Quantum Mysticism: Gone but Not Forgotten

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Some of the physicists who made early contributions to quantum mechanics (left to right, top row first): Neils Bohr, Albert Einstein, Max Planck, Wolfgang Pauli, Werner Heisenberg [Credit: Deutsches Bundesarchiv (German Federal Archive), Bild183-R57262], and Erwin Schrödinger.

Does mysticism have a place in quantum mechanics today, or is the idea that the mind plays a role in creating reality best left to philosophical meditations? Harvard historian Juan Miguel Marin argues the former - not because physicists today should account for consciousness in their research, but because knowing the early history of the philosophical ideas in quantum mechanics is essential for understanding the theory on a fundamental level.

In a recent paper published in the European Journal of Physics, Marin has written a short history, based on a longer analysis, of the mysticism controversy in the early quantum physics community. As Marin emphasizes, the controversy began in Germany in the 1920s among physicists in reaction to the new theory of quantum mechanics, but was much different than debates on similar issues today. At the turn of the last century, science and religion were not divided as they are today, and some scientists of the time were particularly inspired by Eastern mysticism. In his analysis, Marin lays out each player's role and perspective in the controversy, and argues that studying the original interpretations of quantum mechanics can help scientists better understand the theory, and could also be important for the public in general.

"Becoming aware of this subject would help general audiences realize that there are many other alternatives besides the ones offered by the disjunction between science and religion," Marin told PhysOrg.com. "Science vs. religion is a very recent forced choice that the founders of quantum mechanics would have never recognized, much less accepted."

Mind Matters

The controversy boils down to the age-old question of the nature of reality. As Einstein (a firm realist) once asked, does the moon exist only when looked at? Although such a viewpoint seems unlikely in our everyday lives, in quantum mechanics, physicists' observations can sometimes affect what they're observing on a quantum scale. As the famous Copenhagen interpretation of quantum mechanics argues, we cannot speak about an objective reality other than that which is revealed through measurement and observation.

As Marin explains, the debate of consciousness in quantum theory began around 1927 when Einstein accused Neils Bohr of introducing a

mysticism incompatible with science. Bohr denied the accusation and blamed it on Einstein misunderstanding him when he said that humans are both actors and observers in the world. Yet while Bohr believed that quantum processes occurred without the need for observers, he also sympathized with the idea that an extension of quantum theory might help in understanding consciousness.

Einstein, for his part, adamantly opposed any subjectivity in science. He disagreed with Bohr's view that it is unscientific to inquire whether or not Schrödinger's cat in a box is alive or dead before an observation is made. Einstein devoted much of his later life to searching for elements of reality to make quantum mechanics a theory based on realism. For instance, the EPR paradox (Einstein-Podolsky-Rosen paradox) thought experiment in 1935 attempted to restore realism and causality to the theory.

On the other hand, Wolfgang Pauli truly did harbor some of the views that Einstein accused Bohr of. Pauli favored a hypothesis of "lucid mysticism," a synthesis between rationality and religion. He speculated that quantum theory could unify the psychological/scientific and philosophical/mystical approaches to consciousness. Pauli's perspective was influenced by the philosopher Arthur Schopenhauer, whose views on reality were in turn influenced by Eastern religions.

Still other physicists had different views. Marin argues that Max Planck, an adherent of Christianity, framed the controversy as the objectivity of science and Christianity against the mysticism of Schopenhauer and his popularization of Buddhism and Hinduism. Planck considered religion (Christianity) and science compatible based on his opinion that they are both based on objectivity but refer to distinct facets of reality. Meanwhile, Paul Dirac rejected any kind of religious vocabulary, arguing that "religion is a jumble of false assertions with no basis in reality."

The mysticism controversy also expanded into the public realm, starting in 1929 with first astrophysicist Arthur Eddington's popular book The Nature of the Physical World. Although the book distorted many concepts, his defense of mysticism caught the attention of the international media. (Eddington was most famous for confirming Einstein's theory of relativity by measuring an eclipse, which catapulted Einstein into fame.)

