

**COLLOQUIUM
OF
THE INSTITUTE FOR QUANTUM INFORMATION SCIENCE**

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Bio: Howard Wiseman is a theoretical physicist. He did his B.Sc. (1991) and Ph.D. (1994) at the University of Queensland, followed by a post-doc at the University of Auckland. Since then he has held fellowships from the Australian Research Council, being currently Federation Fellow and Professor at Griffith University in Brisbane. His principle research areas are quantum feedback control, quantum information, and fundamental questions in quantum mechanics.

Title: Einstein, the EPR argument, and Steering: New Perspectives from Quantum Information

Abstract: It is not always appreciated that, in the EPR paper of 1935, Einstein's point of attack on the Copenhagen interpretation (CI) was its nonlocality. That the CI was incomplete was the conclusion of EPR, not their starting point. In the same year, Schrödinger also pointed out the nonlocality that arises in the CI, and he called it steering. Unlike Einstein, he drew the conclusion that quantum mechanics itself was probably wrong. In this work, we revisit these old arguments in the light of quantum information. We formalize Schrödinger's concept of steering, showing that it is a form of quantum nonlocality that is logically weaker than Bell-nonlocality but logically stronger than non-separability. For pure states, these concepts coincide. But for mixed states we present strong evidence that steering is practically (not just logically) distinct from both Bell-nonlocality and non-separability.

