this *indirectly* infer time reversal invariance violation of weak interactions. But indirect confirmation is, of course, only conditional confirmation and as such is not as sure as direct confirmation, so it was possible to remain skeptical about this outcome as it took place, for example, in the case of Horwich (1987).²

It was not easy to attain this result because it is not easy to achieve a pure time reversal symmetry violation case without reference to CP violation.³ So, for example, in the earlier experiment performed at CPLEAR (see Angelopoulos *et al.* 1998), which was supposed to measure the direct time reversal symmetry violation, K^0 transitions to $\text{anti}K^0$ and $\text{anti}K^0$ transitions to K^0 were used. However, as was noticed by Jose Bernabeu and his co-authors (2012), who suggested the experiment performed at SLAC, the measured asymmetry between the probabilities of these decays cannot be interpreted as the direct violation of time reversal invariance: “[t]he measured asymmetry among the probabilities $K^0 \rightarrow \text{anti}K^0$ and $\text{anti}K^0 \rightarrow K^0$ cannot be interpreted as such since, being CPT -even transitions, CP and T are experimentally identical, no matter whether there is CPT invariance or not” (Bernabeu *et al.* 2012: 13). In a similar vein, Lincoln Wolfenstein claimed “[t]he CPLEAR result could then be interpreted as evidence that this process would violate time reversal invariance, as well as CP invariance.”⁴

In the experiment performed at SLAC, to avoid the above mentioned ambiguity, entangled B^0 - $\text{anti}B^0$ system produced in positron-electron (e^+e^-) collisions was used. The experimenters compared the probabilities of $\text{anti}B^0 \rightarrow B_-$; $B_+ \rightarrow B^0$; $\text{anti}B^0 \rightarrow B_+$; and $B_- \rightarrow B^0$ transitions to their T -conjugate and when time-reversed pairs were compared, they found discrepancies in the decay rates.⁵ This was the first observation of time reversal invariance violation

are interchanged for antiparticles, in the operation of parity inversion P , particle positions are reflected ($(x, y, z) \rightarrow (-x, -y, -z)$), and in the operation of time reversal T , time is reflected ($t \rightarrow -t$). Roberts (2015) analyzes various approaches to T -violation (the violation of temporal symmetry).

² Horwich’s argumentation will be analyzed later.

³ See Wolfenstein (1999a), and Bernabeu *et al.* (2012).

⁴ Wolfenstein (1999b: 508). See also Wolfenstein (1999a).

⁵ The B_+ and B_- states are defined as the neutral B states filtered by the decay to CP eigenstates $J/\psi K_S^0$ (CP even), and $J/\psi K_S^0$ (for CP odd), respectively. The transitions involved in the experimental tests of CP and T symmetries are different: a test of CP symmetry can be done with the $J/\psi K_S^0$ final state only, while a test of T invariance necessarily involves both $J/\psi K_S^0$ and $J/\psi K_L^0$ final states. See Bernabeu *et al.* (2012) and Lees *et al.* (2012).

in any system through the exchange of (time-reversed states of) the initial and final states in transitions that can only be connected by a T -symmetry transformation. But what are the philosophical consequences of this result?

3. Is time itself asymmetric because of existence of time-asymmetric laws?

We now have a time-asymmetric physical law, whose status as a directly confirmed (or corroborated) scientific hypothesis is exactly the same as that of other physical laws.⁶ Does it mean that we have at last found an arrow (or asymmetry) of time itself?⁷ This is a tempting idea to bind together the arrow of time with a time-asymmetric physical law and it is not surprising that such a conception has its adherents.

3.1 Horwich's gambit

Paul Horwich is an important example of a philosopher who maintained that “time-asymmetric laws of nature are a *sufficient* condition for time to be anisotropic.”⁸ He was convinced that “[i]f what is definitely a law is time-asymmetric, then time is definitely anisotropic” (1987: 46).

⁶ According to Albert (2000: 14), contrary to what is commonly believed, all fundamental physical theories, such as classical electrodynamics, quantum mechanics, relativistic quantum field theory, and general relativity are *not* invariant under time reversal. However, as it was shown by Earman (2002), Albert made use of a highly non-standard interpretation of time reversal invariance that distorted his analysis; while we usually say that a theory is time reversible if whenever a sequence of states S_1, S_2, \dots, S_n is possible according to that theory, then the reverse sequence of *time reversed* states $T(S_n), T(S_{n-1}), \dots, T(S_1)$ is equally possible according to that theory (where T is a time reversal operator), Albert assumed that we should not use time reversed states in this requirement. See also Malament's (2004) critique of Albert's thesis regarding classical electromagnetic theory.

⁷ Such a suggestion is made, for example, by Zeller (2012) in the title of his essay: “Particle Decays Point to an Arrow of Time.”

⁸ See Horwich (1987: 42). Horwich was certain that “the existence of time-asymmetric laws of nature is generally taken to guarantee time's anisotropy” (1987: 39), although, for example, Sklar (1974) and Earman (1974) had not agreed with such a position (I shall present Sklar's motivation later [[2]: 50–52]). Henry Mehlberg (1961) was also among these philosophers who bound together the asymmetry of time with existence of time-asymmetric laws. Because Mehlberg didn't find such an asymmetric law, he insisted that time is symmetric. Horwich follows his path.

Horwich proposed some interesting arguments in favor of this view. He assumed that the anisotropy of time should consist in an intrinsic dissimilarity of the past and future directions: their having different *intrinsic* (vs non-intrinsic or relational) properties, where “the intrinsic properties of an object were those expressible by predicates that are composed of natural predicates, contain no names, and have no quantifiers except those restricted to range over just the object itself and its part.”⁹ Horwich claimed that such a qualification of intrinsic properties is sufficient to assume the dissimilarity between two directions of time, that is, the asymmetry *of time itself*, and was convinced that it should manifest itself in some time asymmetry within our laws of nature:

Thus we are supposing that there must be something about time *itself* that explains the difference. Thus a sufficient condition for there to be an intrinsic dissimilarity between the past and future direction of time is that they be distinguished by laws of nature. And this will be manifested in some difference between the ways in which *earlier* and *later* function in the laws of nature.¹⁰

He thought that this excluded grounding the asymmetry of time in the known at present *de facto* asymmetries because in such a case non-intrinsic properties—initial or boundary conditions of the universe—are involved; these only constitute asymmetries *in* time. However, “we cannot preclude the possibility of (future) physical theories in which some of time’s intrinsic features will be treated as *de facto*, that is, as not required by law” (1987: 42) and that is why Horwich, at the same time, claimed that there is no reason to regard the existence of time-asymmetric laws of nature as *necessary* condition for the anisotropy of time.

To this short presentation of Horwich’s view it should also be added that he rejected the “moving now” conception of time as a source of the asymmetry of time because he claimed (after McTaggart) that such a conception leads to a contradiction,¹¹ and declared to be an adherent of eternalism, according to

⁹ Horwich (1987: 40). “Natural” predicates are “predicates that play a role in articulating laws of nature.”

¹⁰ Horwich (1987: 41). See also (1987: 54–55).

¹¹ Horwich (1987: 16–25). Horwich only accepted the second part of McTaggart’s (1908) argument, according to which the “moving now” model of time is incoherent: ascribing absolute A-properties (or A-determinations) *past*, *present*, and *future* to any event (forming this way A-series of time) leads to a contradiction because every event should have all of them while it can possess only one (they are mutually exclusive)—see fn. 28 for the critique of this argument by Savitt (2001). Horwich rejected the first part of McTaggart’s argument which was intended

which the past, the present, and the future are equally real, and there is no passage of time. In consequence, the flow of time cannot be, according to him, a source of the asymmetry of time.

It could seem that if Horwich assumed that the existence of a time-asymmetric law of nature is a sufficient condition for time to be anisotropic and because he was aware of *CPT* symmetry and the *CP* symmetry violation of weak interactions in physical experiments, then he should have claimed that time is asymmetric but, surprisingly enough, he didn't and instead argued that "the current empirical evidence indicates that time itself is symmetric" (1987: 38). He didn't claim that time is asymmetric because, according to him (1987: 56):

- 1) The time reversal invariance violation of weak interactions had not been directly confirmed and neither the experimental nor the theoretical assumption involved in the argument based on *CP* asymmetry are beyond question;
- 2) Even if time reversal invariance violation of weak interaction were true, it could turn out to be merely a *de facto* asymmetry, which does not involve time-asymmetric laws of nature;
- 3) The *CPT* theorem may be false.

What can we say about these objections? Now the time reversal symmetry violation of weak interactions has been directly confirmed at the experiment performed at SLAC so the first objection is no longer valid. *CPT* theorem, although no longer necessary for the proof of the time reversal symmetry violation of weak interactions, is theoretically without reservation (see Lüders 1957) and its conclusion—*CPT* symmetry—was experimentally confirmed as well, so there is neither a theoretical nor an experimental—at least based on presently available data—reason to support the third objection.¹² The time reversal symmetry violation of weak interactions and *CPT* symmetry are not, of course, proved in the sense in which this word is used in mathematics but its status as a directly confirmed (or corroborated) scientific hypothesis is exactly the same as that of other physical laws.

There is a slightly more difficult problem with Horwich's second objection: that the time reversal symmetry violation of weak interactions can turn out to be merely a *de facto* asymmetry, cannot be *a priori* excluded. We remember,

to show that time and B-series of time (ordered with respect the relation *later than*) exist if events are located in a real A-series.

¹² *CPT* symmetry was experimentally confirmed, inter alia, at Fermilab (Abouziad *et al.* 2011). See also review of particle physics in Beringer *et al.* (2012).

for example, that in the case of the second law of thermodynamics, a regularity which seemed to be lawlike turned out to have a *de facto* character when a macroscopically observable thermodynamic behavior of physical systems was explained as an approach to the equilibrium of microscopic atomic systems.¹³ The point is, however, that to make this objection valid, Horwich should show us how it can be demonstrated that the time asymmetry of weak interactions really has a *de facto* character; that the law governing weak interactions is indeed lawlike is a received view for physicists and philosophers of science, which fact is acknowledged by Horwich.¹⁴ What he claims is that what we assume to be a law *can possibly* turn out to be *de facto*. However, if somebody claims that the received view is not justified, the burden of proof lies with him; this is not enough to claim that it *can* be wrong. Not only has Horwich failed to justify his objection, but, what is more, it is hard to see how it can be done; a similar “microscopic” maneuver as in the case of thermodynamics seems to be impossible here because we are already on the microscopic level. It is also hard to see any involvement of the initial or boundary conditions in the phenomena of the temporal asymmetry of weak interactions.

So it seems that Horwich and everybody who would like to follow his way of binding together the asymmetry of time with time-asymmetric physical laws should claim that time is asymmetric because of the time asymmetry of weak interactions. It seems, however, to be somewhat bizarre to connect the arrow of time with weak interactions. Time really appears to be asymmetric because the past is fixed and the future is (or seems to be) open; we have traces of the past and no traces of the future; causes precede effects and we do not find cases of backward causation, but it seems something implausible to bind these with the weak interactions because we do not find any possible way in which weak interactions could be involved in the phenomena mentioned above.¹⁵ It was noticed a long time ago, shortly after the discovery of *CP* symmetry violation by Richard Feynman (1967, ch. 5), that the distinction between the past and the future cannot depend on asymmetries of weak interactions because

¹³ See, for example, Huang (1987: 85–91); and Sklar (1974: 379–394).

¹⁴ For example, Bernabeu *et al.* (2012) write about their paper entitled “Time Reversal Violation from the Entangled B^0 -anti B^0 System” in the conclusions: “This work concerns the study of microscopic Time Reversal Violation in the fundamental laws of physics.” In a similar vein, Maudlin (2007: 120) writes: “Let’s return for the moment to the violation of *CP* invariance displayed in neutral kaon decay. We noted above that this phenomenon seems to imply that the laws of nature are not Time Reversal Invariant in any sense, and hence that the laws themselves require an intrinsic asymmetry in time directions, and hence that space-time itself, in order to support such laws, must come equipped with an orientation.”

¹⁵ Such a position is vindicated by Sklar in his works, for example, in (1974).

in normal situations—for example, when we are speaking, writing, walking, watching TV, and so forth—weak interactions are not involved. This is not, however, the end of the story.

3.2 Sakharov to the rescue

An adherent of connections between the asymmetry of weak interactions and the asymmetry of time could defend his/her position by claiming that contemporary physics shows us that the asymmetries of the weak interactions are not without impact on our world; on the contrary, it seems that this impact was so significant that it cannot be overestimated. Namely, the universe which we live in and which we observe is composed almost entirely of matter with little or no antimatter.¹⁶ This is the problem with the so-called *baryogenesis*, which consists of an explanation of what physical processes led to the existing asymmetry between matter and antimatter in the universe. In 1966, Andrei Sakharov tried to explain the occurrence of the asymmetry with respect to the number of particles and antiparticles, or baryons and antibaryons, as a consequence of the violation of *CP* invariance in the nonstationary expansion of the hot universe during the superdense stage, which had to influence—according to him—the difference between the partial probabilities of charge-conjugate reactions. He proposed three necessary conditions which must be satisfied to explain the asymmetry between baryons and antibaryons in the early universe, resulting in the lack of antimatter bodies in the universe today:

- i) baryon number violation;
- ii) *C* and *CP* invariance violation;
- iii) deviation from thermal equilibrium in the early universe.¹⁷

The baryon number violation (condition (i)) is a necessary condition to produce an excess of baryons over antibaryons. *C* and *CP* invariance violation (condition (ii)) are also needed so that the total rate for any process producing an excess of baryons is not equal to the rate of the complementary process producing an excess of antibaryons.¹⁸ The third condition should be satisfied

¹⁶ Another important phenomenon on which the weak interactions can have an impact is an increase in the temperature of magma and volcanic eruptions—see Penrose (2004, ch. 34.10).

¹⁷ See Sakharov (1967); Riotto and Trodden (1999: 38).

¹⁸ The thermal average of the baryon number operator *B*, which is odd under both *C* and *CP* transformations, is zero unless those symmetries are violated—see Riotto and Trodden (1999: 38).

since in thermal equilibrium there would be no generation of net baryon number because of CPT symmetry.¹⁹ Different possible scenarios are considered which are supposed to ensure the satisfaction of Sakharov's conditions and an electroweak baryogenesis utilizing CP violation of the weak interactions is one of most important among them. Admittedly, the CP invariance violation of weak interactions is much too small to account for the observed baryon asymmetry of the universe but this scenario can be extended by an additional source of CP violation such as, for example, supersymmetry.²⁰

Now, because CPT is assumed to be a good symmetry, the CP violation of some interactions is equivalent to the T violation of these interactions. So it is possible to claim that the time symmetry violation of the weak interactions had indeed a great impact on our world being a source (or one of possible sources) of the baryon's asymmetry. But does it allow us to bind together a direction of time with weak interactions? It is doubtful. For let us give the advocates of binding together the arrow of time with the asymmetries of weak interactions as much as possible, namely let us assume that the T violation of weak interactions (equivalent to CP symmetry violation if the CPT symmetry holds true) is a necessary condition for the baryon asymmetry of the universe, that it is a necessary condition for the existence of our world in the form known to us with the excess of matter over antimatter. Does it give us any explanation of the main asymmetries of the worlds, that is, the asymmetry of traces, the asymmetry of causation, and the asymmetry between the fixed past and the (probably) open future? Unfortunately, no possible mechanism responsible for these asymmetries and having its source in weak interactions can be seen, so Feynman's remark (that the distinction of the past and the future cannot depend on asymmetries of the weak interactions because in normal situations the weak interactions are not involved) seems to remain valid. Anyway, the burden of proof that the excess of matter over antimatter explains the lack of the traces of the future, lack of the backward causation and openness of the future lies with the adherents of such a view.

Perhaps, somebody would like to claim that *there is* yet another—unknown at present—possible mechanism connected with the weak interactions which is responsible for the above mentioned asymmetries. However, in such a case, it is not enough to maintain such a claim; the burden of proof of existence of such a connections lies with him/her. Otherwise, every our theory could be undermined by a claim that there is another possible—yet unknown at

¹⁹ See Riotto and Trodden (1999: 38).

²⁰ See Riotto and Trodden (1999: 44–45, 71).

present—mechanism connected with XYZ (whatever you want) which can undermine this theory.

3.3 Detour strategy

There is another possible strategy to tackle the problem of the relationship between the asymmetry (or symmetry, as it is claimed by Horwich) of time (on the one hand) and the asymmetries of traces, causation, and the fixed past / open future (on the other hand): trying to treat these problems as independent. The strategy forces its adherents to look for sources of asymmetries we meet in everyday life somewhere other than in (symmetric or asymmetric) time. Such a strategy, when successful, would allow in a special case of an adherent of connections between a/symmetry of time and a/symmetry of physical laws *not to bind together* the asymmetry (or symmetry, as it is claimed by Horwich) of weak interactions with asymmetries of everyday experience.

This is exactly the strategy chosen by Horwich, which is supposed to allow him to claim that time is symmetric in spite of the obvious asymmetries we encounter every day. Although Horwich was wrong in his assessment of the asymmetry of weak interactions, as the recent experiment at SLAC shows, his strategy—when successful—would free its believers from the duty to show connections between the asymmetry of weak interactions and asymmetries of everyday experience. It transpires, however, that this strategy is hard to implement; at least—as I shall try to show—Horwich's trial is implausible.

He did not explain why the past is fixed and the future seems to be open; instead of this asymmetry, he pondered why we care much more about the future than about the past. He proposed the following explanation: we care much more about the future than about the past because of the selectional value of such asymmetric preferences; our past-oriented care and desires cannot be fulfilled and are useless, although those that are future-oriented can be fulfilled and help us to survive and to adapt to our environment.²¹ Horwich is obviously right that our past-oriented care and desires cannot be fulfilled and are useless; however, it is also obvious that these undertakings are impossible not because such past-oriented actions do not improve our situation but because we *cannot* change the past—it is fixed. So the problem with this

²¹ Horwich (1987: 196–198). He follows here Mehlberg (1961).

argumentation is that it is grounded in the *implicit* assumption that the past is fixed while the future is (probably) open and can be changed; otherwise our expectation that our concern for the future is conducive to our survival and reproduction would be pointless. But the asymmetry between the fixed past and the open future is exactly one of these asymmetries which Horwich should have explained in the first place and not taken for granted. Because he did not explain the origin of this asymmetry, it means that his argumentation is implausible and ends up begging the question.

Horwich tried to explain the asymmetry of traces and, especially, why we know more about the past—having so many recorded traces of it (e.g., memory, writing, photographs, tape recordings, footprints, fossils, and paintings)—than about the future, which provide us with no recorded traces, by referring to a fork asymmetry. The phenomenon of recording is, according to him, an instance of this pattern of events that he identified as a “normal fork” which consists in the fact that regularly associated events must have a common cause but need have no joint effect.²² This explanation, however, seems again to be implausible for two reasons. Firstly, although we have sometimes doubled, or multiplied traces of some events from the past, as a matter of fact, traces *need not be doubled* to be traces. I remember what I thought yesterday, and before yesterday (and so on), and I need no more evidence of these processes to be sure what I thought about. Sometimes, of course, I can make notes or some recording in my computer but this, in fact, is not needed if I believe in my memory. A policeman can find a single fingerprint in a place where an offence is committed and should he really think that it is not a trace because it is solitary? An anthropologist can find a single million-year-old fossil bone—with conceivably no other traces—that can bring about a revolution in science even if it is impossible to find another fossil of this type. A single tape recording or a photograph can be, taking for granted that they are not falsified, documentation of important happenings from the past which we believe in. These examples, and many others, show that, contrary to what Horwich claims, the phenomenon of recordings does not consist in the “causal connectedness of correlated events.” In fact, Horwich did not appeal to the fork asymmetry itself in his explanation of asymmetry of our knowledge and asymmetry of traces.²³

²² Horwich (1987, ch. 5). Following Earman (1974), he rejected the explanation of time asymmetry of traces based on the asymmetry of entropy.

²³ Healey (1991: 128) first noticed that Horwich had nowhere appealed to the fork asymmetry itself in his explanation of the asymmetry of our knowledge.

Secondly, the fork asymmetry could only explain why we have more traces of the past than traces of the future (if we had such traces) but it does not explain why we do not have traces of the future *at all*; the fork asymmetry in no way blocks the occurrence of traces of the future.

Our special kind of experience is an experience of the flowing of time. For the adherent of the objectivity of the flow of time, this phenomenon is a source of the asymmetry of time. For Horwich, of course, the passage of time cannot play this role and is only an illusion. He tried to show how we can *create* this illusion—according to him, our “sense of the passage of time” is the effect of two factors: phenomenological and linguistic.²⁴ First, we are aware of sequences of experiences in which events that are initially anticipated are then sensed and subsequently remembered. Just as these sequences of experiences, ordered with the relation “later than” or “earlier than,” we are conscious from “different temporal perspectives” or “different vantage points.” In the second place—according to Horwich—our conventions concerning the concepts of “motion” and “direction” lead to a particular way of describing the array of states of mind as “movement through time” into the future.

The main flaw of this argument is that Horwich was not able to explain the origin of this *changing* “temporal perspectives” or “vantage points”—how is it possible that, in different moments of time, the same subject can anticipate, then sense, and subsequently remember the same event? If he had been able to explain from his eternalist’s perspective the lack of traces of the future, a presence of the traces of the past and the lack of the traces of the future at every moment of time could have imitated a movement of the vantage points and introduced an alleged (although not real) direction of time. But, as I tried to show, he did not explain why there are no traces of the future.²⁵ Thus one can easily become suspicious that in speaking of different “temporal perspectives” Horwich has simply smuggled the passage of time into his reasoning, something what he wanted to explain. It is exactly the moving of different “vantage points” or “temporal perspectives” that he as an eternalist cannot *posit* but should *explain* as to how we produce it. What Horwich actually gave us is a description of how we *experience* the passage of time, whatever it is, but not an explanation of how we *create* an illusion of it in our mind. Thus, just

²⁴ Horwich (1987: 33–36) made use of Miller’s (1984) elucidation of Husserl’s *Phenomenology of Internal Time-Consciousness*.

²⁵ Horwich, as an eternalist, should have also explained why we persist through time, keeping our numerical identity being wholly present at each moment, that is, why we endure, but he didn’t. I will not pursue this question further here.

as in the case of his explanations of the origins of our concern for the future and the asymmetry of our knowledge, Horwich's argumentation is based on a fallacy of *petitio principii*.

The last element of Horwich's strategy which I would like to examine is his explanation of the asymmetry of causation. He maintained that explanation is theoretically prior to causation and that the direction of physical explanation yields the directions of causation. He offered a range of different a posteriori answers to the question of why we believe in the future orientation of causation and use it in our explanations:

- 1) Causation is defined, in part, by the principle that correlated events are causally connected, and this, given the fact that there are no inverse forks, determines the fact that causation is future oriented.
- 2) Causation is defined through its association with our experience of deliberation and control, and our voluntary actions are performed only for the sake of future events.
- 3) Causation is defined, in part, by the idea that a cause is ontologically more basic than its effect and because we have traces of the past but not of the future we tend to think that the past has more reality than the future. Hence, we assume that the past is causally prior to the future.²⁶

Unfortunately, these explanations are unconvincing. The first one is mistaken: we do not connect the direction of causation with the directionality of forks: firstly, we have a good sense of the direction of causation even if there is (or would be) only one effect of some cause. And secondly, let us assume that we have an inverse fork, for example a case (similar although not exactly the same as the case of overdetermination) when two people are—by accident—simultaneously shooting a third and causing his death, and both these shots are necessary to produce this effect. Will we say in such a case that causation is past oriented because of an inverse fork? The answer is, of course, negative.

The explanation (2) cannot be accepted as introducing directionality to causation granted that time is symmetric (Horwich's assumption) because it is based on the hidden time-asymmetric assumption saying that the past is fixed and the future is open, as I tried to show above. I also attempted to show that Horwich did not explain why there are no traces of the future, hence (3) is implausible as well. Therefore Horwich's explanation of the asymmetry of causation is partially mistaken and partially based on a fallacy of *petitio principii*.

²⁶ Horwich (1987: 143–144, 202–203).

Thus Horwich's strategy has failed to treat time as symmetric and to explain the asymmetries of traces and our knowledge, the asymmetry of causation, and the asymmetry between the fixed past and open future without—as he declared—referring to the asymmetric time. It is symptomatic that all his arguments contain the hidden assumption about the existence of time-asymmetric phenomena, although Horwich regarded time as symmetric: the asymmetry between the fixed past and the open future; lack of traces of the future (while we have many traces of the past); and the moving (toward the future) vantage points from which we are experiencing the world. The problem which he encountered is not accidental; when we try to explain the asymmetries which we know from everyday life we first of all want to refer—at the deepest level—to physical laws and these are symmetric, with the exception of weak interactions which are, as pointed out by Feynman and others, not involved in normal everyday situations. The fundamental difficulty here is that it is impossible to receive time-asymmetric phenomena from time-symmetric assumptions (if we ignore accidental initial and boundary conditions), and in the case when Horwich's main tool—the fork asymmetry—failed to do the job, the whole endeavor had to fail.

3.4 Sklar's general argument

The problem of the arrow of time—which should be recalled here—originated from our attempts to understand and explain the asymmetries of traces, causation, and the asymmetry between the fixed past and open future; and every solution to the problem of the direction of time—symmetric or asymmetric one—should explain the source of the last three asymmetries. From the consideration above, it follows that weak interactions and the law governing them do not provide us with such an explanation and should be treated only as a kind of asymmetry *in* time but not as a source of asymmetry *of* time.

I argued above that the direction of time cannot be based on a time-asymmetric law governing weak interactions. Even if it turned out that recent and earlier experiments concerning weak interactions were erroneously carried out, we would not change our opinion about asymmetries of traces, causation and the asymmetry between the fixed past and open future. So the existence of this time-asymmetric physical law seems not to be a sufficient condition for time to be anisotropic and Horwich's reasoning appears to be incorrect. Nevertheless, somebody could try to strengthen Horwich's sufficient condition in the following way:

Time-asymmetry of *all* physical laws is a sufficient condition for time to be anisotropic,

to include other interactions which are involved in the phenomena we meet in everyday life. It can be shown more generally, however, that no time-asymmetric physical law—even if all of them were time-asymmetric—can provide us with the grounds for the asymmetry of time. Such a line of argumentation was proposed by Lawrence Sklar.²⁷ Let us suppose—argued Sklar—even that for every isolated system in the universe times related to one another by temporal priority are times at which the systems have states that are asymmetrically related to one another by a nontemporal relation and are such that their time reversal can never appear in the reversed time order by the laws of nature. Does it give us any explanation with regards to the direction of time? No—answered Sklar—because the only thing which we would know in such a case would be that the reversed time order of the time-reversed states would not be compatible with the laws of nature. We can imagine a possible world consisting of the time-reversed states of the actual world in the reversed time order, which would be governed by its own laws that would be time-reversed laws of the actual world. If we would like to choose which laws are true (in our world), we can only do it—it seems—by checking the behavior of the physical system in our world.

The main point of Sklar's argument is that what real or possible time reversal noninvariant laws give us is the knowledge about the order and the lawlike behavior of physical systems; they do not give us any explanation of what the direction of time is and do not give us any insight in it, and especially they do not explain what is the origin of the asymmetry of traces, the asymmetry of causation and the asymmetry between the fixed past and open future. Such an argument seems to be sound in the case of laws which are known to us at present; it is hard to imagine that any change of this sort that weak interaction would turn out to be time reversal invariant or, alternatively, that if our other physical laws turned out to be time reversal noninvariant then it would give us any explanation of what the direction of time is. Such a change would only mean that the reversed time order of the time-reversed states of actual states would be compatible with these new laws and would not be compatible with the laws we know at present. However, Sklar's argument can turn out to be insufficient in the case of new laws which we are currently searching for. In

²⁷ Sklar (1974: 401–402). Earman (1974: 31) also claimed that that no time-asymmetric physical law can provide us with a basis for the asymmetry of time.

such theories, a role of time can be fundamentally different, as it is, for example, in the theory developed by Carlo Rovelli where time plays no role at all (see Rovelli 2011). Nevertheless, it will be only possible to verify Sklar's argument in the context of this and similar theories when they are fully developed. Anyway, taking into account the present state of our knowledge, the time-asymmetry of a physical law does not seem to be a sufficient condition for time to be anisotropic and Horwich's reasoning appears again to be incorrect.

