On the Big Bang, Qualia, Einstein's Train, Temporal Flow Rates, Existence, Free Will, Hard Problems, etc. **9 30 2021**

Contents

1. McTaggart's two temporal series characterize one dimension of time

1.1 McTaggart [6] identified two different series that characterize time. There is the B-series and the A-series.

> "Positions in time, as time appears to us *prima facie*, are distinguished in two ways. Each position is Earlier than some, and Later than some, of the other positions. And each position is either Past, Present, or Future. The distinctions of the former class are permanent, while those of the latter are not. If M is ever earlier [for time-like separated events] than N, it is always earlier. But an event, which is now present, was future and will be past."

I will not follow McTaggart to the conclusion that time is unreal, but suggest that time is real and 1 dimension of time has both B-series and A-series characteristics, which is called an A-theory of time.

I would argue the A-series is not reducible to the B-series *in any way*, and is a part of a comprehensive view of time. The A-series consists in the 'ontologically privileged' *present* moment or '*now*', and *becoming*.

1.2 In the theory of time of this paper, instead of saying

1.2.1 'time goes from past to present to future'

it would be more appropriate to say that

1.2.2 'time goes from earlier times to later times as it becomes from future into the present and then into the past'

As later and later times become present, time goes on.

1.3 The idea will then be that each system has an A-series that is 'ontologically private' to that system, while retaining the ontologically public (but relativized) B-series interrelations. These are 'private' now's, so, presumably, the *apparent* 'universal now' that contains even every quantum system results from some kind of averaging over the more-or-less ubiquitous private nows.

2. Fragmentalism

2.1 Fine [2] introduced the notion of fragmentalism. The idea was that reality is ontologically divided up into fragments. One way to put this is to say that in one fragment there is no fact of the matter about the value of the relevant parameters in another fragment. In physics there have been several interpretations of the 'fragmental' notion. I'll briefly note three of them and then propose a third.

In Fine's original fragmentalism, it is supposed that different relativistic frames of reference form different fragments, so that what is true in a rest frame of reference is not necessarily true in a frame with a (relative) velocity. This is problematic, as Hofweber et al. [3] note, as different relativistic frames of reference can be accommodated within one ontological 'fragment' (related by the Lorentz transformations) *together*.

2.2 Another notion of fragmentalism has been to apply it to quantum mechanics in the following sense. If Schrodinger's Cat is in the state

2.2.1 [psi> = [alive> + [dead>

then each of the basis vectors [alive> and [dead> form two different fragments, Simon [8]. This is also problematic, as Iaquinto et al. [4] argue. It cannot be that each vector forms a fragment, since in the fragment of the reference (quantum) system the state of the cat is the *one* vector [psi>, given by the sum of the two basis vectors taken *together*.

2.3 Yet another notion of fragmentalism is to posit that positions on the A-series each form different fragments, as in Torrengo et al. [10], or, in other words, different perspectives, as in Ludlow et al. [5], and Slavov [9].

2.4 The notion of fragmentalism proposed in this article is that each quantum system (no matter how small/simple/non-local forms a fragment. And that is related to the (panpsychist) idea that each quantum system has it's own A-series. For the A-series parameters in more than 1 fragment there is no fact of the matter as to their joint values.

3. The Big Bang

3.1 Here are two interesting cases involving both the B-series and the A-series.

3.2 the big bang was infinitely earlier than now (in the B-series) and finitely far in the past (in the A-series)

and

3.3 the big bang was finitely earlier than now (in the B-series) and infinitely far in the past (in the A-series)

I would argue that case (3.3) is a better model than case (3.2). We find the big bang to be 13.8 billion years ago. But this leaves open the question of why it didn't happen a billion years before such that we are also a billion years before now. (These are empirically indistinguishable only on some models of time.)

In case (3.3) the number of seconds that the big bang is earlier than now could remain at 13.8 billion years. But as we go further and further into the past, toward the big bang, it could be that we have to go ever further into the past, i.e. to successively go 1 second earlier in the B-series requires going progressively to a larger and larger extent into the past as we approach the Big Bang. That is the first basic idea of this note.

See the appendix for the definition of the rate r, which is given as B-seconds per A-'seconds' in defined units of seconds/e.

