Mini-symposium on the Nature of Time

Austin College, February 26-27, 2007

Program

The opening technical session will take place in Hoxie Thompson Auditorium in Sherman Hall at 9 a.m. on Monday, February 26. The first talks for the general public will occur in the same auditorium at 11 a.m.

Monday, February 26

9:00 a.m. Hoxie Thompson Auditorium (HT Aud) (technical) Opening remarks by Don Salisbury, Austin College

9:10 a.m. HT Aud (technical) Juan Ferret, University of Texas at El Paso, " Time at the juncture of relativity and quantum physics"

Abstract: Special and general relativity forced us to rethink what constitutes space and time. The adopted notion of *spacetime* generated much debate on how to understand *time*as a fundamental concept in our theories. Some recent proposals for quantum gravity suggest that *time* may be best treated implicitly rather than explicitly. I will assess what happens to the concept of *time* in these types of proposals.

9:40 a. m. HT Aud (technical) Steve Weinstein, University of Waterloo, Canada, "The Dimensionality of time"

Abstract: Many philosophers have concluded that Kant was wrong about space, the form of outer experience - that the space of our experience is not necessarily Euclidean. Be that as it may, one can nevertheless ask whether he was right about time, the form of inner experience. Is time necessarily one-dimensional? If not, does that mean that our bodies, our minds, or both might conceivably be extended in more than one time dimension?

10:10 a.m. HT Aud (technical), A. P. Balachandran, Syracuse University "Spacetime and non-commutative geometry"

10:40 a.m. Coffee

11:00 a.m. HT Aud (public) Welcome by Austin College Vice President for Academic Affairs Michael Imhoff and opening remarks by Juan Ferret

11:10 a.m. HT Aud (public), Wolfgang Rindler, University of Texas at Dallas, "Time and cosmology"

11:35 a.m. HT Aud (public), A. P. Balachandran, Syracuse University "Spacetime and non-commutative geometry"

1:30 p.m. HT Aud (technical), Alexis de Saint-Ours, University of Paris 8, France, "Time, change and spatialization"

Abstract: We will examine and compare different theories of relational time as they appear in special and general relativity but also in canonical approaches to quantum gravity. We will try to show that these different approaches are related to the attempt of representing time without turning it into space.

2:00 p.m. HT Aud (technical), Wolfgang Rindler, University of Texas at Dallas, "Time in Goedel's universe"

3:00 p.m. Wright Campus Center (WWC) 231 (public) Juan Ferret, University of Texas at El Paso, "The nature of entities and time"

Abstract: The physics of the 20th century challenged many common notions, including those of entities and time. After a brief survey of the conceptual changes offered by quantum mechanics and relativity, we will take a look forward to where conceptual and physical investigation of the concepts of 'entities' and 'time' can take us.

3:25 p.m. WWC 231 (public) Alexis de Saint-Ours, University of Paris 8, France, "Time at the Juncture of Physics and Philosophy"
Abstract: We will present a general account of modern and contemporary views of time and conclude with a presentation of how we see interactions between physics and philosophy, especially through the French tradition ofepistemology (Namely Albert Lautman, Gaston Bachelard, Gilbert Simondon and Gilles Châtelet).

3:50 p.m. WWC 231 (public) Steve Weinstein, University of Waterloo, Canada, "Space, time and quantum theory"

Abstract: I will begin by discussing the way in which space and time are conceived in classical physical theories, and then show that this conception paradoxically persists in quantum mechanics. This, I take it, suggests that either quantum theory is not fundamental, or that our conception of classical space and time has been wrong all along.

4:30 p.m. HC Aud (public) Cecile DeWitt-Morette, University of Texas at Austin, "Time, a convenient parameter"

5:00 p.m. HC Aud (public) Don Salisbury, Austin College, "An eternal history of frozen time?"

Abstract: Einstein himself struggled with the significance of time coordinates in his new geometrical theory of gravity, the general theory of relativity. But it was not until progress was made in reformulating the theory such that future prediections could be made from knowledge of the present geometry that many researchers reached the\is shocking conclusion: nothing that can be measured can

vary with time! I will trace some of the history leading to this notion of "frozen time", and indicate how current research suggests a welcome thaw.

7:30 – 9:30 p.m. Buffet dinner in Wright Campus Center. (Dinner price is $15.00. Please indicate on the registration form if you wish to reserve a place.)

Tuesday, February 27

9:00 a.m. HT Aud (technical) Cecile DeWitt-Morette, University of Texas at Austin, "Time, a convenient parameter"

9:30 am HT Aud (technical) Don Salisbury, Austin College, "Time and observables in general relativity"

Abstract: The notion of "frozen time" in the constrained Hamiltonian formulation of general relativity follows from a mistaken identification of time evolution as a symmetry transformation. The correct symmetry group may be applied to construct invariants, i.e., physical quantities that do not change under theaction of this group. The resulting observables do vary with respect to a specially chosen time coordinate. I will show how this program is related to Rovelli's notions of partial and complete observables, and I will suggest a manner in which this time evolution may be implemented in a simple quantum cosmological model. References: Pons, Salisbury and Sheply, "Gauge transofmations in the Lagrangian and Hamiltonian formalisms of generally covariant theories", PRD55, 658 (1997); Pons and Salisbury, "The issue of time in generally covariant theories and the Komar-Bergmann approach to observables in general relativity", PRD71, 12402 (2005); Salisbury and Schmitz, "A generalized Schroedinger equation for loop quantum gravity", gr-qc/0702132 (2007)

10:00 a.m. HT Aud (technical) Discussion

10:45 a.m. Coffee

11:00 a.m. – 12:15 p.m. (public) Panel discussion with A. P. Balachandran, Cecile DeWitt-Morette, Juan Ferret, Wolfgang Rindler, Alexis de Saint Ours, Don Salisbury, and Steve Weinstein

1:30 p.m. HT Aud (public) Dwight Neuenschwander, Southern Nazerene University, "Time does not exist"

2:00 p.m. HT Aud (technical) Sergei Kopeikin, University of Missouri-Columbia, "Causality of the gravity field: experimental testing in the solar system"

Abstract: The general theory of relativity demands that the gravitational field obeys the principle of causality as it does not propagate faster than light. We discuss this principle in the linearized approximation of the general theory of relativity, and demonstrate how it can be tested in ultra-precise, gravitational light-ray deflection experiments conducted in the field of major planets of the solar system.

2:30 p.m. HT Aud (public) Kerri Welch, California Institute of Integral Sudies, "Time and quantum consciousness"

Abstract: Anchored in the theory of quantum consciousness proposed by Roger Penrose and Stuart Hameroff, this discussion will explore the relationships between time, consciousness, quantum mechanics, and relativity