

Book Review: *Time's Arrows and Quantum Measurement*

Time's Arrows and Quantum Measurement. L. S. Schulman, Cambridge University Press, Cambridge, 1997.

In this fascinating book the author presents cogent discussions of many of the fundamentals of modern physics. Thermodynamics, statistical mechanics, quantum mechanics and cosmology are presented and their interrelationships explored from the special point of view of the author. Chapters in the book discuss irreversibility, arrows of time and their correlations, two-time boundary value problems, quantum measurement theory and special quantum mechanical states.

One of the author's theses is that the thermodynamic arrow of time (irreversibility) and the cosmological arrow of time (expansion) are intimately connected and that irreversibility depends on the expansion of the universe. Another is that the mesoscopic and macroscopic properties of materials depends sensitively on the existence of special quantum mechanical states on the molecular level. As the author states: "If even some of the ideas presented here are correct the world is different from what it seems. The major theses of the book, on time's arrows and on quantum measurement theory, are unified by the notion of *cryptic constraints*. We see, sense, specify *macroscopic* states, but what we predict about these states depends on an important assumption concerning their *microscopic* situation." This leads to the expectation that, at the very least, fundamental changes in the foundations of statistical mechanics are necessary.

A mark of the skill of the author in presenting his arguments is that, although I disagree with most of his conclusions, I still enjoyed reading the book and recommend it to researchers in theoretical physics and philosophy of physics.

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