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How to Get out of the Labyrinth of Time? Lessons Drawn from Callender

Abstract. Callender [2017] claims that contemporary science demonstrates that there is no objective present and no objective flow of time, especially since all sensed events come from the past, our various senses need different amounts of time to react, and there are enough asymmetries in the physical world to explain our experience of time. This paper holds that, although Callender's arguments for the subjectivity of the flow of time are unconvincing, the scientific discoveries and arguments he indicates can still be applied to improve theories of the objective flow of time. The paper develops precisely such a theory, one which introduces multiple individual proper presents for all of the objects that make up our world.

Keywords: flow of time; block universe; endurantism; asymmetry of time; dynamic existence; multiple presents; dynamic multipresentism; Callender

1. Introduction

In his interesting and thought-provoking work [2017], Callender claims that the discoveries of physicists and psychologists demonstrate that there is no objective present and no objective flow of time, and — what is more — that there are enough physical asymmetries in the world to explain our experience of time which is strongly asymmetrical (we have traces of the past in our memory and no traces of the future; we have an impact on future events with no possibility of an impact on the past; and the future seems to be open, while the past is fixed). From these considerations, he comes to the far-reaching conclusions that traditional analytic philosophy of time, concerned with problems such as whether the flow of time exists and what it consists of, and whether the past, the

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present, and the future exist, has lost its bond with science and should be radically reformulated. I would like to show that his arguments are unconvincing and that his conclusions are too far-reaching.

Let us start, therefore, with our experience of the flow of time, which is the main subject of Callender's considerations and a starting point for his far-reaching conclusions. Our experience of the flow of time consists of some key phenomena which any plausible theory of the flow of time — regardless of whether it treats the flow of time as a real process or rather as only a product of our mind — has to explain how they are possible and what is their origin:

1. The present is continuously changing; that is, it seems to move toward the future.
2. We are convinced that we and other things persist over time by enduring, that is by being wholly present at each time at which we and other things exist and keeping literal or numerical identity.[1]
3. We have traces of the past in our memory and no traces of the future. The set of traces of the past in both our memory and around us is continuously growing.
4. We can have an impact on future events with no possibility of an impact on the past.
5. The future seems to be open, while the past is fixed.

In this paper, in the second section, I would first like to show how Callender explains these phenomena in a subjectivistic way and criticizes the idea of the flow of time as a real process, and why I find his critique and explanations unconvincing. In the third section, I will develop a version of presentism, which I call *dynamic multipresentism* that is able to correctly describe all of the above-mentioned phenomena connected with the flow of time in accordance with the discoveries of physics and psychology pointed out by Callender. The paper ends with some conclusions.

[1] In what follows, I will treat the condition of literal or numerical identity as a criterion of endurance. The competing views to endurantism are perdurantism and stage theory. According to the former, things persist through time by having temporal parts while, according to the latter, ordinary objects like people are *momentary* parts or stages of four-dimensional objects. In both cases, none of the temporal parts (or stages) are strictly identical with one another.

2. Stuck in the labyrinth of time: Callender on the flow of time

Callender [2017, chapters 9, 14] proposes *subjectivistic* explanations of the points (1) and (2) from the Introduction, saying that we sense the moving present and that we persist over time by enduring, which has the following form:

> Evolution shaped these experiential windows over millions of years. Due to hard physical constraints and many softer environmental factors, these evolved psychological presents emerge as widely shared amongst us, even if around the edges they vary widely. *Widespread intersubjective agreement about this assembled experiential present tricks us into thinking that the present is objective, a global feature of the universe itself, when it is not.*
>
> To keep up with our busy environments, these psychological presents must regularly update themselves. More than that, organisms like us must develop a sophisticated sense of self. We therefore develop not only our spatial boundaries but temporal ones too. For *this we develop a sense of an enduring self.* [...] We are social creatures. To engage with ourselves and others, we are constantly telling stories about this self, representing it as having goals, as having a particular history, and more. *Drawing on temporally asymmetric memories as the ingredients of these narratives, at each moment we regard ourselves as the leading edge of this extended object, this agent acting in the world. Because the story keeps going, this self thinks it is growing through time. This, I claim, is tantamount to conceiving of time as flowing.*
>
> [Callender, 2017, p. 304], my italics

As can be seen in the above passages, Callender rejects reality of the flow of time and proposes instead an evolutionary-psychological explanation of the origin of our understanding of the present, of the flow of time and a sense of an enduring self, all of which have been allegedly developed by us as agents acting in a society. If he was correct, the two first phenomena connected to the flow of time would be explained in a subjectivistic way. In what follows, I would like to show, however, that his critique of the objective flow of time is questionable because phenomena (1–5) are perfectly comprehensible and explainable in a consistent way by believers in the flow of time, and that his subjectivistic explanations of these phenomena, which are shortly presented in the above citation, are implausible.

