Quantum Measurement: Theory and Practice

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This talk will give a selective overview of the advances in the field of quantum measurement theory over the past two decades. I will present selected material from our newly published book on quantum measurement, coauthored with Irfan Siddiqi [1]. Topics covered include weak measurements, quantum measurement reversal, quantum trajectories and the stochastic path integral formalism. The theory and practice of quantum measurement will be discussed, including how to build quantum-limited amplifiers, fundamental noise limits imposed on measurement by quantum mechanics, and the design of superconducting circuits. I will conclude with a reflection on where the field is going and what lessons we should take away about what quantum physics is telling us about the external world and our role as observers.

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[1] A. N. Jordan and I. A. Siddiqi, *Quantum Measurement: Theory and Practice* (Cambridge University Press, 2024).