# NITheP Colloquium

**Monday, 19 October 2020, 16h00**

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## Quantum effects in the brain: How much do we know?

**Abstract:** In the last few decades there have been some efforts made towards identifying whether quantum physics might shine any new light on the complex network that constitutes the brain and central nervous system. While there are various objections towards the application of quantum theory in the context of a biological system such as the brain, the objection most often cited is that non-trivial quantum effects such as coherence and entanglement are relegated to isolated systems at low temperatures whereas living systems interact with their environments at physiological temperatures. The development of the field of quantum biology has focused on topics such as photosynthesis, avian migration, olfaction and the action of enzymes among other things. As such it has gone some way towards suggesting that quantum effects may indeed contribute to the integral functioning of biological systems. Beginning with the Orch OR theory of quantum consciousness, first proposed by Penrose and Hameroff, the emerging field of quantum neurobiology has made some progress in outlining how this knowledge might be applied to understanding the brain. It has been suggested that chemicals integral to brain function, such as anaesthetics and neurotransmitters, might use quantum effects such as coherent energy transfer or electron tunnelling. The role of novel neural signalling mechanisms, such as biophotons, is also under investigation. Finally, it has been hypothesised that quantum entanglement might be fundamental to the way in which nerves communicate

**Bio:** Betony Adams completed her MSc as part of the Centre for Quantum Technology at UKZN, looking at the application of open quantum systems to avian migration, before continuing on to do her PhD. Her research investigates whether non-trivial quantum effects play any role in how the brain works.

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