Callender questions the claim that we experience the flowing now and argues that "we do not sense a (tensed) now or present" [2017, p. 180]

because — and this is the core of his own argument — all sensed events come from the past and our different senses react in different ways (that is, they need different amounts of time to react).[2] Therefore, he argues, there is no good reason to think that we are able to sense a special (tensed) property of presentness, which is additionally missed — as he claims — by physical science: "[n]one of our physical theories have ever employed a distinguished present" [Callender, 2017, p. 31].

Both of Callender's objections concerning the relations between the present and our perception and between the present and physics can be easily answered by pointing to two facts. Starting from the second objection, it was noticed by Smith [1985, pp. 112–115] and [1993, pp. 21–23] that the laws of physics cannot really distinguish any moment of time because they should be valid at every moment of time. Nevertheless, we can find the property of presentness in the *individual processes* analysed by scientists such as, for example, the evolution of the universe: the perfect examples are here the *present* temperature of the cosmic microwave background radiation or the *present* value of energy density and vacuum energy density. In a similar way, we can find the *present* state of evolution in the biological evolution of life on Earth; it is essentially different than it was in the past so, for example, one or more thousand years ago, nobody would have had the chance to consider what makes time special in the context of physics and psychology.

Turning to the first and arguably more complex objection, it should be taken into account that our observation of time, and especially of the present, is theory-laden and changes as science develops.[3] It was wholly natural to assume that we had been observing the spatially extended and global present as long as we were convinced that the velocity of light is infinite. We were also not aware in the past that our senses are unable to react immediately and that — to use Callender's own words — "the brain is 'filling in' or 'leaving out' a lot of what we experience for

[2] The second essential ingredient of his critique is an assumption that the considerations of Albert [2000], Horwich [1987], and Lewis [1979], together with the *de facto* asymmetries which can be found in the world, support his subjectivistic stance concerning the flow of time. Albert's and — more generally speaking — the entropic approach to temporal asymmetry of our world is criticized in [Gołosz, 2021], while Horwich's and the counterfactual approach in [Gołosz, 2017a] and in later part of this section.

[3] I understand this "theory-laden" in a broadly Popperian sense, including evolutionary determined dispositions and expectations [Popper, 1979, pp. 65–66, 346–347].

physiological reasons" [Callender, 2017, p. 203]. Nowadays, however, we are perfectly aware of these facts and especially that we observe events from the past because no signal can travel faster than the speed of light, and that it takes some time for our senses to react. Moreover, this time may be different for different senses, for example:

> (a) the mechanical sound transduction by the hair cells of the inner ear is many times faster than the chemical phototransduction in the retina, and (b) the neural transmission time from the visual cortex to the cerebral cortex is about 30 to 50 ms longer than that from the auditory cortex to the cerebral cortex. [Callender, 2017, p. 191]

Therefore, it is obvious that if we want to remain in touch with science then we have to change our notion of the present and the way we conceive of its perception. The most promising starting point to achieve this goal seems to be the relativistically invariant notion of the point-like present *here-now* as introduced and vindicated by Stein [1968, 1991], Dieks [1988, 2006], Shimony [1993], Dorato [2002], Rovelli [2019] and many others.[4]

Callender [2017, pp. 55–57] is not in favour of an approach with a point-like present, but this does not change the fact that other philosophers and physicists accept it and claim that it is in accordance with physics.[5] He makes a strong assumption which contradicts the view vindicated above, claiming that the present *has* to be global in some sense: "at least one event in the universe shares its present with another event" [2017, p. 57]. However, it only means that Callender elevates our pre-relativistic classical intuition to something akin to a philosophical dogma. It goes without saying that such an approach would mean a no-go condition for the development of our scientific, metaphysical and everyday knowledge as well: after all, they are continuously changing as science develops.

[4] This view will be developed in the third section. Another possibility which will not be vindicated in this paper is to treat the present as a more or less extended region and for this reason not always experienced immediately at the present point-like moment of time but rather theoretically constructed: it can have, for example, a shape of diamond [Savitt, 2009] or be identified with the region of the so-called topological or absolute simultaneity (the set of all points spacelike related to the given point). Adherents of such a construction have to agree with Callender that their present is not sensed by us — in part or in the whole — and admit that our experience is deceiving us.

[5] For example, [Stein, 1968, 1991; Dieks, 1988, 2006; Shimony, 1993; Dorato, 2002; Gołosz, 2015, 2018, 2019, 2020; Rovelli, 2019].

There are strong arguments that we should abandon the notion of an extended present. For example, Dieks emphasizes the fact that, because of the finite speed of causal signals, there are no direct causal connections between what happens in a spacetime point and what occurs at space-like separation from this point, which means that extended *nows* are irrelevant for the purposes of causal explanation.[6] Thus, I think that Callender's arguments denying that we sense the objective present are questionable.

