

UMW Colloquium Announcement
Department of Mathematics

'Spooky Action at a Distance': The Mathematics of Quantum Entanglement and its Applications

Presented by

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Abstract: In 1935, Einstein coauthored a paper with Podolsky and Rosen in which he introduced what came to be known as the "EPR paradox." In this paper, the authors showed that the mathematics of quantum mechanics allowed for the existence of two distinct quantum particles that were so heavily influenced by each other, that changes made to one particle would affect the other, *even if the other particle was on the other side of the planet!* This "spooky action at a distance," as Einstein called it, was considered by the authors to be a paradox, and was used to argue that the mathematical description of quantum mechanics was incorrect. Since then, many experiments have shown that, on the contrary, quantum mechanics does indeed exhibit this "spooky" property, which is now called quantum entanglement. This talk will, by way of a simple example, go through the mathematics of entanglement, and show how it can be used in an even spookier way - to teleport quantum states. The fact that such sci-fi sounding properties are possible (and have been successfully demonstrated) has revolutionary implications to communication and cryptography. This talk is aimed at a mathematical audience, and no prior background in quantum mechanics is assumed.

