FLEET
ARC CENTRE OF EXCELLENCE IN FUTURE LOW-ENERGY ELECTRONICS TECHNOLOGIES

FLEET RESEARCH SEMINAR

Semiconductor Holes: More spin for your buck

ALEX HAMILTON

School of Physics, University of New South Wales

Abstract: There is enormous interest in using the spins of electrons and holes for applications in spintronics, spin-based quantum computing, and topological electronics. However it is often not appreciated that in semiconductors valence band holes are spin-3/2 particles, which gives them very different properties to spin-1/2 electrons. This talk will describe why holes are so different to electrons, with two examples:

1. Holes in two-dimensional quantum wells We demonstrate a new mechanism for electrically controlling the Zeeman spin splitting of holes in a GaAs quantum well, tuning the spin-splitting by over 300%. In addition we introduce a novel method for extracting the g-factor of 2D holes from the magnetoresistance oscillations.

2. Holes in one dimensional quantum wires: I will present studies of 1D hole systems, where the spin-orbit interaction is many times stronger than in electron systems, opening a new pathway to topological superconductivity.

About the Speaker: ***UNSW Scientica Professor Alex Hamilton is a leading expert on the study of holes in semiconductor nanostructures and has contributed significantly to the understanding of electronic conduction in two-dimensional and nanoscale transistors. His work has been recognised through two Australian scientific prizes, an Australian Professorial Fellowship, an ARC Outstanding Researcher Award, a UNSW Scientia Professorship and election as a Fellow of the American Physical Society. Professor Hamilton leads the Quantum Electronic Devices group in the UNSW School of Physics. He is Deputy Director of FLEET and leader of Research Theme 1, where he directs the program on artificially engineered topological materials. Additionally, he works with Research Theme 2 to realise bilayer exciton transistors at room temperature.***

DATE: Monday 26 November 2018
TIME: 2:00PM–3:00PM
VENUE: G29, New Horizons Centre
20 Research Way,
Monash, Clayton
INFO: education@fleet.org.au

MONASH University