Callender [2017, chapter 9] claims that what we make is a reification of the now; that is, a conflation of the egocentric temporal properties (where the subject conceives himself to be in the centre of spacetime and uses concepts such as "now", present", or "here") with allocentric ones (with no distinguished times and places). The conflation is not so much an illusion as much as it is a natural response to the fact that we really are objectively stuck — as he admits [2017, p. 223] — in the common *now*. Callender maintains that the reason for this "hypostatization of the felt present" [2017, p. 224] is that the one-dimensionality of the timelike directions implies that one cannot "turn around" in time to see other nows as one can other heres. It is a case of the so-called *mobility asymmetry* consisting in the fact that we have relatively free mobility in the spatial direction but not the temporal.

To answer this last argument, it is enough to notice that Callender is surely right that one cannot spin around in time and see other *nows* as one can other heres. Unfortunately, he in no way explains why we cannot simply *backtrack* in time, say for one hour or one day until yesterday, or at least *stop* for a moment in time, at least virtually, moving — for example — alternately backward and forward for a fraction of a second in such a way as we scroll an interesting recording forward and then back: the one-dimensionality of time should not be a problem here taking into account that we *can* backtrack in one-dimensional space. Instead of this, we continuously feel — to put it metaphorically — "carried" by the flow of time into the future. Unfortunately, nobody and nothing wants to carry me in a similar continuous way in space in this or that direction, even if I would very much like it to do so. Nor can I pause the happy moments of my life in a similar space-like way. If Callender's answer to these worries

[6] [Dieks, 2016, p. 13]. Dieks vindicates the block theory of time claiming that it can be reconciled with becoming. For a critique of such an approach [see Gołosz, 2018, pp. 410–411].

is the above-mentioned asymmetry of mobility, and if he believes in science as a last resort, he is obliged to explain how it is possible: for, if main physical interactions are invariant under time reversal[7] and cannot be responsible for mobility asymmetry, then what is?

Callender [2017, ch. 11] continues his counter-offensive against believers in the real flow of time by claiming that the flow of time is an illusion and that this illusion stems from the conception of the self as enduring. He tries to flesh out this theory with a few points from cognitive metaphor theory and developmental psychology and broadly takes his inspiration from [Weyl, 1949; Mellor, 1981, 1998].[8] That is, he maintains that our *apparent* present moving up a world line and believing in such a passage is due to two factors: memory asymmetry (which may also be responsible for the conviction that the past is fixed and future open [2017, p. 247] and the extra ingredient needed to get flow mentioned with number (2) in the *Introduction*, namely *the self*¸ which *endures* through time.[9] This is crucial for Callender's conception because he believes that "*the illusion of the enduring self is responsible for the illusion of the flow of time*" [Callender, 2017, p. 251]:

> What crawls up the worldline is not a substantial metaphysical entity, e.g., Weyl's moving spotlight, but rather the character in a kind of story. A narrative is being built up the worldline. At each moment, the main character in this story is being created from the resources available at that time. You are always the leading edge of the story. As more resources become available, the story and self change. Always, however, the story and self are responsible for the assumed unity of the self through time. What is "crawling" up your worldline is a story that

[7] The laws of nature describing electromagnetic, gravitational and strong interactions are time-reversal invariant. The weak interactions are not time-reversal invariant, however, they do not have an effect on the phenomena we meet in everyday life. See, e.g., [Feynman, 1967, ch. 5], [Sklar, 1974, ch. V] and [Lees et al., 2012; Gołosz, 2017a,b].

[8] Callender's position view is also quite similar to Jenann Ismael's [2016] view, which tries to reconcile eternalism with our experience of time. Callender characterises it as a "fantastic 'side on' look at time [which] coincides with mine" [2017, p. xii]. Ismael's view is introduced, inter alia, in her [2016] and can be criticised in precisely the same manner as Callender's position.

[9] "This observation brings us to an important point for our purposes: selves *endure* through time. [...] you feel that you are numerically identical to all those organisms at all those times, one self-same entity surviving all these alterations." [2017, p. 248]

> unfolds "up" the worldline, the story of me (and for you, you). With this understanding, we obtain a reason for our deep conviction that something is moving through time.[10] [Callender, 2017, p. 251]

To avoid begging the question (the narration constitutes the enduring self and the self is narrating its own story), he makes the following stipulation:

> But I don't need the hypothesis that narration *constitutes* selves. What I am committed to is that the narrative theory more or less gets the epistemology right — that is, that the enduring self we posit is the subject of our narration. What we identify as our self is the subject of our story-telling. [Callender, 2017, p. 249]

Unfortunately, it is rather doubtful whether he really does avoid begging the question because if "[w]hat we identify as our self is the subject of our story-telling" (p. 249) and "the main character in this story is being created from the resources available at that time" [2017, p. 251] but since he simultaneously doesn't assume that narration constitute selves, then what is the origin of the enduring self? So, unfortunately, as in the cases of Weyl and Mellor, we are left in the dark as to how it is possible that we are convinced that it is *exactly the same person* who caught a striped bass when he was 14 years old and after many years became a well-known philosopher.