3.5 Horwich's main assumption revisited

It is interesting to examine where a mistake or mistakes in Horwich's reasoning could have been made. His starting point, that the anisotropy of time would consist in the intrinsic dissimilarity of two directions: their having different intrinsic (for time itself) properties, seems to be good but, nevertheless, there are—I think—two flaws in his further argumentation. Firstly, he rejected too quickly the metaphysical theory of the direction of time founded on the idea of the flow of time. Too quickly, I think, because his refutation of our common solution to the problem of the direction of time, which is well grounded in everyday experience, should be based on much more solid foundations than J. M. E. McTaggart's controversial argument.²⁸ Although there are some other interesting arguments which could be discussed instead, none of them seems to be compelling. There is, however, no place here to examine this problem.²⁹

Secondly, Horwich's characterization of "intrinsic properties," which was crucial for his reasoning intended to determine a sufficient condition for time to be anisotropic, is obscure and ambiguous in the case of time. He described as intrinsic properties—I recall—those expressible by predicates that are composed of natural predicates, contain no names, and have no quantifiers except those restricted to range over just the object itself—that is time itself—and

²⁸ Savitt (2001) noticed, for example, that the copula "is" used in the sentences "Every event is past, present and future" and "Every event is past or present or future (and can only have one of these *A*-properties)" is not univocal—with the tenseless sense in the first and the tensed in the second sentence—and therefore there is no contradiction involved in accepting both.

²⁹ For example, a metaphysical solution to the problem of the direction of time which makes use of a notion of directional dynamic existence is proposed in my (2015b); in this approach, the direction of time can be treated as a consequence of a special form of the existence of all objects which our world consists of. Such an approach to presentism allows us to avoid the triviality problem and to treat presentism, that is, the view according to which only the present exists and there is a flow of time, as a consistent, homogenous view consisting of only one thesis.

its part (1987: 40). But he also added that his assumption according to which the anisotropy of time should consist in an intrinsic dissimilarity of the past and future directions (their having different *intrinsic* properties) does not imply a commitment to substantial (or absolute) time (1987: 47). Horwich claims that the question of whether time is (an)isotropic can plausibly be interpreted as a question about the resemblance (or difference) between the relations *later* and *earlier*, and these relations can be understood in a Leibnizian way and can be investigated by analyzing of physical laws. The point is that such a characterization of the intrinsic properties of time is insufficient and ambiguous, which can be best seen in the case of weak interactions; how could we get to know on the basis of this description whether the properties of weakly interacting elementary particles refer to the *time itself* and its parts (and the predicates describing them range over them) rather than that they are specific for *these* specific particles and *these* specific interactions? In the first case, we would really have the asymmetry *of* time, in the second, however, only the asymmetry *in* time of some specific physical processes.

Horwich thinks that the anisotropy of time can be inferred from a temporal asymmetry of *some* physical law. At first glance, this argument seems to be plausible because we make similar reasoning—let us recall—in the case, for example, of the homogeneity of space and time which can be inferred of from the invariance of physical laws under spatial and temporal translations, or of the isotropy of space which can be inferred from the invariance of these laws under the spatial rotation. There is, however, a fatal flaw in Horwich's reasoning because there is a logical gap between the temporal asymmetry of *some* physical law and asymmetry *of* time itself; the first can hold even if the other does not, as can be best seen in the fact that other physical interactions which are active on different levels of physical reality are invariant under time reversal. Should we assume that they are active in *different* spacetime than weak interactions?

His argument would be more plausible if other interactions were also temporally asymmetric as it is in the above mentioned cases of the universal invariance of all physical laws under spatial and temporal translations, or the invariance of these laws under spatial rotation—in such a case we could make a more plausible abductive step from the temporal asymmetry of all physical interaction to asymmetry *of* time. The fact that the electrodynamic, strong, and gravitational interactions are invariant under time reversal seems to give us a strong evidence that the time asymmetry of weak interactions is *only specific* to the weakly interacting particles and that Horwich's "sufficient condition" is, in fact, not sufficient.

Perhaps, then, Horwich should postulate that the time-asymmetry of *all* physical interactions is a sufficient condition for time to be anisotropic. However, as it was mentioned before, Sklar's argument which says about hypothetical world in which all physical processes are irreversible by the laws of nature seems to show that even the time-asymmetry of all physical laws could not explain the observable temporal asymmetries of the world, such as the asymmetry of traces, the asymmetry of causation and the asymmetry between the fixed past and (probably) open future. So—based on our current state of knowledge—it seems that even such a risky maneuver would not help Horwich to maintain his claim about the connections between the direction of time and time-asymmetric laws of nature.

4. Conclusions

I have tried to show that Horwich's claim that the direction of time is grounded in time-asymmetric laws of nature—concerning weak interactions and other interaction as well—is implausible or—strictly speaking—that the existence of a time-asymmetric law of nature is *not* a sufficient condition for time to be anisotropic. It is not so because there seem to be no connections between the temporal asymmetry of physical laws—and temporal asymmetry of weak interactions especially—and the lack of traces of the future, the lack of backward causation and the lack of possibility to influence the past while at the same time we have traces of the past, future-oriented causation which can influence the future. These asymmetries are fundamental for our experience and for our world, and cannot be simply eliminated by any imaginable subjectivistic maneuver because no such maneuver can make it possible to infer these everyday time-asymmetric experiences from phenomena in which time-symmetric strong, electromagnetic, and gravitational forces are involved, only if we do not want to invoke accidental initial or boundary conditions. The asymmetry of weak interactions does not help us to explain these time-asymmetric experiences, nor can this perform a possible change in our assessment of the symmetry of strong, electromagnetic, and gravitational forces.

The difficulty of the problem of the asymmetry *of* time results from the very specific role of time in our experience and in our world that is very different from this played by space: we can find traces of—and we can act causally on (providing that we have enough time to do this)—what is up and down, left and right, in front of and behind us, while at the same time we cannot

causally affect the past. The asymmetry of weak interactions does not help us to explain this situation nor is it conceivable at present that any other possible asymmetric law of nature can do this. Therefore instead of Horwich's "sufficient condition" for time to be asymmetric, a more fundamental requirement should be recalled and put forward: every plausible solution to the problem of the direction *of* time should explain what is the source of the asymmetry of traces, the asymmetry of causation and the asymmetry between the fixed past and (probably) open future in a credible way. Horwich's solution does not satisfy this condition. Nor does any conceivable theory involving weak interactions do so and thus it seems that the time-asymmetry of weak interactions is only an asymmetry *in* time.

3. Presentism and the Flow of Time

This chapter examines the relations between presentism and the thesis concerning the existence of the flow of time. It tries to show that the presentist has to admit the existence of the passage of time and that the standard formulation of presentism as a singular thesis saying that only the present exists is insufficient because it does not allow the inference of the existence of the passage of time. Instead of this, the chapter proposes a formulation of presentism with the aid of the notion of becoming; not only does a formulation state the existence of the flow of time in such a way as to avoid the question of the rate of the passage of time, but it also allows the inference of the existence of only present things and events. The chapter demonstrates that the proposed conception of presentism also has other virtues, such as homogeneity, non-triviality, and ability to express dynamicity of presentists' image of the world which testify for it.

1. Introduction

The issue of how we should grasp the relations between presentism and the existence of the flow of time is a vague and unclear one. Some philosophers assume a single, standard ontological thesis saying about the existence of only the present while others claim that an acceptable formulation of presentism should entail the temporal passage in the form of temporal becoming,¹ and there are still others who claim that the thesis about the existence of the flow of time is a fundamental claim of presentism.² There are even philosophers

¹ See Hestevold and Carter (2002: 493).

² See my (2013: 54–56, [1]: 29–33; 2015b: 813–819).

who claim that “Time does not pass given presentism.”³ So it is an important metaphysical problem which cries out for clarification.

The majority of presentists introduce their view simply in the form:

P₁ Only the present exists;⁴

or that

P₂ Only the present is real.⁵

Such forms of presentism were criticized as leading to the triviality problem. The problem consists in saying when we examine the ontological theses of presentism that only the present objects exist; it turns out that both these ontological theses are trivially true or trivially false, depending on the way in which we understand the verb “exists”: in a tensed or tenseless way.⁶ That is why many presentists—to avoid the triviality problem—transform their main ontological thesis into a more sophisticated form:

P₃ The domain of our most unrestricted quantifiers only includes the present objects;⁷

or

P₄ Only present things exist *simpliciter*;⁸

or

P₅ Necessary, if x exists *simpliciter*, then x presently exists.⁹

³ Tallant (2010: 140).

⁴ See, for example, Merricks (1995: 523).

⁵ See, for example, Hinchliff (1996: 122–123).

⁶ See, for example, Savitt (2006). He precisely shows that the application of the predicate “being real” also leads to the triviality problem because when we try to specify the predicate “being real” in opposition to “being imaginary,” and when we ascribe unreality to the past and the future, the triviality problem revives.

⁷ Sider (1999: 327), for example, claims that the presentist ontological position can be expressed in such a way.

⁸ Sider (2006: 76), for example, claims, that presentist can formulate their thesis with the aid of Lewisian (1986: 3) notion of existence *simpliciter*.

⁹ Hestevold and Carter (2002: 499).

Presentists maintain—contrary to the claims of the adherents of the opposite views—that the past and the future do not exist, or that they are not real, or are not in the domain of our most unrestricted quantifiers, or that they do not exist *simpliciter*.¹⁰ They unanimously agree that the past *was* and that the future *will be*.

As it was recalled above, they sometime also assume, explicitly or implicitly, that the flow of time exists. Thus the important ontological issue arises: is the claim about the existence of the passage of time necessary for presentism? Perhaps it is unnecessary, or can it even be denied, as is claimed by Jonathan Tallant (2010)? And maybe we should assume that it is a sufficient condition for presentism? It is the aim of this chapter to examine these difficult questions: the problem of the necessity of the existence of the passage of time for presentism is examined in the second section, while the third section deals with the issue of whether the thesis about the existence of the flow of time in the form of becoming is sufficient for defining presentism.

2. Is the existence of the flow of time necessary for presentism?

What I claim is that we should answer the question posed in the title positively. It was first noticed by St. Augustine that we should choose such an answer although, of course, he did not state the problem in such a form. In the well-known 11th book of the *Confessions* he wrote:

Boldly for all this dare I affirm myself to know thus much; that if nothing were passing, there would be no past time: and if nothing were coming, there should

¹⁰ There are some opposite views to presentism: according to eternalism, the past, the present, and the future exist; according to growing block universe, only the present and the past exist; according to shrinking block universe, only the present and the future exist. The last two views admit existence of the flow of time and the next two views do it as well: according to the shrinking tree, the world is represented by a tree and the trunk represents the past, the first branch point is the present, and the branches constitute the set of all physically possible futures, and the flow of time is responsible for the progressive branch attrition (McCall 1995: 155). And according to moving spotlight, there are past, present, and future events, and the present is represented by some kind of “moving spotlight” (see e.g. Merricks 2006; and Dainton 2014). I am concentrating on presentism in this chapter.

be no time to come: and if nothing were, there should now be no present time. Those two times therefore, past and to come, in what sort are they, seeing the past is now no longer, and that to come is not yet? As for the present, should it always be present and never pass into times past, verily it should not be time but eternity. If then time present, to be time, only comes into existence because it passeth into time past; how can we say that also to be, whose cause of being is, that it shall not be: that we cannot, forsooth, affirm that time is, but only because it is tending not to be? (St. Augustine 1912: 239)

St. Augustine claims here, as presentists do, that there is only present, and the past is no longer, and the future is not yet.¹¹ And he wrote in this passage also that if nothing passed away, the time called the past were not; and if nothing were coming, the time to come were not either; and if nothing were, then the time called the present could not be either. This means nothing other than that if the flow of time did not exist, the present would not exist either, and in such a case we could not claim that the past was and the future will be. And because the adherents of presentism maintain that the past was, that the future will be, the present exists, and that there was a time when our present events were in the future, they must admit the existence of the flow of time. The only possible alternative to avoid this conclusion is to understand the past as those events and things which are *earlier than*, the future as those events and things which are *later than*, and the present as those events and things which are *simultaneously with* a given moment of time. This maneuver, however, would lead to the static block universe of the eternalist in which everything exists tenselessly in their proper spacetime location and where there is no place for passing away and no place for the coming to be of events. Such a situation seems to be inconsistent with what St. Augustine wrote about time and is also not acceptable for presentists. So, it follows from this that the presentists have to admit the existence of the flow of time; that is, they must accept the condition which I will call *St. Augustine's Condition*:

St. Augustine's Condition: Presentism has to admit the existence of the flow of time.

¹¹ In what follows, I am interpreting this passage literally, that is, I assume that St. Augustine treated time and the flow of time as objective phenomena. Russell (1945: 354), for example, interpreted St. Augustine's theory of time as subjectivist.

And now the essential issue arises of whether any of the presentists' theses P_1 – P_5 alone really satisfies St. Augustine's Condition. So the question is whether the existence of the flow of time can be inferred from the theses P_1 – P_5 alone with no other assumption. Some philosophers claim that it is really possible. For example, H. Scott Hestevold and William R. Carter (2002) declare in their paper that "[a]n acceptable formulation of Presentism should make clear that Presentism implies Transient Time" (identified with the temporal becoming or the temporal passage),¹² while at the same time they claim that the main ontological thesis of presentism ought to be stated in the last form mentioned above:

Necessary, if x exists *simpliciter*, then x presently exists. (2002: 493)

They claim that the presentism formulated in such a form implies a thesis termed by them *Transient Time*:

Transient Time: it is possible that objects and events undergo (in some sense) temporal becoming; in an irreducibly non-tenseless sense, it is possible that there did exist or did occur objects or events that do not presently (or will not), respectively, exist or occur; and it is possible that there will exist or will occur objects or events that, respectively, do not presently exist (or have not yet existed) or do not presently occur (or have not yet occurred).¹³

Transient Time is contrasted by the authors with *Static Time*:

Static Time: Nothing can undergo temporal becoming; with respect to any (tenselessly) existing object or event, there cannot be an irreducibly non-tenseless sense in which it presently exists or occurs, did exist or occur, or will exist or occur.¹⁴

Does Hestevold and Carter's presentism really imply Transient Time? The authors claim that it does and introduce an argument which will be examined below. The mistake made in this reasoning is informative because it also shows why no other form of presentist thesis of the form P_1 – P_4 can infer temporal

¹² Hestevold and Carter (2002: 493).

¹³ Hestevold and Carter (2002: 493). The notion of possibility applied in this definition is vague; is it *possible*, for example, that Hestevold and Carter do not undergo temporal becoming?

¹⁴ Hestevold and Carter (2002: 493).

becoming or the temporal passage alone. Hestevold and Carter's argument has the following form:

- 1) Presentism is correct and Transient Time is incorrect. (assumption for *reductio ad absurdum*)
- 2) If Presentism is correct, then Mozart exists only in the sense that there did exist something that was Mozart.
- 3) If Transient Time is incorrect, then there is a sense in which Mozart exists other than the sense that there did exist something that was Mozart.
- 4) If Transient Time is correct, then Static Time is not correct.
- 5) Therefore, Mozart exists only in the sense that there did exist something that was Mozart. (from 1, 2)
- 6) Therefore, there is a sense in which Mozart exists other than the sense that there did exist something that was Mozart. (from 1, 3)
- 7) Therefore, Mozart exists only in the sense that there did exist something that was Mozart and there is a sense in which Mozart exists other than the sense that there did exist something that was Mozart. (from 5, 6)
- 8) Therefore, it is false that both Presentism is correct and Transient Time is incorrect. (from 1, 7)
- 9) Therefore, either Presentism is incorrect or Transient Time is correct. (from 8)
- 10) Therefore, if Presentism is correct, then Transient Time is correct. (from 9)
- 11) Therefore, if Presentism is correct, then Static Time is not correct. (from 4, 10)¹⁵

It is easy to show that this reasoning is invalid because the second step is not justified. To see this let us imagine a simple model of the possible world W^+ exactly similar to our *present* world W at some fixed moment t_0 , but such that in W^+ there existed nothing in the past of t_0 , and there will exist nothing in the future of t_0 . It would be a static world with a momentary present at t_0 but without a flowing time, with no events and no things which existed in the past of t_0 , and similarly without events and things which will exist in the future of t_0 . It would be a "frozen" presentism, which, of course, is not in agreement with our experience, this is, however, not at issue. The point is that in the world W^+ Hestevold and Carter's presentism is true and that

¹⁵ Hestevold and Carter (2002: 500–501).

it does not allow the inference from the presentist assumption of the (past) existence of any past event and any past object like, for example, Mozart. It means that the second step in the argument is not justified and the whole argument is invalid.

What is important, all other versions of presentism P_1 – P_4 are true in the world W^\dagger , which means that it is impossible to infer from such ontological theses alone the existence of the flow of time. Of course, I do not support such a version of presentism: although such a view is logically consistent, it is not in accordance with our experience of the world and, as such, is of no interest for presentists. What I claim rather, after St. Augustine, is that presentists have to accept the existence of the flow of time and the theses P_1 – P_4 alone do not suffice to define presentism.

There is one more argument in favor of the acceptance of the existence of the flow of time by the presentists. Namely, the presentists who do not assume the existence of the flow of time are vulnerable to attacks similar to that launched by Lewis (1986: 207), who claimed that every view denying existence of the future is implausible and irrational:

Consider the philosophers who say that the future is unreal. If ever anyone is right that there is no future, then that very moment is his last, and what's more is the end of everything. Yet when these philosophers teach that there is no more time to come, they show no trace of terror or despair!¹⁶

The presentists who assume the existence of the flow of time have no reason to despair: due to the existence of the flow of time, although the future does not exist at present, there is more time to come and—for better or for worse—it *will exist* in the future for sure.¹⁷

If it is impossible to infer the passage of time from the theses of the form P_1 – P_5 , then perhaps presentists should define their position as a simple conjunction of one of these theses and a second concerning the existence of the passage of time? Certainly, it would be a better definition of presentism because St. Augustine's Condition would then be trivially satisfied. Nevertheless, such a solution has at least two flaws. Firstly, presentism defined with the aid of the two theses makes use of ontological notions of a different character: whatever notion we will apply to introduce the flow of time, it has to have a dynamic character, while the notion of the existence in the first thesis has

¹⁶ Lewis (1986: 207).

¹⁷ See also my (2013: 55, [1]: 32).

a static character and such a solution would lead to an inhomogeneous view.¹⁸ Secondly—and which I will try to show is more important—is that the thesis concerning the existence of the flow of time in the form of becoming, when properly understood, suffices to conceptualize presentism in a satisfactory way. This problem will be discussed in the next section.

3. Is the existence of becoming a sufficient condition for presentism?

The usage of the notion of becoming to express the passage of time seems to be the most promising approach because it allows us to avoid the intractable question of the rate of time's passage—and Broad (1938) introduced his primitive notion of *absolute becoming* just to avoid the question about the rate of time's passage. He noticed that the passage of time cannot be referred to itself because then the ratio of the same two quantities expressing the rate of time's passage is meaningless. Neither can the passage of time be referred to a second time dimension, because in such a case the problem of the flow of time revives leading to *regressus ad infinitum*. He wrote in his famous quotations:

To “become present” is, in fact, just to “become,” in an absolute sense; i.e., to “come to pass” in the Biblical phraseology, or, most simply, to “happen.” Sentences like “This water became hot” or “This noise became louder” record facts of *qualitative change*. Sentences like “This event became present” record facts of *absolute becoming*. (...) I do not suppose that so simple and fundamental a notion as that of absolute becoming can be analyzed, and I am quite certain that it cannot be analyzed in terms of a non-temporal copula and some kind of temporal predicate. (Broad 1938: 280–281)

So, according to Broad, the flow of time consists in the (absolute) becoming of events. He ascribed absolute becoming to instantaneous events: he wrote that they *come to pass*, that is, that they come into existence to cease to be, where “existence” is understood in a tensed sense. If they “come to pass” or

¹⁸ This is just the reason why attempts to define the flow of time with the help of a kind of a “movement” of the present are impossible.

come into existence to cease to be, this means that they *did not exist* and *will not exist* although *they come into existence at present*. This is a clearly dynamic sense of becoming which is in agreement with our understanding of the passage of time. What is also important is that because it is said here that the events, which are now present, did not exist and will not exist, this conception of becoming fits perfectly well presentism, according to which there are no future and past objects. It is important since there are other ontological views which accept existence of the flow of time such as, for example, growing block universe, shrinking block universe, shrinking tree, or moving spotlight, which admit existence of the past or/and future objects and the notion of becoming assumed here excludes them.

The above interpretation of becoming as a dynamic process of coming into being to cease to be proposes the literal understanding of “coming to pass,” which seems to be in agreement with Broad’s intentions. A quite different interpretation was suggested by Savitt (2002), who proposed interpreting it in a minimalist way to receive the “Radical Middle” (2002: 161) between Broad and the well-known critic of the passage of time D. C. Williams (1951):

Absolute becoming, as explained by Broad, is just the happening of events. Since events are located at various times or moments, they happen at various times or moments. Some events have happened, some are happening now, and others, we hope, will happen eventually. Some events occur simultaneously, some earlier than others, some later. Absolute becoming is the ordered occurrence of (simultaneity sets of) events. (Savitt 2002: 159–160)

Is this attempt at squaring the circle credible? Unfortunately, it seems implausible. Savitt—although he is known as a presentist—identifies the future with the events which happen later than others, the past with events which happen earlier than others, and the present with events which happen simultaneously with others in a typically eternalist way and thus this results in the static eternalist world where there is no place for coming to pass. He ignored the key expression “come to pass” in his interpretation which was used by Broad to introduce dynamics to his becoming, and interpreted “happen” in the static, tenseless way as “happen at time”—later, earlier, or simultaneously with other events—and as a result strips becoming of all of its dynamics. Such a notion of becoming is not in agreement with Broad’s intention and is useless for presentists.

Now, after assuming the dynamic interpretation of becoming, what remains is to introduce the notions of present, the past, and the future. So, to finish

the construction of the proper definition of presentism, we only need to recall what presentists understand as the present. And there is a long tradition in presentism of identifying the present with what exists. To justify this claim, I recall some passages from Prior and his followers:

[T]o say that my lecture is present is just to say that *I am lecturing*—flat, no prefixes. The pastness of the event, that is its having taken place, is not the same thing as the event itself; nor is its futurity; but the presentness of an event *is* just the event. The presentness of an event *is* just the event. The presentness of my lecturing, for instance, is just my lecturing. (Prior 1970: 247)

To be present is simply to be, to exist, and to be present at a given time is just to exist at that time—no less and no more. (Christensen 1993: 168)

On a presentist ontology, to exist temporally is to be present. Since presentness is identical with temporal existence (or occurrence) and existence is not a property, neither is presentness a property. Presentness is the act of temporal being. (Craig 1997: 37)

So, it follows from this that the presentist can identify the present with the totality of events that exists, and in a similar way the past with the totality of events that existed but ceased to be, and the future with the totality of events that will exist but do not yet exist. Now, if we recall Broad's thesis about the passage of time as becoming of events, that is as their coming into existence to cease to be, we can easily see that Broad's becoming leads precisely to the presentists' ontological consequences, just those which form the presentist's thesis P_1 – P_5 : events that we call present come into existence to cease to be. It means that no other ontological thesis is needed with the exception of the definition of the present, the past, and the future assumed above. In this way we gain an essential advantage over the standard formulation because the proposed one is only expressed with the aid of one thesis—which satisfies the St. Augustine Condition. It can be true or false, nonetheless it is certainly not trivial; Broad does not say that the *present* becomes or comes into existence. He says that events become or come into existence to cease to be. And Prior adds that we *understand* or *define* the present as that which exists. What is perhaps crucial is that neither Broad's thesis nor Prior's definition are trivial.

So presentism can be expressed, as I have tried to show, in the form of one thesis which I will call *becoming*:

Becoming: Events which our world consists of become or come into existence to cease to be.¹⁹

This thesis is to be completed by the three definitions:

The present \equiv The totality of events which become or come into existence.

The past \equiv The totality of events which became or came into existence.

The future \equiv The totality of events which will become or will come into existence.

This analysis was performed in the language of events, but there is no difficulty to carry it out in the language of things (or things and events). To this end, it would be enough to recall Sellars's notion of becoming which was ascribed to things: "*only things can become in the sense of come into being*," (1962: 556) and to swap in the above analysis terms "events" for the terms "things" (or for the terms "things and events").

I would like now emphasize some virtues of such a formulation of presentism:

- 1) It satisfies St. Augustine's Condition, while no other form of presentism formulated as single thesis of the form P_1-P_5 does so.
- 2) It allows the expression of a *dynamic* character of reality, which presentism in the form of a single thesis of the form P_1-P_5 is not able to do.
- 3) It avoids the question of the rate of the passage of time because—as emphasized by Broad—the notion of becoming is primitive and unrelated to anything else, and especially not to time.
- 4) This formulation of presentism also avoids the triviality objection because the main thesis about the becoming of events (or things) is not trivial.
- 5) This formulation of presentism is consistent and—which should also be emphasized—homogenous: it is not composed of concepts of different types.

All these virtues seem to suggest that the proposed conceptualization of presentism should be assumed as the correct one and a better one than the standard formulation.

¹⁹ A similar definition of presentism was proposed in my (2013: 54, [1]: 31).

4. Conclusions

The chapter has tried to show that presentism has to admit the existence of the flow of time to be in accordance with our intuitions concerning the present, the past, and the future. It also tried to demonstrate that the thesis concerning the existence of the flow of time in the form of becoming, when properly understood, suffices to conceptualize presentism in a satisfactory way. That is, it can be treated as the most fundamental thesis of presentism, from which we are able to infer the ontological thesis about the existence of only these events (and things) which we call the present. Such a formulation of presentism has some important advantages over the standard formulations, as I tried to show: it is homogenous, avoids the question about the rate of time passage, it is undeniably non-trivial, and emphasizes the dynamic character of the presentist's image of the world. Because it gives us important benefits, it is worth considering it to be the successor to the traditional formulations.

4. Presentism and the Notion of Existence

The aim of this chapter is to make presentism a dynamic view of reality by basing it on a notion of dynamic existence, that is, on a notion of existence which has a dynamic character. The chapter shows that both of the notions of existence which are used in metaphysical theories of time (in presentism and eternalism) have a static character and, while such a notion is useful for eternalists, it is useless for presentists if they want to make their view able to remain in agreement with our everyday experience and self-consistent. It is demonstrated that both empirical and theoretical arguments indicate that the presentist should replace the notion of this static existence with the notion of a dynamic existence and that this maneuver allows the presentist to treat his/her existential thesis as equivalent to the thesis that time flows. Not only does this strategy allow us to express presentism in a simple, homogenous way which remains in agreement with our experience, but also permits us to solve some of the difficult problems which presentism faces, such as, for example, the objection of triviality and the question about the rate of time passage. Moreover, such an approach to presentism allows us to solve fundamental metaphysical problems concerning time, such as, the problem of the openness of the future and the fixity of the past, direction of causation, and relations between presentism and persistence through time by endurance.

1. Introduction

We know—or seem to know—that the present is continuously changing from everyday experience; that instantaneous events which come into being have to cease to be because the past no longer exists. In a reverse way, future

events—as we imagine them—although they do not exist, come into existence for a moment to cease to be. These facts are taken at face value by presentism, that is the view usually formulated as saying that only the present things exist, or that only the present things are real; and denied by eternalism, the view saying that the past, present, and future things exist in the same way (or are ontologically on a par, or are equally real).¹ But then—taking for granted that daily experience does not deceive us—some fundamental questions arise of *where are* past things, that is objects like Socrates, which existed in the past but no longer exist? What is their ontological status and what is the difference between them and fictitious objects, like, for example, Zeus and Apollo? In a similar way, we can ask where are the future things and events which are to become present? Are they waiting somewhere for the right moment to come into existence or, maybe, moving from the future to the present and then into the past? Is the flow of time responsible for these phenomena? But if it is, what does the flow of time consist in, and can it avoid serious difficulties connected with the questions: How fast does time flow?; Why does the future seem to be open while the past is fixed? Why is the causation we observe in the world always *future* directed, that is, why do causes precede effects, in spite of the fact that the physical interactions (with the exception of weak interactions) are time reversal invariant? Why do we have traces of the past and no traces of the future? And, finally, why do at least some objects, for example, the author of this book and its readers, persist through time—as our experience seems to indicate—retaining our strict (or literal, or numerical) identity, that is, why do we endure and not have temporal parts?²

These are fundamental metaphysical questions and this chapter will try to answer some of them by analyzing the problems in two ways: from an

¹ Because I am looking for a proper formulation of presentism, I will concentrate on the two main competing views of presentism and eternalism and will not consider the Growing Block Universe Theory, according to which the past and the present (but not the future) exist or are equally real (see e.g. Broad 1923; and Tooley 1997).

