

Quantum Entanglement: A Comprehensive and In-Depth Study of Theory, Experiments, Methodology, and Applications

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Abstract: *Quantum Entanglement-one of the weirdest and most exciting aspects of quantum mechanics. Two or more particles become entangled in a way that if the state of one of the particles is measured, then instantaneously the state of another particle is determined even if they are far apart from one another. The content of this paper explores the details of quantum entanglement: where it came from, what the basic principles are, what experiments support this notion, and what experiments we use to study entanglement. The trends of the data are laid out and what it signifies. From here, I then move to what effects quantum entanglement will have on quantum computing, cryptography and communication. I will attempt to justify my arguments through thirteen published academic sources prior to 2019.*

Keywords: Quantum Entanglement, Non-locality, Bell's Inequality, Quantum Information, Quantum Computing, Quantum Cryptography, Decoherence, Wave Function