Anyway, Callender claims that memory is crucial to constructing selves:

> The memory arrow turns out to be crucially important. It's just not the whole story. Memories are the raw materials out of which selves are built. Since these materials are temporally asymmetric, the selves created from them are too: they crawl up the worldline in one direction, not the other. Asymmetric memories, however, aren't the full story. The self they help create is the missing ingredient, the hidden variable that provides additional movement, or at least, the conception of it. [Callender, 2017, p. 252]

Because temporally asymmetrical memories are the ingredients from which selves are born and are responsible for the illusion of the flow of time, just as [Mellor, 1981, 1998] claims, Callender needs something which could make them temporally asymmetrical. However, in contrast

[10] This is the so-called *egomoving perspective*, which Callender [2017, p. 252] distinguishes from a *time-moving perspective*.

to Mellor, he assumes that a source of this knowledge asymmetry may not only lie in asymmetric causation but also that the opposite relation à la Horwich [1987] is possible as well:

> How does the knowledge asymmetry relate to the causal arrow? Knowledge and causation are two of the more loaded concepts of philosophy, so we really can't say definitely. There might be plenty of connections. For instance, on a causal theory of knowledge (Goldman, 1967), the relationship is quite intimate: S knows that p just in case p caused S's belief in the right way. Alternatively, the knowledge asymmetry may be the foundation of the causal asymmetry à la Horwich [1987]. They might also have the same origin and explanation (Albert, 2000). Or perhaps they're utterly separate. Fortunately I can afford to be agnostic. The two asymmetries exist. How they relate to one another won't matter for our purposes. What's important is that we have these asymmetries. [Callender, 2017, pp. 274–275]

According to Callender, the same asymmetric causation and asymmetry of our knowledge are also responsible for the fact that the past is fixed while the future seems to be open:

> With a directed whoosh in hand, we have regained almost everything found in manifest time. One major feature remains. We believe that the direction that hasn't yet whooshed is in some sense open. Why? Part of the answer must be that the kind of knowledge that we have about the past is of a different character than that we have about the future. Another part of the answer is that the world is causally asymmetric. Causes always seem to precede their effects. Or if one wishes to frame this asymmetry in terms of counterfactuals, we might say that the future depends counterfactually upon the present in a way the past does not. Future outcomes depend upon actions now whereas past outcomes do not. These two massive temporal asymmetries, the knowledge asymmetry and the causal-counterfactual asymmetry, have a powerful effect on creatures in our world. They entail that creatures like us will be very uncertain about later events on their worldlines even though they tend to have some measure of control over these events. Like many others, I hold that these asymmetries are ultimately responsible for the past/future asymmetry. [Callender, 2017, p. 259]

So, as it can be seen from above passage, we have here the two "massive" asymmetries — asymmetric causation (which can be expressed in terms of counterfactuals) and the asymmetry of our knowledge — which are also responsible for the asymmetry between the open future (as it seems to

us) and a fixed past. Because all three asymmetries are necessary for explanations of asymmetries (3, 4 and 5) from the Introduction which were supposed to be responsible for our experience of the flow of time, then providing a plausible explanation of these two massive asymmetries, which are responsible — according to Callender — for the third one, in a way which do not involve the real flow of time is crucial for the whole of his reasoning. Unfortunately, Callender does not offer his own explanations of these two asymmetries but instead invokes three different approaches from Horwich and Lewis' counterfactual approach, so what remains is to analyse the approaches consecutively invoked by Callender.

Let us start with Horwich's explanation of the asymmetry of our knowledge. Horwich tried to explain why we know more about the past (because we have many recorded traces of it) than about the future (we have no recorded traces of it) by referring to a fork asymmetry. He claims that the phenomenon of recording is a special case of the pattern of events which he terms a "normal fork" [Horwich, 1987, ch. 5]: regularly associated events must have a common cause but need have no joint effect. Nonetheless, such an explanation is implausible for at least two reasons. Firstly, the fork asymmetry could only explain why we have more traces of the past than traces of the future, but it does not explain why we have *no* traces of the future. And, secondly, traces *need not be doubled* to be traces; thus, for example, one single DNA test or a single photo can be a conclusive piece of evidence in a court hearing.[11] What follows from this is that the asymmetry of our knowledge cannot be explained by the "causal connectedness of correlated events".[12]

The next strategy of Horwich's invoked by Callender [2017, pp. 274–275] is his explanation of the asymmetry of causation. Horwich reversed the traditional relation between explanation and causation and maintained that explanation is theoretically prior to causation, that is, he claimed that the direction of causation is analytically defined as the direction that would provide correlations with causal explanation. He proposed three different a posteriori answers to the question of why we believe in the future orientation of causation:

1. Causation is defined, in part, "by the principle that correlated events are causally connected, and this, given the fact that there are no

[11] See [Gołosz, 2017a, pp. 26–27]. Frisch [2010, sect. 3] shows that there are many mundane events that leave no or only very few traces in the future.

