



FLEET

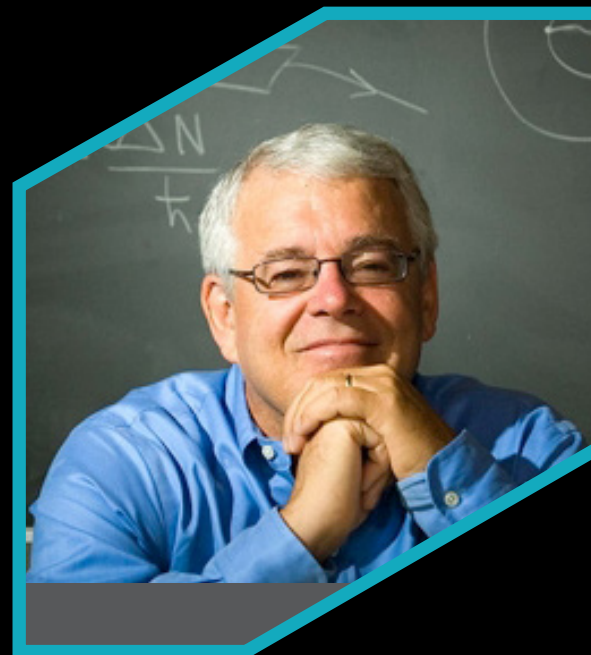
ARC CENTRE OF EXCELLENCE IN
FUTURE LOW-ENERGY
ELECTRONICS TECHNOLOGIES

FLEET RESEARCH SEMINAR

Cavity QED of Strongly Correlated Electrons: Go and No-Go

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Abstract: Cavity QED in interacting electron systems continues to yield new puzzles and new surprises. In spite of decades of work, it has remained unclear whether or not super-radiant photon condensate quantum phases can occur in equilibrium. I will discuss a recent proof that when a non-relativistic quantum many-body system is coupled to a cavity field, gauge invariance forbids photon condensation. Explicit calculations for a realistic toy model of a semiconductor in a planar cavity demonstrate that the opposite conclusion can be reached by studying theoretical models that are not precisely gauge invariant. On the other hand, non-equilibrium steady-state polariton condensates can be a rich source of new physics. I will discuss a recent proposal that polariton condensates can form nematic half-moon states when their electron and hole populations are not balanced, and the possibility of forming electrical reservoirs for spatially indirect excitons or polaritons and using them to drive bosonic transport currents.

About the Speaker: Allan H. MacDonald received the B.Sc. degree from St. Francis Xavier University, Antigonish, Nova Scotia, Canada in 1973 and the M.Sc. and Ph.D. degrees in physics from the University of Toronto in 1974 and 1978 respectively. He was a member of the research staff of the National Research Council of Canada from 1978 to 1987 and has taught at Indiana University (1987-2000) and the University of Texas at Austin (2000-present) where he now holds the Sid W. Richardson Chair in Physics. He has contributed to research on the quantum Hall effect, electronic structure theory, magnetism, and Super conductivity among a variety of other topics. Prof. MacDonald is a fellow of the American Physical Society, a member of the American Academy of Arts and Sciences and the National Academy of Sciences, and a recipient of the Herzberg Medal and the Buckley Prize.

DATE: Monday 2 December
TIME: 11:00 - 12:00
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