For case (3.3) we have $r \rightarrow 0$ sec./e

Quantum systems form distinct fragments. In the Fragmentalist Presentist interpretation of quantum mechanics [7] a mutual measurement/observation is given when and only when there is a collapse of the wavefunction, described by projecting in a Hilbert space. Such a projection updates the value of the rate r for each system.

This model therefore predicts that as one goes back in time toward the big bang there will be a larger and larger number—tending toward an infinity—of quantum interactions per second. If we take the speed of light $c = 1$ m/sec. as a conversion factor, then the closer we get to the big bang the larger the number of quantum interactions per 4-volume. This looks like it approaches an infinite number of interactions—and therefore temperature—at the singularity. That is the second basic idea of this note.

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5. Appendix 1: Rates of temporal flow

Start with a parameter *t* whose unit is change in B-series, an interval, in for example seconds. Add a parameter τ whose unit is not an interval in B-series clock time: in AB-theory, τ is the parameter of the A-series, and "*e*" will be a unit of temporal becoming (*e* does not denote electric charge here). Let τ be the future-present-past spectrum. The idea will be *es* coordinatize τ the way seconds coordinatize *t*.

Define an *indexical clock* to be a clock that's not accelerating, has relative velocity 0 meters-per-second, and is spatially local, to a centered inertial reference frame, all in terms of a B-series.

Define

5.1 1 *e* is what becoming is like for 1 second of indexical clock time

If becoming is indeed phenomenal in the way that qualia are, then, it could be argued, it *must* be 'defined' or 'referred to' in this curious 'what it is like' way, on salient views. E.g. a green quale is defined as 'what it is like' to experience green. The necessity of doing this has to do with their ineffability. *e* can be well-defined for each τ for a system. Further, a second is well-defined across systems such as Alice and a protozoan, even though the protozoan doesn't have the mental capacities Alice does. It's plausible that it's the same way with 1 *e* of A-series time.

Just the way one can re-define seconds to be longer or shorter than the usual seconds, one can re-define *e*s to be further or closer into the future (or past) than the usual *e*s. The physically significant stuff should be invariant under these changes.

Define

5.2 r sec./*e* = - d(Alice's B-series)/d(Alice's A-series)

as the change in 1 second of indexical clock time per change in *e*, for any quantum system Alice (no matter how small or non-local), which defines Alice's fragment. For example, the position of a particle at 1 second *later than* t = 0 is also 1 *e* closer to the present from the future (or further into the past from the present) relative to some event for the 'flat' case of AB-spacetime with the obvious coordinitazition. The minus sign accounts for the fact that increasing B-series times become into the decreasing A-series times, assuming positive numbers of *e* are in the future and negative numbers are in the past.

The countdown to a rocket liftoff, 10… 9… 8… could be seen as counting the number of es. When the announcer says ‘10’ this means that the liftoff, if it is going to happen, is 10 e *in the future* of the control center. In the case of ‘flat’ AB-spacetime, in the relevant coordinate system, the liftoff is also 10 seconds *later than* the clock-time when the announcer says ‘10’. When the announcer says ‘9’ this means the liftoff, if it is going to happen, is 9 e *in the future* of the control center. However, the beginning of the countdown is still 10 seconds *earlier than* the liftoff—it’s just that 1 second has receded 1 e into the past.

We would say ‘3 *minutes* later than 2 pm’. But, supposing it is now 2 pm, we would not say ‘3 *minutes* in the future of ‘now’’. Instead we would say ‘3 *e* in the future of ‘now’’.

Consider the rate $r = 2$ sec./*e*. This can be interpreted as meaning there are 2 seconds of indexical clock time per unit of becoming. That would imply that, for 1 *e*, 2 seconds go by, so earlier-to-later relations would appear to go by faster. This would be like the ‘sped up movie’ metaphor in which time goes by at twice the usual rate.

