INSTITUTE SEMINAR

13 January 2015 4:00 p.m. Fermion

Speaker:

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Title:

Understanding quantum weirdness: quantum spatial continua are topologically non-Euclidean

Abstract:

Quantum weirdness is the name given to a collection of phenomena in which microscopic systems are observed to behave in ways which are puzzling when viewed with a macroscopic intuition. These phenomena fall into two groups. In one, a quantum system is de-localised, that is, it is in more than one spatial location, and, when previously separated parts are brought together, they may interfere. In the other, quantum systems are non-localised, that is, spatially separated parts of the system affect each other even when they no longer interact. The prototype for de-localisation is the double slit experiment, for non-localisation it is the Einstein-Podolsky-Rosen experiment. Both are described in standard quantum mechanics; de-localisation by a wave function which is the superposition of other wave functions representing distinct quantum states and non-localisation by the entanglement of the wave functions for the separate parts of the system. While these descriptions are effective in predicting correlations between observations they do not satisfy our need to understand. I argue that an understanding comes from noting that the spatial continua of quantum systems are different from the classical Euclidean continuum.

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