

A quantum leap forward?

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Jeff Barrett, with an original Hugh Everett III paper in hand, is embarking on an adventure to better understand quantum mechanics theory involving concepts such as parallel universes. Photo by Daniel A. Anderson

The dusty boxes that line the walls of Jeff Barrett's UC Irvine office mark a high point in his academic career. Their contents: pages and pages of notes, most more than 50 years old, penned by late quantum theorist Hugh Everett III.

With \$160,000 from the National Science Foundation, Barrett and colleagues are combing through, scanning and preserving documents they hope will shed light on how to understand measurement as a consistent physical process in quantum mechanics - one of physics' most debated puzzles that Everett believed he had solved as a graduate student.

"Everett liked to debunk commonly held beliefs," said Barrett, logic &

philosophy of science professor and author of *The Quantum Mechanics of Minds and Worlds*, a book about Everett's work. "He often was the first to say, 'It can't work like that,' and then he'd try to provide evidence showing he was right."

Everett developed a new way of thinking about quantum mechanics, which explains the behavior of physical objects - the stability of matter, the nature of fundamental particles like electrons and photons, and the function of devices such as personal computers and laser pointers.

Standard quantum mechanics has two rules about how physical objects change over time: one for when an object is observed or measured and a second for all other times. Everett believed the second rule applied to all physical processes, including observation and measurement.

Eschewing the first rule would mean the physical universe is constantly evolving into many parallel, also-splitting universes, each containing copies of every observer and object. Everett's "many-worlds" theory attracted some attention when first published, in 1957, but didn't gain wide popularity until the mid-1970s.

Everett died in 1982, and his son, Mark - lead singer and songwriter of the indie-rock band Eels - inherited documents related to his scientific work.

In 2007, to honor the 50th anniversary of Everett's theory, *Scientific American* commissioned journalist Peter Byrne to write Everett's biography. Byrne contacted Mark Everett and found a treasure trove - everything from notes on the theorist's days as a college student to personal commentaries on other physicists' interpretations of his work.

Byrne asked UCI's Barrett to help make sense of the more technical documents.

"Most physicists today would agree with Everett's basic proposal, but exactly how it works has never been clear," Barrett said. "Significant disagreement remains about how Everett's interpretation of quantum mechanics should itself be interpreted."

Sifting through the physicist's notes, he says, is "a once-in-a-lifetime chance to read something I care very much about but never knew existed." Adds Barrett: "Everett's reflections on [quantum mechanics](#) almost certainly will help us better understand his theory and develop options for addressing the quantum measurement problem."

UCI plans to make the documents available online. They will become part of the American Institute of Physics' archive on Everett. Typescripts of the most important work, together with introductory essays and interpretative notes by Byrne and Barrett, are scheduled to be published by Princeton University Press in the 2010-11 academic year.

Source: University of California - Irvine

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