Let the rate *r* be in units of seconds/*e*. The general idea is then

5.3

$r > 1$ B-series time appears sped up (earlier-times to later-times appear to be going by faster than normal).
$r = 1$ the change in B-series information per change in A-series information is given by 1 second of indexical clock time per unit *e* of becoming. This unit *e* is assumed to be applicable to each panpsychist system, the way 1 second of indexical clock time is applicable to such systems as a macroscopic Alice or a protozoan.
$0 < r < 1$ B-series time goes by slowed down.
$r = 0$ B-series time appears stopped (but the *appearance* goes on as usual in the A-series)
$r < 0$ time appears (from future to present to past) to be going backward in B-series time, i.e. later times to earlier times, e.g. time-reversal, or watching the movie go backward.

One may define (for example) d*r*/d*e* which would have something to do with the rate of becoming accelerating through the A-series. e^{-2} would be something like “per unit of becoming, per unit of becoming”.

We could consider the difference in the rates of time’s becoming in a general relativistic context. Let clock c_2 be above the surface of the earth and clock c_1 be 1 meter directly above c_2. Let c_2’s time be given by $T(\tau, t)$ and c_1’s time be give by $T'(\tau', t')$. General relativity tells us that c_2 runs slower than c_1.

So

5.4 $dt/dt' < 1$ sec./sec.'

Each clock registers that later and later respective times are becoming into their respective presents at a rate of 1 in their own fragments,

5.5 $dt/d\tau = 1$ sec./*e*, $dt'/d\tau' = 1$ sec.'/*e*' which allow one to calculate that

5.6 $dt/d\tau' < 1$ *sec./e'*, $dt'/d\tau > 1$ sec.'/*e*

We could try to compute

5.7 dT'/dT

except (5.7) treats T' and T functionally equally and therefore with an equal reality, contradicting fragmentalism.

Let x be the position of a point particle defined relative to a chosen origin in a particular system. One may define dx/dt, the 'rate' at which the position of the particle changes with respect to the B-series time t, i. e. with respect to the 'time' going from earlier times to later times, in units of meters/second. One may define dx/dτ, the 'rate' at which the position of the particle changes as it 'becomes' from the system's future into the system's present and then into the system's past, in units of meters/*e*. This neither assumes nor implies the future is predetermined, as there may be many futures which are consistent with the system's present state.

In high school we learn to plot the position x of a classical point-particle as a function of time, i.e. we plot x(t). But here t is a B-series. But then we can also plot x(τ) where τ is an A-series. In this latter case x(5) means the position x at 5 *e* in the future (which might be wholly or partially in the present given a thick present). x(0.1) means the position x at 0.1 *e* in the future(/present). x(-2) means the position at 2 *e* in the past(/present). Thus with the more complete notion of time we want to plot x(τ, t), or x(T(τ, t)).

If a clock 'slows down' as it falls into a black hole, from our viewpoint, then the rate r = [sec.'/*e*] decreases in magnitude.

5.8 One interesting feature of this interpretation is that the enlarged 'presentist spacetime' is, within each fragment, described by *five* parameters (namely, an A-series parameter *τ*, a B-series parameter *t*, and the three space parameters x^a) and not *four* parameters (namely, a B-series parameter *t*, and the three space parameters x^a) as in the case of Minkowsi space.

With the definition of the rate r in hand, for each fragment, we are lead to a generalization of the Lorentz transformations.

6. Appendix 2: Einstein's Train in the Fragmentalist Presentist Interpretation

6.1 Einstein's train thought experiment considered [1].

6.2 Suppose Alice is standing in the middle of the platform of a train station and lightning strikes each end of the platform simultaneously in her reference frame. She knows the strikes were simultaneous in her reference frame because after each strike a message is sent to her about when it happened.

6.3 Suppose Bob is standing in the middle of a train car that is the length of the platform in the rest frame of the car, and that the car is moving past the station.

6.4 The two lightning strikes will *not* be simultaneous in Bob's frame of reference.

6.5 It is often concluded that there is no ontologically privileged present moment, or no unique 'now', since if there were such a moment it would be simultaneous with itself (!), and therefore could not encompass both Alice's frame of reference and Bob's frame of reference.

6.6 We'll propose a flavor of presentism that is consistent with (1.1) – (1.3), looking at the train thought experiment in more detail. The basic idea will be that the Alice's system forms an ontological fragment that does indeed have a unique present moment that extends throughout all of space. Within her fragment Bob's (relatively moving) frame of reference is modified by the Lorentz transformations. But her fragment does *not* contain the information of Bob's unique present moment. And *vice versa*. There is just no fact of the matter about both present moments taken together.

