Jeffrey A. Barrett and Peter Byrne, eds. *The Everett Interpretation of Quantum Mechanics: Collected Works 1955-1980 with Commentary*. Princeton University Press 2012. 000 pp. $78.50 USD (Hardcover ISBN 9780691145075).

Hugh Everett, in philosophy and life, was a modern day Spinoza as theoretical physicist. Everett provided a bold interpretation of Quantum Mechanics (QM) that was heretical to mainstream interpretations. He realized early on that his heretical theory would prevent a successful career in academic physics and turned to work in nuclear war strategic planning for the Pentagon before receiving his doctorate in physics.

The two editors have each written excellent introductions and provided clarifying annotations for each of Everett's essays and the correspondence. His only publication in physics was a short synopsis of his dissertation and his dissertation was a shortened version of his original thesis that omitted most of his extensive critique of Quantum orthodoxy. The most important contribution of this collection is that the editors help solve the puzzle of how, in the face of the many interpretations of Everett's interpretation of QM, Everett interprets his own interpretation.

In the sections containing correspondence, the physicists who corresponded with John Archibald Wheeler (Everett's doctoral dissertation mentor and 'promoter') and with Everett about Everett's works only objected to his interpretation—'the theory of the universal wave' and 'the theory of the relative wave'. As Nathan Rosen (famous for his role in the 1935 Einstein-Podolsky-Rosen Paradox or EPR intended as a *reductio ad adsurdum* of QM) is quoted to have said in the record of a conference (in 1962) about Everett's work: 'It's not a question of mathematics...but rather a question of interpretation' (271). Mainstream physicists had trouble understanding Everett. Bryce DeWitt, a mathematical physicist who became not only sympathetic to Everett's work, but also developed his own, now dominant interpretation of Everett's work as the Many-Worlds Theory around 1970, in a letter of 1957 says that 'the professional philosopher will have a greater appreciation of Everett's work than the average physicist' (242). In Everett's response to DeWitt, Everett outlines the fallibilist philosophy of physics that guided his work, and in particular, his epistemology: 'There can be no question of which theory is "true" or "real"—the best that one can do is to reject those theories which are *not* isomorphic to sense experience' (253). Furthermore, Everett goes on to say, 'one accepts or rejects on the basis of whether or not the *experience which is predicted by the theory* is in accord with actual experience' (253-4). 'Predicted experience' is experience corrected by theory and 'actual experience' is experience correcting theory—in a cybernetic feed-back loop.

There are various tacks a philosopher can take on approaching this book. One can, as the editors do, look at how Everett develops his theory in opposition to the dominant interpretations of QM in his day—for instance the Copenhagen interpretation of Niels Bohr. Also, as the editors do, one can look at how Everett approaches the problem of measurement in QM that arises with the use of the theory proposed by Paul Dirac and John von Neuman of the collapse or reduction of the wave packet upon measuring or observing quantum phenomena. Another approach that the editors take is to look at how Everett deals with the various famous paradoxes in QM, such as Schroedinger's live-dead cat, Wigner's Friend who only exists when an observer records his friend observing Schroedinger's cat, wave-particle duality where a quantum phenomenon becomes a wave or a particle depending on the apparatus the observer is using for measurement, and EPR (or what Einstein is widely quoted to have called 'spooky action at a distance'). I want to do something a little

different here and discuss how Everett's interpretation of QM can apply to the metaphysical problems about the nature of nature or existence, and the place of mind in nature.

Everett proposes a theory of the universe as static where mind or observers are relative aspects of the static universe. I want to use the following quotation taken from the long version of Everett's thesis that is published in this book, as a proof-text: 'One is thus free to build a conceptual model of the universe, which postulates only the existence of a universal wave function which obeys a linear wave equation. One then investigates the internal correlations in this wave function with the aim of deducing the laws of physics… For example, the classical mechanics of a system of massive particles becomes a law which expresses the correlation between the positions and momenta (approximate) of the particles at one time with those at another time. All statements about subsystems then become *relative* statements' (158). How do observers fit into this monistic universe of the Universal Wave? Observers, Everett postulates, 'can be conceived as automatically functioning machines (servomechanisms) possessing recording devices (memory) and which are capable of responding to their environment. The behavior of these observers shall always be treated within the framework of wave mechanics' (77). So, what exactly is Everett proposing about the universe, how observers fit into it, and also what observers do to it by observing it?

Everett proposes a Spinoza-type static universe where the Observer functions in the Quantum System and not outside the system. Everett proposes the Theory of the Relative Wave to account for the role of the Observer in QM. Observation is a physical process, an information and cybernetic process, within the Quantum System, and only relative to the Quantum System. How did Everett come to do this viewpoint?

Everett, as the editors discuss, was highly influenced by information theory, game theory, and cybernetics. Actually, even before he became involved with physics, he made an important contribution to the theory of recursive games. For Everett, the Observer is not outside the physical system as assumed in both classical and QM physics, but is part of the physical system as a type of servo-mechanism in a recursive feed-back loop. The recursive feed-back loop as part of an overall physical system is only a 'slice' or 'branch' (using Everett's own terminology) of the Universal Wave Function. Moreover, an observer has multiple existences by existing in each of the infinite slices branching off the singular wave function relative to the infinite observations that each observer can make on the Universal Wave. This theory of the role of the Observer branching into 'slices' counters both classical physics and mainstream QM. As compared to classical physics where the Observer can be interpreted as an external passive recording system of the effects of the laws of nature, in Everett's viewpoint, the Observer must be part of the physical system to be able to record the effects of the laws of nature. In standard QM, the Observer exists outside QM, is part of a universe completely described by classical physics, and creates the quantum physical system by recording it. However, in Everett's theory, Observers do not create physical systems including other Observers when taking their measurements, but only take their measurements internal to physical systems that are relative to the entire Universe as a single state or Universal Wave.

On this interpretation of Everett, where the Observer is a recursive feed-back loop within quantum systems relative to the Universal Wave Function, there is only one reality—the Universal Wave Function. Observers and their observations are wave functions relative to the singular wave. Consequently, all forms of existence can be explained as part of information and cybernetic systems. To be is not to be perceived, as in standard QM, but rather to be is to be a subsystem of the single

state universal wave function; and to be a mind is to be a recursive cybernetic feed-back loop as part of a system relative to the single state Universe.

In sum: Spinoza's metaphysics has returned in the work of Hugh Everett as physics—as a complete and consistent interpretation of QM that resolves the traditional puzzles of the standard interpretation.

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