

'Trust me, I'm a physicist' – the weird world of quantum entanglement

February 3 2006



Sir Peter (on the stage) and Rector Sir Richard Sykes demonstrate the consequences of entanglement

Declaring that it is always useful to start a lecture with a literary quote, Professor Sir Peter Knight began his on quantum entanglement with the statement: "Let's just say we want to avoid any Imperial entanglements."

After identifying his inspiration as *Star Wars Episode IV - A New Hope*, Sir Peter, Head of the Faculty of Natural Sciences at Imperial College London, went on to explain how quantum entanglement has divided scientists and transformed our understanding of the natural world.

Its discoverer, the physicist Erwin Schrodinger, defined entanglement as

the process of two systems entering into temporary physical interaction and separating after a period of mutual influence. Following this process, he said, they can no longer be described in the same way as before.

This discovery sent waves through the scientific world and in 1927 a group of physicists, including Schrodinger and Marie Curie, gathered to debate the implications. Showing recently discovered film footage of that meeting, dubbed the Solvay Conference, Sir Peter drew his audience's attention to the appearance of the attendees, and asked: "Why were they looking so grim when they left, compared to when they started?"

The cause, he explained, was the real worry caused by this new theory's introduction of randomness to quantum physics. The idea that an electron might have the free-will to choose how and when to move even drove Albert Einstein to write in a letter to fellow physicist Max Born: "In that case I would rather be a cobbler, or even an employee in a gaming-house, than a physicist."

Schrodinger's response was that it is no more possible to experiment with single particles than it is to raise ichthyosauri in the zoo. Sir Peter adds, however: "In my game, we are in the business of raising ichthyosauri - it's what we do all the time."

Quantum entanglement, he explained, is now the basis for emerging technologies such as quantum computing and encryption, already used in the City of London to securely move financial information.

Further illustrations of the intriguing consequences of entanglement involved members of the audience including Rector Sir Richard Sykes taking part in the 'Balinese plate dance', about which Sir Peter commented: "I used to do this with 200 quantum mechanics students."

Sir Peter's lecture 'Quantum entanglement weird but useful' was delivered as Imperial's 18th annual Schrodinger lecture.

The full lecture can be viewed [here](#) (RealMedia)

Source: Imperial College London

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