Applications of topological algebras to quantum computing and information

Dr Martin Weigt (Nelson Mandela University)

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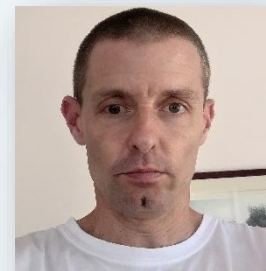*Venue*: Online and Physics Seminar Room, Stellenbosch University

ABSTRACT

A well-known mathematical tool that is applied to quantum computing and information is operator space theory. To be brief, completely positive linear mappings between operator spaces serve as quantum channels. Observables in a quantum system can be represented as self-adjoint elements of a *-algebra consisting of self-adjoint elements in a locally convex *-algebra. Reversible time dynamics of a quantum system can be represented as a one parameter group of *-automorphisms of the locally convex algebra, whereas if the time dynamics is irreversible, one parameter semi-groups of completely positive linear mappings of the locally convex algebra are used. The role of locally convex algebras specifically in quantum computing and information appears not be well known in the literature. On of the aims of this talk to show how locally convex algebras can add to the existing mathematical techniques from operator space theory in quantum computing. Some results of the speaker will also be presented, especially results having to do with quantum entanglement. A brief recap on the role of quantum entanglement in quantum information will also be discussed.

BIOGRAPHY

Dr Martin Weigt is a C2-rated researcher with the National Research Foundation (NRF), and works in topological algebras, and operator and unbounded operator algebras, which include applications to mathematical physics.

He was born in Cape Town and obtained his BSc, BSc Honours degree in Mathematics, and Master of Science degree in Mathematics at the University of Stellenbosch. He obtained his doctoral degree in Mathematics at the University of Cape Town, and undertook postdoctoral research at the University of Athens in Greece.

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