More Notes on Time, After "9 Temporal Knowledge Arguments..." 3 13 2022

These are more notes on time, after the paper "9 Temporal Knowledge Arguments… 2 16 2022" [3].

Friends,

1. The arrow of time is not entropic in origin. It's often proposed that the direction of time is given by an increase in entropy. The problem is that humans, and life in general, are correlated to a *decrease* in entropy, so as to accommodate the (continual) addition of memories and abilities. The conclusion is that we should experience time as going *backward* in some sense. But we do not. So the idea that the arrow of time is entropic in origin *has already been falsified*.

2. Superdeterminism is the idea that all correlations in the universe were formed at the Big Bang. But if that were true there would be greater-than-quantum correlations all over the place (both literally and metaphorically). But there are not such correlations (there is a theorem to this effect: the QFT Cluster Decomposition Theorem). So superdeterminism *has already been falsified*.

3. Retrocausality is the idea that current quantum states require information from the future as part of their definition and/or behavior. But if that were true, then the states in the future would have to receive information from states in *their* future. And *those* states would have to receive information from **their** future, and there is an infinite regress. Thus on the retrocausal idea an infinite amount of information from the future would be required to specify a single quantum state in the present. That's not parsimonious.

4. A (probably not novel) model has been proposed wherein ever-later times (in McTaggart's B-series, earlier-times to later-times) 'become' from the future into the present and then into the past (in McTaggart's A-series, future-present-past) [1]. This model accords with experience.

5. The 'moving-spotlight' theory of Presentism is beset with what seem to be insurmountable problems [2]. A more plausible theory is that there is *one* unique, non-relational, and ontologically privileged present moment, through which the B-series 'becomes' from the future into the present and then into the past. (The non-relational nature of the present means that 'a present going up a B-series timeline' is not the same thing as 'a B-series timeline going past the present'.) An update of the state is given by an operator that irreducibly *operates*—i.e. is irreducibly a *verb* [1]. This aligns with the Presentist Fragmentalist interpretation of quantum mechanics, where, it could be that the operator just mentioned is a projection in a certain Hilbert space that is defined in the terms of a given quantum system (or non-anthropocentric 'fragment' of reality) [1].

This solves the problem of retaining the ontological privilege of the present, and the problem of super/hyper times.

6. To begin with, it is consistent with quantum mechanics that the future is not predetermined. It is probable there are multiple futures any one of which could become present.

Exactly the same considerations apply to the past: there are, in general, multiple pasts that are consistent with the present state.

7. The EPR criterion for Reality does not hold here. This is a virtue.

8. *Actual* future states are *possible* present states (as opposed to *actual present* states, etc.). This is reflected in the formalism...

9. There are (generally) multiple futures that are consistent with the present state of a system. So a new definition of entropy can be given—one in which the entropy of a system *decreases* (or, at least, does not increase) as the future states become pruned into the present state. This leads to the possibility of a c*onservation* of AB-entropy. This would go a long way toward solving the Past Hypothesis problem.

10. It is possible to go toward the Big Bang in two semi-independent ways [1]. These are 1. going to *earlier* times, and 2. going to times *further into the past* (in each ontological fragment, which are formed by each quantum system). It has been argued that this leads to an increase in the number of quantum interactions per unit 4-volume as we go into the past [3], [5].

11. In QFT, as I understand it, there is an event e_1, and an event e_2 that is in some sense temporally *later* than e_1, and the probability of a system going from e_1 to e_2 is given by such-and-such sum of would-be classical paths going from e_1 to e_2 (these are not classical paths proper because they sum). This can (probably) be interpreted as e_1 being in a fragment's present, and e_2 also being in the fragment's present, where the *ever-later* paths from e_1 are coordinated with the *ever-earlier* paths from e_2. The particular sum is a function of the requirement of going later *and* going *earlier* along the same path (there are speculative arguments as to why this should be so, but this paper will not give them here now).

12. The only time that you can *demonstrate* an experimental outcome to me is in our mutual present. You can talk about and theorize about future and past times all you want. But all that these *demonstrate* to me is that you can talk and (I would infer) theorize—and that you can do these only in the present. So by Ockham's Razor we should conclude that there is, in fact, only the present, and that our models should therefore reflect this fact. Therefore every scientist should be a presentist.

The trick is to not confuse the *experience of the present* with *ideas* (that are also in the present) *about* future, present, and past times. This is akin to the Buddhist notion of 'enlightenment' and not everyone can perceive this confusion as such. It requires a kind of 'internal technology'. To be honest, it can be said that most physicists have not spent as much time meditating as they have thinking about physics.

The same is true of more conventional qualia. The 'unenlightened' researcher confuses the *experience* of redness (for example) with an *idea about* the experience of redness. In the latter case one is indeed having an experience, but it is the experience of an idea, and not necessarily an experience of what the idea is *about* (though it is also possible to have both, but this case is also different from the experience of only red). The same mistake would be made with ideas about ideas, etc.

This mistake is sometimes expressed as the mistake of mistaking the finger that *points to* the moon for the moon itself, which is a mistake that occurs often in some milieux.

13. There is a well-known similarity between Schrodinger's Equation and the Diffusion Equation, though a direct equivalence also has well-known problems. I think the A-theory given previously (which involves both an A-series and a B-series) makes it worth investigating whether the former equation on *present* (quantum) states is basically the latter equation on *future* states [4].

[1] see the slightly mis-named “Fragmental Presentism and Quantum Mechanics” https://philpapers.org/rec/MERFPA-2 and the earlier slightly mis-named “Perspectival QM and Presentism: a New Paradigm” https://philpapers.org/rec/MERPQA

[2] “An Un-moving Spotlight Theory of Presentism” https://philpapers.org/rec/MERAUS

[3] “9 Temporal Knowledge Arguments and a Note on Presentism 2 17 2022” https://philpapers.org/rec/MERTK

[4] “Philosophical Derivation(?) of the ‘Presentist Fragmentalist’ interpretation of quantum mechanics”, to be posted on PhilPapers soon.

[5] “Toward the Big Bang in McTaggartian Time 3 29 2022”, this will be either published or posted to PhilPapers in the not too distant future.