Abstract Submitted
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Many worlds and the appearance of probability in quantum mechanics ROBERT A. VAN WESEP — The theory of measurement has posed a conceptual problem since the beginning of quantum mechanics (QM). One the one hand, the quantum theory of interacting systems says that when a system $\mathcal{O}$ measures the value of a quantity A associated with a system $\mathcal{S}$, the state of the compound system $\mathcal{SO}$ following the measurement is a superposition of pure product states, one for each eigenvalue of A. On the other hand, one's subjective experience (as the observer $\mathcal{O}$) is that this statevector "collapses" nondeterministically to a pure state with probability given by the Born rule. The *Copenhagen interpretation* (CI) says that this collapse actually occurs. The *many-worlds view* (MW) is that it doesn't. The defects of CI are obvious: there is no way to say which interactions are measurements to which the interpretation applies, and there is no way to describe the process of collapse that it calls for. MW, on the other hand, does not seem able to incorporate the Born rule. If this were true, it would rule out MW as a description of reality. We show that it is not true, in the strongest possible way: the Born rule is actually a derivable consequence of the quantum theory of measurement *as long as we accept the theory as is*, i..e, as long as we accept MW[1]. The proof uses the strong law of large numbers, which is the link between the abstract notion of probability and the concrete properties of sequences of observations.
[1] R.A. Van Wesep, Ann. Phys. 321 (10) (2006) 2438–2452.

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