[12] See also [Healey, 1991, p 128], where emphasized this fact.

inverse forks, determines the fact that causation is future oriented." [Horwich, 1987, p. 143]

2. Causation is defined by its association with our experience of deliberation and control: "we define causation as that general relation between events that is exemplified when an event is deliberately brought about by free choice." [Horwich, 1987, p. 143] What is more, "our voluntary actions are performed only for the sake of future events." [Horwich, 1987, p. 143]
3. Causation is defined, in part, "by the idea that a cause is in some sense 'ontologically more basic' than its effects." [Horwich, 1987, p. 143] But because of the fact that traces of the past are knowable and these of the future are not, we tend to think that the past has 'more reality' than the future [Horwich, 1987, p. 143].

However, all of these explanations are dubious. The first is obviously mistaken because the direction of causation is not connected with the directionality of the forks. Firstly, we can talk about the direction of causation even if there is only one effect of some cause. Secondly, in the case of an inverse fork which is possible when we have overdetermination, we would not say for sure that causation is past oriented because of an inverse fork [see Gołosz, 2017a, p. 27].

The second explanation is implausible because it is based on the hidden time-asymmetric assumption saying that the past is *fixed* and the future is *open* (our voluntary actions are performed only for the sake of future events because the past is fixed and cannot be changed): it is this asymmetry which both Horwich and Callender should explain and therefore it begs the question. I also attempted to show earlier that by appealing to fork asymmetry Horwich did not explain the asymmetry of our knowledge concerning the past and the future, and thus the third explanation cannot be accepted as well. Therefore, Horwich's explanation of the asymmetry of causation is implausible for the same reasons as his explanation of the asymmetry of our knowledge [see Gołosz, 2017a, p. 26].

With the aid of the evolutionary approach of Horwich [1987] and Parfit [1984],[13] Callender also tries to explain the past-future asymmetry of our *sense of agency*, that "*our actions are sometimes effective*

[13] The kind of evolutionary approach which is applied by Callender should be drawn from [Mehlberg, 1961, 1980, pp. 200–202], where applied it first, rather than from Parfit and Horwich.

in bringing about future goals, but rarely or never effective in bringing about past goals" [2017, p. 273] by claiming that it is an effect of natural selection:

> A tendency to care strongly about the satisfaction of future desires would have been selected for because this would have led to behaviour that increased the chances of these desires (e.g., finding food, mates, and shelter) being satisfied. By contrast, the tendency to care strongly about past desires would not have been selected for, since no amount of caring or effort after the fact will increase the chances of those desires' being satisfied. [2017, p. 273]

Assessing this explanation in passing, which evokes our evolutionary history and the role of natural selection, it should be noticed that Callender, Parfit and Horwich (and Mehlberg before them) are of course right that our past-oriented desires cannot be fulfilled and because of this are useless for our survival. However, it is also obvious that it is impossible because the past is *fixed* and cannot be changed while the future is *open*. So the issue with this argumentation is that it is based in the implicit assumption that while the past is *fixed*, the future is *open* and as such can be influenced; otherwise our expectation that our actions for the sake of the future, but not for the past, is beneficial to our survival would be useless. Yet the asymmetry between the *fixed* past and the *open* future is precisely one of these asymmetries which Callender, Parfit and Horwich (and Mehlberg) should have explained and not taken for granted. Because they did not explain the origin of this asymmetry — as I have tried to show — it means that their argumentation begs the question [see Gołosz, 2017a, p. 26].

According to Callender, Lewis' counterfactual approach to temporal asymmetry can explain both the asymmetry of causation and the asymmetry of the fixed past vs the open future [Callender, 2017, p. 259]. I am afraid, however, that these attempts are equally doomed to failure as those analyzed above. What makes this approach to temporal asymmetry implausible is its *de facto* character:

> Let me emphasize, once more, that the asymmetry of overdetermination is a contingent, *de facto* matter. Moreover, it may be a local matter, holding near here but not in remote parts of time and space. If so, then all that rests on it — the asymmetries of miracles, of counterfactual dependence, of causation and openness — may likewise be local and subject to exceptions. [Lewis, 1979, p. 475]

