

THE COLLEGE OF AGRICULTURE, ENGINEERING AND SCIENCE

The School of Chemistry and Physics
National Institute for Theoretical Physics

cordially invites you to attend a

Public Talk

Decoherence and the Quantum Theory of the Classical

by

Wojciech Hubert Zurek

Los Alamos National Laboratory, New Mexico, USA



Date:

Monday, 18 September 2017

Venue:

Science and Technology Education Centre (STEC), Building H1, UKZN Westville Campus

Time:

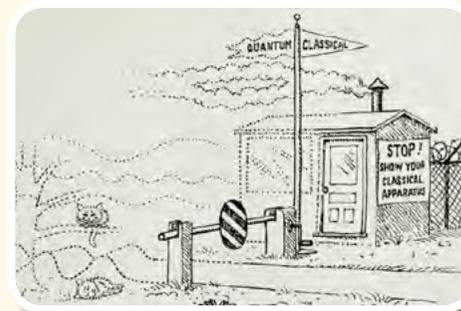
16h30 for 17h00



RSVP: Neli Mncube by 15 September on 031 260 7570 or e-mail mncubene@ukzn.ac.za

Refreshments will be served before the talk

INSPIRING GREATNESS



ABSTRACT

I will describe three insights into the transition from quantum to classical. After a brief discussion of decoherence I will give (i) a minimalist (and decoherence-free) derivation of preferred states. Such pointer states define events (e.g., measurement outcomes) without appealing to Born's rule ($p_k = |\psi_k|^2$). Probabilities and (ii) Born's rule can be then derived

from the symmetries of entangled quantum states. With probabilities at hand one can analyze information flows from the system to the environment in course of decoherence. They explain how (iii) robust "classical reality" arises from the quantum substrate by accounting for all the symptoms of objective existence of preferred pointer states of quantum systems through the redundancy of their records in the environment. Taken together, and in the right order, these three advances (i)-(iii) elucidate quantum origins of the classical.



About the Speaker

Wojciech Hubert Zurek is a leading authority on quantum theory, especially decoherence and non-equilibrium dynamics of symmetry breaking and resulting defect generation (known as the Kibble-Zurek mechanism). He was educated in Kraków, Poland and Austin, Texas (Ph.D. 1979). He spent two years at Caltech as a Tolman Fellow. In 1984 he started at Los Alamos as Oppenheimer Fellow, and was elected Laboratory Fellow in 1996. He was an External Professor at the Santa Fe Institute and co-organized the Quantum Coherence and Decoherence and the Quantum Computing and Chaos programs at UCSB's Institute for Theoretical Physics. In

2005 he received the Alexander von Humboldt Prize, in 2009 Marian Smoluchowski Medal (highest prize of the Polish Physical Society), and in 2010 Albert Einstein Professorship Prize of the Ulm University. Among the books are Quantum theory and Measurement (1983, co-edited with John Wheeler) and Complexity, Entropy, and Physics of Information (1990).