In the next few years Werner Heisenberg and Erwin Schrödinger leaned toward the side of mysticism, irritating Einstein and Planck. For others, the choice was not clear cut. Marin argues that the mathematician John Von Neumann intentionally used ambiguous terms when discussing the philosophy of quantum equations, meaning he could fit on either side. "He was a genius at linguistic innovation and came up with German terms that could support many different interpretations," Marin said.

In 1958, Schrödinger, inspired by Schopenhauer from youth, published his lectures Mind and Matter. Here he argued that there is a difference between measuring instruments and human observation: a thermometer's registration cannot be considered an act of observation, as it contains no meaning in itself. Thus, consciousness is needed to make physical reality meaningful. As Schrödinger concluded, "Some of you, I am sure, will call this mysticism. So with all due acknowledgement to the fact that physical theory is at all times relative, in that it depends on certain basic assumptions, we may, or so I believe, assert that physical theory in its present stage strongly suggests the indestructibility of Mind by Time."

Cultural Reflections

As Marin notes, Schrödinger's lectures mark the last of a generation that lived with the mysticism controversy. As Marin explains, quantum mechanics up to World War II existed in a predominantly German context, and this culture helped to form the mystical zeitgeist of the

time. The controversy died in the second half of the century, when the physics culture switched to Anglo-American. Most contemporary physicists are, like Einstein, realists, and do not believe that consciousness has a role in quantum theory. The dominant modern view is that an observation does not cause an atom to exist in the observed position, but that the observer finds the location of that atom.

As Marin has shown, the mysticism controversy in quantum mechanics did not involve just a few physicists and mystics (as it seems to today), but at one time it attracted the physics community at large. Some of the ideas have since resurfaced, such as in Eugene Wigner's 1961 paper on the subject, which inspired popular books such as The Tao of Physics and The Dancing Wu Li Masters, which seek to connect quantum physics to Eastern mysticism for a new generation, along with the recent film What the Bleep Do We Know?

"But here it was scientists vs. non-scientists," Marin explained. "Today it is seen as science vs. religion, but at the time of the foundation of quantum mechanics it was not. There were religious physicists on both sides of the controversy. Most of the important physicists held what we could call today religious beliefs, whether Western or Eastern. When we speak today of the 'two cultures,' sciences and humanities, we are referring to the famous early '50s lecture by C.P. Snow, in Britain, lamenting the division. German thinkers of the previous decades were barely into that phase of discipline specialization. At the turn of the century, mathematics and physics were still distinguishing themselves from the 'natural philosophy' that gave birth to them."

Marin hopes that scientists today might gain a new perspective on their research by considering how the founders of quantum mechanics viewed the theory.

"Whenever I read scientific articles citing the classic equations

conceived by German scientists, it seems to me they could have been improved by researching how the scientists themselves interpreted their own equations," Marin said. "Among contemporary quantum field theories, the important gauge theories are indebted to the work of [Hermann] Weyl and Pauli. Yet many physicists today would be shocked if they learned how Weyl and Pauli understood the concept 'field' when they wrote their classic articles. They were both immersed in mysticism, searching for a way to unify mind and physics. Weyl published a lecture where he concluded by favoring the Christian-mathematical mysticism of Nicholas of Cusa. Moreover, Pauli's published article on Kepler presents him as part of the Western mystical tradition I study.

"For those who do not favor the Copenhagen interpretation and prefer the alternative proposed by David Bohm, I would suggest reading Bohm's many published dialogues on the topic of Eastern mysticism," he added. "Eddington and Schrödinger, like many today, joined forces to find a quantum gravity theory. Did their shared mysticism have a role to play in whatever insights they gained or mistakes they made? I do not know, but I think it's important to find out."

More information: Juan Miguel Marin. "'Mysticism' in quantum mechanics: the forgotten controversy." European Journal of Physics. 30 (2009) 807-822.