² There are two opposite views on persistence: endurantism and perdurantism. According to the latter, things perdure, meaning persistence through time by having temporal parts, persisting things are here treated as mereological aggregates of temporal parts, none of which are strictly identical with one another. Usually, the enduring of things generally assumed by presentists is defined as a persistence over time by being wholly present at each time but, as it was noticed by Merricks (1994: 182), “(...) the heart of the endurantist’s ontology is expressed by claims like ‘[object] *O* at *t* is identical with [object] *O* at *t*’.” For the author of this book, this second condition alone suffices for the definition of endurantism and is a better criterion of endurance so it will be used in what follows.

empirical point of view and the metatheoretical point of view³ or—in other words—by tracing an upward and downward path to the problems. This first means a requirement to look for a solution which remains in agreement with our everyday experience, while the second point of view means that the solution should provide us with satisfactory—or at least promising—answers to the questions raised above and that this solution should remain in agreement with empirical sciences.

The second section of the chapter will try to show that our daily experience seems to force us to assume the existence of the flow of time; the third will try to prove that the properly understood passage of time compels us to reconceptualize presentism, and that to this end we should swap the common notion of existence, which has a static character, for a new one—*dynamic*. This third section and the next one will also attempt to demonstrate that the proposed formulation of the ontological thesis of presentism will turn out to be equivalent to a thesis expressing the existence of the flow of time and as such it can provide us with satisfactory, or at least promising answers to the above mentioned difficult questions. The fifth section examines the problem of the agreement of the proposed version of presentism with the empirical sciences.

2. St. Augustine's challenge

As that clear-sighted observer of reality—especially concerning time—St. Augustine noted in the famous 11th book of the *Confessions*:

Boldly for all this dare I affirm myself to know thus much; that if nothing were passing, there would be no past time: and if nothing were coming, there should be no time to come: and if nothing were, there should now be no present time. Those two times therefore, past and to come, in what sort are they, seeing the past is now no longer, and that to come is not yet? As for the present, should it always be present and never pass into times past, verily it should not be time but eternity. If then time present, to be time, only comes into existence because it passeth into time past; how can we say that also to be, whose cause of being is,

³ Taking into account the theory-laden nature of observation, it is not so easy to differentiate between the empirical and theoretical (or metatheoretical) approach to problems; I assume (crudely) the empirical approach to be the one which is interested in our world while the theoretical (or metatheoretical) consists in the analysis of our theoretical knowledge.

that it shall not be: that we cannot, forsooth, affirm that time is, but only because it is tending not to be? (St. Augustine 1912: 239)

There are controversies about St. Augustine's approach to time, largely centered around whether it is subjective or objective. Although I am a supporter of the latter view, I will not assume this stance in this chapter but rather what I claim is that every supporter of presentism should treat the phenomena described by the author of the *Confessions* as objective and that s/he should explain the issues raised by him.

What are the issues raised by St. Augustine? There is one condition and two important questions. Beginning with the first, he wrote that if nothing passed away, the time called the past was not; and if nothing were coming, the time to come was not either; and if nothing were, then the time called the present could not be either. This means exactly that if the flow of time did not exist, the present would not exist either, and in such a case we could not claim that the past was and the future will be. And because the presentists maintain that the past was, that the future will be, the present exists, and that there was a time when our present events were the future, they must admit the existence of the flow of time. What is also important here is that presentists cannot trade the monadic property of "being past," for the B-relation "earlier than," the monadic property of "being future" for the B-relation "later than," and the monadic property of "being present" for the B-relation "simultaneous with" because these relations—as was noticed by McTaggart (1908)—are fixed and do not change in time, so in such a case there would be no *coming into existence* and no *passing away* and the condition posited by St. Augustine would be not satisfied. So, because the adherents of presentism claim that the present exists but must pass away, that the past existed and the future will exist, they must accept the following condition, which deserves to be called *St. Augustine's Condition (AC)*:⁴

AC Presentism has to admit the existence of the flow of time.

St. Augustine also asks in the further part of the citation:

Q1 Those two times then, past and to come, how are they, seeing the past now is not, and that to come is not yet?

⁴ See my (2017c: 288, [3]: 59).

And the second question in the remaining fragment of the quotation, which can be briefly formulated as:

Q2 How can we say that the present is, if it only comes into existence for a moment and passes into time past, that is, if it is tending not to be?

Now, I would like to discuss the second problem, which has the form of the question **Q1**. This question is fundamental and not so easy to answer. We know, of course, that the future and the past *do not* exist (although they *did* exist or *will* exist, respectively) when we take this word in the tensed meaning, the problem is, however, that this does not exhaust all aspects of the subject. For, when we analyze the ontology of presentism in its standard version, we can say only about objects that *do* exist and that *nothing* more exists: the ordinary meaning of the word *exist*, as we use it in ontology and which I will later call *static* because it has a static character, only allows one to say that something *does* exist, or *does not* exist. Objects that existed simply no longer exists. Nonetheless, although Socrates and Apollo do not exist (in the tensed meaning of this word), there is a fundamental difference between them: the first *did* exist and the second *did not*. So, how to express the ontological difference between them if both do not exist (in the tensed meaning of this word), or—saying this in a simpler way—where are past things, what kind of ontological domain do they form, “how are they”? The eternalist can simply say that Socrates *does* exist (in the tenseless meaning of this word),⁵ and Apollo *does not*; the presentist, however, should not use tenseless language, at least s/he must not use it as his/her main philosophical language. So, how should the presentist explain the difference between Socrates and Apollo, that is, what is the ontological status of the past and what is the difference between the past and fiction? And a similar problem arises for the future: what is its ontological status? It is obvious that there must be some difference between what will happen (for example, in London tomorrow) and what will not (for example, paradise on earth), although both do not exist.

The answer to this question can be sought by invoking the condition **AC**: the difference between Socrates and Apollo is that there was a time when

⁵ After Quine (1960: 170), we can introduce tenseless verbs in the following way: “We can conveniently hold to the grammatical present as a form but treat it as temporally neutral.” I am not interested in this book in the question of the existence of abstract objects and consequently I will ignore this issue.

the first existed and there was no time in which the second did, and that it is the flow of time which is responsible for the fact that Socrates ceased to be, and for the ontological difference between him and Apollo, who has never existed. This entails once again that the presentist should accept the flow of time as an essential part of his ontological position. Temporarily setting aside the problematic question of what the flow of time consists in, the rub lies in the fact, that the simple acceptance of the flow of time—in a form of moving now—still does not explain all aspects of the second issue; we still do not know what it means that some objects like Socrates *did* exist although they *do not* exist (in the tensed meaning of this word) and *where are they*, that is, what is the ontological status of the past. The point is that in the domain of our ontology we only include objects which *exist*, where the word “exist” is understood in the tensed meaning by the presentist, and tenseless by the eternalist. There is no place for objects which existed or will exist.

St. Augustine's Condition also sheds some light on the second of St. Augustine's questions **Q2**; this is the flow of time which is responsible for the transient character of the present, that events that exist have to cease to be. But this third problem of St. Augustine shows us something more as well; if the present is continuously passing, we cannot simply say that the present things *statically* exist at some fixed moment of time. But that means that the usual notion of a fixed existence at a fixed moment of time is not appropriate for expressing the transitory character of the present, and that it should be changed in such a way as to make it dynamic if we want to remain in agreement with our experience.

3. Presentism, flow of time, and dynamic existence

St. Augustine's observations (realistically interpreted) show us, as the above analysis tried to demonstrate, that the presentist *should* introduce the thesis about the existence of the flow of time into his ontological view and that s/he should formulate his/her position in a dynamic way. Many presentists are often unaware of this problem⁶ and they usually formulate their position

⁶ There are some exceptions. For example, Hestevold and Carter (2002: 493) claim that presentism should imply the passage of time in the form temporal becoming and Gołosz (2011b, 2012, 2013 [1], 2015b, 2017c [3]) maintains that the thesis about existence of the flow of time is a fundamental claim of presentism.

with the aid of the single ontological thesis that only present things exist, or that only present things are real.⁷ To escape the triviality problem,⁸ they sometimes formulate their view in a more sophisticated way after Lewis (1986) by using the notion of existence *simpliciter*, for example in the form: “Only present things exist *simpliciter*”; or “Necessary, if x exists *simpliciter*, then x presently exists.”⁹ Whether such articulations of presentism can really escape the triviality objection is a controversial issue.¹⁰ I will not, however, examine this question because I am going to show that we can find a better solution to this problem in another way and which at the same time introduces dynamics into presentism.

If it is correct that presentism has to admit the existence of the flow of time, then the essential issue arises of whether the presentists’ theses in a standard form really entails the existence of the flow of time. So the question is whether from the theses recalled in the first paragraph of this section alone (and with no other assumption) the existence of the flow of time can be inferred.¹¹ It was shown, however, that it is generally impossible.¹² To see this let us imagine a simple model of the possible world—let us call it W^\dagger while calling our actual world W —exactly similar to our *present* world W at some fixed moment t_0 , but such that in W^\dagger there existed nothing in the past of t_0 , and there will exist nothing in the future of t_0 . It would be a static “frozen” or “petrified” world with a momentary present at t_0 but without a flowing time, with no events and no things in the past of t_0 , and similarly without events and things in the future of t_0 . It would be a “frozen” (or “petrified”) version of presentism, which, of course, is not in agreement with our experience but this is not under consideration. The point is that all the above mentioned

⁷ The first option can be found in, for example, Merricks (1995: 523); the second one, for example, is to be seen in Hinchliff (1996: 122–123).

⁸ The triviality problem for the controversy between presentism and eternalism consists in this that when we examine their ontological theses, saying that only present things exist—in the first case—or that the past, the present, and future things exist in the same way—in the second—it turns out that both these ontological theses are trivially true or trivially false, depending on the way we understand the verb “exists”: in the tensed or in the tenseless way. See, for example, Merricks (1995: 523); discussions of the problem in Zimmerman (2004); and my (2013 [1]). It was also shown by Savitt (2006) that application of the predicate “being real” does not allow one to escape the triviality problem because of the ambiguity of the term “real.”

⁹ See, for example, Sider (2006: 76); and Hestevold and Carter (2002: 499).

¹⁰ See, for example, the critical analysis of Savitt (2006) and my (2013 [1]).

¹¹ For example, Hestevold and Carter (2002: 500–501) claim that the presentist thesis in the just mentioned form implies becoming.

¹² Such an argument was proposed in my (2017c: 289, [3]: 58–62).

ontological theses of presentism are true in the world W^+ although there is no flow of time in the model which means that it is impossible to infer the passage of time from these theses.

Presentists can look for the solution to this problem by defining presentism as a simple conjunction of the two theses about existence of the present (only) and the flow of time. Certainly, it would be a better definition of presentism because St. Augustine's Condition would then be trivially satisfied. Nevertheless, such a solution has some flaws: firstly, presentism defined with the aid of the two theses which make use of ontological notions of different character—static existence in the first case and the flow of time possessing undeniably dynamic character in the second—would lead to an inhomogeneous view.¹³ Secondly, there is a long tradition of presentism consisting in treating the present as a totality of what tensedly exists, which would mean that sentences of the type “Only the present things and events (tensedly) exist” are analytically true.¹⁴ And thirdly—as I will show—the thesis about the existence of the flow of time, if properly expressed, suffices to conceptualize presentism in a satisfactory way. The clue to the right expression of the flow of time is the notion of becoming so I shall try to show this starting from an analysis of this notion.¹⁵

The application of the notion of becoming to express the dynamic nature of reality has a long tradition—to recall, for example, Bergson (1944), Alfred North Whitehead (1967, 1978), Arthur Stanley Eddington,¹⁶ and Broad as those who applied it.¹⁷ I shall analyze the notion of becoming proposed by Broad (1938), which is relatively clearer and—what is also important—was introduced to avoid the essential difficulty associated with the conception of the passage of time, that is, the question about the rate of time's passage. Broad noticed that the passage of time cannot be referred to itself because then the ratio of the same two quantities expressing the rate of time's passage is meaningless. Neither can it be referred to a second time dimension because in such a case the problem of the flow of time returns, leading to *regressus ad infinitum*. Instead of this, Broad introduced his primitive notion of *absolute becoming*, which cannot be analyzed further:

¹³ See my (2017c: 290, [3]: 62).

¹⁴ See my (2013: 53–55, [1]: 30–31; 2015b: 819). Such an interpretation of the present reveals the real origin of the triviality problem.

¹⁵ See also my (2015b, 2017c [3]).

¹⁶ See ch. 5 of his (1929), called “Becoming.”

¹⁷ See Broad (1938), Savitt (2017), and my (2017c, [3]).

To “become present” is, in fact, just to “become,” in an absolute sense; i.e., to “come to pass” in the Biblical phraseology, or, most simply, to “happen.” Sentences like “This water became hot” or “This noise became louder” record facts of *qualitative change*. Sentences like “This event became present” record facts of *absolute becoming*. (...) I do not suppose that so simple and fundamental a notion as that of absolute becoming can be analyzed, and I am quite certain that it cannot be analyzed in terms of a non-temporal copula and some kind of temporal predicate. (Broad 1938: 280–281)

Broad offered us a dynamic image of the world with the real passage of time: events come to pass, that is, future events which earlier did not exist come into existence to cease to be. The static B-relations “later than,” “earlier than,” and “simultaneous with” cannot be used to describe Broad’s becoming because his absolute becoming introduces real change into the world: events come to pass while—as was noticed by McTaggart (to recall again)—the above mentioned B-relations are fixed and do not change. In the static world described by the fixed relations, there would be no place for coming to pass. For the same reason, absolute becoming cannot be treated as a tenseless notion because some events became, some events are becoming, and some other will become, which means that absolute becoming is a paradigmatically tensed notion.

It is easy to misinterpret Broad’s conception if one only concentrates on an explication of absolute becoming by means of the *happening* of events, ignoring at the same time Broad’s coming to pass. The happening of events is an ambiguous notion; it can be interpreted actively—just as *coming into existence to pass*; or passively—as simply *being an event at* $(x; t)$, or *taking place at* $(x; t)$. If somebody ignores Broad’s explication of becoming as *coming to pass* and interprets becoming as the passive happening of events at some spacetime locations, then, of course, he receives the passive tenseless becoming and the static block universe of the eternalist. For example, such a misleading interpretation was proposed by Mauro Dorato:

I plan to begin by proposing a new analysis of such a notion [becoming], to be regarded, on the wake of Gödel (1949b), simply as the *successive occurrence* (coming into being) of *tenselessly conceived facts or events*.¹⁸

¹⁸ Dorato (2002: 256). He describes his position as “a relational, tenseless view of becoming” (270).

My suggestion is to explicate, or rather simply *equate* becoming with the notion of “taking place” or “occurring,” which is also the natural way to understand *change* in Broad’s absolute, non-qualitative sense referred to above:

Def: *Becoming is real if and only if events successively and mind independently take place at their own proper time of occurrence.*¹⁹

The author equates becoming with taking place or occurring, which leads to a passive interpretation of becoming. This static interpretation ignores Broad’s *coming to pass* and results in the notion of becoming being stripped of any dynamic connotations, and as such deforms Broad’s absolute becoming. Such a conception of the becoming of events cannot, of course, be used to express the real flow of time.

Because I am looking for a conception of becoming which is self-consistent and can be in agreement with everyday experience, I would like to transform this notion so as to conform it to this experience—on the one hand—and our knowledge about the world—on the other. I would still treat this notion as a primitive notion—exactly as Broad did—but I will suggest in this section and in subsequent ones a number of proposals which will make this transformed notion more precise by determining some of its properties.²⁰ Some of these proposals will justify swapping the term “becoming” for a new one of “dynamic existence.”

Broad ascribed absolute becoming to instantaneous events, however, it seems that the world consists not only of events but, first of all, of things; we can simply equate events with acts of acquiring, losing, or changing properties by things, which means also changes in their position, velocities and relative configurations. For example, plants and animals are considered to be primary objects of evolution in Charles Darwin’s theory. Even the theory of relativity—contrary to what is widely claimed—should be interpreted as a theory in which primary ontology consists of things and not events: we ascribe, for example, mass, momentum and energy to particles or conglomerates of them and not to events. How, for example, will it be possible to ascribe mass and momentum to events, which do not possess them? How events can move, rotate, and interact one with another? The task of building things from events

¹⁹ Dorato (2002: 269). A similar interpretation was proposed by Savitt (2002: 159–160) and by Dieks (2006). Dieks’s proposal will be analyzed further. Savitt’s interpretation was criticized in my (2017c: 291, [3]: 64).

²⁰ In a similar way—let us say—as the axioms in the set theory make the primitive notion of set more precise.

so as such constructions could possess mass, momentum and energy seems to be very difficult, if it is possible at all.²¹ Thus—in what follows—I would treat things as primary objects and events and states of affairs as secondary.

One can claim also that things are just the objects which in some way become or come into existence. It was noticed by Sellars who wrote: “*only things can become in the sense of come into being*” (1962: 556). I agree only partly with him; for presentists, both things and instantaneous events become in the sense that their existence has a dynamic character. The difference between them is that the latter *come to pass*, the former *do not cease to be* but persist—which results from our experience—by enduring, that is by keeping their strict (literal or numerical) identity. Even if some objects do not exist at present, such as for example dinosaurs or stars which formed heavy metals that we are—inter alia—built of, there still exist particles which they were built of.

The necessity of acceptance of the endurance of things and the fact that things (such as, for example, elementary particles, their smaller and bigger conglomerates like atoms, things on Earth, planets, stars and so on) form a fundamental part of the furniture of the world justify—I am convinced—the swapping of the term “become” for a new one which I will call “dynamically exist.” This new notion is understood in a tensed sense and is for the presentist—exactly as “become”—irreducible to the tenseless one (some objects like Socrates dynamically existed while others, like Earth, dynamically exist and others, like research posts on the Moon, will probably dynamically exist).²²

To complete the conceptualization of presentism, we have to introduce the notion of the present. As I wrote at the end of the last section, there is a long tradition of presentism to treat the present as all those objects (things and events) which tensedly exist.²³ If we follow this tradition, *we obtain* the

²¹ This book is based on the assumption of scientific realism in a strong version in which it says that we should take scientific theories at face value, that is, we should understand them as scientists, who use these theories, and one cannot propose an ontology of a given scientific theory imposing such an interpretation on it which clashes with the interpretation current among its users. If one wanted to construe physical quantities in a theory in a non-standard way, one should prove that theory interpreted in such a way is reasonable and can work effectively. See my (1999: 5, 9).

²² This analysis is to be acceptable for both relationists and substantialists (regarding the controversy of substantialism vs relationism over substantiality of space and time); the substantialist can simply ascribe dynamic existence to space (or its parts).

²³ See, for example, Prior (1970: 247): “the presentness of an event *is* just the event. The presentness of my lecturing, for instance, is just my lecturing”; Christensen (1993: 168): “To be present is simply to be, to exist, and to be present at a given time is just to exist at that time—no less and no more”; and Craig (1997: 37): “Presentness is the act of temporal being.” See also my (2017c: 292, [3]: 64–65).

present defined as something which is dynamically existing, that is as dynamically existing things and events, and while instantaneous events come into being to cease to be, dynamically existing things can persist by enduring as, for example, me and my computer. Similarly, the *past*, that is, the past things and events, are here understood as things and events that dynamically existed (past events no longer dynamically exist, past things have been able to endure in the whole or in parts until now as, for example, the Acropolis of Athens or particles from early stars from population I and II, and the *future* as things and events that will dynamically exist (future events do not dynamically exist yet while some of the future things dynamically exist now in the present form, with present properties in present states and often unknown future states).

So as a result of these two steps, we have obtained the flow of time defined as the dynamic existence of all objects which our world consists of with instantaneous events which come into existence to cease to be, and dynamically existing things which persist by enduring, and the present as something *continuously changing*. Such an understanding of the flow of time is not only *in perfect agreement with our experience*, but also avoids, exactly like Broad's becoming, the problem of the question of the rate of time's passage because it only makes use of the primitive notion of dynamic existence and does not involve time in any way.²⁴ What is especially worth emphasizing is that *such an understanding of the flow of time provides us also with the right ontology for presentism* because it says that exactly what dynamically exists are these things and events which we call the present. What is more, the present understood in such a way is dynamically changing.

In this way we can obtain a definition of presentism which satisfies St. Augustine's Condition. It can be expressed in the form which I will call *Dynamic Reality*, which—making use of the notion of dynamic existence—expresses at the same time the ontological thesis of presentism and the reality of the flow of time:

Dynamic Reality: All of the objects that our world consists of exist dynamically.²⁵

The proposed term “Dynamic Reality” (**DR**) is more adequate than a term of the form “The flow (or passage) of time” because time is not involved in this claim. What is more—as I shall propose in the fourth and fifth sections—although

²⁴ See my (2015b, 2017c [3]).

²⁵ In my (2013: 55, [1]: 32), a similar ontological thesis was applied.

time is not involved in **DR**, it exists and can just be regarded as a secondary entity constituted by the dynamically existing objects.

But what about the presentists' theses concerning the past and the future: do we still need an additional ontological thesis excluding the existence of objects other than present? Fortunately, we do not need such additional theses because **DR** says that all of the objects that our world consists of exist dynamically, which means that it is unnecessary to talk about not existing (dynamically) objects. That is, we have received the intended effect with the single thesis **DR** and three definitions of the dynamically existing objects (called the present), objects which dynamically existed (called the past), and objects which do not dynamically exist yet (called the future).

The important consequence of such a construction is that we have received a dynamic version of presentism introduced with the aid of one single thesis (and the three definitions), which means that this position can now be expressed in a *simple, homogeneous* way, satisfying—what is more—St. Augustine's Condition. That is an important advantage over other formulations of presentism which either do not satisfy **AC** or do so in an inhomogeneous way with the aid of a conjunction of the two theses making use of notions which have different character.

It is now the right time to return to the triviality objection. The notion of dynamic existence is a tensed notion. Is it, then, justified to say that **DR** is trivial? The answer is *no* because the notion of the present is not involved in this thesis, neither are the past nor the future involved. And, it is obvious that the definitions cannot be accused of being trivial. **DR** simply states that all of the objects which our world consists of exist dynamically (what is equivalent to the existence of the flow of time), which can be true or false (this last assessment according to the eternalist, of course) but this is not trivial. On the contrary, this is a very important and deep claim about reality which can be examined by its explanatory value. Our world—as we observe it—is one which is dynamically existing (or becoming with enduring things) and continuously changing. And this gives us good reason to believe—I maintain—that **DR** is true. This claim needs, of course, more justification than the sentence given above, so I will try to show in the next parts of this chapter that the proposed conception can really explain some phenomena which we observe in a consistent way and make it possible to answer—at least in a preliminary way—some difficult metaphysical questions mentioned in the first part of the chapter.

We can now examine some of the important properties of the introduced notion of dynamic existence. First of all, I would like to emphasize its dynamic

character, which can be contrasted with the standard notion of existence which is used in the definitions of both standard versions of presentism and eternalism. For, both these views use the notions of existence which have a static character; it is fixed existence in fixed moments of time. The difference between them is that standard presentism talks about (tensed) existence in *one* fixed moment of time while eternalism is concerned with (tenseless) existence at *all* moments of time which leads to the formation of a petrified four-dimensional block universe. In contrast, **DR** introduces the dynamic form of presentism describing our World *in statu nascendi*—as dynamically changing: events come into being to cease to be, things dynamically exist enduring and changing their properties.²⁶ According to **DR**, dynamic existence is ascribed to all of the objects of the world.

The next important feature of dynamic existence which I would now like to discuss is *directionality*. This is a very interesting property of dynamic existence that it is not symmetrical under time reversal. Events come into being to cease to be, that is forming the fixed past consisting of things and events which dynamically existed. On the contrary, the future does not exist dynamically yet and seems not to be fixed (at least some future events seem not to be determined), it has just to come into (dynamic) being. Things come into being persisting through time by enduring, that is—so to say *metaphorically*—they are “moving” into the future keeping their strict identity. This means that dynamic existence is intrinsically time-asymmetrical and, as such, it is in perfect agreement with our experience. What is worth emphasizing, is that this asymmetry consists in this that past things and events have *already* dynamically existed and as such are not only fixed, but also possibly known to us by their traces (for example, in our memory) and impossible to change for sure, while future things and events did not have these possibilities yet; we can sometimes predict them but we cannot remember them. This is the main difference between the future and the past; it would remain even if the future were determined.

The notion of existence that is usually used by presentists has a static character and does not have the property of directionality. If the presentists want to “move” the present to receive the flow of time, then—even if they are able to solve or omit the problem of “How fast is the present moving”—they

²⁶ It was shown by Merricks (1994: 177–178; 1995: 526); and Hinchliff (1996: 124–129) that change does not involve inconsistency into presentism—contrary to what was claimed by Lewis (1986: 202–204)—because, according to presentism, no object (dynamically) exist in two (or more) moments of time simultaneously.

can do it in both directions because there is nothing in this notion which can block such a maneuver. Of course, the presentists want to “move” the present towards the future but they desire to do so not as a consequence of their ontological thesis but only to be consistent with our experience: it does not follow from their notion of existence.

The last property of dynamic existence which I would like to discuss in this section concerns the problem of the relations between presentism and persistence through time. I assumed above that the dynamic existence in the case of things means persistence by enduring. It was assumed partly as a generalization of Sellars’s becoming and partly as a conception “inferred” from our experience of persistence: as it was said above—metaphorically speaking—things are “moving” or “drawing” into the future. Both seem to justify the conviction that we (and other things) persist while keeping our strict identity. Thus endurance is—in the case of dynamic existence—just a simple logical consequence of the way in which we and other things exist. This does not mean, however, as I will try to show in the next section, that future moments of time are in some way waiting to be fulfilled by things and events because it would mean eternalism.

Thus endurance of things is here a simple logical consequence of the dynamic existence of things, that is, it is a consequence of their way of existence proposed in this book. We can now compare this solution with other versions of presentism. Usually it is assumed that presentism implies endurance, I would like, however, to show that there is a logical gap in such inferences. This logical gap was taken advantage of by Berit Brogaard (2000) in her simple model of presentism remaining in accordance with perdurantism (which she called *four-dimensionalism*).

The above mentioned argument aiming to show that presentism implies endurantism is very simple: an object cannot have another object as a part if that other object does not exist, so if an object persists at all, it must endure.²⁷ There is the logical gap in this argument because from the idea that the past and the future do not exist one cannot infer that the persisting object keeps its strict identity. It is possible, after all, that an object persists without keeping its strict identity in such a way that it is four-dimensional and its temporal parts (or stages)—not strictly identical with themselves—are coming consecutively into being. Such a model of persistence, which joins together presentism and perdurance, was proposed by Brogaard: in her model, things have four

²⁷ See, for example, Merricks (1995: 524–526) and Loux (2006: 235–36).

dimensions (that is, they perdure) in the sense that they have an unfolding temporal dimension in addition to the three spatial ones.²⁸

The problem is that presentism defined in the standard way does not imply that endurance is *necessary*; the presentists have to look for another rationale for their favorite way of existence. They can, of course, assume an additional postulate about endurance but then their view ceases to be homogenous. The presentism proposed in this book, which is based on the notion of dynamic existence, solves this problem in a simple way without additional assumptions, a considerable advantage and virtue.

4. St. Augustine's questions revisited: a new insight into the nature of time?

We can now return to St. Augustine's questions:

- Q1** Those two times then, past and to come, how are they, seeing the past now is not, and that to come is not yet?
- Q2** How can we say that the present is, if it only comes into existence for a moment and passes into time past, that is, if it is tending not to be?

