

quantum states, usually predicts that when subatomic particles interact with a measurement device, the apparatus "pointer" will be left in a so-called superposition of states so that there is no *matter of fact* about what the measurement result is. Yet experiments do have definite outcomes: The macroscopic superpositions quantum theory predicts seem never to be observed. To be sure, the Schrödinger equation yields excellent statistical predictions for measurements results. Yet it cannot explain the nondeterministic "collapse" in the quantum state that seems to be required for measurements to have definite outcomes. In *Quantum Mechanics and Experience*, David Albert critiques leading attempts to solve this measurement problem and gives a good overall introduction to the foundations of quantum mechanics. Surprising stories about our psychological experiences arise when he applies these interpretations of quantum mechanics to belief states of sentient observers. Yet Albert's stories seem to be at least as much a product of strong physicalist and reductionist theses as of the interpretations of quantum mechanics he considers.

The focus of the book is introduced with a lucid statement of the measurement problem. But Albert pushes beyond traditional presentations by discussing the belief states of a sentient observer. He argues that the equations of quantum mechanics predict that an observer's brain should be in a superposition of belief states after a measurement, a state in which there is no *matter of fact* about what she believes. Yet this is "at odds with what we know of ourselves by *direct introspection*... and so things are turning out badly." Notice, though, that Albert assumes "that everything in the world always evolves in accordance with the dynamical equations of motion" of quantum mechanics, *pace* the difficulties of precisely how mental states supervene on brain states, which he admits. Also, Albert's reductionism forces interpretations of quantum mechanics to account for something that physical theories are seldom required to explain: namely, the belief states of sentient observers.

This is nowhere more apparent than in his treatment of the Ghirardi-Rimini-Weber (GRW) spontaneous collapse theory. Albert uses a fictional thought experiment to argue that, although an observer can be functionally described as a *knower* of measurement results, the GRW theory predicts that the observer must be in a superposition of belief states and hence cannot *truly* be a *knower*. Albert considers these good reasons to reject not just the GRW theory but *all* collapse theories. But until GRW are given plausible reasons for believing that brains can really generate belief states in accord with Albert's simple quantum mechanical model (involving only a *single* subatomic particle and a hypothetical

Quantum Mechanics and Experience.

David Z. Albert. 206 pp. Harvard University Press, 1992. \$27.95.

The Schrödinger equation, which describes the deterministic evolution of

brain implant!) they are likely to deny the force of the argument.

Albert sympathetically introduces the Bohm theory as one of the best efforts to solve the measurement problem—although again he questions it because of its inability to account for belief states and knowledge claims. But, for Albert, “what’s so cool about this theory” is that it contains nothing ambiguous or unintelligible and “nothing metaphysically novel.” In this theory “the whole universe always evolves *deterministically*” but conspires to appear quantum mechanical. This is just one example of where Albert’s distinctive style leads him to overstate his claim. There are key elements of the Bohm theory—such as its sourceless quantum potential and the contextualism of properties it implies, which Albert himself later emphasizes—without metaphysical counterparts in classical mechanics.

The book closes with a chapter on “self-measurement” that contains even more “interesting surprises” about the unimaginably rich and private mental lives of quantum-mechanical observers. There is also an appendix that attempts to refute modal interpretations of quantum mechanics.

Quantum Mechanics and Experience will appeal mostly to nonspecialists. Albert’s colloquial style makes the introductory chapters less daunting than most other introductions. His use of observables like “hardness” and “color” to represent spin observables is helpful to nonspecialists at the outset. However, it conceals, until much later in the book, that the particular conception of properties, such as “hard” and “soft,” actually depends very much on the interpretation being considered. And for specialists, mock observables like “scrad” and “zap” are distracting because one is constantly wanting to translate lengthy equations involving them into standard spin notation. Although the conflation between the main text and the footnotes (and the numerous parenthetical remarks) is distracting, Albert’s energetic style makes the book a lively and provocative read.—Francisco Flores and Robert Clifton, *Philosophy, University of Western Ontario*