

Seminar Notice

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Theoretical Physics Department

Title:	Weak Measurements, Quantum State Collapse and the Born Rule
Speaker:	Apoorva Patel, I.I.Sc., Bangalore
Date:	October 14, 2016 (Friday)
Time:	03:00 p.m.
Venue:	Theoretical Physics Seminar Room (R/No.-C406), 3rd Floor, Centenary Building, IACS
Abstract:	<p>Projective measurement is used as a fundamental axiom in quantum mechanics, even though it is discontinuous and cannot predict which measured operator eigenstate will be observed in which experimental run. The probabilistic Born rule gives it an ensemble interpretation, predicting proportions of various outcomes over many experimental runs. Understanding gradual weak measurements requires replacing this scenario with a dynamical evolution equation for the collapse of the quantum state in individual experimental runs. We revisit the quantum trajectory framework that models quantum measurement as a continuous nonlinear stochastic process. We investigate the restrictions needed on the ensemble of quantum trajectories so as to reproduce projective measurement in the appropriate limit. We can describe the ensemble of quantum trajectories as white noise fluctuations on top of geodesics that attract the quantum state towards the measured operator eigenstates. The Born rule is reproduced when the magnitudes of the noise and the attraction are precisely related, in a manner reminiscent of the fluctuation-dissipation theorem. That implies that the noise and the attraction have a common origin in the system-apparatus measurement interaction. Moreover, the ensemble distribution of quantum trajectories is completely determined in terms of a single evolution parameter, which can be tested in weak measurement experiments.</p>

All are cordially invited to attend the seminar