With the aid of the conception of Dynamic Reality the second question **Q2** can be answered in a simple way: events which we call present ones dynamically exist, which means that they come momentarily into being to cease to be. Things dynamically exist by enduring, which means that they come into being by continuously changing, by losing some properties and gaining others (including properties of spatial locations, velocities and relative configurations). Their every-time states cease to be exactly like instantaneous events. This way we have received the world which is continuously changing as it really seems to be.

Dynamic Reality also allows us to answer the first question: past events *do not* dynamically exist because they ceased to be; they *did* exist dynamically. But quite a different answer should be given in the case of things; the past things dynamically exist—lock, stock and barrel, or in parts. Of course, they

²⁸ Brogaard (2000, section 3). It is also possible to imagine that in spite of spatiotemporal and causal continuity, there are no persisting things, just as there is no persistence of things in space.

are always changed, nevertheless they dynamically exist. So, for example, the Parthenon in Athens still dynamically exists although it is changed and does not look like it did in the time of Socrates. But as regards Socrates, can we also say that he dynamically exists? Socrates does not dynamically exist but the particles which he was built of did not vanish, they still dynamically exist, just as atoms of heavier elements dynamically exist—for example, carbon, oxygen and iron—which came into existence in the nuclear fusion reactions inside the hearts of hot stars billions of years ago. From such atoms he was built—and we are made from such atoms ourselves. They are parts of us and of our present world.

And what about the future? It does not dynamically exist yet, it will only come into (dynamic) existence. Contrary to the past, which dynamically existed and as such is fixed and cannot be changed, the future looks as if it were open—our experience seems to suggest this openness and quantum mechanics confirms this conviction—and perhaps it depends on our actions. But even if it is determined and not open, it is not in existence and will just come into (dynamic) existence.

I have tried to show that the proposed solution to the ontology of presentism and the flow of time can provide us with the right answer to St. Augustine's challenge and that it can also explain in a simple way the other fundamental question: why the past is fixed and the future seems to be open. And now to turn to the last explanation which I would like to propose, the most speculative but also probably the most intriguing. It concerns the most mysterious phenomena we know—time. What is the origin and nature of time? The answer, I suppose, lies just in the way of existence of all objects which our world consists of. When I introduced the notion of dynamic existence, I *never* appealed to time itself, that is, I did not claim that future objects and future moments of time are somewhere *waiting* to be fulfilled by dynamically existing objects. I could not have done this because it would mean introducing the four-dimensional block universe of the eternalists into the presentist picture of the world and the resulting breakdown of St. Augustine's Condition. What I have done was to introduce the notion of dynamic existence as a primitive notion which has the intrinsic property of directionality. This property means that dynamic existence distinguishes one direction—toward the future. So what about time? Where do future moments come from if they are not waiting somewhere to be fulfilled? There remains only one answer which is possible: time is, according to this proposal, a consequence of the way we and other inhabitants of the world exist, that is, it is a *derivative of the dynamic existence* of objects: time, that is consecutive moments of time—each of which constitutes momentarily

present—are *created* by dynamically existing objects, whatever they are.²⁹ In consequence of this, time is a parameter which can be used to mark (or label, or measure) consecutive stages of dynamic existence of objects.³⁰

5. Dynamic existence and empirical sciences

The proposed formulation of presentism—as a thesis about dynamic existence of the world, that is, the directional (into the future) persistence of all objects through time joined with keeping their strict identity (in the case of things) and creation of time, the thesis which can be identified with the flow of time—is *purely metaphysical*. However, the process which is described by this theory is fully objective and of fundamental importance to us so it is hard to imagine that such a process cannot be observed by scientists. Therefore the question arises as to whether there are any traces of the dynamic existence of the world and the flow of time in the empirical science, or simply whether can we find any positive argument in empirical sciences in favor of the existence of the flow of time understood in the proposed way.

Because we connect the flowing of time with the continuously changing present, to answer this question, one should point out what is *now* (and a shape of the present), how it is changing and whether we can really find such a process of changing present in empirical science. I would like to begin to analyze this problem with recalling a widespread opinion about an alleged lack of the presence of *now* in empirical sciences; not only Albert Einstein but also, for example, Adolf Grünbaum were their supporters. Einstein is an author of the well-known passage from the letter of condolence to his friend Michele Besso's widow after Besso's death: "People like us, who believe in physics, know that the distinction between past, present and future is only a stubbornly persistent illusion."³¹ In turn, Grünbaum (1967: 7) wrote that "no cognizance is taken of nowness (in the sense associated with becoming) in any of the extant theories of physics." However, such a view was criticized by Quentin Smith, who argued that it is rooted in a misapprehension, namely

²⁹ See also my (2015b: 816–817).

³⁰ I will show in the next section that, thanks to the locality of the dynamic existence of objects, time constituted by dynamically existing things is their individual time, which can be equated with the so-called *proper time* of the theory of relativity.

³¹ See Norton (2010) and my (2017b) for their doubts about Einstein's position.

on a mistaken belief that a subject matter which uniquely pertains to *observational physics* should be represented in *theoretical physics*.³² Physical laws are universal which means that they have to hold *everywhere* and *always* and that is why we should look for *now* rather in observational physics. And, in fact, Smith showed that in observational cosmology we can find physical events that possess the property of presentness: the present value of T (T being the Hubble age), the present value of energy density and vacuum energy density, the present temperature of the cosmic microwave background radiation, and so on. The presentness of some events does not appear, for example, in the equations of the theory of relativity, but that no more shows that no event is present—as argued Smith (1994: 5)—than the fact that the location of Earth is not mentioned in its equations shows that Earth is not located anywhere.

There is also a well-known problem of the “shape” of the present which arose with the advent of the theory of relativity, with specific difficulties connected with the special and general versions of this theory. According to the special theory of relativity (STR), we have no distinguished hypersurface of simultaneity, which could play a role of *now*, and in turn Kurt Gödel (1949a, b) showed that we should not introduce global hypersurfaces of simultaneity as a proposal for *now* because there are some solutions of the field equations of the general theory of relativity (GTR)—for example, his own solution with closed timelike loops is just such a case—where no global hypersurface of simultaneity exists. These are not difficulties that cannot be overcome: to remove the first obstacle, it is sufficient to choose the present in a relativistically invariant way; and to remove both, it is sufficient to choose the *local* present as the point-like *here-now* (e.g. Stein 1968, 1991; Čapek 1976; Shimony 1993; Dorato 2002; and Dicks 1988, 2006) because this last solution is also relativistically invariant.³³

Does the proposed formulation of presentism based on the notion of dynamic existence satisfy this criterion of locality? Fortunately, dynamic existence can be ascribed to singular objects which means that it has an intrinsically *local* character: each object dynamically exist forming its own point-like present. To recall Prior and William Lane Craig: “the presentness of an event *is* just the

³² Smith (1985: 112–115; 1993: 21–23; 1994: 5; 2005: 477–478). The same point is emphasized by Dicks (1988: 459–460).

³³ For example, (Dicks 2006: 157) wrote: “I propose that if we want to make sense of becoming we should attempt to interpret it as something purely local. Second, I address the question of what this local becoming consists in. I maintain that processes of becoming are nothing but the successive happening of events, and that this happening of events consists entirely in the occurring of these events at their own spacetime locations. This leads to a consistent view of becoming, which is applicable even to rather pathological spacetimes.”

event" (Prior 1970: 247); "Presentness is the act of temporal being" (Craig 1997: 37). As a consequence, the proposed in this paper notions of dynamic existence and the present have the desired local character and as such can be reconciled with GTR. This is, in fact—exactly as in the case of the directionality—an advantage of this notion and of the approach which makes use of it.

What is interesting and worth emphasizing is that the notions of dynamic existence and the present which are proposed in this paper have an essential advantage over Dorato (2002) and Dennis Dieks's (2006) proposals of reconciliation of becoming with GTR because they introduce a notion of becoming which has been stripped of the whole dynamics. Because I recalled Dorato's becoming earlier, I will only mention Dieks's relational, tenseless view of becoming here:

Thus, our proposal is that "coming into being" means the same thing as "happening." Since everything that happens is recorded in the block universe diagram, "coming into being" is also fully represented. There is no need to augment the block universe in any way.

This proposal boils down to a deflationary analysis of becoming: becoming is nothing but the happening of events, in their temporal order. (Dieks 2006: 170–171)

So according to this proposal, "coming into being at (x, t) " is what it means *to be an event at (x, t)* (Dieks 2006: 172).

Therefore, for example, according to Dorato and Dieks's proposal, the trial of Socrates comes (in the tenseless sense of this word) into being or happens (in the tenseless sense of this word) in 399 BC, and the death of Socrates takes (in the tenseless sense of this word) place or happens (in the tenseless sense of this word) after the trial. But if these are tenseless facts (so-called B-facts),³⁴ which can be stated in sentences whose truth-value does not change, and where there is no place for the distinguished and changing present, so where is there room for the becoming and flow of time?

Dieks asks: "Events come into being by occurring, by happening; what other coming into being could there be?" (2006: 170) The answer is so simple that one may wonder why he did not give it: to really come into existence of

³⁴ Tenseless facts, called also B-facts, include necessary facts and contingent facts concerning which events are simultaneous, or how much earlier or later events are than each other. Contingent facts concerning which events are present, or past, or future are called A-facts. See e.g. Mellor (1998: 19).

the objects which did not exist earlier there *has* to be a *distinguished* present which is continually changing and which cannot be a relational, static B-fact; a *tensed* language to express these A-facts has to be used as well. The notion of dynamic existence proposed in this paper and the notion of the present derived from it are expressed in *tensed* language, the present (as what dynamically exists) is continuously changing, and that is why they introduce a *real* dynamics to the world. Thanks to this, the view which is proposed here is a real full-blooded presentism and not a *tertium quid* between presentism and eternalism as is the case of the position of Dorato and Dieks.

What is also worth emphasizing, in the conceptions of Howard Stein (1968, 1991); Milič Čapek (1976); Abner Shimony (1993); Dorato (2002); and Dieks (1988, 2006), the point-like present was chosen *in order to* be a relativistically invariant solution to the problem indicated by Gödel, or as a solution choosing epistemologically close (directly accessible) set of sense data, but not *because of* some purely ontological reason: the notion of present was chosen independently of the notion of becoming and similarly the status of time was not explained. However, in the proposed conception based on the notion of the dynamic existence, the local character of the present was a *consequence of local character of dynamic existence* and time is closely connected with dynamic existence: I wrote at the end of the last section that time is created or constituted by dynamically existing objects and it is a parameter which can be used to mark (or label, or measure) consecutive stages of dynamic existence of singular things.

Thanks to the locality of the dynamic existence of objects and the locality of *now*, time constituted by dynamically existing objects is their individual time, which can be equated with the so-called *proper time* of the theory of relativity. What is more, by the conception proposed in this paper, we can receive not only an explanation of the origin of time but also the absent origin of dynamics of the point-like *here-now* moving along or traversing world lines of things in the conceptions like these of Čapek (1976), G. J. Whitrow (1961), Dieks (1988), and Shimony.³⁵ They all introduced the moving *now* conceptions of the present with the now-points moving along or traversing world lines of things, but they were unable to explain what was the source of the dynamics of their now-points. The proposed conception points to the

³⁵ For example, Shimony (1993: 284) noted: "Something fleeting does indeed traverse the world line, but that something is not subjective; it is the transient *now*, which as a matter of objective fact is momentarily present and thereafter is past. Without this minimal amount of objectivity there cannot even be an illusion of transiency."

dynamic existence of physical things such as, for example, elementary particles or their conglomerates, as an origin of this dynamics.

It is sometimes claimed that nothing in known physics corresponds to the passage of time.³⁶ As far as it only means that there is no theory of the flow of time in physics, I agree.³⁷ What is more, I would like even to show that there are good reasons to believe that a theory of the (objective) flow time is to be sought—just as it was proposed above—on a deeper level in metaphysics, and not in science.³⁸ And, interestingly enough, there are—outside and inside of empirical science—some powerful arguments for the existence of the flow of time and I will introduce them below.

So first of all, why should we search for the theory of the flow of time in metaphysics, and not in physics? We should do so—I am convinced—because every plausible theory of the flow of time ought to explain two things: firstly, why this that *exists* (that is, the present things) is continuously changing; and secondly, why we persist through time, keeping strict or numerical identity, or, in other words, why we endure. This means that in such a theory notions and conceptions that are analyzed just by metaphysics and not by science are involved: notions of existence, persistence through time, and diachronic identity over time.

Of course, there is no proof that a theory of the flow of time is beyond the reach of science (and there cannot be) and it cannot be *a priori* excluded that—as in the case of doctrine of atomism which was a purely metaphysical doctrine for over two thousand years—scientists will be able to propose some theory of the objective flow of time in the future. The author of this book is, however, skeptical of such a possibility simply because—if the presented approach is correct—a fundamental notion of existence is involved in the flow of time, which is the basis for our thinking and which cannot be further explained by science. Science can analyze *what entities are posited* by our theories, that is *which* objects exist according to these theories. It also can investigate *whether* such and such things exist, such as the Higgs boson or subatomic particles which dark matter can consist of, and what their properties are, but cannot analyze—it seems—*what it means* that they exist.

However, even if we agree that metaphysics can provide us with a theory of the flow of time, the problem mentioned in the beginning of this section

³⁶ See, for example, Davies (2002: 40).

³⁷ In the next part of this section, I would like to show that physics (and other empirical sciences as well) allows us to analyze and describe dynamic processes of physical systems.

³⁸ I follow Bergson, Whitehead, and James here.

remains, namely, if the process which is described by such a metaphysical theory is fully objective and of fundamental importance for us, it should be in some way endorsed as such by science. So, is the existence of the flow of time authenticated by empirical sciences or not? I claim that not only should the answer be positive but, what is more, its impact on empirical science is so big that without the existence the flow of time our best scientific theories would be incomprehensible. And the point is that, as it is well known, the main subject of interest of physicists (who are, for example, interested in the evolution of universe) but also chemists (in the case of, for example, chemical processes in the non-equilibrium systems), biologists (for example, in Darwin's theory of evolution or theories describing evolution of ecosystems), sociologists (for example, in the theories describing the dynamics of social groups), psychologists (for example, in developmental psychology) are dynamic systems of different kinds. Scientists are searching for theories describing the evolution *in time* of such systems, which makes possible the understanding of the mechanisms that underlie these processes and making predictions. And so, for example, we use Darwin's theory of evolution to explain the evolution and variety of life on Earth, the GTR to understand the evolution of the universe—its *past* and the possible *future*—and quantum mechanics (QM) to analyze the evolution of quantum systems. Of course, we are also sometimes interested in the spatial distribution of the parts of some systems, for example, in the geographical differences of our biosphere, but nonetheless we explain these geographical differences by means of the *temporal* evolution in different climatic conditions and our interest in the temporal evolution of dynamic systems is incomparably greater.

From the point of view of somebody who denies the flow of time, it is hard to explain why we are so interested in the variability of different systems in *time* rather than in *space*, and why we are so interested in explanations in terms of *former* causes rather than in teleological ones. And it is especially hard for him/her to explain our asymmetrical interest in the temporal properties of dynamic systems both in science and in everyday life, namely why we care much more about the future than about the past. If s/he tries to explain this by invoking the evolutionary and selectional value of such asymmetric preferences, as Henry Mehlberg (1980: 200–202) and Horwich (1987: 196–198) did for example, s/he is obliged to explain why our past-oriented care and desires cannot be fulfilled and are useless, although those that are future-oriented are useful. Such an explanation cannot simply appeal to empirical facts on pain of begging the question, because these empirical facts (the future-oriented evolution) are already temporally asymmetric and this is just the asymmetry

of the fixed past—the open (as we believe) future which is involved in this explanation and should be explained.

The world with the flow of time is the world—as is often emphasized in this book—*in statu nascendi*. This is the world which is dynamically changing and if the proposed approach to the flow of time is correct, scientists should look not for the present and its “motion,” but rather for the *dynamic existence* of the world, that is, for the *dynamic evolution* or *temporal becoming* of these systems. And it turns out that we really have theories which describe dynamically the temporal evolution of biological and physical systems, namely Darwin’s theory of evolution in biology, and in physics such theories as, for example, Newtonian mechanics, Maxwell’s theory, the theory of relativity, the Big Bang theory, or quantum mechanics. These physical theories determine the *derivatives of some physical entities*, like momentum (in Newtonian theory), or the electric and magnetic fields (in the case of Maxwell’s equations), or the so-called scale factor describing the evolution of the universe (in the Friedmann equations derived from Einstein’s field equations),³⁹ or the system’s wave function (in the case of Schrödinger equation in QM) *with respect to time*, that is, they describe how these entities *are evolving* or *changing* in time. Thus, contrary to what was claimed, for example by Paul Davies (2002) and was recalled in this section, the adherent of existence of the flow of time can simply interpret such dynamic theories just as theories *describing dynamic existence* or *temporal becoming* of the world or respective parts of it, without, however, introducing a theory of the flow of time.

In the last part of this section I would like to briefly analyze the problem of the directionality of causation in the context of physics and to show that the proposed approach involving the notion of the dynamic existence can help us to solve this problem. Namely, if we consider the problem of the directionality of causation in the context of physics, it is reasonable to assume that physical interactions are involved in all causal relations and responsible for them, and then two difficult problems arise which are connected one with another and hard to explain: the problems of the direction of causation and of the asymmetry of traces. They are conjugated because we can suppose that this is just the directionality of causation in the forward direction which is responsible for the lack of the traces of the future: a charged particle, for example, can only leave a white track in a bubble chamber *after* moving through it because

³⁹ See e.g. Kopczyński and Trautman (1992: 156–161).

this particle can cause ionization of a superheated liquid.⁴⁰ This causation, however, is forward directed and that is why we cannot observe *now* in the bubble charged chamber particles which *will* move through it in the future although we can observe traces of particles which *moved* in the past through the chamber. And when we try to find out why this causation in which electromagnetic forces are involved is future directed, we meet a difficult problem because electromagnetic forces are time reversal invariant. The problem is, of course, more general. In fact, all physical interaction—with the exception of weak interaction—are time reversal invariant, so why is the causation we observe in the world always *future* directed, that is, why events from the past and from the present affect those which occur later, but we have no evidence of backward causation?

The main source of this difficulty is that all physical interactions with the exception of weak interactions are time reversal invariant, that is, whenever a sequence of states S_1, S_2, \dots, S_n is possible according to time reversible laws of physics, then the reverse sequence of *time reversed* states $T(S_n), T(S_{n-1}), \dots, T(S_1)$ is equally possible according to these laws (where T is a time-reversal operator). To be sure, the weak interactions are not time reversal invariant, but they are not involved in the causal relations we observe in normal situations, for example when we are speaking, writing, walking, watching TV, and so forth.⁴¹

The metaphysical conception proposed in this chapter solves this problem by appealing to the dynamic existence of things. For even if physical interactions (with the exception of the weak interactions) do not distinguish any time direction and even if we assume that the interactions are immediate, according to the proposed conception, what is responsible for a direction of causation is the dynamic existence of things, which is—as I tried to persuade in the previous section—future directed. Interacting bodies dynamically exist in the future direction and just in this direction transport effects of interactions with themselves as is, for example, the case in the growing of microscopic bubbles along the ionization track in the bubble chamber or a change of momentum of

⁴⁰ There was a trial undertaken by Reichenbach (1956: 150–1) and his followers (Smart 1967–2005: 469; and Grünbaum 1973: 235–236, 281–289) to explain the asymmetry of traces by entropy considerations, namely, by introducing space ensemble of branch systems with different levels of orderliness which can interact one with another. However, it was shown by Earman (1974: 34–45), that an assumption speaking about the asymmetry of causation concerning interactions between the two systems was involved in this reasoning and it was responsible for the asymmetry of traces. See also Horwich (1987) and my (2017b, 2021b [8]).

⁴¹ Feynman (1967, ch. 5) noticed a long time ago, shortly after the discovery of the CP symmetry violation, that the distinction between the past and the future cannot depend on asymmetries of weak interactions. See also Sklar (1974); and my (2017a [2], 2017b).

interacting particles. That is why we always observe a causation which is future directed although we have good reason to believe that physical interactions are always involved in causation and these are (*modulo* weak interactions) time reversal invariant.

6. Conclusions

The chapter tried to show that presentists should admit the dynamic version of presentism assuming the existence of the flow of time in order to be in accordance with everyday experience and to make their view self-consistent. It also attempted to demonstrate that the ontological thesis of presentism formulated with the aid of the notion of dynamic existence suffices for the correct formulation of presentism and that such a formulation gives us important theoretical benefits. Namely, it allows us:

- 1) To develop a full-blooded tensed theory of the flow of time, which avoids vicious circles and *regressus ad infinitum* and, thanks to locality, can be claimed to remain in agreement with the General Theory of Relativity;
- 2) To express presentism in a simple, homogenous way;
- 3) To satisfy St. Augustine's Condition concerning the flow of time, and to answer his ontological questions concerning the past, the present, and the future;
- 4) To explain a possible origin of the changing present of our experience;
- 5) To explain what is the origin of asymmetry of time, and especially why the past is fixed while the future seems to be open and why we have traces of the past and no traces of the future;
- 6) To explain what is the origin of the directionality of causation in spite of the fact that physical interactions (with the exception of the weak interactions) are time reversal invariant;
- 7) To propose a possible explanation of the origin of the fundamental time of the Theory of Relativity, that is the so-called proper time.

The last points in this list mean—if the proposed metaphysical theory is correct—that the presented conception is able to explain the fundamental problems we face in metaphysics: the problem of the origin of the direction of time (points 4, 5, 6) and the even more important problem of the origin of time itself (point 7). The explanatory value of the proposed conception

and difficulty of the problems it solves should testify to the superiority of this conception over the standard formulations of presentism.

The proposed change in the metaphysics of presentism is not extensive—it only involves the alteration of precisely one notion, the notion of existence, and then, in consequence, a new approach to time—nevertheless it is fundamental just because it concerns our two most elementary notions: the notions of existence and time. The author of this book, who is working on the common ground of physics and philosophy, is aware that the proposed conception, by looking for the solution to central problems concerning the physical world in metaphysics rather than in physics, goes against the mainstream of physics and philosophy of science. Nonetheless, he does not see any other possible solution to the above mentioned exciting puzzles. They are fundamental ones and need to be solved if we want to understand ourselves and the world we live in.

5. Meyer's Struggle with Presentism or How We Can Understand the Debate between Presentism and Eternalism

This chapter consists of two parts: in the first one, it critically analyses Meyer's (2005) version of the triviality objection to presentism (according to which, presentism is either trivial or untenable), and tries to show that his argument is untenable because—contrary to what he claimed—he did not take into account an entire possible spectrum of interpretations of the presentist's thesis. In the second, positive part of the chapter, it is shown that a leading form of tensed theory of time postulates the same ontology as presentism and that it avoids the triviality problem which means that it can be used to generate an alternative formulation of presentism which is no longer vulnerable to the triviality objection.

1. Introduction: Meyer's objection

Repeating the well-known objections to presentism,¹ Ulrich Meyer (2005) attempts to show that presentism, which claims, roughly, that only the present exists, is either trivial or untenable.² He does it, however, using a line of

¹ See, for example, Merricks (1995: 523), Zimmerman (1998: 208–210), Sider (1999: 325–327), Lombard (1999: 254–255; 2009); Crisp (2004a, b); Ludlow (2004); and Savitt (2006).

² Similar arguments have been repeated in chapter 9 of Meyer (2013).

reasoning which unfortunately contains flaws and is indefensible. I shall criticize his reasoning and next show that the debate between presentism and eternalism is not only genuine but also concerns a deep metaphysical problem of our world.

I shall begin with Meyer's minor mistake: he mentioned Sklar (1981) as one of the authors who "argue that presentism is incompatible with the theory of relativity, and thus false a posteriori" (Meyer 2005: 213). However, contrary to what is claimed by Meyer, in "Time, Reality, and Relativity" and his other papers, Sklar did not maintain that presentism is incompatible with the theory of relativity.³ Indeed, just the opposite is true, as Sklar wrote: "One thing is certain. Acceptance of relativity cannot force one into acceptance or rejection of any of the traditional metaphysical views about the reality of past and future."⁴

This point is interesting because, since the discovery of the theory of relativity, there have been debates about metaphysical consequences of this theory regarding the objectivity of the distinction between the past, the present, and the future with many physicists and philosophers on both sides of the fence: let us recall that Einstein, Weyl, Russell, Quine, Putnam, Smart, Lewis, Mellor, Horwich stand on one side (as denying this possibility), and Heisenberg, von Weizsäcker, Jeans, Broad, Shimony, Prior and Stein on the other (as accepting it). For example, Stein (1968, 1991) maintained that the theory of relativity does not refute presentism but imposes constraints on our notion of the present such that it is reduced to a point, and Sklar took into account the possibility of the reconciliation of presentism with the theory of relativity in his works.⁵ So, if Meyer is right that "presentism is either trivial or untenable," one of the stances would be a trivial view and such debates would be pointless. Of course, it is possible that the concerns of, for example, Broad, Prior, Shimony and Stein were pointless but were they really?

³ Sklar is, generally speaking, an adherent of the MIMO principle "metaphysics in, metaphysics out" (see e.g. Sklar 1992: 9), speaking that when we interpret a scientific theory, "the metaphysical stance one ought to adopt follows only from the adoption of a number of fundamentally philosophical postulates." (1985: 289)

⁴ Sklar's (1981), that is the paper "Time, Reality, and Relativity," first appeared in R. Healey (1981: 129–142) and was reprinted in Sklar (1985: 289–304). The quote above appeared on p. 302 of the reprinted version and other references in this text to Sklar's paper relate to the reprinted version as well.

⁵ Sklar (1985: 302; 1992: 73). In his (1974: 272–275), Sklar considered an additional possibility of the reconciliation of presentism with the theory of relativity by relativizing the presentist's notion of reality to an inertial state of motion of the observer in the same manner as this is assumed for the simultaneity.

Meyer (2005: 213) defines presentism as the thesis:

P: Nothing *exists* that is not present.

Difficulties arise, as it is well known, when we ponder which notion of existence is used in P: the usual *tensed* meaning from natural language, in which the “exists” in P is the ordinary present tense of the verb “to exist,” or tenseless called by Meyer *temporal existence* and defined by him in the following way: “an object exists temporally just in case it exists at some time or other” (2005: 214). It is easy to see that in the first case P is trivially true:

P1: Nothing *exists now* that is not present.

And in the second obviously false:

P2: Nothing *exists temporally* that is not present.

Meyer also takes into account three other possibilities of understanding the notion of existence: an intermediate (between tensed and tenseless) notion of *existence**, in which objects exist* only for certain choices of time *t*, and not for all times, as in the case of temporal existence (p. 216), *existence outside time*, and *existence in some other possible world*. Thus we receive the following possibilities:

P3: Nothing *exists** that is not present.

P4: Nothing *exists outside time* that is not present.

P5: Nothing *exists in other possible worlds* that is not present.⁶

P3 is true only for present time *t* in which case P3 is again trivially true, in other cases it is obviously false. And neither of the theses P4 and P5 are recognizably presentist theses. Meyer concludes that because “there is thus an entire spectrum of interpretations of the presentist’s thesis” and “since these readings exhaust all possible alternatives, presentism is therefore either trivial, untenable, or a balanced mix of the two” (2005: 216).

⁶ The notions of existence outside time, and existence in other possible worlds are received by Meyer (2005: 214–215) as possible explications of a notion of *existence simpliciter* which could be an alternative to temporal existence.

2. Meyer's objection extended

Before I begin to analyze Meyer's claim, I would like to recall that the triviality objection can be raised against the eternalist thesis as well,⁷ and the same refers to Meyer's version of the objection. Let us consider the eternalist thesis in the form:

E: Past, present, and future objects *exist*.⁸

And let us now consider consecutively all senses of "exist" proposed by Meyer:

E1: Past, present, and future objects *exist now*.

E2: Past, present, and future objects *exist temporally*.

E3: Past, present, and future objects *exist**.

E4: Past, present, and future objects *exist outside time*.

E5: Past, present, and future objects *exist in other possible worlds*.

It is easy to see that E1 and E3 are obviously false, E2 is trivially true, and neither of the theses E4 and E5 are recognizably eternalist theses. Thus the triviality objection refers to the eternalist thesis as well because all competitors agree on the truth values of E1–E3. This would mean—if his argument is correct—that Meyer's restriction only to the critique of presentism is misleading.⁹

3. Meyer's objection refuted

If Meyer is right that presentism is a trivial position then a question arises: is there really nothing to dispute over and have we been misled for so long? I don't think so, at least it is not proven by the (original or extended) argument of Meyer. For, his argument is based on a serious interpretative mistake: he claims—I recall—that he takes into account "an entire spectrum of interpretations of the presentist's thesis" (2005: 216), and that "these readings exhaust

⁷ It was noticed by Savitt (2006).