If Lewis and Callender, who tends to follow Lewis in some parts of his book, were right, it would mean that in the case of the different arrangement of matter or processes in our world, or even in some parts of it (overdetermination "may be a local matter"), causation could be symmetrical or even have an opposite direction, the future could be fixed and the past open. To see this more clearly, let us take two simple models: in the first, we have two or more point-like particles that are closed in a box and only take part in elastic collisions. The second is a reversal of Lewis' paradigmatic example of a standard (retarded) spherical wave [Lewis, 1979, p. 475]: namely, let us suppose that as a matter of accidental fluctuation (in accordance with statistical mechanics) [see, e.g., Sklar, 1974, pp. 386–388] instead of a (retarded) spherical wave which expands outward from a point source to the borders of a reservoir we received the opposite processes, that is, an advanced spherical wave in which a spherical wave contracts inward from the borders of a reservoir or from infinity and is absorbed. Would we really believe that causation is temporally symmetrical in the first case because of this (counterfactual analysis does not distinguish any direction in this case), or that it has an opposite direction in the second case (overdetermination points to the opposite direction than in the standard retarded wave)? Would we really believe that the past is open in the second case because overdetermination has changed its direction? It is a logically possible explanation, but a highly implausible one at that.

At the end of this critique of Callender's analysis of the past-future asymmetry, the so-called *Past/Future Value Asymmetry* (all else being equal, we tend to prefer past pain (future pleasure) to future pain (past pleasure)) should be mentioned.[14] While it can be explained by a believer in the flow of time by simply invoking it,[15] the value of explanations given by a disbeliever such as Callender strongly depends on his ability to explain the asymmetry of our knowledge concerning the past and the future and the asymmetry of causation which I concentrated on earlier in my analysis. And, especially, the value of disbelievers'

[14] A similar character has — and a similar analysis can be given to — the *Proximal/Distant Discounting Asymmetry*: all else being equal, we tend to prefer distant future pain (proximal future pleasure) to proximal future pain (distant future pleasure [see Callender, 2017, ch. 12]).

[15] See, for example, the metaphysical theory of the flow of time introduced in the next section which explains asymmetry of causation, asymmetry of our knowledge, and the asymmetry between the fixed past and the open future.

responses given Prior's [1959; 1996] argument Thank Goodness That's *Over* (a headache, for example), the most famous argument in this category, depends strongly on their ability to explain the asymmetry of our knowledge. Callender is aware of the fact that his answer to the *Thank Goodness That's Over* argument depends on his ability to explain the asymmetry of our knowledge concerning the headache *before* and *after* it as well:

> Before the headache, one cannot narrate a self that experiences the headache "from the inside." The "self-building" materials don't yet include autobiographical memories or other psychological states associated with this event. Hence the self hasn't crawled up to the headache yet; it hasn't 'happened' yet. After the headache, one has plenty of material for narrating a self through the headache period. The headache has happened for that self, i.e., those experiences were used in building one's narrative up to that point and therefore later selves won't have to go "through them" again, for they are part of the story already. In that sense the headache is not merely earlier, but over and done.
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> [Callender, 2017, p. 268]

As can be seen in this explanation, Callender's self has an *asymmetrical* knowledge concerning the headache and this alone — according to Callender — is responsible for the sense of relief which occurs *after* rather than *before* the headache. However, because this explanation of *Past/Future Value Asymmetry* depends strongly on Callender's ability to explain the asymmetry of our knowledge concerning the past and the future and the last one was — whether it is based on asymmetric causation or not — implausible, as I tried to show earlier, this one should also be regarded as implausible.

I have tried to demonstrate that Callender's arguments trying to show, firstly, that the flow of time does not exist and, secondly, that it is possible to explain our experience of the flowing in a subjectivistic way seem to be implausible. An essential question now arises of whether there is an Ariadne's thread which might help us to escape the labyrinth of time created by the fact that our senses need different amounts of time and different ways to react to stimuli which always come from the past in the world where time-reversal invariant interactions dominate. The next section shows how one can escape from the labyrinth.

3. The way out

Without claiming that this is the only way out of the labyrinth which Callender has been lost in, nor even that it is the best one, I would like to present an escape route based on the assumption of the real flow of time. The first step is simple and is a natural generalisation of the notion of the point-like present introduced in the section above: let us now assume that our world consists of things that are made up of approximately point-like objects and that *each of them* have approximately point-like presents. Such a point-like present can really be sensed by us — or rather by the cells and their different groups that we consist of — at every moment of our life. Of course, a certain approximation is necessary, taking into account that the cells, although small, are nevertheless spatially extended and that the different cells of our nervous system need varying amounts of time to react, and different amounts of time for the transmissions of signals. To avoid the objection that an organism and nervous system are spatially extended and as such cannot be treated in a point-like manner, they should be treated simply as collections of interacting parts — as small as one wants — each of which has its own individual time consisting of consecutive approximately point-like present *here-nows*.[16] To justify this approximation, I would like also to recall at this point that the process of idealization is a normal procedure for all scientific research.

