Department of Physics
THE UNIVERSITY OF HONG KONG

Physics Colloquium

Quantum Many-body theory in the Quantum Information era

Date: April 20, 2022 (Wednesday)
Time: 10:00 a.m.
Zoom Online Lecture: https://bit.ly/3Lp6zHq
Meeting ID: 917 5067 8182
Password: 2859

Prof. Matthew P.A. Fisher
UC Santa Barbara

Abstract:
Traditionally, quantum many-body theory has focussed on ground states and equilibrium properties of spatially extended systems, such as electrons and spins in crystalline solids. In recent years “noisy intermediate scale quantum computers" (NISQ) have emerged, providing new opportunities for controllable non-equilibrium many-body systems. In such dynamical quantum systems the inexorable growth of non-local quantum entanglement is expected, but monitoring such open systems (by making projective measurements) can compete against entanglement growth. In this talk I will describe recent theoretical work exploring the behavior of “hybrid" quantum circuits consisting of both unitary gates and projective measurements. These circuits can be shown to exhibit a novel quantum dynamical phase transition between a weak measurement phase and a quantum Zeno phase. Detailed properties of the weak measurement phase - including relations to quantum error correcting codes - and of the critical properties of this novel quantum entanglement transition will be described.

Biography:
Matthew Fisher received his Ph.D. in theoretical physics from the University of Illinois at Urbana-Champaign in 1986, and went on to become first a Visiting Scientist and then a Research Staff Member at IBM T. J. Watson Research Center (1986-1993). Matthew joined the Kavli Institute for Theoretical Physics and the Physics Department of the University of California in 1993. In 2007 he joined Microsoft's Station Q as a research physicist, on leave from the UCSB physics department. During the academic year 2009-2010 Matthew was on the faculty at Caltech, returning to the physics department at UCSB in summer 2010. Fisher received the Alan T. Waterman Award bestowed by the National Science Foundation in 1995, the National Academy of Sciences Award for Initiatives in Research in 1997, and the Oliver E. Buckley Prize in Condensed Matter Physics in 2015. He was elected as a Member of the American Academy of Arts and Sciences in 2003 and to the National Academy of Sciences in 2012.

Anyone interested is welcome to attend!

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