⁸ See, for example, Sider (1999: 326) and Rea (2003: 246–247).

⁹ Lombard (2010), for example, claims that there is no real controversy between presentism and eternalism.

all possible alternatives" (2005: 216), but he did not show that the considered interpretations are really exhaustive. Moreover, it is doubtful whether such a proof can exist since even newer versions of presentism are being proposed. Thus, for example, two dynamic versions of full-blooded presentism were developed by means of the notion *becoming* (Gołosz 2013 [1], 2017c [3]), and by means of the notion of *dynamic existence* (Gołosz 2013 [1], 2015b, 2018 [4]), which were not taken into account by Meyer. Both versions attempt to make an essential *problem-shift* (to use Lakatos's (1970) terminology) in our understanding of presentism: they resign from treating the thesis that only the present exists as a main ontological thesis of presentism because—in accordance with the long presentist's tradition—*the present is identified there with what exists*. Here are some examples:

Before directly discussing the notion of the present, I want to discuss the notion of the real. These two concepts are closely connected; indeed on my view they are one and the same concept, and the present simply *is* the real considered in relation to two peculiar species of unreality, namely the past and the future. (Prior 1970: 245)

The pastness of the event, that is its having taken place, is not the same thing as the event itself; nor is its futurity; but the presentness of an event *is* just the event. The presentness of my lecturing, for instance, is just my lecturing. (Prior 1970: 247)

To be present is simply to be, to exist, and to be present at a given time is just to exist at that time—no less and no more. (Christensen 1993: 168)

On a presentist ontology, to exist temporally is to be present. Since presentness is identical with temporal existence (or occurrence) and existence is not a property, neither is presentness a property. Presentness is the act of temporal being. (Craig 1997: 37)

As a result of such an approach to the notion of the present (to use Prior's (1970) words), the statement that only the present exists can be treated as analytically true. It does not trivialize presentism, however, for in the proposed *problem-shift*, the thesis saying that the flow of time exists (in the form of becoming or dynamic existence of the world) becomes the main ontological thesis of presentism, and, certainly, whether time does flow or not is not a trivial problem.

The first version of dynamic presentism introduces presentism in the following form (expressed in tensed language):¹⁰

Becoming: The events which our world consists of become (come into being to pass).

Where becoming, as Broad's absolute becoming, is a primitive notion which cannot be further analyzed.¹¹ This thesis states—following Broad—the reality of the flow of time in the way which avoids the question of the rate of time's passage. What is important, it can be shown that **Becoming** also expresses precisely the *intended* ontology of presentism without trivializing it.¹² To show this, it is enough to recall that the presentist can identify the present with the totality of events that become (come into being to pass) if we assume, following Broad, the ontology of events, and in a similar way the past with the totality of events that became (came into being to pass), and the future with the totality of events that will become (will come into being to pass) but do not yet exist. Now, if we take into account that **Becoming** states that events *become* (*come into being to pass*), we can easily see that it leads precisely to the intended presentist ontology which—and that is crucial here—is *dynamic*: events' becoming (coming into being to pass) means their becoming firstly *present*, and then *past*. That we *identify* (tensed) existence with being present is here accepted by definition and having no effect because **Becoming** is now the main ontological thesis of presentism.

Let me introduce the second version of dynamic presentism which swaps the ontology of events for the ontology of things as fundamental objects. Now, the main ontological thesis is:

Dynamic Reality: All of the objects that our world consists of exist dynamically.¹³

¹⁰ See my (2013: 54, [1]: 31; 2017c: 292, [3]: 65).

¹¹ "To 'become present' is, in fact, just to 'become,' in an absolute sense; i.e., to 'come to pass in Biblical phraseology, or, most simply, to 'happen.' Sentences like 'This water became hot' or 'This noise became louder' record facts of *qualitative change*. Sentences like 'This event became present' record facts of absolute becoming. (...) I do not suppose that so simple and fundamental a notion as that of absolute becoming can be analyzed, and I am quite certain that it cannot be analyzed in terms of a non-temporal copula and some kind of temporal predicate." (Broad 1938: 280–281).

¹² See my (2017c: 292, [3]: 65–66).

¹³ See my (2013: 55, [1]: 32; 2015b: 814–819; 2018: 404, [4]: 79).

where **Dynamic Reality (DR)** is expressed in tensed language and the notion of *dynamic existence* is a primitive notion (just as Broad's absolute becoming) which can be roughly characterized by the following set of postulates:

- i) the notion of dynamic existence is tensed;
- ii) things dynamically exist in the sense of coming into being to endure;¹⁴
- iii) events (which are acts of acquiring, losing, or changing properties by dynamically existing things and their collections) dynamically exist in the sense of coming into being to pass.

The term "objects" applies to things and events, however things are treated here as *primary objects*, while events are secondary. Again, as in the case of **Becoming**, **DR** is accompanied by three definitions:

The present \equiv The totality of objects that dynamically exist.

The past \equiv The totality of objects that dynamically existed.

The future \equiv The totality of objects that will dynamically exist.

Now, it should be emphasized that not only does **DR** states that time flows but it also provides us with the intended ontology for presentism without trivializing it because it says that exactly these objects dynamically exist that we call present. The same concerns the past and the future because **DR** says that all of the objects that our world consists of exist dynamically, which means that it is unnecessary to talk additionally about not existing (dynamically) objects (that is, the past and the future). That is, we have received the intended effect with the single thesis **DR** and three definitions of the present, the past, and the future.

Is **DR** trivial? The answer has to be negative because the notion of the present is not involved in this thesis, neither are the past nor the future involved. And, it is obvious that the definitions cannot be accused of being trivial. **DR** simply states that all of the objects which our world consists of exist dynamically (what is equivalent to the existence of the flow of time), which can be

¹⁴ The enduring of things is usually defined as a persistence over time by being wholly present at each time but, as noticed by Merricks (1994: 182), "(...) the heart of the endurantist's ontology is expressed by claims like '[object] *O* at *t* is identical with [object] *O* at *t*'." For the author of this book, this second condition alone suffices for the definition of endurantism and is a better criterion of endurance, so it will be used in what follows. According to the competing view, namely perdurantism, things perdure, meaning persistence through time by having temporal parts, and persisting things are here treated as mereological aggregates of temporal parts, none of which are strictly identical with one another.

true or false but for sure is not trivial. On the contrary, we have good reason to believe that **DR** is true. This claim needs, of course, more justification than the sentence given above, but it is not a problem here: I wanted only to show that there are versions of presentism which were not taken into account by Meyer, so they are counterexamples to his claim that he took into account “an entire spectrum of interpretations of the presentist’s thesis.”¹⁵

The point which is exploited above appears to be very important because a presentism devoid of dynamics—although logically consistent—seems to be inconsistent with our experience. The transitory character of the concepts of being past, present and future were emphasized by St. Augustine and is underlined today:

[I]f nothing were passing, there would be no past time: and if nothing were coming, there should be no time to come: and if nothing were, there should now be no present time. (...) As for the present, should it always be present and never pass into times past, verily it should not be time but eternity. If then time present, to be time, only comes into existence because it passeth into time past; how can we say that also to be, whose cause of being is, that it shall not be: that we cannot, forsooth, affirm that time is, but only because it is tending not to be?¹⁶

St. Augustine noticed that if nothing passed away, the time called the past was not; and if nothing were coming, the time to come was not either; and if nothing were, then the time called the present could not be either. If we ignore this transitory character of the concepts of being past, present and future, we receive a “petrified” or “frozen” version of presentism which is—to be sure—logically possible, nevertheless is incompatible with our experience and as such should be of no interest for presentists. This point, unfortunately, was ignored by Meyer and this means that his analysis of presentism is one-sided and inadequate, just as in the case of ignoring the problem of triviality for eternalism.

¹⁵ Meyer (2005: 216). Other versions of dynamic presentism are introduced by Dainton (2014: 87–95), however, I will not analyze the problem of whether they are able to escape the triviality objection.

¹⁶ St. Augustine (1912: 239). See also Loux (2006: 221) who highlighted that adherents of different versions of A-theory (the tensed theory of time) assume the transitory nature of the A-determinations and represent different possible ways of expressing it. The stipulation that presentism has to admit the existence of the flow of time was called *St. Augustine’s Condition* in my (2017c: 288, [3]: 59).

I shall also try to demonstrate later that he seriously misinterprets the debate between the tensed and tenseless theories of time, or A-theories and B-theories of time—as they are often called at present, and that this debate—when correctly interpreted—can be seen at least in the case of a leading version of the former ones as a discussion between presentism and eternalism as this controversy is seen from the point of view of our language and its relation to the world. What is more, I would like to show below that the debate between presentism and eternalism, seen as the dispute between the tensed and tenseless theories of time (or A-theories and B-theories of time), is not only immune to the objection of triviality but seems to seriously clarify the controversy as well. Undoubtedly, there are other versions of the tensed theories of time (A-theories of time) such as the spotlight theory, the growing block theory, or the shrinking block theory,¹⁷ however, to the purpose of the current argument, it is sufficient, that—using Michael J. Loux's (2006: 221, 235) words—the most popular version of the tensed theories of time (A-theories), for example, these championed by Prior, John Bigelow, or Craig, advocate presentism while their opponents (for example, Smart, and Mellor) eternalism. What is the most important—as I will show—is not only that the presentist's tensed/A-theoretical ontology matches very well with our phenomenological experience (the present separates what is fixed, known by traces and cannot be changed anymore, that is the past, from this which can only be predicted and has no traces but, at least sometimes, can be affected, that is, the future), but that it also corresponds perfectly well with what our tensed language says about the world: saying that the future tensedly exists would mean breaking the rules of this language (because the future *will exist* and does not exist yet) and we do exactly the same when saying that the past tensedly exists (because the past *did exist* and does not exist).

Meyer (2005: 216–219) takes into account a possibility of a defence of presentism against the objection of triviality by referring to the debate between tensed and tenseless theories of time, however, he quickly denies the above mentioned possibility: “The widely held view that tensed account of time endorse presentism while tenseless theories reject it, is simply mistaken” (2005: 217). He tries to show this by spelling out the theses P1 and P2 in two different ways:

¹⁷ See, for example, Loux (2006: 221), and Smith (2005: 478).

	P1	P2
tensed theory	$\forall x (Ex \supset Ex)$	$\forall x (MEx \supset Ex)$
tenseless theory	$\forall x (Ext^* \supset Ext^*)$	$\forall x (\exists t Ext \supset Ext^*)$

where the monadic existence predicate E is used to account for time-relative existence claims in the case of tensed theories of time, and (the same term) E is a temporal “location” relation that objects bear to times in the case of tenseless theories of time; the primitive sentential tense operator M means “at some time,” and t^* is the present time (time of utterance) while t is a variable ranging over times.

Then, we receive again the trivial view P1 and the obviously false P2. And this means, according to Meyer, that “[t]ensed theories neither support nor require a non-trivial form of presentism, and even the proponent of the tenseless theory of time has to accept the trivial presentist thesis P1” (2005: 218).

Unfortunately, Meyer seriously misinterprets tensed and tenseless theories of time (A-theories and B-theories of time); although adherents of the former really accept sentences like P1, its triviality is not something they have to argue about with adherents of the latter. The adherents of the tensed theories of time (A-theories of time) need not call into question the “triviality” of P1 simply because they can treat such sentences as analytically true consequences of their understanding (or definition) of the notion of present: for them, *to be present* just means *to exist*. As follows from the citations from Prior and his followers given above, the adherents of the tensed theories of time (A-theories of time) can simply *identify presentness with existence* and this is why they need not call into question the fact that P1 is trivially true.

But, if the adherents of the tensed theories of time (A-theories of time) do not argue with the adherents of the tenseless theories of time (B-theories of time) about the triviality of P1, so, what do the adherents of the tensed theories of time discuss with their opponents? Well, their arguments are—and which is typical for the analytical tradition—arguments about language and about the relation between language and reality; strictly speaking this is a debate as to whether the tensed structure of our language reflects the real structure of the world or not, and as such this is a debate on a metalanguage level. As Loux puts it, “A-theorists will all agree that tensed language must be taken at face value: tensed language, they say, points to irreducibly tensed properties and irreducibly tensed states of affairs.”¹⁸

¹⁸ Loux (2006: 218). See also my (2011b: ch. 4) where these problems are analyzed.

It can be seen, for example, in Prior's "Some Free Thinking about Time," where Prior defends the reality of the passage of time, objectivity of the distinction between the past, the present, and the future, and indefinability of A-determinations of "past," "present," and "future" in terms of B-determinations of "earlier" or "later." Quite the contrary, Prior (1998) claims that "*X* is earlier than *Y*" means "At some time *X* was past and *Y* was present," and "*X* is later than *Y*" means the opposite of this:

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 favourable conditions they are *perceived* properties. (...) I have a good friend and colleague, Professor Smart of Adelaide, with whom I often have arguments about this. He's an advocate of the tapestry view of time, and says that when we say "*X* is now past" we just mean "The latest part of *X* is earlier than this utterance." But, when at the end of some ordeal I say "Thank goodness that's over," do I mean "The latest part of that is earlier than this utterance?" I certainly do not; I'm not thinking about the utterance at all, it's *overness*, the *nowendedness*, the *pastness* of the thing that I'm thinking for and nothing else. Past, and future are in fact not to be defined in terms of earlier or later, but the other way round—"X is earlier than Y" means "At some time X was past and Y was present," and "X is later than Y" means the opposite of this.¹⁹

If the distinction between the past, the present, and the future is objective, which was emphasized by Prior, it would mean that *the tensed structure of our language reflects the real structure of the world*. As Loux puts it (emphasizing transitory character of A-determinations):

A-theorists take time to be irreducibly tensed. They think that the various linguistic expressions of tense (tensed verbs, predicates like "past," "present," and "future," and referring expressions like "now," "then," "yesterday," and "today") point to objective features of time, features that time would have even in a world without

¹⁹ Prior (1998: 106). "Tapestry" is characterized by Prior as "timeless tapestry with everything stuck there for good and all" (1998: 104) and connected with the view which is just the opposite of his own tensed view of time. All references in this text to "Some Free Thinking about Time" relate to the reprinted version (1998).

thinkers. But while they take them to be objective, A-theorists hold that these features are transitory: times, events, and objects change with respect to the various temporal properties. (Loux 2006: 217)

Prior also underlined the transitory character of the distinction between the past, present and future, and the reality of the passage of time. That is why—he explained—we use past-tensed sentences to express our experiences of yesterday, and the future-tensed sentences to talk about our plans.²⁰ What is of great importance here is that we receive this way in the case of Prior's version of a tensed theory of time (A-theory) the same ontological theses which characterize presentism.

The adherents of the tenseless theories of time (B-theories) will, of course, deny that the tensed structure of our language reflects the real structure of the world and, as a consequence, the objectivity of the distinction between the past, the present, and the future, as well as the objectivity of the passage of time. This can be seen, for example, in the last part of the quote from "Some Free Thinking about Time" (Prior 1998: 106), where Prior wrote about his arguments with J. J. C. Smart about the translatability of tensed sentences into the tenseless language, and what we find there is Prior's famous argument "Thank goodness that's over."²¹ The adherents of the tenseless theories of time, such as Bertrand Russell (1903), Smart (1963), and Nelson Goodman (1951) claimed that tensed sentences are translatable into tenseless sentences and, as such, do not describe events and things with their real properties, while their adversaries, such as for example Broad (1938) and Prior (1959, 1970), denied this.²²

After 1980, the debate changed: the thesis about the translatability of tensed sentences turned out to be untenable because sentences with temporal indexicals, such as for example "now," are untranslatable into sentences not containing them.²³ Instead of this, adherents of tensed and tenseless theories

²⁰ Please, recall Prior's claims: "But, when at the end of some ordeal I say 'Thank goodness that's over,' do I mean 'The latest part of that is earlier than this utterance'? I certainly do not; I'm not thinking about the utterance at all, it's *overness*, the *nowendedness*, the *pastness* of the thing that I'm thinking for and nothing else." (1998: 106).

²¹ See, for example, Prior (1959), where the argument is developed in a broader way.

²² See, for example, Loux (2006: 215–218).

²³ See, for example, Smith (1987: 372), and Loux (2006: 224–228). Smith reminded after Castañeda that "the basic kinds of indexicals are irreducible to each other, so that tenses and 'now' for example cannot be systematically translated by indexical-containing expressions like 'this time' or 'simultaneously with this utterance'."

of time started to discuss whether the tensed sentences have tenseless states affairs as truth conditions (or truthmakers).²⁴ This became a crucial question because if truth conditions (or truthmakers) involving only unchanging relations of temporal simultaneity and priority suffice as explanations of whether the tensed sentences are true, this would mean that events and things in the world do not have changing, monadic properties of futurity, presentness or pastness. In other words, it would mean that there is nothing in the world corresponding to the tensed structure of our language or, at least, that such an assumption is gratuitous. D. H. Mellor, for example, described the debate in such a way:

What both parties mean by a belief's truth condition is its so-called "truthmaker," i.e. what in the world *makes* it true. What we disagree about is whether A-facts or B-facts—in the substantial sense of "fact" for which I argue explicitly—makes temporal beliefs true. This is a real issue, for if B-facts do this job, A-facts do not; and if they do not, they do not exist, since this is what they exist to do.²⁵

In Mellor's (1998) own indexical theory of A-propositions, "'*e* is present' is made true at *t* by *e*'s being located at *t*, and similarly for other A-propositions."²⁶

So the metalanguage debate about truth conditions and truthmakers of tensed sentences, propositions, and temporal beliefs is—as a matter of fact—the debate about whether there are the objective A-facts and A-properties of being past, present and future in the world. And if we recall the transitory character of the concepts of being past, present and future, it becomes obvious that the debate involves the problem of the reality of the flow of time and that the discussion about truth conditions and truthmakers of tensed sentences and tensed propositions—similarly like earlier debate about translatability of tensed sentences—is the debate between presentism and eternalism, as this problem is seen from the point of view of our language. Mellor, who is a well-known eternalist, states explicitly in the quotation above that if A-propositions have B-facts as their truthmakers, A-facts concerning properties of being past, present and future in the world do not exist. And if they do not exist, their

²⁴ See, for example, Mellor (1981), Smart (1980), Loux (2006: 205, 226–228), and Smith (2005: 475).

²⁵ Mellor (1998: XI). Here A-facts are contingent facts about the A-times of events (for example, that an event is present), and B-facts include necessary facts ("if there are such facts" (1998: 19)—Mellor adds), and contingent facts about how much earlier or later events are than each other—and hence about what their B-times are. See Mellor (1998: 19).

²⁶ Mellor (1998: p. XII and ch. 3).

changes, that is the flow of time, also do not exist: there is only a sequence of A-beliefs in us and the flow of time is a myth:

But then we agents must be constantly changing our A-beliefs, especially our beliefs about what is happening *now*, in order to try to keep them true. These changes in us, mostly prompted by our senses, are what make us think of time as flowing, even though it does not flow. For without such properties as being past, present and future, time cannot flow, i.e. make events change from being future to being present and then to being past.²⁷

Again, similarly to the case of older tensed and tenseless theories of time, A-theorists and B-theorists defend or deny (respectively) the objectivity of the flow of time and the objectivity of the distinction between the present, the past and the future, that is they assume or deny (respectively) ontological theses of the presentism.

Of course, none of metalanguage claims of the type:

MLP: A-propositions (or A-sentences) need A-facts as their truthmakers (B-facts are not sufficient for their truth);

MLE: A-propositions (or A-sentences) have B-facts as their truthmakers;

MLP': The tensed structure of our language corresponds to real metaphysical structure of our world (tensed language points to irreducibly tensed properties, that is, A-properties, and irreducibly tensed states of affairs, that is, A-facts);

MLE': The tensed structure of our language does not correspond to real metaphysical structure of our world (the tensed sentences have B-facts as their truthmakers);

is trivially true (they cannot be proved with help of meanings of the words and logical laws) or obviously false because it is not obvious whether A-propositions and A-sentences have, or do not have, A-facts as their truthmakers. This means that the debate between presentism and eternalism is not trivial: on

²⁷ Mellor (1998: 4).

the contrary, it raises profound metaphysical and epistemological questions with regards what is the metaphysical structure of the world.

4. How can we understand the debate between presentism and eternalism?

We are approaching the questions mentioned in the last section through the analysis of the language of time as it is done in the discussion between the adherents of the tensed and tenseless theories of time (A- and B-theorists). If we take this route, we simply ponder which language—tensed or tenseless—correctly describes the metaphysical structure of the world. A-theorists are convinced that the various linguistic expressions of tense, that is tensed verbs, predicates like “past,” “present,” and “future,” and referring expressions like “now,” “then,” “yesterday,” and “today” point to objective features of time, and—what is more—they hold that these features are transitory: times, events, and objects change with respect to the various temporal properties (Loux 2006: 217, 221). This must involve a commitment to a real passage of time in the world in some form, as it was emphasized by Prior.²⁸ For it seems to be obvious that if the tensed theory of time is correct, and there are changing objective A-properties and A-facts in the world, time really has to flow because this passage of time is responsible for the transitory character of these features.

It follows from the above considerations that both debates between presentism and eternalism and between the tensed and tenseless theories of time (A-theory and B-theory) do not relate to the theses P1, P2, E1, E2 only but rather should be related to the much deeper problem of what is the metaphysical structure of the world, which involves the issues of the transitory character of the concepts of being past, present, and future and the existence of the flow of time as well. When we approach this problem from the starting point which is our language, we ponder which notion of existence—tensed or tenseless—should be applied to the world, or—more generally—whether the tensed structure of our language corresponds to the metaphysical structure of the world or, yet otherwise, whether tensed language points to irreducibly

²⁸ “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.” (Prior 1998: 104).

tensed properties and irreducibly tensed states of affairs or rather B-facts are sufficient for the truth of tensed sentences. We can resolve these problems not only by analyzing the theses MLP, MLE, MLP', MLE," but also by discussing such problems as:

- 1) Does time really flow?²⁹
- 2) If it does, what the flow of time consist in?
- 3) If it doesn't, what is the source of the illusion of existence of the flow of time?
- 4) What is the nature of cross-time relations and how can they be explained by presentists?³⁰
- 5) Are presentism and the tensed theory of time compatible with the theory of relativity?³¹
- 6) Why do we have traces of past events but do not find traces of future events if all physical interactions (with the exception of weak interactions) are time reversal symmetric?³²
- 7) How is it possible that we can affect (as we believe) future events but we cannot affect the past if all physical interactions (with the exception of weak interactions) are time reversal symmetric?

These problems are connected—as it is well known. For example, if we deny the passage of time and assume the tenseless notion of existence, we end up with eternalism, that is the view which is easy to reconcile with the theory of relativity. In such a case, we do not have difficulty with (2, 4, and 5), but—instead—we have problems with (3) and with vindicating MLE and MLE'. If we assume the existence of the passage of time and the tensed notion of existence, in turn, then we should answer the questions (2, 4, and 5) which is not trouble-free. It can be seen from this that there is no simple and easy solution to the controversy between presentism and eternalism but it can in no way be treated as pointless and non-existent.

²⁹ See citations from Prior in fn. 28 with a positive answer and Mellor's before fn. 27 with a negative one.

³⁰ This issue arises when we assume the principle that if a relation holds between two things, then both of those things must exist. See, for example, presentists Bigelow (1996), Markosian (2004) on one side of the controversy and Sider's (1999) on the other side.

³¹ See, for example, Gödel (1949b) and Prior (1998) who claim that the conception of the distinguished present cannot be reconciled with the theory of relativity and Shimony (1993) on the contrary.

³² See, for example, Earman (1974), Sklar (1974), and my (2017a [2], 2017b).

5. The triviality objection once again: conclusions

I tried to show that we can avoid the triviality problem concerning controversy over temporal structure of the world, called the controversy between presentism and eternalism, if we assume the proposed versions of dynamic presentism or if we consider it as a debate between A- and B-theory of time (or—using outmoded Meyer's terms—between tensed and tenseless theories of time).

Now, however, an interesting question arises related to this second solution of the triviality problem: how is it possible that the metalanguage approach which is used in the debate between A-theorists and B-theorists allows us to avoid the triviality problem? Should not the metalanguage approach lead to the same problems as presentism/eternalism in one-sentence formulation of these positions: "Only present things exist" / "Past, present, and future things exist" (in the tensed or detensed way)? The explanation of the point at issue seems to be simple and lies in the holistic line of attack to the problem proposed by the A-theorists and B-theorists. When we ponder whether the tensed structure of our language corresponds to real metaphysical structure of our world, not only do we analyze the one-sentence statements "Only present things exist" / "Past, present, and future things exist" (expressed in the tensed or detensed way), but also have to analyze deep and difficult problems such as, for example, MLP, MLE, and (1–7) listed above, which are far from being trivial. They involve such profound metaphysical and epistemological questions as, for example: whether there are for any truth some things in the world that make them true and, especially, whether do past-tensed and future-tensed sentences need presently existing truthmakers; what is the source of our experience of time and the tensed structure of our language; how we should metaphysically interpret physical theories such as theory of relativity; what is the nature of causation and the origin of its asymmetry.

It seems, then, that the ontological controversy between presentism and eternalism can be alternatively converted into one over the language which we use to describe the world and over the relation between language and reality in such a way that it allows us to avoid the triviality problem. It does not mean, of course, that what there is depends on words. It is not so just because what we really do in such an approach is simply to look for the best conceptual scheme for describing the world. Some of the problems to which this approach leads have been discussed in philosophy since the time of Heraclitus and Parmenides. They refer to the deep metaphysical structure of the world and need to be analyzed and resolved, and—I have to repeat again—are in no way trivial.

6. Dynamic Presentism and the Grounding Objection

This chapter analyses the grounding objection to presentism, arguing that presentists who claim that only present things exist have no ontological basis for their claims as they themselves refer to the past. It attempts to demonstrate that the objection is invalidated when we consider a dynamic version of presentism, that is one which introduces a dynamic ontology by means of the notion of dynamic existence. Not only does this approach facilitate the introduction of a metaphysical category of the past (past things and past facts) which provides an ontological basis for past-tense propositions, but also allows us to explain why the future is open (in contrast to the fixed past) and why contingent propositions about the future lack truth value and do not need truthmakers.

1. Introduction

It seems that whatever we claim to be true has to be anchored in some way in reality. And it also seems that if we take the correspondence theory of truth into account—the most natural one to adopt—we should expect that propositions are true if and only if (iff) they correspond to the facts. Truthmaker theorists take this theory as claiming that every truth has something that makes it true, namely a truthmaker. So, for example, D. M. Armstrong (2000: 150) wrote:

I hold the view that every truth has a truthmaker. The truthmaker for a particular truth is that object or entity in the world in virtue of which that truth is true.

(...) The truthmaker is the “correspondent” in the Correspondence theory of truth, but with the repudiation of the view that the correspondence involved is always one-one.¹

In its extreme form, namely Truthmaker Maximalism (**TM**), an example of which appeared in the above quotation from Armstrong, the truthmaker principle can be stated in the form:

TM Every true proposition has a truthmaker.

If we accept **TM**, a tough problem which remains for adherents of the so-called dubious ontologies such as, for example, presentism, modal realism, or Platonism,² who want to meet the challenge put forward by the truthmaker theory, is the question of whether all their ontological claims really have truthmakers and where these truthmakers should be sought.

Putting aside the problem of negative existentials,³ it can be shown more generally that **TM** is not always satisfied: Peter Milne (2005) has shown, for example, that we have such a situation in the case of self-referential statements of the type:

G There is no truthmaker for the proposition expressed by **G**.⁴

However, truthmaker theorists can still defend a weakened demand by excluding self-referential propositions from the domain of the general quantifier in **TM**. They can maintain, for example, that their aim is to eliminate dubious ontologies and, as such, **TM** should only be applied to propositions which try to say something about the world and are not self-referential. So, they can claim strongly that every true proposition which states something about

¹ Armstrong (2000: 150). See also Niiniluoto (2004: 57), who states that “[a] hallmark of correspondence theories of truth is the principle that sentences are made true by some truth-makers.”