Such a *collective* approach to the point-like present, where approximately point-like interacting objects form greater collections such as an organism, provides us with an answer to the objection of solipsism according to which, firstly, a single point cannot be all that is real for an observer and, secondly, that it is not justified why an observer privileges his own *here-now* point over and above other observers' *here-now* points.[17] The answer is simple and *does not* privilege any observer: every approximately point-like thing constitutes its own approximately point-like present, and interacts *directly in its own present* (that is, strictly speaking, in its own approximately point-like spacetime location) with different stimuli coming from other approximately point-like objects or

[16] For different concepts of an organism see, for example, Stencel and Proszewska [2018] and [Suárez and Stencel, 2020]. A dynamics will be added to this conception later in this section.

[17] Such an objection is raised to standard idea of a point-like present of a *single* object/observer. See, for example, [Saunders, 2002, p. 286] and [Cohen, 2016, p. 47].

with (quantum) fields, sources of which are other approximately point-like objects or their collections. So, according to the proposed conception, the world consists of approximately point-like interacting objects, each of which has its own approximately point-like present; such approximately point-like objects can form greater or lesser collections. Such a view can be termed *multipresentism*.[18]

The view introduced above also addresses Dolev's [2016, pp. 24–25] concern, according to which every presentism with a spatially restricted present leads to a bizarre consequence, namely that some events became past (in the past cone of the present) without ever having been present. In consequence, Dolev claims, "we must choose — either every event, regardless of location, is, at some point in time, present, or else no event is ever present. That is, either there is no such thing as presentness, or else presentness is global." [2016, p. 25] The presentism proposed above elegantly answers this objection: we received a form of presentism in which every event, regardless of location, is, at some point in time, present — approximately point-like present — that is not global.

One might raise the objection that such an approach smuggles in what it claims to have ruled out of the ontology through the back door of the ideology because it allegedly re-introduces a global present by introducing multiple individual proper presents for all of the objects. Such an objection would, however, be invalid. To show this, it is enough to evoke an example of a physical model where we can say about the multiple individual proper point-like presents for all of the objects in this model although there is no global present. In fact, we have many such models, with Gödel's model of a rotating universe being a primary example of them [Gödel, 1949a,b]. In such a model, there are no global hypersurfaces of simultaneity and no other candidates for a global present, although we can obviously postulate that the smallest constituents of these worlds, such as elementary particles, have their own approximately local point-like present (that is, their own approximately point-like spacetime location) as they crawl along their world lines. So, we have the multiple individual proper point-like presents with no global present in such a world which shows that the former demands the latter in no way.

Now, there remains an essential ingredient that should be added: *dynamics*. It can be introduced by the *dynamising of existence* and be-

[18] After adding dynamics to this view in later part of this section, it will deserve to be called *dynamic multipresentism*.

cause such an approach develops the stance introduced above by adding dynamics it deserves to be called *dynamic multipresentism*.

Let us start with the idea of becoming developed by [Broad, 1938]. Broad showed that becoming, which he termed *absolute becoming*, can be treated as a primitive notion so that the difficult question of "How fast does time flow?" can be avoided [Broad, 1938, pp. 280–281]. Broad ascribed absolute becoming to instantaneous events, but if — following Sellars[19] — we ascribe it to things and additionally mix it with a conception of enduring, we receive a conception of the dynamic *existence* of objects which is supposed to meet all of the expectations related to the theory of the *real* flow of time. This theory can be expressed in the form of the following thesis:

Dynamic Reality: All of the objects that our world consists of exist dynamically. where **Dynamic Reality** (**DR**) is expressed in tensed language.

Just as with Broad's absolute becoming, the notion of *dynamic existence* is a primitive notion and can be roughly characterised by the following set of three postulates:[20]

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

To finish this dynamic image of the world, **DR** should be accompanied by three definitions:

The present ≡ The totality of objects that dynamically exist.

The past ≡ The totality of objects that have dynamically existed.

The future ≡ The totality of objects that will dynamically exist.[21]

[19] "[...] whereas both *things and events* can become Φ, *only things can become in the sense of come into being*" [Sellars, 1962, p. 556].

[20] See [Gołosz, 2018, p. 403], [Gołosz, 2019, pp. 736–737], [Gołosz, 2020, pp. 41-42], [Gołosz, 2021, sect. III], [Gołosz, 2022, *Introduction*]. The term "objects" is applied here to both things and events (facts and states of affairs), nevertheless things are treated as fundamental objects, while events are only secondary. The events are treated here as instantaneous; nonetheless, we can also introduce processes in which are involved things and which perdure.

