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### Entanglement and Distinguishability of Quantum States

The most profound physical consequence of entanglement is non-locality. We will show that entanglement is also physically related with the distinguishability of quantum states. Suppose that Alice gives to Bob two states without saying if they are identical or just shifted by a unitary transformation. Can Bob decide, with a finite number of measurements, if the two states are different?

Quantum mechanics can give a different answer to this problem if the states are entangled or not. The basic reason is that entangled states can evolve faster, and therefore become more distinguishable, under unitary transformations than separable states. This has important implications for quantum technologies, ranging from ultra-precise interferometric phase estimations to the creation of quantum Zeno dynamics and decoherence control.

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