6.7 Einstein's train thought experiment reconsidered.

6.8 Alice stands at the train station in the middle of the platform, ready for the experiment to commence. She is 'always' in her ontologically privileged present moment. *This is empirically given data.* Suppose the train car containing Bob (who is of course at rest relative to the train car) moves past the platform.

Many pairs of events that are simultaneous in Alice's frame of reference will *not* be simultaneous in Bob's frame of reference. Indeed the space and time of Bob's frame of reference are modified by the Lorentz transformations from the perspective of Alice.

6.9 So far, there is no contradiction, because we've only talked about Alice's present moment (given by her A-series), her clock-times (given by her B-series), and the clock times in Bob's frame of reference (given by his B-series).

6.10 The idea is then that Alice's A-series defines her ontological fragment. The contradiction comes in only if we add the postulate that Bob has a unique present moment *in Alice's fragment*. But this postulate is avoided if we suppose that Bob's A-series delineates his own fragment—one that is distinct from Alice's fragment—and is one in which there is no information about Alice's unique present moment.

Alice's fragment contains the information of Alice's A-series, Alice's B-series, and Bob's B-series. But Alice's fragment does *not* contain the information of Bob's A-series, and *vice versa*. As they pertain to two different fragments, there is explicitly no 'simultaneous' fact of the matter about both Alice's A-series (and therefore her present moment and her 'becoming') and Bob's A-series (and therefore his present moment and his 'becoming').

In Alice's fragment, Bob's B-series is modified by Lorentz transformations. And in Bob's fragment, Alice's B-series is modified by the corresponding Lorentz transformations.

6.11 In this way, a present moment that extends throughout space is relativised (so to speak) to each fragment, and no contradiction ever arises.

6.12 This concludes the Fragmentalist Presentist account of the Einstein's train thought experiment.

6.13 Epilogue to Einstein's Train

6.14 Clearly there is a great deal more to say. But the aim of this note was to only focus on the train/station thought experiment because that is one of the clearest arguments showing the relativity of simultaneity and the (erroneous) conclusion that presentism is untenable.

6.15 At the risk of oversimplification, the slogan here might be that the time of quantum mechanics is a (fragmentalist) A-series, and the time of relativity is a B-series, with the understanding that these two temporal series are not entirely independent. But, again, the intention of this note was to focus narrowly on the train/station thought experiment.

7. Appendix 3: Where did the Big Bang come from? Do qualia exist *necessarily*?

Why is there something rather than nothing? I don't know. And if there were *absolutely* nothing—not even potential logical structures or time or … it's difficult to see how things could get off the ground. But it's simply not clear that that's the right question. It may be that it requires fewer (weaker) assumptions to allow that there are *possibilities*. If that's the case, we may at least consider the existence of such-and-such possibility.

Now, suppose we have the existence of the possibility p_1, $2 + 3 = 5$, which is to say, if there were 2 things (physical, numerical, etc.) and 3 (other) things, then there would be 5 things. But this already gives us other information. For example, it rules out the existence of the possibility p_2, $2 + 3 = 6$. So p_1 rules out p_2.

We want to consider the possibility '(a particular shade of the quale) red exists'. The problem here is that this simply does not rule out that what 'red' means within the possibility is not what we would call 'green' (for example). The locution 'red exists' does not rule out that 'red' could refer to any particular quality whatsoever. Thus, 'red' cannot be part of the existence of the possibility, as the possibility does not mean what we want it to mean.

Instead, we have the existence of the possibility p_3 that

7.1  exists

which is to say, if there were  then red would exist.

(This is an example of what I have elsewhere called a qualation.)

Now, (7.1) rules out that the possibility in question *could* be talking about anything other than red qualia and (I would claim) it is the only way to do so. But notice that to merely specify the *possibility* of the existence of red *qua* redness, we had to give an *actual* red. Otherwise, the possibility does not know (so to speak) what is meant by 'red'. So in p_1 and p_2 we have it that the subjunctive 'if there were …' does not require the actual existence of anything, but in p_3 we have it that the subjunctive 'if there were …' *does* require the actual existence of some particular thing.

