An Expanded Introduction to QBism:

A Deep Dive into Quantum Bayesianism

Dr. Sanjay Basu

QBism, short for Quantum Bayesianism, is one of the latest and most promising interpretations of the meaning of quantum theory. Still in development, Dr. Sanjay Basu has found that QBism elegantly answers some of the most perplexing paradoxes left unanswered by competing theories such as the Copenhagen Interpretation devised by Niels Bohr and Werner Heisenburg, and the many worlds interpretation by Hugh Everett.

These paradoxes include the dilemma of Schrodinger's cat (Is the cat in a superposition of being alive and dead before an observation?), Wigner's friend (Does measurement create an objective reality for everyone?), and entanglement (Is there some yet unknown variable that communicates between particles as Einstein suggested in his EPR thought experiment?).

As for the EPR paradox, Basu says that no action at a distance is required when measuring separated correlated particles. Each separate measurement is independent and local and the correlation between particles is a result of what standard quantum theory predicts.

As for Wigner's friend and the Schrodinger's Cat paradoxes, the dilemma arises because of the mistaken assumption that the collapse of the wave function is something physical, when in fact, it is only the collapse of our uncertainty. "The measurement problem disappears," says Basu, "when we recognize that measurement is action, not passive observation, and that outcomes are experience, not revelations of preexisting facts."

Basu recognizes that QBism has shortcomings. For example, the problem with the Copenhagen interpretation is that it is unclear exactly what constitutes a measurement. Does the measuring device have to be a macro-object? Does the measurement require a conscious observer? Similarly, QBism says that the measurement requires an "agent", but leaves open the question as to what constitutes an agent. Both interpretations are equally problematic on this issue. In addition, if measurement is an individual experience, it doesn't explain why we all share virtually the same reality, unless Qbists believe that consciousness is fundamental and that we, our brains, tune into a reality existing behind our illusory perception of reality.

If the reader will excuse this personal interpretation, the agent could depend upon an organism, such as a human, that has both an *aware conscious* mind and a *self-aware conscious* mind (having awareness that we are aware.) In this case, our aware conscious projects what we naively believe to be objective reality. The collapse happens when our self-aware conscious perceives the projection created by our aware conscious. The collapse is not physical therefore, as QBism attests, but a shift from our aware conscious minds to our self-aware conscious minds.

Basu has become fascinated with the parallels between the tenants of QBism and Buddhist philosophy in that both disciplines deny that things have inherent existence independent of observation (an experimental fact winning three researchers: Anton Zeilinger, Alan Aspect, and John Clauser the 2022 Nobel prize in physics), what Buddhist call the theory of emptiness. Carlo Rovelli, who developed a similar theory to QBism, called *relational quantum mechanics* says: "One of the central ideas is that objects do not exist by themselves; they exist only because they interact with something else."

QBism is certainly a new and exciting interpretation of the meaning of quantum theory and Dr. Sanjay Basu does an excellent job illuminating its strength and weaknesses.