

NITheCS COLLOQUIUM:

Quantum Physics and Biology: the Local Wavefunction Approach

Prof George Ellis, FRS (University of Cape Town)

Monday, 11 March 2024 | 16h00 – 17h00 SAST

Venue: Neelsie Cinema, Stellenbosch University, and online

--- Cheese and wine will be served at the venue ---

ABSTRACT

Is there a single linearly evolving Wave Function of the Universe that is able to lead to all the nonlinearities we see around us? This proposal seems *a priori* highly implausible. I claim that instead, in the real Universe, generically only local wave functions exist. Non-local wave functions occur for carefully engineered contexts such as Bell experiments, but there is no single wave function for a cat or macroscopic object such as a brain, let alone for the Universe as a whole. Contextual wave function collapse leads to a defensible version of the Copenhagen interpretation of quantum theory, where classical macro levels provide the context for quantum events and biological emergence. Complexity arises via multiscale adaptive modular hierarchical structures that enable logical branching to emerge from the underlying linear physics. Each emergent level is causally effective because of the meshing of upwards and downwards causation that takes place consistently with that physics. Quantum chemistry approaches in biological contexts fit this local wavefunction picture.

BIOGRAPHY

George Ellis, FRS, is Professor Emeritus of Applied Mathematics at the University of Cape Town. He obtained his PhD at the University of Cambridge, where he worked on general relativity theory and cosmology. He has been based at the University of Cape Town since 1974, but has been visiting Professor at Texas, Chicago, Hamburg, Boston, Edmonton, London, and Oxford, and for a while, was Professor of Cosmic Physics at the International School of Advanced Studies (SISSA), Trieste, Italy.

In recent years he has been working on the philosophy of cosmology and the emergence of complexity, the nature of causation, and aspects of neuroscience. His books include *The Large Scale Structure of Space Time* written with Stephen Hawking, *Downward Causation and the Neurobiology of Free Will* (Ed, with N Murphy and T O'Connor), *How Can Physics Underlie the Mind*, and *Beyond Evolutionary Psychology* (written with Mark Solms).



REGISTER TO ATTEND

Visit <https://bit.ly/3ST6cKK>
or scan:



SUBSCRIBE TO THE NITheCS MAILING LIST:

