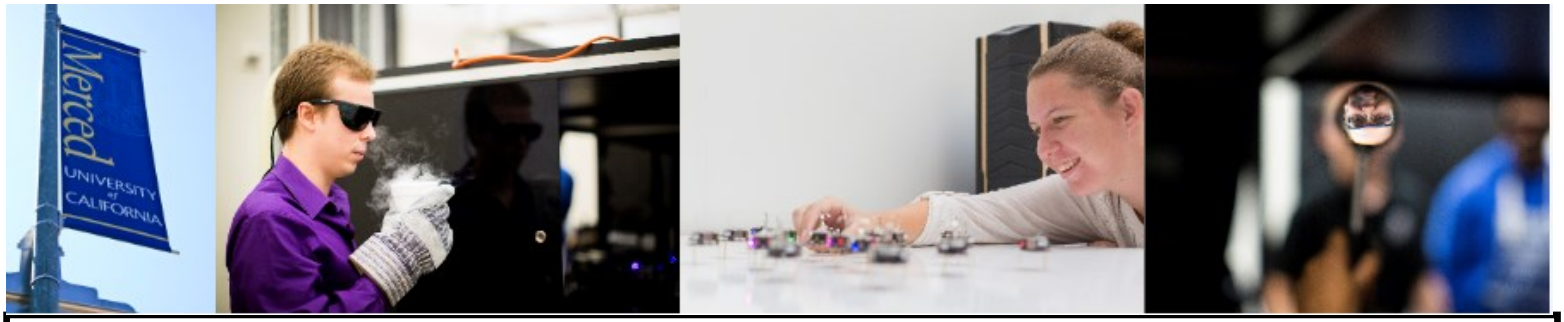

PHYSICS COLLOQIUM:

SiGe-based Quantum Electronic Devices

Date: **9/20/19**

Time: **10:30 AM**

Location: **COB2 140**

Tzu-Ming Lu

Quantum Materials Systems

Sandia National Laboratories

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Abstract

One of the building blocks of today's digital technology is two-dimensional electrons in a Si metal-oxide-semiconductor field-effect transistor. These low-dimensional electrons may play an equally essential role in future computing paradigms. SiGe heterostructures hosting low-dimensional electrons/holes have recently emerged as an important material platform for future quantum electronics and spintronics. In this talk, I will first review the fabrication and device operation of SiGe heterostructure field-effect transistors with mobilities as high as $10_5 – 10_6$ cm_2/Vs and then present some interesting quantum phenomena we observe in two-dimensional electron/hole systems in these high-mobility devices, including tunneling-limited non-equilibrium charge distributions, interlayer coherence between two coupled electron layers, and a gate-controlled quantum Hall ferromagnetic transition. Paths toward creating Majorana fermions in SiGe-based materials using the quantum Hall ferromagnetic transition and nanomagnet arrays will be discussed.

Acknowledgements

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