Lunch-to-Dinner in Quantum Mechanics and Relativity

This short informal note gives an Gedankenexperiment, an *M.O.* of the early Einstein. It is not at all meant to be a full-fledged academic paper. The Gedankenexperiment here is one among several that lead to the Presentist Fragmentalist interpretation of QM.

McTaggart's distinction is between the A-series (future/present/past) and the B-series (earlier/simultaneous/later), where the values of the former change and the values of the latter do not. This very distinction actually goes back to the Heraclitus (A-series) – Parmenides (B-series) debate initiated 2,500 years ago. Time has these two series that cannot be reduced to each other..

This note will not survey the many arguments for or against the conclusion that both series are needed and not inter-reducible in the extensive literature in the philosophy of time, but as an aside it will give 3 minor but apparently new arguments in this paragraph.

One argument that they cannot be reduced to each other is that the debate itself has gone on for 2,500 years. If one series were clearly more fundamental than the other this would not have happened.

A second argument is the mini-experimental result that there are *two* temporal parameters required for narrowing the search for finding a video on YouTube. These are "Upload Date," which is the A-series, and "Duration," which is the B-series. If one series were really more fundamental than the other, having just one temporal parameter would surely have been sufficient. We don't see this as an epistemological curiosity but as a very important check on ontology.

A third, but significant, argument is that the several thought experiments, one of which is given starting in the next paragraph, which yield a realist interpretation of quantum mechanics which gives a single account of both manifest time and relativistic time.

Dinner tonight is 6 hours later than lunch today. We are in our present, and this remains the case. But both lunch and dinner are in our future, then (consecutively) in our present, then (consecutively) in our past. The number of hours that dinner is later than lunch does not change as it is a B-series. But the future/present/past status changes 'relative' to' or 'in relation to' our present as it is an A-series.

Where does relativity come in? We will assume that lunch and dinner are in the same place, so they are time-like separated. For time-like separated events their temporal order does not change, but the 'duration' between them might change. So, depending on the (relative) motion of Bob, in his frame of reference our dinner might be 7 hours later than our lunch, or 8 hours later. But the fact remains that dinner is later than lunch, and, importantly, the fact remains that both are in our future, then our present, and then our past. This is also true in Bob's frame of reference. The ordering is a B-series (earlier/simultaneous/later) and the changing state is an A-series (future/present/past).

To a first approximation the time of relativity is a B-series and the time of quantum mechanics is an A-series. (The relativity of simultaneity is handled by the fact that each quantum system has its own A-series which fragments reality.) These two series interrelate in any theory of quantum gravity. This is one important part of the Presentist Fragmentalist interpretation of quantum mechanics. This scenario as well as others can be described by equations but the point here is the conceptual issue.

Now suppose a cat Alice is sleeping on the lunch/dinner table in the whole scenario. The next thing to give an account for would be to suppose it's a Schrodinger's Cat in a box. That would take us outside the bounds of this note.