² See Sider (2001).

³ There are lasting controversies about truthmakers for negative existentials—see e.g. Armstrong (2000), Merricks (2007). **TM** can be defended in this case by, for example, pointing to *general facts*—totality states of affairs as Armstrong (2000) call them—as an ontological basis for the negative existentials. According to Armstrong, the general facts can also serve as truthmakers for general truths.

⁴ Milne (2005). See also López de Sa and Zardini (2006); and Rodríguez-Pereyra’s (2006) critique of this argument and a vindication of Milne’s (2005) argument in Milne (2013) and my (2015a).

reality should have a truthmaker anyway.⁵ Nevertheless, I would like to show that even in the case of excluding the self-referential propositions from the scope of **TM** to restore its validity, presentism is not endangered by it. It is so, at least in the case of a dynamic version of presentism which introduces a dynamic ontology by means of the notion of dynamic existence,⁶ as I will later demonstrate in the chapter.

This chapter analyses the grounding objection to presentism which states that presentists, who claim that only present things exist, have no truthmakers (or no ontological basis) for their claims which refer to the past. In the second section, I will begin my analysis of the objection by showing that it is an implausible response to this objection to attempt to find an ontological basis for the past-tense propositions in the present. In the third section, I will try to show that dynamic presentism can do the job because it introduces the past in the form of past things and past facts, and, as a result of this, it provides presentists with the correct ontological grounding for past-tense propositions. Also very important according to this view is the fact that the future is to be constituted by the dynamically existing world and it explains in this way why the contingent future-tense propositions lack truth value and, as such, do not need truthmakers. The fourth section vindicates such an ontological approach.

2. Past-tense propositions and the grounding objection

The objection of the truthmaker theorists to presentism, which is standardly presented by means of the thesis that only present things exist, is very simple: if we consider sentences about the past, for example:

⁵ Another possible way of weakening **TM** is by assuming the Supervenience Principle, according to which truth supervenes on reality (see Bigelow 1996). In what follows, I will widely treat the truthmaker objection to presentism as a demand for ontological grounding for its past-tense propositions: presentists can maintain, after Aristotle (*De Interpretatione*, ch. 9), that contingent propositions about the future lack truth value. What is more, in the third section, I will show that dynamic presentism explains why the future can be treated as open (contrary to the fixed past).

⁶ In this chapter, I will only analyze the version of dynamic presentism introduced in my (2011b, 2013 [1], 2015b, 2018 [4]), which is based the notion of dynamic existence. Other versions of dynamic presentism were introduced in Dainton (2014: 87–95) and my (2017c [3]).

- S** Socrates was a philosopher;
D Dinosaurs existed;

we believe that the propositions expressed by them are true, but, according to the presentists, neither Socrates nor dinosaurs exist so the presentists allegedly seem to have no ontological basis for claims about the past.

All such attacks aimed at presentism insist on the alleged necessity of presently existing truthmakers for the existential claims of the presentists concerning the past, that is that they are based on a common assumption which can be presented in the form:

- A** Presentists' past-tense propositions are true iff they have presently existing truthmakers.

And because this demand is not satisfied by presentism, truthmaker theorists maintain that a plausible ontology is provided by eternalism saying that the past, present, and future exist in the same way (ontologically on a par) or by growing block universe theory according to which only the past and the present exist.

There have been some attempts to seek an ontological grounding for past-tense claims in the present. For example, according to *Lucretianism* as upheld by Bigelow,⁷ it is possible to satisfy the stipulation **A** if we assume that the propositions expressed by **S** and **D** are true because they tell us something about the past properties of the *present* Earth, of the *present* space that has been occupied, or—in the version preferred by Bigelow (1996: 46)—of “the whole world, the totality of things that exist.” Thus, according to this approach, it is a *present* property of the Earth (or of the space or of the whole world) that it was inhabited by dinosaurs, and was a place in which Socrates lived and was a philosopher.

Analyzing this solution to the truthmaker objection, one may ponder whether there are, perhaps, *some* properties of *some* present objects about which we can say are past-directed. So, for example, Trenton Merricks, who is generally against Lucretianism, takes into account the possibility: “*that Merricks was a child* is grounded in [his] having the irreducible property of

⁷ Bigelow (1996) developed this view from the passage taken from Lucretius (1994: 21): “For we could put it that whatever has taken place is an accident of a particular tract of Earth or of the space it occupied.” Keller’s *atomic presentism*, according to which information about the past and the future “is all encoded in the past- and future-tense properties of presently existing atoms” (2004: 100), can be treated as a version of Lucretianism as well.

*having been a child.*⁸ But, even in such cases one can have serious doubts and argue—after David Sanson and Ben Caplan (2010)—that the direction of explanation and—as consequence—of ontological grounding is in fact the other way around: Merricks' property of *having been a child* is grounded in this that he *once had* the irreducible property *being a child*. After all, it is possible that Merricks in spite of being a child some years ago did not live long enough to have a property of *having been a child now*, however, it is not possible that he could have a property of *having been a child now* without the fact that he *was a child earlier*, so that he *once had* the irreducible property being a child is undoubtedly more fundamental ontologically.

More generally speaking, as pointed out by Sider (2001: 39–41), Crisp (2007: 121–122) and Merricks (2007: 135–137), among others, there seems to be something suspicious in ascribing such past-directed properties to the present Earth (or to its parts, such as, for example, present Merricks or presently existing atoms, or to the space, or to the whole world). It was the property of *Socrates* that he was a philosopher, who looked for the truth, and not the property of the Earth, or of the space, or of the whole world, or presently existing atoms. Even if there is a big crunch in the future, in which the universe recollapses with nothing surviving and remaining (no matter and no space), it will always be true that there was a man who looked for the truth and was called Socrates, although in such an instance there would be no world with a past-directed property of having Socrates-philosopher.

As was emphasized by I. G. McFetridge, Simon Keller, and by Sanson and Caplan,⁹ we want the truth of a proposition to be explained by how things are in the world, and nothing in the present world explain the fact that Socrates was a philosopher and that he was prosecuted and convicted by Athenians. Thus it seems that Sider (2001) was right in describing such solutions as *ontological cheating*.

Do these unconvincing answers to the grounding objection mean that presentism is an unviable position? I would like to show that this is not the case and what should be changed or abandoned is rather the presentists' notion of existence, and presentists' ontology, and—as a result—the truthmaker theorists' postulate **A**.

Let us then return now to the postulate **A** assumed by the truthmaker theorists, which says that:

⁸ Merricks (2007: 135, fn. 16)

⁹ McFetridge (1977: 38–39); Keller (2004: 86); and Sanson, Caplan (2010: 26, 29, 31, 36, 38).

- A** Presentists' past-tense propositions are true iff they have presently existing truthmakers.

Is it really reasonable for the presentists to admit **A**? I maintain that it is not because the presentists who state **S** and **D**—let us recall them:

- S** Socrates was a philosopher;
D Dinosaurs existed;

will claim at the same time in their tensed language that:

- S'** Socrates does not exist;
D' Dinosaurs do not exist;

that is, when asserting **S** and **D**, they will claim at the same time that there are no presently existing states of affairs to which these propositions refer. But it also follows from this that the truthmaker theorists' insistence on presently existing truthmakers for **S** and **D** is not justified.

Naturally, the truthmaker theorists can choose to continue their attack by claiming that **S** and **D**, on the one hand, and **S'** and **D'**, on the other hand, are nevertheless *different* statements and regardless of whether **S'** and **D'** have or do not have truthmakers, **S** and **D** should have if only the present exists. And the fact that the propositions expressed by these sentences do not have truthmakers is fatal for the ontological claims of the presentist. If these claims are to be true—they will maintain—there must be something in the world which makes them true and, this is exactly what is imposed on the presentists by the requirement of a correspondence with facts.¹⁰

However, such a critique will not be justified if it is to be understood as a demand for presently existing truthmakers because the notion of correspondence does not demand them. As noted by Prior: "(...) to say that X's belief that *p* is true is to say that X believes that *p* and (it is the case that) *p*. There seems no reason to see any more in 'correspondence with fact' than this."¹¹ And in a similar way we were taught by Tarski that there is not much more to be said about truth than is described by the schema:

¹⁰ See the quotation from Armstrong in the first paragraph of this chapter.

¹¹ Prior (1971: 22). Prior maintained, as can be seen in this quotation, that talk of correspondence can be removed while retaining the spirit of the correspondence theory of truth.

T A sentence X is true iff p ;

where X is a name of some sentence of the object language under study and p is the translation into the metalanguage of the same sentence.¹² This condition implies, for example, that the proposition expressed by the sentence “Snow is white” is true iff snow is white. What follows from such an understanding of the correspondence with facts is that the proposition expressed by the sentence **S** is true iff Socrates *was* a philosopher and the proposition expressed by the sentence **D** is true iff dinosaurs *existed*. It implies that the propositions expressed by **S** and **D** are true for the presentist not in virtue of some things and states of affairs presently existing in the world but in virtue of some things and states of affairs that *did exist*, and the insistence **A** of the truthmaker theorists’ on presently existing truthmakers for such propositions is not justified.

Therefore, the question now arises as to what is really the ontological basis for past-tense propositions if the past does not exist, and whether the presentists can invoke in some way past things and past facts which *did exist* but which *do not exist* to base their claims? Furthermore, what is the ontological difference between past events and past objects like Socrates and dinosaurs—on the one hand—and fictions like Apollo and Pegasus—on the other—if all of them do not exist? For presentism, this is a matter of life or death.

3. Presentism and dynamic existence

I have shown above that it is baseless for the presentists to insist on a presently existing ontological basis for past-tense propositions since they tell us something about the past and not about the present. I have also claimed that an ontological basis for past-tense propositions should be sought in the past. It was earlier noticed, *inter alia*, by Sanson and Caplan (2010) that “[w]hen explaining the truth of a proposition about how things were, one needs to

¹² Tarski (1944: 343–345). Sentences were truthbearers for Tarski. See also Niiniluoto (2004), who critically analyzes objections to treating Tarski’s definition of truth as a correspondence theory: according to these objections, Tarski’s approach does not relate sentences to any entities like facts to which true sentences might correspond. Niiniluoto argues that Tarski’s definition presupposes that material truth is always related to some kind of truthmaker.

appeal, not to how things are, but rather to how things once were.”¹³ After noticing this, they wonder: “This sounds rather obvious, to put it mildly, which makes it all the more confounding to us that so many presentists have gone to such lengths to deny it.” However, it is rather obvious why the presentists avoid appealing to the past when explaining the truth of a proposition about how things were: if only present events and things exist, how can we appeal to past things and facts which do not exist? Therefore, what exactly do these past-tense propositions refer to?

The problem here lies in the fact that the standard formulation of presentism makes use of the notion of existence at some fixed moment of time and, as such, it has a static character which is not appropriate for expressing the transitory character of the present.¹⁴ From this, for example, that I exist—in the tensed meaning of the term “exist”—in no way follows that I did exist, neither that I am changing and I will probably exist in the near future. Similarly—when we use tensed language—the standard notion of existence does not explain *how* it is possible and what it really means that *the past existed* and that *the future will exist*. Therefore, it is no great surprise then that there were undertaken attempts to interpret A-properties of being past, present or future with the aid of static B-relations of earlier than, simultaneously with, or later than.¹⁵ The point is, however, that such a move deprives presentism of all dynamics and *de facto* denies presentism leading directly to the block time universe, where the past and the future exist (in the tenseless way) as well.

Thus, when we use tensed language and say that the present exist, the past existed, and the future will exist, the problem arises what is the origin of the past and the future? Neither can we then explain what is the difference between the future and the past, which do not exist, and between them and fictional characters such as Zeus and Apollo, which do not exist as well. In consequence, we are left in the dark what is the ontological status of the past and the future and whether we can say about them something more than that

¹³ Sanson and Caplan (2010: 38). Similar sentiments can be found in Kierland and Monton's brute past presentism according to which “[t]he shape of the past is what makes past-tense claims true” (2010: 492), however, their position becomes ambiguous when they claim that “as brute past presentists, not only do we say that the past is a fundamental aspect of reality, but we are also willing to say that the past is a present aspect of reality” (2010: 496). Kierland and Monton's view is analyzed in my (2021a [7]).

¹⁴ See my (2018: 398–399, [4]: 72–73).

¹⁵ See e.g. Russell (1903, ch. 54); Goodman (1951: 93–98); and Smart (1963: 133–134).

they do not exist (in the tensed meaning of “exist”), which makes the origin of the tensed structure of our language mysterious.

So, I claim that the standard notion of existence—even in the tensed meaning of the term “exist”—has a static character and only allows to introduce an ontology which also has a static character, that is, it does not change in time and it only allows one to say that something *does* exist (the present) or *does not* exist (the past and the future). That is to say, it simply says that only present things exist and that the past and the future do not exist and in this way it does not allow one to differentiate between objects—such as Socrates and dinosaurs—that existed and others—such as Zeus and Apollo—that did not. To be able to differentiate between what existed and what did not, the presentists have to include the phenomena which is responsible for the dynamics and changing character of reality, that is, *the flow of time*, into their ontology and this way to make it *dynamic*.¹⁶ For it is the flow of time which is responsible for the fact that some objects—such as Socrates and dinosaurs—*did exist* and do not exist any longer and which distinguishes them from objects—such as Zeus and Apollo—that *did not exist*. Can such ideas be consistently incorporated by presentism?

One such version of presentism, which was intended to involve the passage of time into the ontology of presentism and was based on the notion of dynamic existence has been developed in my papers (Gołosz 2011b, 2013 [1], 2015b, 2018 [4]) and can be called *dynamic presentism*.¹⁷ It was inspired by Broad’s and Sellars’s notions of becoming, and Prior’s (1970) approach to the relations between existence and the present. How was it done?

Let us firstly recall that the flow of time according to Broad consists in absolute becoming of events, that is their coming to pass:

To “become present” is, in fact, just to “become,” in an absolute sense; i.e., to “come to pass” in the Biblical phraseology, or, most simply, to “happen.” Sentences like “This water became hot” or “This noise became louder” record facts of *qualitative*

¹⁶ It was St. Augustine who first noticed that “if nothing were passing, there would be no past time: and if nothing were coming, there should be no time to come: and if nothing were, there should now be no present time” (1912: 239) and that is why the stipulation that presentism *has* to admit the existence of the flow of time was called the *St. Augustine Condition* in my (2017c: 288, [3]: 65; 2018: 398, [4]: 71).

¹⁷ Another version of dynamic presentism which also provides an ontological basis for past-tense propositions was proposed in my (2017c [3]) and is based on the notion of the becoming of events.

change. Sentences like “This event became present” record facts of *absolute becoming*. (...) I do not suppose that so simple and fundamental a notion as that of absolute becoming can be analyzed, and I am quite certain that it cannot be analyzed in terms of a non-temporal copula and some kind of temporal predicate. (Broad 1938: 280–281)

Broad ascribed absolute becoming to instantaneous events while Sellars was convinced that we should ascribe becoming to things: “*only things can become in the sense of come into being*.” (1962: 556) I agree only partly with Sellars; for presentists, both things and instantaneous events become in the sense that their existence has a dynamic character. The difference between them is that the latter *come to pass*, the former *do not cease to be but persist*—which results from our experience—by enduring, that is by keeping their strict (literal or numerical) identity.¹⁸ Combining the ideas of becoming and enduring results in the idea of *dynamic existence* of objects, where the term “objects” applies to both things and events, however things are treated there as *primary objects*, while events are secondary.

What is crucial for the proposed dynamic approach to presentism is that its main ontological thesis makes use of the notion of *dynamic existence* and that this thesis is equivalent to the (dynamic) existence of the flow of time:

Dynamic Reality: All of the objects that our world consists of exist dynamically;¹⁹

where **Dynamic Reality (DR)** is expressed in tensed language and the notion of *dynamic existence* is a primitive notion—just as Broad’s absolute becoming—which can be characterized by the three postulates:

- i) the notion of dynamic existence is tensed;
- ii) things that dynamically exist endure;
- iii) events (which are acts of acquiring, losing, or changing properties by dynamically existing things and their collections) dynamically exist in the sense of coming to pass.

¹⁸ Usually, endurance of things is defined by their being wholly present at each time but for the author of this book, the condition of keeping strict identity suffices for the definition of endurantism and is a better criterion of endurance and thus will be used in what follows.

¹⁹ See my (2011; 2013: 55, [1]: 32; 2015b: 814–819; 2018: 404, [4]: 79; 2019: 736–737, [5]: 100).

The thesis **DR** is accompanied by three definitions: the first one suggested by Prior and his followers,²⁰ the two others assumed by analogy with the first one:

The present =^{df} The totality of objects that dynamically exists.

The past =^{df} The totality of objects that dynamically existed.

The future =^{df} The totality of objects that will dynamically exist

What is important is that not only does **DR** state that time flows, but it also provides us with the intended ontology for presentism because it says that exactly these objects dynamically exist that we call present, which means that it is unnecessary to talk additionally about not existing (dynamically) objects (that is, the past and the future). In this way, we have received the intended effect with the single thesis **DR** and three definitions of the present, the past, and the future.

The difference between this formulation and the standard version (“Only present objects exist”) is that the standard formulation of presentism utilizes a notion of existence which has a static character and, as such, says nothing about the possible behavior of the present objects, and nothing about the ontological status of past and future objects except for the fact that they do not exist. In this standard version, the present can be “frozen” or “petrified,” which is logically consistent but contrary to our experience, or it can “move” (if we assume an additional postulates intended to “move” the present) but then it leads to a related cluster of problems: what is the origin of the move of now; what does it consist in; and what is the rate of the time passage. What is also important, in no way does it follow from the notion of static existence that things endure,²¹ neither that they are changing.

The proposed form of dynamic presentism, based on the notion of dynamic existence and equivalent to a metaphysical theory of the flow of time, solves

²⁰ “[T]o say that my lecture is present is just to say that I am lecturing—flat, no prefixes. The pastness of the event, that is its having taken place, is not the same thing as the event itself; nor is its futurity; but the presentness of an event is just the event. The presentness of an event is just the event. The presentness of my lecturing, for instance, is just my lecturing” (Prior 1970: 247).

“To be present is simply to be, to exist, and to be present at a given time is just to exist at that time—no less and no more” (Christensen 1993: 168).

“On a presentist ontology, to exist temporally is to be present. Since presentness is identical with temporal existence (or occurrence) and existence is not a property, neither is presentness a property. Presentness is the act of temporal being” (Craig 1997: 37).

²¹ Berit Brogaard (2000, section 3) showed that presentism can be reconciled with perdurantism (called by her *four-dimensionalism*); in her model, things have four dimensions (that is, they perdure) in the sense that they have an unfolding temporal dimension in addition to the three spatial ones.

all of these problems: according to this conception, the main ontological thesis of presentism expressing the dynamic nature of reality states simply existence of the flow of time, and that it consists of the dynamic existence of all of the objects which our world consists of. That only the present (=df what dynamically exists) dynamically exists is an analytically true consequence of the first definition, as it should be because we *call* the present just all these objects which dynamically exist.²² This does not, however, trivialize presentism because this is not an ontological thesis of presentism and the main ontological thesis **DR** of the presentists is not trivial. Dynamically existing things are treated here as objects which persist through time directionally toward the future; dynamic existence introduces an essential temporal asymmetry into the world because the past consists of things and events that dynamically existed and cannot be changed while the future is to come into being and as such is probably open. They retain their strict identity through time being wholly present at each moment, what is again consistent with presentism.²³ The present understood in such a way is continually changing, which is also in accordance with our everyday experience.

Because the flow of time is treated in this conception as an effect of the dynamic existence of the world, the question about the rate of flow of time becomes invalidated: it makes no sense to ask “How fast does the world dynamically exist?” because no moving present and no time was used to introduce **DR**. What is more, and of greater consequence according to this conception, the future does not dynamically exist, nor did it dynamically exist, but *it is just to dynamically exist*. In this manner, the proposed approach to the origin of future time provides us with a rationale for possibly treating the future as open while the past is fixed, and it explains why we should not look for truthmakers for future-tense contingent propositions: the future—contrary to the past—*is just to be constituted* by the dynamically existing objects and this is why contingent propositions about the future lack truth value.²⁴

²² This is the real origin of the triviality problem for presentism, according to which the ontological thesis of presentism is trivially true. For the triviality problem see e.g. Crisp (2004a); Lombard (2010); and my (2011b, 2013 [1], 2015b, 2018 [4]).

²³ Objects such as things endure while processes have their temporal parts, that is, they persist by perduring.

²⁴ See my (2011b, 2015b, 2017c [3], 2018 [4]). Strictly speaking, the proposed conception of dynamic presentism can also be reconciled with the deterministic world of Spinoza; on this view, the open future does not exist and is just about to be constituted but in a deterministic way.

What is especially important from the perspective of this book, and which will be additionally analyzed in the next section, is that *this conception introduces the metaphysical category of the past* that will provide us an ontological basis for past-tense propositions. It means that the truthmaker objection to the past-tense propositions of the presentists becomes invalidated because the notion of the dynamic existence, which lies at the heart of the new proposed dynamic ontology of presentism, allows us to claim that this is just the past which forms the ontological grounds for past-tense propositions. At the core of this ontology lies the assumption that present events dynamically exist only momentarily and *have* to cease to be to form *the past*: the totality of things and objects that dynamically existed, and this is just *the past* which provides us with an ontological grounding for past-tense propositions which we have been looking for. Present facts, consisting of events that dynamically exist, can only provide us with the ontological basis for present-tense propositions. All of these can be easily verified by our experience and empirical science: we have been continually detecting *traces* of past events and other past objects, around us and in our memory, something which is possible because they dynamically existed. And the traces of these past objects are a real source of our knowledge about the past and particular statements concerning the past.

It follows from this that if the correspondence with facts is to be satisfied, the stipulation **A** saying that the presentists' past-tense propositions are true iff they have presently existing truthmakers (exactly as present-tense propositions) should be changed in such a way that the same tenses occur on both sides of this biconditional. I will call this new requirement the principle of the compatibility of tenses (**PCT**):

PCT: Presentists' past (respectively: present)-tense propositions are true iff there existed dynamically (respectively: exist dynamically) facts described by these propositions.

The notion of dynamic existence therefore seems to provide us with a plausible ontological grounding—a dynamic ontology with past and present facts—for presentism; it explains perfectly well why some objects do not dynamically exist, although they did, and why others do dynamically exist, although they did not do so previously, and what is the difference between the past objects, on the one hand, and fictions, on the other hand. The notion of dynamic existence also explains why some objects will dynamically exist even though they do not yet dynamically exist.

According to **PCT**, propositions about the present are true due to present facts, and propositions about the past are true due to past facts. **PCT** as a direct consequence of the idea of truth as a correspondence with facts, which seems to give the best explanation of the difference between truth and falsity, is more fundamental than the truthmaker principle **TM**, and if **TM** is to be recognized as plausible, it should not be interpreted in such a way that it requires presently existing truthmakers for past-tense propositions. The past-tense propositions are grounded in what dynamically existed, that is, in past facts, and the ontological basis for them can in no way be sought in what dynamically exists at present.

4. In support of metaphysical category of past things and past facts

The essential attribute of the proposed approach is that it introduces the metaphysical category of *the past* as *the totality of things and events which dynamically existed*. Now, I suppose that a possible objector to the proposed concept of the past could raise an objection such as this: what is, on earth, this metaphysical category of past things and past events, whether they exist or not? Perhaps, are they somewhere in a metaphysical limbo between being and non-being?

I would answer such a critic that s/he doesn't understand the problem, and that s/he should change completely her/his way of thinking and looking at the world, perhaps in a Kuhnian-revolutionary-way as when we learn to see rabbits instead of ducks (or the other way around).²⁵ Namely, if s/he is not able to see the past things and past events, it is probably because s/he has still been making use of an old concept of existence, that is, what I called earlier the notion of static existence (existence at some fixed moment of time). This is why s/he doesn't accept the metaphysical category of past things and facts. Just the notion of static existence alone introduces a dichotomy: to exist or not to exist. If we swap this notion for the dynamic one, it transpires that our metaphysical horizon expands to a broader category of past things and past events which, in fact, *do not exist*, which however, *did exist*. Their

²⁵ See Kuhn (1996: 111).

importance is so high that it cannot be exaggerated. That is to say, the presentists, who believe that only a present exists in some way and that the present is changing because the time flows, receive this way a metaphysical category to which objects such as Socrates, Heraclitus or Twin Towers belong; they have just been *taken out from* the metaphysical limbo rather than have been *thrown into it*.

For a traditional metaphysician, it might seem strange to introduce things and facts that do not exist and to ground them on some of her/his ontological claims. I would maintain, however, that it is only a consequence of a force of habit to static ontology and to the notion of static existence. I would even say something more: not only should we ground our past-tense sentences on past facts but we should realize that *we and the whole world are ontologically grounded in the past*, such as hot stars (because we are made from atoms of heavier elements—for example, carbon, oxygen, and iron—which came into being in the nuclear fusion reactions inside the hearts of hot stars billions of years ago), biological evolution, history of the earth and humankind, and so on. Who could oppose this? The four-dimensional space-time block rids the world of the real dynamics, so it is no real alternative to dynamic presentism. And, if the proposed dynamic view of reality is true, why then do we oppose grounding past-tense sentences in the past?

Precisely how essential the difference is between the standard static approach to the ontology of presentism expressed by the thesis “only present things exist” and the dynamic approach utilized above, can be illustrated in the following way.²⁶ Let us imagine that there is a possible world—I will call it W^+ while calling our actual world W —exactly similar to our *present* world W at some moment t_0 , but such that in W^+ there existed nothing in the past of t_0 , and there will exist nothing in the future of t_0 . It would be a static world equipped with the static concept of existence with a momentary present at t_0 but without a flowing time, with nothing (no events, no things) in the past of t_0 , and similarly without events and things in the future of t_0 . In the case of W^+ , which satisfies the presentist’s condition that only the present exists, the objection of the truthmaker theorists raised against presentism in virtue of the lack of truthmakers for past-tense propositions would be justified just because there would have existed nothing in the past of t_0 (and there would exist nothing in the future of t_0) in W^+ . However, what distinguishes our world W from W^+ is the existence of the passage of time in our world, and that there

²⁶ See my (2015b: 812; 2017c: 289–290, [3]: 61; 2018: 400, [4]: 74–75).

were past events and objects like Socrates and dinosaurs in it. It is precisely the passage of time in our world that is responsible for this that these objects *did dynamically exist* but *do not dynamically exist anymore*, some others *do dynamically exist*, and yet some others *will dynamically exist* although they *do not dynamically exist* at present. And it is the passage of time that means that some propositions, for example stating that Socrates exists, or that dinosaurs exist, were true but are no longer true where the notion of existence should be understood dynamically. The presentists are able to distinguish between what dynamically existed, for example dinosaurs and Socrates, and did not dynamically exist, such as, for example, Zeus and Apollo, and can talk about this. They do so not in virtue of what presently dynamically exists but in virtue of what did. The truthmaker theorists' assumption **A** does not take into consideration the dynamic character of the presentists' notion of existence and ontology, that is, it does not distinguish between two kinds of worlds with and without the passage of time, with and without the continually changing present, and these two kinds of situations: between what *did* dynamically exist and *did not*. So in the case of the dynamic approach to ontology of presentism it should be changed in accordance with **PCT** so as to take these distinctions into account, or else wholly abandoned. In both cases, however, presentism remains untouched.

The above considerations and our fundamental idea of truth as the correspondence with facts show us two important things. Firstly, the presentists should make use of a different notion of existence than the notion of static existence used for describing the world W^+ with the frozen present: while in the latter, events and objects exist statically in their fixed spatiotemporal location, for the presentists in the dynamic approach assumed in this chapter and used for describing the real world W , all objects *dynamically exist*. And secondly, the notion of dynamic existence makes it possible to talk about a constantly changing present as the totality of things and events that dynamically exists, about things and events which dynamically existed but that no longer dynamically exist—that is about past objects—and about these objects and events which are expected to dynamically exist in the future. It also makes it possible to differentiate between objects that dynamically existed, such as Socrates and his case, and objects that did not, like Zeus and Apollo. Thanks to this, the notion of dynamic existence can be used to differentiate between the worlds W and W^+ , which were mentioned above: the notion of dynamic existence should be used for describing our world W , but not the hypothetical world W^+ , where there is no flow of time and no dynamics. In this way our dynamically changing world, equipped (and described) with such a notion of

dynamic existence, provides us immediately with the dynamic ontological basis for the propositions expressed by sentences like **S**, and **D**: such propositions are true in our world W because objects like Socrates, his case and dinosaurs dynamically existed in our world, while propositions expressed by sentences **S** and **D** would not be true in world W^+ because there was no Socrates and dinosaurs in this world.

