

Bell's theorem, entanglement, quantum teleportation and all that

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One of the most surprising aspects of quantum mechanics is that under certain circumstances it does not allow individual physical systems, even when isolated, to possess properties in their own right. This feature, first clearly appreciated by John Bell in 1964, has in the last three decades been tested experimentally and found (in most people's opinion) to be spectacularly confirmed. More recently, it has been realized that it permits various operations which are classically impossible, such as "teleportation" and secure-in-principle cryptography. This talk is a very basic introduction to the subject, which requires only elementary quantum mechanics; it is primarily aimed at senior undergraduates or beginning graduate students, but has on occasion been given with apparent success as a departmental colloquium.