

On the nature of continuous physical quantities in classical and quantum mechanics

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Abstract

Within the traditional Hilbert space formalism of quantum mechanics, it is not possible to describe a particle as possessing, simultaneously, a sharp position value and a sharp momentum value. Is it possible, though, to describe a particle as possessing just a sharp position value (or just a sharp momentum value)? Some, such as Paul Teller, have thought that the answer to this question is No -- that the status of individual continuous quantities is very different in quantum mechanics than in classical mechanics. On the contrary, I shall show that the same subtle issues arise with respect to continuous quantities in classical and quantum mechanics; and that it is, after all, possible to describe a particle as possessing a sharp position value without altering the standard formalism of quantum mechanics.

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