

# Stochastic Mechanics and the Unification of Quantum Mechanics with Brownian Motion

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## Abstract

We unify Brownian motion and quantum mechanics in a single mathematical framework. In particular, we show that non-relativistic quantum mechanics of a single spinless particle on a flat space can be described by a Wiener process that is rotated in the complex plane. We then extend this theory to relativistic stochastic theories on manifolds using the framework of second order geometry. As a byproduct, our results show that a consistent path integral based formulation of a quantum theory on a Lorentzian (Riemannian) manifold requires an Itô deformation of the Poincaré (Galilean) symmetry, arising due to the coupling of the quadratic variation to the affine connection.

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# Stochastic Problems In Mechanics

**Yan Bai**



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## Unveiling the Energy of Verbal Artistry: An Psychological Sojourn through **Stochastic Problems In Mechanics**

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