[21] In the first definition, I follow Prior: "the presentness of an event *is* just the

It is easy to show that **DR** satisfies all of the posited in the *Introduction* conditions and is compatible with the theory of relativity: firstly, because dynamic existence can be ascribed to the smallest constituents of the world, such us, for example, elementary particles, we receive an approximately *local point-like present* for all of them as they dynamically exist along their world lines. Secondly, it follows from the meaning of dynamic existence that things *endure*. Thirdly, the present is continuously changing in accordance with our everyday experience. And, fourthly, dynamic existence introduces an essential *temporal asymmetry* into the world because the past consists of things and events that have dynamically existed: at least some objects from the past, such as Socrates, have passed away while others, like Donald Trump, still dynamically exist. Events, which are acts of the acquisition, loss or changing properties by dynamically existing things, dynamically exist in the sense of coming to pass. The past cannot be changed while the future is to come into being and, as such, is probably open. As an effect of these, one can also say that things exist dynamically toward the future. Thanks to this — despite the symmetry of strong, electromagnetic, and gravitational interactions under time reversal — things can transport traces of these interactions into the future and can only impact on things and events that happen later. This would mean introducing temporal asymmetry into the world that we have been looking for.

All this means that the view introduced is in perfect agreement with both our everyday experiences and science. What is more, it can be shown that, thanks to the dynamics and temporal asymmetry inherited by it, the presented conception can help us in our search for quantum gravity.[22]

Now, as can easily be seen, the stance introduced above fully deserves to be called *dynamic multipresentism* because every present, which exists for every approximately *point-like* dynamically existing object along its world line, is dynamically changing. And every approximately point-like dynamically existing object along its world line forms its point-like present in which it can interact *directly* with different stimuli coming from the past of other approximately point-like objects or with (quan-

event. The presentness of my lecturing, for instance, is just my lecturing" [Prior, 1970, p. 247]. The definitions of the past and of the future are assumed by analogy.

[22] It is shown in [Gołosz, 2017b, 2020] that such a form of dynamic presentism can complement *Causal Dynamical Triangulation*, (CDT [see Ambjørn et al., 2008a,b, 2014]) with dynamics and temporal asymmetry which are lacking in it.

tum) fields, sources of which are others approximately point-like objects or their collections. That it is a form of presentism follows from the fact, that *by definition*, only the present exists. It does not lead to triviality, however, because it is **DR** that is the main ontological thesis of this view, while the sentence "**The present** ≡ The totality of objects that dynamically exist" is only a definition of the present.

This view bears some similarities to Ellis' [2006] *evolving block universe* (EBU) in that Ellis also maintains that "evolution is not related to any preferred surfaces in spacetime; rather it is associated with the evolution of proper time along families of world lines" [Ellis, 2006, p. 1797]. The difference between the two views is that the first vindicates a form of presentism with multiple presents as only existing moments of time for each object (that is why it is called *dynamic multipresentism*) and it is based on the notion of dynamic existence, while Ellis defends a form of growing block theory, where the past and the present exist on a par with one another, and EBU is based on the notion of becoming and does not involve the enduring of things.

The theory of the flow of time presented has, of course, a metaphysical character, something unsurprising given that it describes *how* things exist: sciences such as physics, biology and psychology care about *what* exists but not *how* they exist: for example, physicists are interested in the problem of whether WIMPs (that is, weakly interacting massive particles) exist and if they form dark matter, but not in the problem of whether they exist in a tensed or detensed way, or how they persist over time (by enduring or by perduring). That latter task is one which belongs to metaphysics [see Gołosz, 2018, p. 412; Gołosz, 2020, pp. 43–44]. If the proposed approach is correct, it would mean that metaphysics can complement the scientific image of the world in a somewhat unexpected way with temporal asymmetry and dynamics, which are so needed for all scientists describing evolution of different dynamic systems.

4. Conclusions

Callender can be praised for the collation of an impressive set of scientific results from cognitive research which enriches our knowledge as to how we *experience* time and for showing what consequences follow from these outcomes for the idea of the flow of time. However, in no way has he managed to show that we produce an illusion of the flow of time in a

static world where the flow of time is non-existent. He has not shown that the fact that all sensed events come from the past and our different senses need different amounts of time to react demonstrates that there is no objective present and no objective flow of time. Callender also failed to demonstrate that there are enough asymmetries in the physical world to explain our experience of flowing time in a subjectivistic way, while the external arguments invoked by him in favour of the existence of such asymmetries seem to be both frail and fragile. He also failed to explain the origin of our sense of an enduring self.

In this paper I have tried to show, however, that by taking into account the physical and recent psychological discoveries described by Callender, we are able to change our notion of the present, our conception of the flow of time, and of presentism in such a way that it can be reconciled with physics and psychological discoveries. What is more, such a view can even complement some physical theories in an essential way and explain why, for example, physicists (the evolution of the universe), biologists (the theory of evolution) and psychologists (the developmental psychology) are so interested in the evolution of dynamic systems of different kinds [see Gołosz, 2017a,b, 2018, 2020]. Such a version of presentism, which I have termed *dynamic multipresentism*, has been presented in the paper and I hope that its explanatory value will persuade sceptics that contemporary philosophy of time, especially a philosophy which vindicates the existence of the real flow of time, not only remains in touch with science, but also seems to be in quite good health.

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