Motivation and synopsis of the new theory of time

1. The motivation for this theory is in (5). The A-series is the *future/present/past* series and includes *becoming* and is a different series for each different closed physical system, no matter how small. The B-series is the earlier-times to later-times *ordering* for each system.

2. *The mutual quantum observation of two systems with each other happens when and only when their respective A-series become the same A-series*.

This is not an *ad hoc* hypothesis but is the result of a philosophical exploration (see (5) below).

4. In spite of the names and analogies that will be used it is not assumed that Alice or Bob or experimenter E or Schrodinger's Cat, Cat, are macroscopic or conscious (to a human extent). These are all merely stand-in names for any two closed systems.

5. In Dualism there is, for two different systems Alice and Bob, no ontic state that contains specific values of both Alice's qualia and Bob's qualia. This is the philosophical observation that, in Dualism, there is simply *no fact of the matter* as to whether my subjective experience of 'red' is qualitatively the same as your subjective experience of 'red' when we each look at an apple that we each call 'red' [SEP 1]. This is a somewhat common but extremely robust observation. This is a 'perspectival' ontology (see (9)). The A-series of a system is like (or is?) qualia. Thus the crux of this theory is to suppose there is no ontic state that contains specific values of both Alice's A-series and Bob's A-series in a single AB-spacetime (see (6)) until mutual observation.

6. Take, for example, an experimenter, E, and Schrodinger's Cat, Cat. They do not share the same A-series while the experiment is underway (the 'now' of E is not the 'now' of Cat, and the 'becoming' of E is not the 'becoming' of Cat). Therefore during the experiment there is no time at which a contradiction in Cat's ascribed states arises.

7. What might be called McTaggartian spacetime, or AB-spacetime, has the *five* coordinates τ, the position of an event in the future/present/past of a selected system, t, the position of the event with respect to the ordering of earlier-times to later-times (which is relative for space-like separated events), and the three space coordinates x^a. The *four* dimensions of Minkowski space, with its *one* dimension of time, t, is, in the viewpoint of this theory, outright incomplete. Also, Minkowski space from the point of view of our experience is incomplete.

8. The B-series t is coordinatized by seconds, and the A-series τ is coordinatized by a unit of becoming e. (e is not the electric charge in this context.)

9. Later and later times *become* from the selected system's future into its present and then into its past This does not assume the future is fixed.

10. One may envision islands of AB-spacetimes whose interfaces are quantum-mechanical.

11. If Alice's A-series coordinate τ has a definite value then Bob's A-series coordinate τ'' does not have a definite value and *vice versa*. This is the temporal analogy (equivalence?) to qualia in Dualism and is the crux of this theory.

There can be a ‘presentism function’ $p(\tau)$ that can define a non-point-like duration of the present (which might be required by the Planck time anyway). If $p(\tau)$ is non-point-like then, when an experimental outcome happens in a system's present, there is uncertainty about the exact value of τ. In this case the value of τ'' of another system with its own presentism function $p(\tau'')$ need not be completely unrestricted, and we have some kind of uncertainty relation on our hands.

12. One may usefully define rates such as dx/dt, dx/dτ, dt/dτ, etc., where, for example, dx/dτ is the rate of change in position with respect to becoming from future to present to past in the A-series of the selected system, ignoring minus signs, and has units of meters/e.

13. There might be some metric on each island of AB-spacetime (here is just one example) such as (setting aside constants)

$$(\Delta s_{\text{AB-spacetime}})^2 = + \Delta\tau^2 - \Delta t^2 + \Delta x^2 + \Delta y^2 + \Delta z^2$$

At the risk of belaboring a point, is worth reiterating that AB-spacetime has *five* not *four* coordinates.

14. It might be that there is an island of E and an island' of Cat, both from E’s ontological perspective, and analogous islands, island'', island''' both from Cat’s ontological perspective. It requires further study to see if these two islands—from within a chosen perspective—have the same metric signature. But the perspectives would still be comparable only via a quantum theory until mutual observation.

15. The probability $pr(e_{\text{A and B}})$ of the actualization of an event $e_{\text{A and B}}$ when perspectives A an B come together is the probability of the event happening in perspective A, $pr(e_A)$ *and* the probability of that event happening from the perspective of B, $pr(e_B)$. Thus $pr(e_{\text{A and B}}) = pr(e_A) \times pr(e_B)$.

16. The A-series variable τ and the B-series variable t can, depending on the situation, be varied independently. Therefore they *cannot* be the same temporal variable. Therefore any theory that aspires to be complete in some sense must account for both variables in one way or another.

For example, let W = w(t) be a worldline from an event e_1 to a time-like separated event e_2. Then it may be, in a prototypical coordinization, that W *becomes* from the selected system's future, $\tau > 0$, into the system's present, $\tau = 0$, and then into the system's past, $\tau < 0$ (generalizable by a presentism function $p(\tau)$). Let the B-series duration of the propertime of W be [t]. Suppose for the sake of an example that it takes 3 e for the B-series duration to become past the system's A-series present $\tau = 0$. Then the 'rate of time' or 'the rate of the becoming of propertime' $r = dt/d\tau = [t]/3$ in units of seconds/e, ignoring minus signs. It goes without saying that this gets modified with relativistic and other considerations.

On the other hand, suppose there is a time-like worldline W = w(t) from e_3 which is at t = 0 to e_4 which is at t = 14 seconds, so that in the B-series $e_3 < e_4$, such that e_3 is in the selected system's past, $\tau < 0$, and e_4 is in the system's present, $\tau = 0$. Then suppose that after 1 e of A-series time the world line has evolved such that the event e_4 is still in the system's present, but e_4 = 28 seconds later than t = 0. Then the event e_3 is now 28 seconds earlier than e_4, but e_3 is only 1 e further into the system's past. Thus $r = dt/d\tau = 14$ seconds/e, ignoring minus signs.

17. The crux of this theory is (5) and leads directly to (2).

References

[SEP 1] Stanford Encyclopedia of Philosophy, *Inverted Qualia*,
https://plato.stanford.edu/entries/qualia-inverted/