5. Conclusions

The chapter assumed that the presentists' claims about the past, as claims pretending to say something about reality, need truthmakers and that the dynamic version of presentism, which introduces the dynamic ontology by means of the notion of dynamic existence, can provide us with the correct ontological grounding for these claims in the form of past things and past events. The truthmaker objection can be successfully raised against the static version of presentism and then it can be understood as an objection against the obscure ontology of this view, in which there is a lack of the category of things and events that existed but do not exist, and as a demand for an improvement of this ontology.

Contrary to the static version, the dynamic version of presentism, with a dynamic ontology based on the notion of dynamic existence, allows us to explain why the present is changing without falling into a vicious circle and *regressus ad infinitum*, and to introduce the ontological categories of present things and events, consisting of things and events that dynamically exist; and of past things and events, consisting of things and events that dynamically existed. As such, it allows us to differentiate between what has dynamically existed and what has not dynamically existed, providing us with the right ontological basis for a tensed language, that is, in particular, for the past-tense propositions used by the presentists.

What is more, according to dynamic presentism, the future does not (dynamically) exist, nor did it (dynamically) exist, but *it is just to (dynamically) exist*. In this way, the proposed approach to the origin of future time provide us with a rationale for treating the future as open and the past as fixed, and it explains why we should not look for truthmakers for future-tense contingent propositions: the future—contrary to the past—is *just to be constituted* by dynamically existing objects and, as a result, contingent propositions about the future lack truth value. For all these virtues, dynamic presentism and its solution to the problem of the ontological basis for past truths are worth accepting.

7. Brute Past Presentism, Dynamic Presentism, and the Objection from Being-Supervenience

Presentism faces the following well-known dilemma: either the truth-value of past-tense claims depends on the non-existing past and cannot be said to supervene on being, or it supervenes on present reality and breaks our intuition which says that the true past-tense claims should not depend on any present aspect of reality. This chapter shows that the solution to the dilemma offered by Kierland and Monton's brute past presentism, the version of presentism according to which the past is supposed to be both a fundamental and present aspect of reality, is implausible and proposes how to cure presentism: the dilemma can be avoided by taking a third road consisting of introducing dynamics into presentism in the form of the real passage of time. Dynamic presentism, which is constructed in such a way, can overcome the dilemma by providing an ontological basis for the past-tense propositions in the form of the real past. Dynamic presentism also offers a rationale for treating the future as being open.

1. Introduction

Presentism, the view that the way things are is the way things presently are,¹ faces the following well-known difficulty for all presentists: what is the ontological basis for true past-tense claims such as, for example, "Socrates was

¹ I follow here Hinchliff (1996: 123) and Kierland, Monton (2007: 485). As noted by Kierland, Monton (2007: 485), this thesis entails the more popular formulation of presentism: the only

a philosopher,” if the past does not exist. This entails the following dilemma which Brian Kierland and Bradley Monton (2007) tried to solve:

Dilemma: either truth-value of past-tense claims depends on the non-existing past and cannot be said to supervene on being, or it supervenes on present reality and breaks our intuition which says that the true past-tense claims should not depend on any present aspect of reality.²

Solving this dilemma, the authors developed the view which is a version of presentism they termed *brute past presentism* (**BPP**).³ According to this view, in addition to the standard thesis of presentism which claims that the only things that exist are presently existing things, it claims that the past is supposed to be a fundamental aspect of reality and—at the same time—a present aspect of reality. I would like to show that this is a strategy which amounts to the old adage of two steps forward, one step back: the authors interestingly push forward presentism when they claim that the past is supposed to be a fundamental aspect of reality, however, in the next step, they retreat by claiming that the past is a present aspect of reality. This diagnosis is put forward in the second section of this chapter, while the third part introduces a potential remedy to this weakness in the form of modified versions of dynamic presentism (**DP**),⁴ that may restore the patient to full health: not only does **DP** try to provide presentists with an ontological basis for the past-tense propositions in the form of the real past, but it also offers a rationale for treating the future as being open as an extra bonus.

2. The problem: diagnosis

According to **BPP**,

- 1) The way things are is the way things presently are.

things that exist are presently existing things. This more popular formulation of presentism will be used in the book as well.

² Kierland, Monton (2007: 495–496).

³ The authors add that they “are not yet fully convinced by this attempt,” nonetheless, they “think it important that, even if it ultimately fails, such a defence of this version of presentism be represented in the literature” (Kierland, Monton 2007: 486).

⁴ Other versions of dynamic presentism are analyzed by Dainton (2014: 87–95).

Which entails that

- 2) The only things that exist are presently existing things.

As concerns the truth-value of past-tense claims, referring to our intuition the authors claim that

- 3) "The truth-value of past-tense claims is determined by the past." (Kierland, Monton 2007: 485)

But how this can be done? The authors answer:

- 4) "The shape of the past is what makes past-tense claims true." (2007: 492)
- 5) "This shape does not consist in a structure of things having properties and standing in relations to one another." (2007: 491)

Then the essential question arises as to what is the past if—according to presentism—the past does not exist. Kierland and Monton (2007) give us a number of declarations clarifying how they understand the past:

- 6) The past is a fundamental aspect of reality different from things and how things are. (2007: 485, 496)
- 7) The past is what has happened: what things existed and how they were. (2007: 491)

But what does it mean that objects like Socrates existed and somethings have happened if presentism only talks about what does and does not exist? They try to solve this question by means of the sidestep strategy:

- 8) "The past is an aspect of reality, even though no past things are. How can this be? There is no reductive explanatory answer to this question." (2007: 491)

However, according to all standard versions of presentism, only the present exists, so the authors felt to be forced to admit that:

- 9) "The past is a present aspect of reality." (2007: 496)

There is no contradiction between (6), saying that the past is a fundamental aspect of reality different from things and how things are, and (9) because Kierland and Monton assume that

- 10) Reality is not exhausted by things and how things are. (2007: 485, 491)

Nonetheless, a more essential difficulty arises as a consequence of the proposed solution. Namely, the authors wanted to solve the **Dilemma**: either the

truth-value of past-tense claims depends on the non-existing past and cannot be said to supervene on being, or it supervenes on the present reality and breaks our intuition which says that true past-tense claims should not depend on any present aspect of reality. Did they succeed? I claim that not at all because Kierland and Monton smuggle in through the back door of their ideology what they thought they had ruled out of the ontology, saying that the past is a present aspect of reality. In the solution preferred by them, to avoid the second horn of the **Dilemma** they assumed, firstly, that the truth-value of past-tense claims is determined by the past (3), and, secondly, that the past is a fundamental aspect of reality different from things and how things are (6), nevertheless then the first horn (if the truth-value of past-tense claims depends on the non-existing past, then it cannot be said to supervene on being) fought them off back to the second horn and forced them to reject the stipulation (let us call it after the authors **P**) that the past-tense claims do not depend on any present aspect of reality for their truth-value. The rationale for such a move was that reality is not exhausted by presently existing things and how things are (2007: 496). This is why, according to Kierland and Monton, "**P** is not intuitively true" (2007: 496).

The point is, however, that even if we agree to deny the existence of facts as the authors do (2007: 497), we will still believe that Socrates is part of the *real* past and not of a present aspect of reality, so **P** seems to be still intuitively true contrary to what Kierland and Monton claimed. It is hard to accept that the past is a present aspect of reality (9): it is *not* a present aspect of reality that Socrates was a philosopher and that he was convicted by the Athenians. Strictly speaking, we have, of course, a history of philosophy but it is not the history that made Socrates a philosopher but rather the other way around: that he was a philosopher made our history and us as we are. And we are responsible in no way for his conviction by the Athenians and it is no aspect of the present world; we are really responsible but only for our own faults. McFetridge, Keller, and by Sanson and Caplan noted that we do not want a mere correlation between what is true and what the world is like; rather, we want the truth of a proposition to be *explained* by how things are in the world.⁵ Kierland and Monton do not offer us such an explanation. As long as a plausible explanation of the ontological status of the past is not offered, such a solution cannot be regarded as reasonable.

Of course, our knowledge is fallible and perhaps **P** is just the thesis that should be changed. I would like to show, however, that **P** can be saved in

⁵ McFetridge (1977: 38–39); Keller (2004: 86); and Sanson, Caplan (2010: 26, 29, 31, 36, 38).

a plausible way which has some other virtues for the presentists and therefore there is no need to reject it. Before I introduce the proposed improvement of presentism, I would like to briefly analyze Kierland and Monton's second strategy of solving the **Dilemma**, one which is connected with a different reading of **P**.⁶ According to this second strategy, in the intuition that past-tense claims do not depend on any present aspect of reality for their truth-value, the past should be understood as a one big event (let us call it "the past_c" after the authors) which consists of all past events, such as that Socrates died, World War II occurred, and Mount St. Helens erupted. Then—Kierland and Monton (2007: 496) claim—"The past_c occurred' is a true claim about a *past* event," and **P** is intuitively true. One can certainly agree with them, but only when the past is not a present aspect of reality (and it is a *real* past which means that the truth-value of past-tense claims depends on the non-existing past), because when the past is a present aspect of reality, the second horn of the **Dilemma** is encountered (that true past-tense claims should not depend on any present aspect of reality), contrary to what is claimed by the authors.

So, is the patient terminally ill without any chances of surviving? I claim that this is not the case at all. Kierland and Monton (2007) were on the right track when they claimed that the truth-value of past-tense claims is determined by the past (3); and that the past is a fundamental aspect of reality which is different from things and how things are (6); and that the past is what has happened: what things existed and how they were (7). However, it is hard to accept that the past is a present aspect of reality as it was argued above.

Where, then, did Kierland and Monton make a slip? The point is that the fundamental thesis of presentism (2) "The only things that exist are presently existing things" seems, at first glance, to block any other understanding of the past than that which is offered by (9) ("the past is a present aspect of reality"). The thesis (8), let us recall, "The past is an aspect of reality, even though no past things are. How can this be? There is no reductive explanatory answer to this question," seems to confirm this diagnosis of the authors' approach. However, our intuition, which is so highly estimated by them, together with our everyday experience, gives us a simple answer to these exciting mysteries: the past is *not* a present aspect of reality, but *by definition* past. And it is *the passage of time* that is responsible for the fact that Socrates and his contemporaries *do not exist*, although they *did exist*, and this concerns all other past things as well.

⁶ In Kierland and Monton's paper (2007: 496), this is the first strategy which is analyzed.

Strictly speaking, Kierland and Monton maintain that the past “is what has happened: what things existed and how they were” (7), however, they do not explain what this is and how it is possible that something has existed and does not exist? Nor have they explained what is the origin of the phenomena that something existed but no longer exists. They simply declare that there is no reductive explanatory answer to this question (8), and we are left in the dark as to how this is possible; the past is declared to be *brute* and that it is a present aspect of reality.

Sider (2001: 39–41) claims that introducing “primitive tensed properties of the world” as a solution to the grounding objection is a case of cheating. Answering this objection, Kierland and Monton compare brute past presentism to brute disposition and brute counterfactuals (2007: 494) and suggest that the latter “can be reductively explained” so they can be accused of cheating. And they add: “Maybe something similar can be said about a brute past, but that requires *independent* motivation.” So, let us show that such a motivation is known for philosophers and, what is more, enjoys a very long pedigree. Namely, let us look at the following passage from the 11th book of St. Augustine’s *Confessions*:

Boldly for all this dare I affirm myself to know thus much; that if nothing were passing, there would be no past time: and if nothing were coming, there should be no time to come: and if nothing were, there should now be no present time. Those two times therefore, past and to come, in what sort are they, seeing the past is now no longer, and that to come is not yet? As for the present, should it always be present and never pass into times past, verily it should not be time but eternity. If then time present, to be time, only comes into existence because it passeth into time past; how can we say that also to be, whose cause of being is, that it shall not be: that we cannot, forsooth, affirm that time is, but only because it is tending not to be? (St. Augustine 1912: 239)

This observation is simple but one which is hard to overestimate: *if nothing were passing, there would be no past time*, in other words, if there was no flow of time, there would be no past time. It means that every presentist who wants to speak *seriously* about past time, should accept the existence of the flow of time.⁷ Then, undoubtedly, someone who claims, as Kierland and Monton do, that the past is a fundamental aspect of reality (6), should accept existence of the flow of time. And, naturally, St. Augustine offers us in this way an explanation of

⁷ The stipulation that presentism has to admit the existence of the flow of time was called *St. Augustine’s Condition* in my (2017 [3], 2018 [4]).

the origin of past time which is lacking: time present, to be time, only comes into existence because it passes into time past. What is also important, our intuition and our experience strongly confirm that it is the flow of time which is responsible for the fact that Socrates existed and was convicted, and that he does not exist anymore. Unfortunately, conceptions such as the flow of time or becoming do not appear in Kierland and Monton's paper.

Thus the question arises as to why Kierland and Monton, as is the case with many other presentists, did not refer to the flow of time? There seem to be three reasons which are responsible for this: firstly, conceptual difficulties connected with the idea of the flow of time; secondly, the fact that the main thesis of presentism is introduced with only one ontological thesis (1 or 2), which says nothing about the flow of time; and thirdly, the fact that presentism makes use of the notion of existence which allows only the dichotomy of exist or do not exist, and which does not permit the introduction of the metaphysical category for objects that existed and do not exist. In other words, the notion of existence exploited by the presentists, and by Kierland and Monton as well, has a static character, that is, this is the notion of existence (or non-existence) at some fixed moment of time, and it does not make it possible to talk about ontological changes in time.⁸ All these reasons deprive presentism of dynamics and make it impossible to find an ontological basis on which the truth-value of past claims can supervene.

So, in summary, the proposed diagnosis of the weakness of **BPP** and other static versions of presentism is the following: *the lack of dynamics* and—in consequence—*the lack of a plausible metaphysical base on which truth-value of past-tense sentences can supervene*. The next section tries to find a remedy for these flaws.

3. A remedy with an extra bonus

It was already suggested in the previous section, that every presentist who wants to speak seriously about past time should accept the existence of the flow of time and introduce it into her/his ontology. Kierland and Monton were close to the solution which is going to be proposed in this chapter when they claimed that, for the presentist, the past is a fundamental aspect of reality (6)

⁸ See my (2018 [4]).

and that the past is what has happened: what things existed and how they were (7). Unfortunately, they also maintained that the past is *brute* and although the brute past is supposed to *form a sui generis metaphysical category*, an explanation of what the brute past is, according to the authors, unattainable:

The brute past has an intrinsic nature. Given what we say next, we like to think of this intrinsic nature in terms of the past having a certain “shape.” This shape does not consist in a structure of things having properties and standing in relations to one another. The past is an aspect of reality, even though no past things are. How can this be? There is no reductive explanatory answer to this question. The crucial feature of brute past presentism is that it postulates a *sui generis metaphysical category*, one independent of things and how they are. (Kierland, Monton 2007: 491)

Of course, any opponent of the idea of the introduction of the flow of time into the ontology of presentism can object: not so fast, wait a moment: have you perhaps explained what is the flow of time, or perhaps you are trying to explain *ignotum per ignotius*? S/he may also object that a simple admixture of the thesis about the flow of time to her/his main thesis (1, 2) does not change the situation of the presentist too much because, according to the main ontological thesis of presentism, only the present exists and thus there will still be missing a plausible metaphysical category of the past on which the truth-value of past-tense claims can supervene.

I would answer such doubts by saying that a deeper change in the ontological position of the presentist is indeed necessary. This is a change which introduces *real dynamics* into this view and allows us to say what *did exist*, however, *does not exist*. I would also add that a plausible explanation of what constitutes the flow of time was offered by Broad (1938) in terms of the *absolute becoming* of events, that is, their coming to pass,⁹ and that this approach can be developed in the *dynamic* and *full-blooded* versions of presentism which deserve to be called *dynamic presentism (DP)*. Let us briefly introduce two such presentist solutions developed by means of the notion *becoming* after my (2013 [1], 2017c [3]), and by means of the notion of *dynamic existence* after my (2013 [1], 2015b, 2018 [4]).

⁹ “To ‘become present’ is, in fact, just to ‘become,’ in an absolute sense; i.e., to ‘come to pass’ in the Biblical phraseology, or, most simply, to ‘happen.’ Sentences like ‘This water became hot’ or ‘This noise became louder’ record facts of *qualitative change*. Sentences like ‘This event became present’ record facts of *absolute becoming*.” (Broad 1938: 280–281).

So, let us start with the first approach and introduce this version of **DP** in the following form (expressed in tensed language):

Becoming: The events which our world consists of become (come to pass);

where becoming, as Broad's absolute becoming, is a primitive notion which cannot be further analyzed in terms of a non-temporal copula and some kind of temporal predicate.¹⁰ This thesis expresses, of course, the reality of the flow of time, however, it is easy to show that **Becoming** also leads precisely to the ontological thesis of presentism.¹¹ To show this, we should only notice that **Becoming** says that events become, that is, they come into being and then they pass, and recall that, according to the long presentist tradition, the present can be identified with what exists.¹² It means exactly that only present events exist. This formulation of presentism, however, avoids the triviality objection because neither the notion of the present nor the notion of time are involved in **Becoming**.¹³

Now, what remains is to introduce three definitions:

The present \equiv The totality of events which become (come to pass).

The past \equiv The totality of events which became (came to pass).

The future \equiv The totality of events which will become (will come to pass).

The first of these definitions was adopted following the above mentioned presentist tradition of identifying the present with what exists, the second and the third ones were assumed by analogy. Such a version of presentism has some virtues which speak for themselves:¹⁴

¹⁰ See Broad (1938: 280–281) and my (2013: 54, [1]: 31; 2017c: 292, [3]: 65).

¹¹ See my (2017c: 292, [3]: 65–66).

¹² See, for example, Prior (1970: 247): “the presentness of an event *is* just the event. The presentness of my lecturing, for instance, is just my lecturing”; Christensen (1993: 168): “To be present is simply to be, to exist, and to be present at a given time is just to exist at that time—no less and no more”; and Craig (1997: 37): “Presentness is the act of temporal being.”

¹³ The triviality problem for presentism consists in this that when we examine its ontological thesis, saying that the only things that exist are presently existing things, it turns out that this thesis is trivially true or trivially false, depending on the way we understand the verb “exists”: in the tensed or in the tenseless way. See, for example, Merricks (1995: 523); Savitt (2006); Gołosz (2013 [1]), and discussions of the problem in Zimmerman (2004).

¹⁴ See my (2017c: 293, [3]: 66).

- i) according to **Becoming**, the present is continuously changing, which means that it allows the expression of a dynamic character of reality, which presentism in the form of a single thesis of the form (1, 2) is not able to do;
- ii) it avoids the question of the rate of time's passage because—as emphasized by Broad—the notion of becoming is primitive and unrelated to anything else, and especially it is not related to time;
- iii) this formulation of presentism also avoids the triviality objection because the notion of the present is not involved in **Becoming** and thus this thesis is not trivial;
- iv) this version of presentism provides us with the metaphysical category of the past which we have sought.

From the point of view of this book, the last virtue is especially important: this version of presentism provides us with the metaphysical category of the *real* past which we have sought: the past consists of the totality of events which became (came to pass). Thanks to this, it allows us to differentiate between actual events, such as, for example, the case of Socrates, which *did become*, and fictions such as the capture of Cerberus by Heracles, which *did not become*.

At this point, Kierland and Monton could oppose: **Becoming** cannot be treated as a remedy for positions such as **BPP** because we rejected the ontology of facts and our ontology is based on things and the way they are; we emphasized that fact-talk is always parasitic on something which is metaphysically more fundamental.¹⁵ And that is why we cannot accept such a solution to our **Dilemma**—they could add.

I would answer such an objection by claiming that the presented notion of becoming and the dynamic version of presentism can be further developed in such a way that things and the way they are would be included in ontology as fundamental objects. This is precisely the second version of presentism which was mentioned above and which is introduced in my (2013 [1], 2015b, 2018 [4]). It is based on the notion of the dynamic existence of things to emphasize a fundamental difference between things and events—while existence of both things and instantaneous events has a dynamic character, the former

¹⁵ Kierland and Monton (2007: 497): “we deny the existence of facts altogether. As we explained in Section III, we think fact-talk is always parasitic on something metaphysically more fundamental. In the case of talk of facts about present things, it's the present things and how they are that is more fundamental. In the case of talk of facts about the past, it's the past itself which is more fundamental.”

do not cease to be but persist by enduring, that is by keeping their strict (literal or numerical) identity over time:¹⁶

Dynamic Reality: All of the objects that our world consists of exist dynamically;

where **Dynamic Reality (DR)** is expressed in the tensed language and the notion of *dynamic existence* is a primitive notion (just as Broad's absolute becoming) which can be roughly characterized by the set of postulates:

- 1) The notion of dynamic existence is tensed;
- 2) Things that dynamically exist endure;
- 3) Events (which are acts of acquiring, losing, or changing properties by dynamically existing things and their collections) dynamically exist in the sense of coming to pass.

The term "objects" is here used in such a way that it applies to things and events, however things are treated here as *primary objects*, while events are secondary.¹⁷

DR is accompanied by the three definitions (similarly to **Becoming**):

The present \equiv The totality of objects that dynamically exist.

The past \equiv The totality of objects that dynamically existed.

The future \equiv The totality of objects that will dynamically exist.

Again, as in the case of **Becoming**, **DR** expresses at the same time the reality of the flow of time and the ontological thesis of presentism in the form of one single thesis. **DR** has the same virtues (i–iv) as **Becoming** (with swapping **Becoming** for **DR**, of course) and once again, from the point of view of this book, the last virtue is especially important: this version of presentism also provides us with the metaphysical category of the *real* past which we need so much: the past consists of the totality of objects that dynamically existed.

¹⁶ See my (2018: 404, [4]: 79). There are two opposite views on persistence: endurantism and perdurantism. According to the latter, things perdure if they persist through time by having temporal parts, and persisting things are treated as mereological aggregates of temporal parts, none of which are strictly identical with one another. The enduring of things is usually defined as a persistence over time by being wholly present at each time but, as noticed by Merricks (1994: 182), "(...) the heart of the endurantist's ontology is expressed by claims like '[object] *O* at *t* is identical with [object] *O* at *t*'." That is why, for the author of this book, this second condition alone suffices for the definition of endurantism and is a better criterion of endurance, so it will be used in what follows.

¹⁷ See my (2018: 403, [4]: 77–78).

DR, however, has two essential advantages not only over **Becoming**, but over every other version of presentism: first, the endurance of things is here a simple logical consequence of the dynamic existence of things, that is, it is a consequence of their way of existence proposed in this thesis. Contrary to what is commonly assumed by the presentists, the enduring of things is not a logical consequence of presentist theses of type (1, 2) as shown by Brogaard.¹⁸

The second advantage is even more important: the notion of dynamic existence which is applied in it is supposed to *supersede* the ordinary notion of existence which is standardly used by the presentists (and eternalists as well) and which has a static character, that is, it is a fixed existence in a fixed moment of time which is not appropriate for expressing the transitory character of the present. From this that I exist—in the tensed meaning of the standard term “exist”—in no way follows that I will not exist, neither that I am changing. Similarly—when we use tensed language—the standard notion of existence does not explain how it is possible and what it really means that *the past existed* and that *the future will exist* although both do not exist (in the tensed meaning of the term “exist”).

This is very important for two reasons: first, because it means that it makes no sense to ask whether things that *dynamically existed* do (*statically*) exist or do not (*statically*) exist: the notion of dynamic existence supersedes the notion of (static) existence and introduces more metaphysical categories than the latter. While the latter introduces only two *fixed* metaphysical categories of what exists and what does not exist, the former introduces six metaphysical categories which are *continuously changing*: the past (things and events that dynamically existed); the present (things and events that dynamically exist); the future (things and events that will dynamically exist); and their complements, that is, the past’ (things and events that did not dynamically exist); the present’ (things and events that do not dynamically exist); and the future’ (things and events that will not dynamically exist). So, for example, Socrates belongs to the past, while Zeus and Apollo belong to its complement, that is, the past’. They (Zeus and Apollo, of course) belong to the present’ and to the future’ as well. What should be emphasized, once again, is that all six categories are continuously changing, namely the past and the future’ are

¹⁸ From the idea that the present exists while the past and the future do not exist, one cannot infer that the persisting object keeps its strict identity. It is possible, after all, that an object persists in such a way that it is four-dimensional and its temporal parts (or stages)—not strictly identical with themselves—are coming consecutively into being. See Brogaard (2000: sect. 3) and my (2018: 406–407, [4]: 82–83).

growing, the future and the past' are shrinking, while the present—to say it metaphorically—is “moving” toward the direction which we call the future (I would like to emphasize here that the term “move” was not used in **DR**).

There is a second reason to be considered and which is mentioned above, namely that Kierland and Monton (2007: 492) complained about the lack of a metaphysically perspicuous language for describing the “shape of the past.”¹⁹ The last version of dynamic presentism equipped with the notion of dynamic existence provides us with a language which allows us to talk not only about Kierland and Monton’s “shape of the past,” but also about a structure of past things, their having properties and standing in relation to one another. Thus it allows us to say, for example, that Heraclitus (who dynamically existed) didn’t like Pythagoras (who dynamically existed), or that Heraclitus (who dynamically existed) was a native of the city of Ephesus (which dynamically existed). The language of **DP** also enables us to talk about the past, the present and the future, as they are changing, and to differentiate between objects like Socrates—on the one hand—that *did dynamically exist*, and Zeus and Apollo—on the other—that *did not dynamically exist*. What this means, and is of fundamental importance, is that, in this way, the notion of dynamic existence and **DP** provide presentists with a *rationale for introducing and making use of tensed language*:²⁰ this is exactly the dynamic existence of the world which is responsible for this that it is continuously changing, and that although Socrates (*dynamically*) *existed*, does not (*dynamically*) *exist* anymore, and we should speak about him using the past tense. And, of course, the same concerns all other past objects.

At the end of this section, I would like to mention an additional bonus provided by **DP** concerning the problem of being-supervenience (or truth-making). Namely, the presentists who try to respond to the objection from being-supervenience, usually assume that they need not look for an ontological basis for (contingent) future-tense claims because the claims about the future are not determined and lack truth-value.²¹ But what is the origin of this asymmetry between the fixed past and (probably) open future? We

¹⁹ “This shape does not consist in a structure of things having properties and standing in relations to one another” (Kierland and Monton 2007: 491). “Of course, we have no independent, metaphysically perspicuous language for describing this shape (and we don’t propose to introduce one), but that does not matter” (2007: 492).

²⁰ In my (2019 [5]), it is argued that the debate between presentism and eternalism can be understood as a debate concerning the problem whether the tensed structure of our language corresponds to the metaphysical structure of the world.

²¹ See the famous Aristotle’s problem of sea-battle tomorrow (*De Interpretatione*: ch. 9), and, for example, Kierland and Monton (2007: 486).

cannot change the past no matter how strongly we would like to do this. But we have traces of it in our memory and in the world around us. Conversely, the future seems to be open—our experience seems to suggest this openness and quantum mechanics confirms this conviction—and perhaps it depends on our actions. How it is possible? Physics is silent on this issue; the physical laws describing the electrodynamic, strong and gravitational interactions are invariant under time reversal and as such cannot distinguish any direction of time. In turn, weak interactions are not time reversal invariant, but they are not involved in the processes leading to the coming into being of the traces of the past which we observe in everyday life.²² Presentism in its standard form (1 or 2) is also silent on this issue: no “move” of the present and no asymmetry of time follows from (1 or 2). **DP** in both versions provides us with a simple metaphysical solution to this exciting mystery: the past has already become or dynamically existed, as such is fixed and directly unavailable, we can only get to know it by its traces. Contrary to the past, which dynamically existed (or became) and as such is fixed and cannot be changed, the future looks as if it were open: it does not dynamically exist yet, it will only come into (dynamic) existence and, for this reason, we can probably influence it, at least sometimes.²³

It should also be emphasized that while brute past presentism can be accused of being an ad hoc solution to the objection from being-supervenience,²⁴ **DP** cannot be: both versions of presentism, and the notions of becoming and dynamic existence which these versions of presentism are based on, were introduced as a solution to the difficulty with the explanation of what the flow of time consists in and the explanation of the ontological status of past, present and future objects is an additional bonus.