What I have been struggling to argue is that 'the possibility red' must itself contain actual redness, since otherwise the possibility cannot specify what it is a possibility *of*. If this possibility wants (so to speak) to rule out that it is the possibility of the existence of greenness, then it must specify 'red' in the possibility in such a way that it can be differentiated from ‘green’. But a mere *name* for a color cannot do this. The only way to do this is to use the actual quale of redness.

The conclusion is that the mere possibility of the existence of *redness* requires the actual existence of redness. Otherwise the possibility cannot specify which quale it is the possibility *of*.

But this is exactly the behavior of the A-series. We may suppose each state has a prior state, but, as Leibniz pointed out, there is then the question of where the whole sequence of states came from. But in our (fragmentalist) ontic perspectivalism there is no perspective from which the *whole* sequence of states can be surveyed, so the sequence taken as a whole does not need an explanation.

This argument evidently applies to any possible quale whatsoever. On the one hand that sounds bad. But on the other hand, it could turn out that physical laws and physical things can be understood as particular kinds of qualia.

Anyway, on panpsychism, idealism, or neutral monism, we may have solved the question of where the Big Bang came from.

This would also solve the problem of evil: pain exists in the universe because it, too, is qualia.

7.2 … but again: how do you get something from Nothing? But, again: is Nothing really the state of affairs (if such exist) with the weakest assumptions? At very least this would require an argument. These ideas are surely not new with this paper; I’m still in the process of find antecedents.

Consider the following two arguments.

7.2.1

1. Suppose there is Nothing.
2. If there is Nothing, then it is possible for there to be Nothing.
3. If it is possible for there to be Nothing, then there exists the possibility (in a 2nd-order sense) that there is nothing.
4. If that possibility exists, something exists.

Moreover,

7.2.2

5. At first we want to say that Nothing means Nothing and therefore even a possibility does not exist.
6. But if the possibility of Nothing does not exist, then it is impossible for there to be Nothing.
7. If it is impossible for there to be Nothing, then something exists.

Do 7.1.1 and 7.1.2 show there is something rather than Nothing? At the very least, they show that what the weakest assumption(s) is is not such a straight-forward question.

8. Appendix 4: Differences Between equations and qualations; Zombies, and Mary

8. I'd like to discuss the qualations. These are two questions that *in the correct language* are *different* questions:

8.1 Why is my red the internal, subjective, phenomenal, *red*?

8.2 Why is my red ?

These are subtly but, I would contend, profoundly different questions. The first question elicits in the mind of the reader a *thought/concept/idea about* red qualia. The second question elicits in the mind of the reader *red qualia*.

There are differences between (8.1) and (8.2). But before moving on to some of these it should be said that for the reader who understands these questions to be the same question, he or she has not understood the questions *in the correct language*. In particular, it is possible have a *thought about* red qualia elicited by (8.1) *and* to make the mistake of having (only) a *thought about* red qualia elicited by (8.2). That would be a misunderstanding.

(8.2) might be called a *qualation*, the idea being that it is like an equation whose expression involves qualia.

The first thing to say is that, for those of us who understand the language, there are solutions that suggest themselves to question (8.1) that are nevertheless clearly not solutions to question (8.2). These include, but are not limited to, tenets of materialism, physicalism, functionalism, informationism, emergentism, mathematical-realism, etc. This mistake results from the fact that in (8.1) we have only a *thought about* red, so it (experientially) seems like a *thought about* a brain could answer the question. In the correct language (8.2) does not give a *thought about*. There is strictly different information in the questions (8.1) and (8.2). In fact, (8.1) is not a hard problem at all but merely *points to* a hard problem. This is the classic mistake of mistaking the finger pointing to the moon for the moon.

The second thing to say is that the copyright of this paper must insist on actual red to reproduce question (8.2). This is in contrast to all philosophy papers in all philosophy journals to date. This is a consequence of understanding the correct language mentioned above.

The third thing to say is that (8.2) is an example of *a* hard problem, and there are many of them: at least one for each quale.

