Review of: "A Phenomenological Approach to Quantum Mechanics"

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Review of the paper "A phenomenological approach to quantum mechanics, by George Williams" Review byHarish Parthasarathy, ECE division, NSUT, N.Delhi, India. The central problem in quantum mechanics as it stands today is the problem of probabilities associated with a measurement on the quantum state. When the states of two observers are entangled, the measurement by the first observer of his state causes state collapse and hence affects the measurement outcome of the second observer on his state. Secondly, with every measurement, is associated a probability distribution on the space of his outcomes. This is the classical Born interpretation of the wave function, ie, the wave function of several particles lives in a very large dimensional Hilbert space and each Hilbert space itself has an infinite number of degrees of freedom. This leads to a probability distribution of the measurement outcome having a large number of degrees of freedom; however, despite this apparent randomness in the outcomes, there is a certain order, the probability distribution becomes nearly degenerate when the number of particles is very large and gets assembled into an object of classical size. This is also manifest by Feynman's path integral approach to quantum mechanics; namely, when the size of the object becomes macroscopic so that the action functional is much greater than Planck's constant, then rapid cancellations of the phase occurs, causing thereby the trajectory of the object to be within a very small neighbourhood of the classical trajectory predicted by the Euler-Lagrange equations. This order on macroscopic objects in the physical world makes us tend to believe that there is no consciousness or awareness or life in the physical world of objects around us. However, at the microscopic scale, many significant phenomena take place like Heisenberg uncertainty, which prevents two observers from jointly communicating the results of their measurements (In mathematical language, non-commutativity of two observables prevents one from assigning a joint probability distribution on the space of joint outcomes of measuring the two observables in a given state). All this compels us in some sense to believe that there must be an underlying consciousness in the physical universe that forces us not to observe many finer aspects of it, induces randomness in our measurements, but induces randomness in a sufficiently ordered manner. The very idea that two observers are prevented from communicating the results of their experiments to each other means that some conscious entity in the physical world is causing this to happen. Hidden variable theories that attempt to embed the Hilbert space of quantum mechanics along with the events described by the lattice of orthogonal projections in the Hilbert space and a density matrix that determines the probability of the events in accord with Gleason's theorem in a larger classical probability space wherein the results of quantum measurement of several non-commuting observables can be explained have failed owing to the inequalities of John Bell, and that is the reason why the author has proposed the existence of a conscious entity in this universe who is causing this to happen. Randomness in quantum mechanics apparently puts us in

a position to believe in the idea of free will; however, this is an ordered form of randomess, ie, the probability distribution of the outcomes of measurement of an observable is degtermined by the state/wave function, and further, this randomness in the outcome is followed by a state collapse so that the new state is determined by the original state and the outcome that the observer chooses to measure. So a part of the randomness in quantum mechanics is determined by an invisible conscious entity, and a part by the observer himself. The question is, does the physical world exist independent of the observer? The author's contention is yes, indeed, that the physical world is controlled by a conscious entity or awareness and this entity prevents the observer from gaining exact information about our universe via measurements. A nice support of this statement is provided in string theory, wherein the world is twentysix or ten dimensional and that we are able to observe only a four-dimensional space-time projection of it via our senses. The remaining compactified dimensions are unobservable, but they nevertheless influence our four-dimensional physics. The unobservable dimensions are controlled by a conscious entity, and we have to develop our extrasensory perceptions to perceive these extra dimensions. In Hindu philosophy, this extrasensory perception is developed by love for God or the path of Bhakti yoga, ie, unalloyed devotional service to the lord. This path is also present in all the other religions of the world in various other forms. The fact that if the states of two observers located at a considerable distance from each other are independent so that the overall state is a tensor product of these two states, then after joint unitary evolution, they become entangled and that enables the possibility of each observer obtaining information about the other person's state by local measurement alone and that too instantaneously (action at a distance) in according to the EPR theory forces us to believe that a cosmic consciousness pervades the entire universe and keeps a track of all the observers. I think, therefore, that this paper is well formulated and shall prove to be a landmark in our understanding of quantum mechanics and the nature and origin of life, a question that has hitherto been very elusive to the physicist.