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NITheP Colloquium
Monday, 26 April 2021, 16h00
Prof Michael Laidlaw | Retired

"Topology and Quantum Mechanics 50 Years Ago"

Between 1967 and 1971 I was a physics graduate student at the University of North Carolina at Chapel Hill. On the faculty were Bryce and Cecile DeWitt, husband and wife. Cecile was my research supervisor and introduced me to the path integral formalism of Richard Feynman. The application of this approach to systems of indistinguishable particles was the subject of my research. For two such particles in a transition, there is a dilemma because either they exchange positions **or** they do not. The resolution is to say that they exchange positions **and** they do not. That thinking requires the configuration space be taken modulo the group of permutation which is multiply connected. The natural progression was to a study of the general behaviour of quantum systems in multiply connected spaces. The conclusion was that there would be a distinct propagator for each scalar representation of the fundamental group. For the case of indistinguishable particles, there are two scalar representations of the permutation group giving either Fermions or Bosons. Topology gives rise to a strong super selection rule because, once a system propagates in its distinct manner, it will continue to do so indefinitely or until something occurs which disrupts the topology.

BIOGRAPHY

After his Ph.D., Dr. Laidlaw held various positions in the USA, New Zealand, and South Africa. From 1978 to 2001 he was Head of Computer Science at the University of Durban-Westville, and then from 2001 to 2005 at the University of Natal (Pietermaritzburg). Since his retirement in 2005, he is a trader and author in numismatics.

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