The fourth thing to say is that (8.2) makes it clear that a solution to this hard problem must include red qualia in the answer, since otherwise there is no way to specify precisely what the solution is a solution *to*. (For example a solution to a hard problem that involves only an abstract (mathematical) class of qualia would not do the job. *That* solution could be given in black ink on white paper/screens.)

The fifth thing to say is that a problem that is not only *referred to* but (supposed to be) *given* in the 3rd-person is not sufficient to *state* a hard problem in the language mentioned above.

The sixth thing to say is to note that many researchers talk about the somewhat artificial taxonomy of 'Western' approaches to consciousness versus 'Eastern' approaches to consciousness. To be frank, aside from cultural differences, you cannot get any more Western than (1) and you cannot get any more Eastern than (8.2).

The seventh thing to say is to give an explanation of how I know I'm not a zombie. The answer is that —in the correct language—the experience of red in (8.2) is *pre-theoretical*. Yes, I can think about (8.2) and spin a theory of its red based on *thoughts about* it. But the *data* does not rely on any such thoughts. The *data* comes before any thought that could be wrong about it. The data comes before any thought that could be wrong about it.

Now, I cannot be sure that you are not a zombie. But that is because my notion of 'you' relies on thoughts constructed in my mind. And *thoughts about* can (generally) always be wrong. This includes thoughts about your behavior and thoughts about my own behavior. Similarly, you can (presumably) be sure you are not a zombie (if you understand the correct language) and yet not be sure that I am not a zombie.

So the question about Mary in the black-and-white room who knows everything there is to know about color and is then released into a colorful world is misstated. It is not whether *she* experiences something new. It is whether *I* experience something new.

9. Appendix 5: How to Answer Hard Problems, if possible

Elsewhere I've given a method for answering hard problem. First, induce a brain process that is correlated to seeing red (for example). Second, note the class(es) of brain processes that are correlated to answering a 'why?' question. Third, induce both the process correlated to seeing (and focusing on) red and a process correlated to answering a 'why?' question simultaneously. If there is an answer, it should then be subjectively forthcoming. (Of course there could be a complication if the 'why?' processes are strictly different for answering a hard problem. But there might not be.)

10. Appendix 6: On the efficaciousness of consciousness

As of this writing, I'm puzzled by something (though perhaps others are not). If subjective experience is irrelevant to evolutionary survival, then it's not clear why a cohesive physical body that operates and survives in a particular environment should be correlated to a cohesive subjective experience when that body operates. It is perfectly possible that a human brain be correlated to an incohesive and, for all intents and purposes, random, subjective experience, as the body would still fulfill the evolutionary requirements for survival and promulgation. Thus 'what it's like' to be a human should make no more sense than 'what it's like' to be a physical system chosen at random.

Is that an argument for the causal efficaciousness of subjective experiences over-and-above their physical correlates? I don't know.

Maybe the immediacy of consciousness has something to do with it. That is, consciousness seems to happen in, and only in, the *present* (of McTaggart's A-series). And it could be this is one place causality surpasses mere mechanical causation, which is plausibly based on the B-series. The generalization to quantum mechanics: collapse happens in and only in the present of a (fragmentalist) reference system (Merriam); probabilistic or collapse behavior could be an opening for where metal causation comes into play (Chalmers); at collapse the (physical) conservation of Energy is violated (Carroll). (In fact, because of the violation of the conservation of energy at collapse, something odd has to be going on with time, as they are related by Noether's theorem.)

Alice’s choice of experimental arrangement of her own free will ‘over here’ can affect the outcome of Bob’s experiment ‘over there’. Free will will mean at least that the state is not a function of states that are only in her past (and future?) light-cone. *Funny how philosophers of consciousness generally assume the ‘causal closure’ of the physical, while philosophers of quantum mechanics generally assume free will, in the above sense, to chose the orientation of an experimental apparatus for a given experiment (given no super-determinism).*

Maybe consciousness is such that it tries to increase its capacity (at collapses), regardless of what physical semi-correlates are doing. Thus, at collapse, the ‘next’ state is not determined only (if at all) by the physical laws governing the previous states, but by the consciousness of the system, which is to be somewhat independent of the physical states/processes and perhaps functions of the brain (which means at least that you can vary one without changing the other in some cases, or at least (or only?) that part of consciousness that has to do with intentionality).