4. Conclusions

I have tried to show that Kierland and Monton interestingly extended our knowledge about presentism and its ontological basis for past-tense claims when they proposed that the past should be regarded as a fundamental aspect

²² See, for example, Sklar (1974); and my (2017a [2], 2017b).

²³ This “can” follows from the possibility which cannot be *a priori* excluded that our world will turn out to be deterministic after all because, for example, the quantum gravity which we are looking for will be deterministic in accordance with Einstein’s expectations. But even if it is determined and not open, it does not dynamically exist yet and will just come into (dynamic) existence.

²⁴ See fn. 3.

of reality. Unfortunately, after this move they retreated and assumed that this fundamental aspect of reality is a present aspect of reality: the rub is that the past is a *past* and not a present aspect of reality. It was also recalled—as noticed long ago by St. Augustine—that if there was no flow of time, there would be no past time. So, the cure proposed in this chapter consists of including the flow of time into the ontology of presentism and making presentism a dynamic view of reality. The world in which we live—as we see it—is the world *in statu nascendi*, in which everything is changing and **DP** tries to describe such a world. The dynamic ontology of this view provides the presentists with the correct ontological basis for both present- and past-tense claims.

Two versions of **DP** were presented which are based on the notions of becoming and dynamic existence and which provide us with metaphysical categories of the past—*real* and *dynamic* past as we know from our experience—the past as the totality of events which became (came to pass in the first version of dynamic presentism), and the past as the totality of objects that dynamically existed (in the second version of dynamic presentism). Not only do they introduce the past as growing, as it should be expected, but also both introduce the asymmetry between the fixed past and the (probably) open future (events, which are acts of acquiring, losing, or changing properties by dynamically existing things and their collections, dynamically exist in the sense of coming to pass).

The latter of these two versions (based on the notion of dynamic existence) seems to be more promising because it entails as its direct consequence the enduring of things which is commonly assumed by the presentists, and—what is even more important—it eliminates a potential tension between becoming and existence which is still present in the former version of **DP** because the notion of existence is not changed there. The version based on the notion of dynamic existence can eliminate this tension because the notion of dynamic existence which is applied in it is supposed to *supersede* the ordinary notion of existence which is standardly used by presentists (and eternalists as well), and which has a static character (it is a fixed existence in a fixed moment of time). Thanks to this, instead of only two *fixed* metaphysical categories of what exists and what does not exist, we receive six metaphysical categories which are *continuously changing*: the past (things and events that dynamically existed); the present (things and events that dynamically exist); the future (things and events that will dynamically exist); and their complements, that is, the past' (things and events that did not dynamically exist); the present' (things and events that do not dynamically exist); and the future' (things and events that will not dynamically exist). The future defined in such a way is (probably)

open, while the past defined in such a way is fixed and provides adherents of this version of **DP** with a missing ontological basis on which truth-value of past-tense claims can supervene.

For all these virtues, the versions of **DP** presented in this chapter—and especially the one based on the notion of dynamic existence—deserve to be regarded as the potential successors to traditional presentism.

8. Entropy and the Direction of Time

This chapter tries to demonstrate that the process of the increase of entropy does not explain the asymmetry of time itself because it is unable to account for its fundamental asymmetries, that is, the asymmetry of traces (we have traces of the past and no traces of the future), the asymmetry of causation (we have an impact on future events with no possibility of having an impact on the past), and the asymmetry between the fixed past and the open future. To this end, the approaches of Boltzmann, Reichenbach (and his followers), and Albert are analyzed. It is argued that we should look for alternative approaches instead of this, namely we should consider a temporally asymmetrical physical theory or seek a source of the asymmetry of time in metaphysics. This second approach may even turn out to be complementary if only we accept that metaphysics can complement scientific research programs.

1. Introduction: the asymmetry of time and the asymmetry in time

One of the most fundamental features of our world is that it is strongly temporally asymmetrical: as our experience shows, we have traces of the past in our memory and around us and no traces of the future; we can have an impact on future events with no possibility of having such an impact on the past; meanwhile, the future seems to be open, while the past is fixed and cannot be changed. The problem of the direction or the asymmetry *of* time itself consists in answering the question of whether the world is truly temporally

asymmetrical and in finding an explanation of what is responsible for this asymmetry.¹

Two clarification are needed here: firstly, after Sklar (1974, 1993, 1995a, b, 2005), I distinguish between the asymmetry *of* time and asymmetry *in* time. That the causation is future directed and we find only traces of the past but can affect only the future, and that the past cannot be changed while the future can be, seem to be essential features *of* time itself, and not this or other particular process occurring *in* time. Like many others, I eat my dessert after my main courses and go to bed after sunset, but these temporally asymmetrical processes do not constitute the asymmetry *of* time itself; they are only some processes which are asymmetrical *in* time and tell us nothing about time itself.

In contrast to such processes which are asymmetrical *in* time, the three features mentioned in the beginning seem to constitute essential features *of* time itself and require explanation. This is a second point which I feel it is important to emphasize. The asymmetry *of* time constituted by these three asymmetries is *fundamental* for us and every explanation of the directionality *of* time since Ludwig Boltzmann's *Lectures on Gas Theory*² has stemmed from our attempts to understand these asymmetries, and that is why every plausible theory of the direction of time should explain them in a credible way.

What do I mean by plausible explanation? We have perfect examples of such explanations in physics: we were able to explain that light is an electromagnetic wave and what constitutes the difference between “up” and “down” are gravitational forces (or the structure of spacetime in the general theory of relativity (GTR)). That we can try to explain the direction of time in a similar way to the fact that the difference between “up” and “down” is explained by gravitational forces was suggested by Boltzmann himself (1964), as I will recall in the next section.

We believe in physics and that it should explain all of the essential characteristics of the world and the three fundamental asymmetrical features of the world as well. Unfortunately, it transpires that fundamental interactions,

¹ Some philosophers, such as Mehlberg (1980), Horwich (1987), and Price (1997) claim that the world is temporally symmetrical due to the temporal symmetry of fundamental physical interactions; according to them, an alleged temporal asymmetry is a product of our awareness. Adherents of such a view should explain where such an illusion comes from: a far from easy task, which I will show by means of the example of Price in the third section of this chapter.

² Boltzmann (1964). See also Sklar (1974, 1993); and my (2011b, 2017a [2], 2017b).

that is, strong, electromagnetic, and gravitational interactions, are time reversal invariant and as such they cannot explain these asymmetries. Although weak interactions are not time reversal invariant, they are unable to explain this asymmetry as well because of two reasons:

- 1) They do not take part in everyday processes which are temporally asymmetrical, when we are, for example, writing, reading or doing some task (Feynman 1967; Sklar 1974, 2005);
- 2) Weak interactions are only *feebly* temporally asymmetrical, that is, for any weak process, a time-reversed sequence of time reversed states is possible, although it can have a different probability, while time is *strongly* temporally asymmetrical, that is, we have *no* cases of backward causations, *no* traces of the past and *no* possibility of influencing the past (Gołosz 2011b, 2017a [2], 2017b, 2020).

That is why weak interactions are unable to ground and explain the asymmetry of time and the processes involving weak interactions should be qualified as only processes which are asymmetrical *in* time.

Although the laws of physics do not provide us with enough temporal asymmetry, one could insist that we have enough asymmetry in the world as it is described by physics to explain the asymmetry *of* time after all: if not in physical laws than perhaps we should look for the direction of time in temporary asymmetrical processes *de facto*. Of course, the process of the increase of entropy has been the most plausible candidate for any explanation of the direction of time since the second half of the nineteenth century.³ Contrary to this, using different examples in the second section of this chapter, I would like to show that despite these high hopes the process of the increase of entropy is unfortunately not up to the task, that is, it explains none of the three above mentioned temporal asymmetries. This will be demonstrated by means of the well-known examples from Boltzmann, Hans Reichenbach (and his followers), and David Z. Albert, namely that the increase of entropy is unable to explain the asymmetry of traces, the asymmetry of causation, and the asymmetry between the fixed past and the open future, and it should only be treated as a process that is asymmetrical *in* time.

³ Whenever the term entropy is employed in this chapter, it should be read in the sense of Boltzmann's understanding of entropy.

2. The increase of entropy as a process asymmetrical in time

As is well-known, Boltzmann hoped that the process of the increase of entropy would explain the manner in which we experience the direction of time in precisely the same manner that gravity explains the difference between the directions of up and down:

One can think of the world as a mechanical system of an enormously large number of constituents, and of an immensely long period of time, so that the dimensions of that part containing our own “fixed stars” are minute compared to the extension of the universe; and times that we call eons are likewise minute compared to such a period. Then in the universe, which is in thermal equilibrium throughout and therefore dead, there will occur here and there relatively small regions of the same size as our galaxy (we call them single worlds) which, during the relative short time of eons, fluctuate noticeably from thermal equilibrium, and indeed the state probability in such cases will be equally likely to increase or decrease. For the universe, the two directions of time are indistinguishable, just as in space there is no up or down. However, just as at a particular place on the earth’s surface we call “down” the direction toward the centre of the earth, so will a living being in a particular time interval of such a single world distinguish the direction of time toward the less probable state from the opposite direction (the former toward the past, the latter toward the future). By virtue of this terminology, such small isolated regions of the universe will always find themselves “initially” in an improbable state. This method seems to me to be the only way in which one can understand the second law—the heat death of each single world—without a unidirectional change of the entire universe from a definite initial state to a final state. (Boltzmann 1964: 402–3)

What reduction does Boltzmann have in mind? *Reduction by definition* or *scientific reduction*? One might speculate that he did not think about reduction *by definition* because in such a case—as noticed by Eddington (1929: 93)—the second law of thermodynamics became an analytic truth which is always true independent of the real course of processes in the world. I do not suppose that Boltzmann wanted to transform the second law of thermodynamics into a tautology.

Yet if he had in mind *scientific reduction*, then—as noticed by Sklar (1974: chapter 5)—he should explain why we have traces of the past and no traces of

the future; why we can have an impact on future events with no possibility of having an impact on the past; and why the future seems to be open, while the past is fixed and cannot be changed in a similar way as we explain the difference between “up” and “down” with the aid of gravitational forces. Unfortunately, he did not do so and I will show later that the attempts of Reichenbach and his followers to explain the asymmetry of our knowledge concerning the past and future, that is, the first asymmetry, failed as well.

What is more, when we assess Boltzmann’s attempt to explain the asymmetry of time, we should take into account the real status of the second law of thermodynamics and the temporal symmetry of the statistical mechanics (SM). The latter says—as noticed by Boltzmann—that the entropy of a physical system which is in a state of thermal equilibrium can spontaneously *fluctuate* to more ordered states and that physical systems that are not initially in a state of thermal equilibrium will *evolve* with a great probability to more probable states, that is, to states with greater entropy. Such a theory takes for granted the *dynamical* evolution of physical systems and the flow of time: in the course of the flowing of time, the systems can fluctuate, firstly decreasing and then increasing its entropy. Yet this means that we assume the existence of the flow of time and, in consequence, the existence of an objective arrow of time connected with the passage of time which is not explained by Boltzmann’s reduction and makes his reduction redundant. In turn, if we do not assume a dynamical evolution of physical systems based on the flow of time, Boltzmann’s magnificent explanation of the statistical behavior of these systems with the aid of occurring spontaneous fluctuations becomes incomprehensible.

I have critically analyzed Boltzmann’s approach to the arrow of time. For philosophers, the attempts of Reichenbach (1956), and his followers (particularly Smart 2005; and Grünbaum 1973) are perhaps better known. According to the approach initiated by Reichenbach, if we find some traces of the past, such as footprint shaped marks on the beach, we can infer from this that “at some earlier time an interaction took place, that a person’s steps caused the ordered state of the sand” (1956: 151) because “this orderliness is bought at the expense of an increased disorderliness (metabolic depletion) of the pedestrian who made it” (Smart 2005: 469) or—using Grünbaum’s words—“we can reliably infer a past interaction of the system with an outside agency from a present ordered or low entropy state” (Grünbaum 1973: 235).

However, as highlighted by John Earman (1974), we do not have to appeal to entropy considerations to infer our knowledge about the past from traces: traces give us much more information which is more precise than that which would follow from entropy considerations—these, at best, would only

say about the past interaction of the system whose entropy is lower than it should be with some external system so as to produce a greater order of the sand.⁴ Secondly, it can be seen from the above citations (from Reichenbach, Grünbaum, and Smart) that an assumption about some *asymmetric causal interaction* is involved in every such inference, which means that this inference is in fact based on temporal asymmetric causation,⁵ and since causal theories of time direction have failed (as noticed below), this reasoning also fails. Thirdly, there are well known cases—for example, when a bomb is dropped on a city—when the formation of subsystems of temporarily higher entropy than their surroundings form traces which are easily readable for us.⁶ All this shows that the entropic approach to the asymmetry of our knowledge adopted by Reichenbach, Smart, and Grünbaum is unsuccessful; we have to appeal to the asymmetry of causation and apply a causal theory of time to explain the asymmetry of our memory but this approach does not work.

This is perhaps not the best place for a critique of causal theories of time direction, I would like only to notice that it is reasonable to assume that physical interactions are involved in all causal relations and because the strong, electromagnetic, and gravitational interactions are time reversal invariant, the causal theories of time are unable to distinguish between the past and the future (Sklar 1974; and my 2011b, 2017a [2]).

As a response to such objections, one might try to apply the strategy of biting the bullet and assume that causal relations are reduced to thermodynamic processes as well. A prominent adherent of such an approach is David Albert.⁷ Albert claimed that causal asymmetry is grounded in the same processes that give rise to the second law of thermodynamics, first of all in a low-entropy constraint on the initial state of the universe, which is known as the *Past-Hypothesis* (PH).⁸ Generally speaking, he claims that according to SM and PH, possible macro-evolutions are much more restricted toward the past than toward the future and this is responsible for the temporal directedness of our own capacity to *acquire information* about the world and to *influence causally* the occurrence of future events but not past events

⁴ See Earman (1974: 43–45).

⁵ See Earman (1974: 41–42).

⁶ See Earman (1974: 40).

⁷ Albert (2000). See also Loewer (2007) and Frisch (2010). Albert did not analyze Earman's critique of entropic approach in his book.

⁸ According to the Past-Hypothesis, "the world first came into being in whatever particular low-entropy highly condensed big-bang sort of macrocondition it is that the normal inferential procedures of cosmology will eventually present to us" (Albert 2000: 96).

(Albert 2000: X, chapter 6). To understand the problem of how PH works, we should—according to Albert—focus our attention on macro events such as billiard ball collisions in a given collection which behave—Albert claims—in a temporally asymmetrical way:

Think (to begin with) of the collection of billiard balls we were talking about before. And suppose that some particular one of those balls (ball number 5, say) is currently stationary. And suppose (and this is what's going to stand in—in the context of this extremely simple example—for a *past-hypothesis*) that that same ball is somehow known to have been *moving* ten seconds ago. (2000: 126)

It follows from the laws of mechanics that ball 5, which is currently stationary but *on Albert's assumption* was moving ten seconds ago, had to have been involved in a collision in the past ten seconds. On these assumptions, he claims (2000: 126–128), that whereas, on the one hand, there are obviously any number of hypothetical alterations of the present condition of the balls in the set which would alter the facts about whether ball number 5 is to be involved in a collision over the next ten seconds or not, there can be, on the other hand, *no* hypothetical alterations in the present condition of this set of balls, unless they involve hypothetical alterations in the present velocity of ball number 5 *itself*, which would alter the facts about whether or not ball number 5 *had been* involved in a collision over the *past* ten seconds. And that is why “there are (as it were) a far wider variety of potentially available *routes to influence* over the future of the ball in question here, there are a far wider variety of what we might call *causal handles* on the future of the ball in question here, under these circumstances, than there are on its past” (2000: 128).

Here—and which is important—“under these circumstances” means that it is taken for granted that ball 5 is somehow known to *have been moving ten seconds ago* (2000: 126–128). In this example, the condition that ball 5 was moving ten seconds ago plays the role of a PH while—as Albert emphasizes—we have no its counterpart concerning the future.

Now, the important question arises as to whether Albert managed to explain the asymmetry of time, that is, the asymmetry of how we *acquire information* about the world and the asymmetry of how we *influence causally* the occurrence of future events but not of past events. Unfortunately, the answer must be in the negative: assuming that ball 5 in his example is somehow known to *have been moving ten seconds ago* while not assuming a symmetrical postulation concerning the future, Albert *introduced the temporal asymmetry* into the process analyzed in his argument instead of explaining it. More specifically,

he assumed the fundamental asymmetry between the fixed past and the open future, that is, this very asymmetry which he should explain and in this way his reasoning begs the question. This mistake is even more perplexing if one takes into account the fact that Albert begins his book with the strong declaration that “[t]his book is intended both as an elementary introduction and as an original contribution to the development of a scientific account of the distinction between the past and the future.”⁹

Another fundamental objection can be raised against Albert’s approach and all those that try to reduce the asymmetry of our knowledge and asymmetry of causation to the second law of thermodynamics. Namely, according to SM, it is possible in every physical system during some period of time that entropy will be constant or even decrease as an effect of thermodynamic fluctuations. Should we then believe that causal relations in the first case will be temporally symmetric and—in the second one—change its temporal direction? Should we believe that our knowledge concerning the past and the future in the first case becomes temporally symmetric?

In turn, Mathias Frisch (2010: sect. 3, 6) highlights the obvious fact that thermodynamic asymmetry often results in the destruction of records or traces of the past and there are many “human-scale” macro-events that leave no or only very few traces in their futures. If, for example, the wind wipes out the footprint-like traces in the sand and traces of ancient civilizations have vanished under layers of sand and soil, it can be argued that one central role played by the thermodynamic arrow is as a destroyer of macro-records and macro-traces rather than as their creator. In consequence, we cannot treat the increase of entropy as being responsible for the fact that we have traces of the past and no traces of the future.

Frisch (2010: sect. 3) also criticizes Albert’s claim that, according to SM and PH, possible macro-evolutions are much more restricted toward the past than toward the future, that is—in Barry Loewer’s (2007) terminology—the claim that a possible macro-evolution has a “tree structure.” Frisch indicates that, while there really is a macro-branching of many physical systems toward the future, thermodynamic considerations imply that there is also a possible widespread reconvergence of possible macro-histories. For example, at the cosmological level, even though the initial state of the universe might not

⁹ Albert (2000: viii). Hemmo and Shenker (2016) also claim, as does the author of this book (Golosz 2011b, 2017a [2], 2017b), that the second law of thermodynamics and the Past-Hypothesis in statistical mechanics cannot yield arrows of time since the second law of thermodynamics and PH already assume an arrow of time.

determine the large-scale distribution of matter, different cosmological macro-histories will converge toward the final equilibrium state. Similarly, Frisch shows that there is a convergence at the level of “human-sized” macro-systems: for example, in the paradigmatic case of a container half filled with gas, *no matter which part of the container* the body of gas initially occupies, the gas will spread after the partition is removed until it is uniformly distributed throughout the whole container. All this suggests that possible macro-evolutions may exhibit an upside-down tree structure.

3. Final remarks

I have tried to show that the thermodynamic explanation of the asymmetry of time is implausible because the process of the increase of entropy does not explain why we have traces of the past in our memory and around us and no traces of the future; why we can have an impact on future events with no possibility of having an impact on the past; and why the future seems to be open, while the past is fixed and cannot be changed. Thus, if I am right in adopting this line of argumentation, one can conclude that the increase of entropy as it is described by the second law of thermodynamics is only a process which is asymmetrical *in* time and in no way helps us to explain the asymmetry *of* time itself.

Perhaps, in such a situation where the strong, electromagnetic, and gravitational interactions are time reversal invariant and the increase of entropy does not explain the asymmetry *of* time, we should maintain that time has no direction and following Huw Price (1997), for example, assume that this essential component of temporal asymmetry, namely causal asymmetry, reflects an asymmetry in us rather than an asymmetry in the external world. He suggested that the causal asymmetry may be conventional, or perspectival, that is, not an objective aspect of the world, but a kind of projection of our own internal temporal asymmetry as agents who act in the world with the thermodynamic gradient:

From an objective standpoint, very crudely, an agent is simply a natural system which correlates inputs with outputs. The inputs are environmental data and the outputs are behavior. The details of these correlations vary with the agent's internal state, and this too may vary in response to inputs. The terms “input” and “output” assume a temporal direction, of course, but this is inessential. From an

atemporal viewpoint what matters is that events on one temporal side of the box get correlated with events on the other side. It doesn't matter that one side is thought of as earlier and the other later. From a sufficiently detached perspective, then, deliberation appears broadly symmetric in time—an agent is simply a “black box” which mediates some otherwise unlikely correlations of this kind. Certainly the operations of working models may depend on temporal asymmetry, in the way that actual agents require the thermodynamic gradient, but it is possible to characterize what such a system does, at least in these very crude black box terms, without specifying a temporal direction. (Price 1997: 168)

Is it really a plausible solution? I do not believe so. Let us consider Price as an agent who is writing his book (1997)—this is our “black box”—from an atemporal point of view, which is preferred by him.¹⁰ Then, on one temporal side of the box, we receive Price, who is collecting more and more materials for his book and analyzing them. On the other side, however, we receive the book and philosophers who are reading it. Yet why do we have traces of Price's work and rising traces of reading it¹¹ on only one temporal side? The thermodynamic gradient, as I have shown in the former section, does not explain the asymmetry of traces and Price, unfortunately, does not add anything new to this subject. We are also left in the dark as to why Price is only able to answer objections raised to his arguments on one temporal side of “black box,” that is precisely the one which is *later*. Therefore, unfortunately, Price's solution appears to be highly implausible.

Thus, it seems that the idea that time has no direction is a far from tempting one. Now, however, an important question arises: if time really is asymmetric, how can we explain such a fundamental property of our world which is the asymmetry *of time*? I suggested in my former paper (2017b) that there are two possible ways where we can look for solutions to this conundrum: the first is that the future quantum gravity which we are looking for will be a time-asymmetric theory and perhaps such a theory would be able to explain the asymmetry *of time*. The second possibility is that we should seek the origin of the asymmetry *of time* in metaphysics rather than in physics.

Therefore, Roger Penrose (1989: 345, 350–353) suggests that our sought-for quantum gravity must be a time-asymmetric theory. To the possible objection that his postulated theory should correspond to GTR in the “classical” level and GTR is itself time-symmetric, Penrose replies that although the separation

¹⁰ See my (2011b: 180).

¹¹ For example, in the form of a growing number of citations.

between dynamical equations and initial (or boundary) conditions has historically been of vital importance, his sought-for theory should dissolve away this separation. That is, he suggests that the future quantum gravity should absorb PH into its main body in some way, and should not treat it as something external. Such a move would, of course, be at odds with our present methodological rules as they have been assumed since Isaac Newton but—as was noticed by Laudan (1984)—the methodological rules can change when science develops and new theories are created, so nobody can *a priori* exclude Penrose's proposal as implausible.

The second—metaphysical—approach to the asymmetry of time was developed by the author of this book (Gołosz 2011b, 2015b, 2018 [4], 2020). According to this approach, temporal asymmetry is introduced into our world by the way it exists, that is, by *dynamic existence*, which is a generalization of the notion of *becoming*. That we should include becoming into our image of the world has been advocated by, among others, George F. R. Ellis (2006), Lee Smolin (2013), and Carlo Rovelli (2019). Rovelli, for example, wrote:

Physics (if not science in general) is a theory about how things happen. Its core, since ancient astronomy, Galileo, Kepler and Newton, all the way to quantum field theory and general relativity, is the description of: motion, evolution, change, becoming. (2019: 1331)

In turn, Smolin adds a number of interesting remarks:

If space is emergent, does that mean that time is also emergent? If we go deep enough into the fundamentals of nature, does time disappear? In the last century, we have progressed to the point where many of my colleagues consider time to be emergent from a more fundamental description of nature in which time does not appear.

I believe—as strongly as one can believe anything in science—that they're wrong. Time will turn out to be the only aspect of our everyday experience that *is* fundamental. The fact that it is always some moment in our perception, and that we experience that moment as one of a flow of moments, is not an illusion. It is the best clue we have to fundamental reality. (Smolin 2013: xxxi)

We have to find a way to unfreeze time—to represent time without turning it into space. I have no idea how to do this. I can't conceive of a mathematics that doesn't represent a world as if it were frozen in eternity. (Smolin 2006: 257)

If mathematics tends to represent a world as if it were frozen in eternity, it is a strong indication, I think, that we should look for our solution to unfreezing time elsewhere. My choice is metaphysics: the main thesis of my position, which is called *dynamic presentism*, says that all of the objects that our world consists of exist dynamically. The notion of dynamic existence is treated in my approach as a primitive one which is roughly characterized by the following set of three postulates:¹²

- 1) The notion of dynamic existence is tensed;
- 2) Things that dynamically exist endure;
- 3) Events (which are acts of acquiring, losing, or changing properties by dynamically existing things and their collections) dynamically exist in the sense of coming to pass.¹³

Such a metaphysical theory introduces dynamics into the world and explains all of the fundamental temporal asymmetries: firstly, the future is (or seems to be) open, while the past is fixed because events—which are acts of acquiring, losing, or changing properties by dynamically existing things and their collections—dynamically exist in the sense of coming to pass. Secondly, the enduring things—one can say metaphorically—dynamically exist toward the future carrying traces of the past interactions and thanks to this, in spite of the symmetry under time reversal of physical interactions (*modulo* weak interactions, of course), convey traces of the past into the future. Thirdly, and because of the same reason, things can impact on future events with no possibility of having an impact on the past.

One can perhaps treat the fact that it is metaphysical and not physical as a drawback of this last explanation of asymmetry of time, and that it introduces a piece of hard metaphysics into the heart of our knowledge about the physical world. I think, however, that such an objection would be too strong. Firstly, we know after the demise of logical positivism that metaphysical ideas can be introduced into scientific research programs.¹⁴ Secondly, it transpires that the situation is not so bad and that not only do not the two proposed approaches—the physical and the metaphysical—contradict one another, but even then it can turn out that they are deeply complementary. Namely, in some

¹² The first postulate means that we can speak about what *dynamically existed*, what *dynamically exists*, and what *will dynamically exist*, that is, we are able to differentiate between the past, the present, and the future.

¹³ See my (2020: 41–42); and (2018: sect. 3, [4]: sect. 3). Things endure when they persist over time keeping their strict identity.

¹⁴ See e.g. Lakatos (1970); Laudan (1977, 1984); and my (2011a).

approaches to quantum gravity, for example, in causal dynamical triangulation,¹⁵ temporal asymmetry and dynamics are strongly desired because their authors assume that spacetime has a built-in arrow of time which is needed to distinguish between causes and effects and in turn causal time-asymmetric processes are necessary to treat the spacetime as emerging dynamically as a four-dimensional object. Unfortunately, the authors of this approach do not explain the origin of dynamics and the asymmetry of causation, and thus the kind of metaphysics introduced above, if added, can be treated as a source of both these lacking components.¹⁶

I think that it is by no means accidental that both the proposals for solving the problem of the asymmetry of time introduced above propose new methodological approaches: the fact that we have so many doubts concerning such a fundamental property of our world means that we do not understand it and perhaps we should change the way we think about it. After all, former revolutions in physics—such as those connected with Newton, Einstein or quantum mechanics—involved essential changes in our thinking about science itself (Laudan 1977, 1984), so we can expect that some changes will be necessary in the future as well.

¹⁵ See Ambjørn *et al.* (2008, 2014); and Ambjørn, Jurkiewicz, Loll (2008).

¹⁶ See my (2017b, 2020).

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This collection of papers defends a dynamic view of reality which is founded on the assumption of the objective existence of the flow of time. The vindication makes use of a metaphysical theory of the flow of time developed by the author which is based on the notion of dynamic existence.

"The topics covered in the book are presented in an exhaustive and complete way. The defended position is presented in many aspects—ontological, methodological and scientific (physical). (...) It will certainly be a valuable contribution to the ongoing discussions on the passage of time, the problem of time asymmetry, and the relationship between the ontology of time and modern physics."

From the review by Prof. Tomasz Bigaj

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