Existence and the big bang[1] Updated 8 21 2021, post-Foundations of Physics submission

Abstract

We start by asking the question of 'why there is something rather than nothing' and change this to the question of 'what are the weakest assumptions for existence' Eagle [1]. Then we give a kind of Fragmental Perspectivalism. Within this Fragmentalist interpretation of quantum mechanics (each quantum mechanical system forms a fragment) Merriam [2], it turns out McTaggart's [3] A-series of time (the A-series is future to the present to the past) has a kind of perspectivalism. We then use McTaggart's A-series and the B-series (the B-series is earlier times to later times) of time to differentiate between *how far in the past* the big bang was vs. *how much earlier than now* the big bang was. In one example model, the former goes infinitely far into the past while the latter stays finitely earlier-than. In this model the number of quantum interactions per unit 4-volume goes up to infinity as the big bang is approached from the present epoch.

1. Without further ado, consider two why-is-there-something-rather-than-nothing questions.

More specifically, the questions (1.1) and (1.2) below are two *different* questions:

1.1 'why is there something rather than nothing?'

1.1.1 we could be asking for logical or temporal or causal (or something else) reasons—take your pick

1.1.2 on one end of a spectrum we have that every logically possible (or, more generally, qualitatively possible) thing exists. On the other end of the spectrum we have that only *this* (indeed solipsistic) universe exists. (Two semantic dimensions.)

1.1.3 (1.1) seems insoluble, but ontic perspectivalism is a possible solution. 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 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. But this is exactly the behavior of the A-series (defined below).

1.2 Arguably, a more germane question is 'what state of affairs requires the fewest (weakest) assumptions?'

1.2.1 is the existence of the *possibility* of some state of affairs *x* a weaker assumption than the assumption that the possibility does not exist? This might be the case because the requirement that there is 'nothing' seems to itself be an assumption.

But again: how do you get something from absolutely nothing? But, again: is absolutely nothing really the state of affairs (so to speak) with the weakest assumptions? At very least this would require an argument.

1 Paul Merriam; unaffiliated; Santa Cruz, CA, USA; pmerriam1@gmail.com

Consider the following problem. Suppose there is absolutely nothing. But then we ask the question: does absolutely nothing require the existence of the *possibility* of absolutely nothing? To restate this, does it require the *existence* of the possibility of absolutely nothing? At first we want to say that absolutely nothing means absolutely nothing and therefore even a possibility does not exist. But if the possibility of absolutely nothing does not exist, then it is impossible for there to be absolutely nothing, and thus something must exist anyway.

So it is not so straight-forward a question what the weakest assumptions are.

1.2.2 if we admit the existence of even a possibility we have a toe-hold on existence and it might be possible to bootstrap from there.

1.2.3 In view of (1.2) an interesting answer to question (1.1) is the classic response: why not?

2. McTaggart (1908) pointed out that two series characterize one dimension of time:

2.1 the A-series (which we'll take to be): future-present-past.

2.2 the B-series: earlier-times to later times.

It is usually supposed that the A-series values change, while the B-series values do not change on time-like worldlines.

In the fragmentalist interpretation of quantum mechanics of (Merriaim 2019) each quantum system forms a fragment, and each fragment has its own distinct A-series. Thus the value of the present (or when the 'now' is) in one fragment implies there is no fact of the matter about the value of the present in another fragment. It will not be necessary to go into all the specific details of this interpretation in this paper.

For each fragment, its A-series is perspectival in the sense of (1.1.3). Thus, each moment of A-series time in an arbitrarily long sequence has a predecessor. But there is no predecessor to the sequence taken *as a whole* (there is no A-series moment after which we have the whole sequence 'all at once'). This avoids the need for an explanation for the whole.

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

3.1 the big bang was infinitely earlier than now and finitely far in the past

and

3.2 the big bang was finitely earlier than now and infinitely far in the past

I would argue case (3.2) is more likely than case (3.1). 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 that such that we are also a billion years before now. (These are empirically indistinguishable only on some models of time.)

In case (3.2) the number of seconds that the big bang is earlier than now remains at 13.8 billion years. But as we go further and further into the past, toward the big bang, we have to go even 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.

See the appendix for the definition of the rate r.

For case (3.2) we have r → 0 sec./e

Quantum systems form distinct fragments. In the Fragmental interpretation of quantum mechanics 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.

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 temperature at the singularity.

4. Conclusion

We give a fragmentalist perspectival possible answer to the question of why there is something rather than nothing. We then noted the A-series is perspectival within each fragment.

This allows us to make sense of the idea that the big bang was 14.8 billion years *earlier* than now but infinitely far in the *past*. From this we conclude that the number of quantum interactions per unit 4-volume goes toward infinity as we go toward the singularity.

5. References

[1] Eagle, David.: Why is there something rather than nothing?. TEDxEmbryRiddlePrescott. https://www.ted.com/talks/david_eagle_why_is_there_something_rather_than_nothing (2017), Accessed 17 August 2021

[2] Merriam, P.: Fragmental Presentism and Quantum Mechanics. PhilPapers, (2021), https://philpapers.org/rec/MERFPA-2

[3] McTaggart, J. M. E.: The Unreality of Time. Mind, 17(68): 457–474, (1908)

6. Appendix: definitions and rates

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

6.1 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

6.2 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

6.3

$r > 1$ 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) dr/de 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(τ, t) and c_1's time be give by T'(τ', t'). General relativity tells us that c_2 runs slower than c_1.

So

6.4 $dt/dt' < 1$ 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,

6.5 $dt/d\tau = 1$ sec./*e*, $dt'/d\tau' = 1$ sec.'/*e*'

which allow one to calculate that

6.6 $dt/d\tau' < 1$ *sec.*/*e*', $dt'/d\tau > 1$ sec.'/*e*

We could try to compute

6.7 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.