Speaker: Eric Fullerton

Center for Memory and Recording Research (UCSD)

July 15th 2026 at 4 PM in Room Alnot 4-A014, IJL

Spin-orbit torque phenomena in complex oxide heterostructures

Eric Fullerton is a Distinguished Professor at the University of California, San Diego in the Departments of Electrical and Computer Engineering and Chemical and Nano Engineering, affiliated Professor in the Department of Physics and is an Endowed Chair Professor of the Center for Memory and Recording Research. He received his B.Sc. in Physics from Harvey Mudd College in 1984 and his Ph.D. in Physics from UC San Diego in 1991. Previously to joining UC San Diego he held research positions at Argonne National Laboratory, the IBM Almaden Research Center and Hitachi Global Storage Technologies. His current research focuses on the synthesis and characterization of magnetic nanostructures, both as a probe of materials in reduced dimensions and for the development of novel information technologies. He has co-authored >430 journal articles, been issued 51 US patents, is a Fellow of the American Physical Society and the IEEE and is a member of the National Academy of Engineering.

Abstract : Energy-efficient magnetic spin orbit torque nano-oscillators and coupled oscillator arrays are being explored for low-power neuromorphic computing systems. Commonly studied oscillator systems are mostly based on metallic bilayers of ferromagnet (FM)/ heavy metal (HM) (FM=CoFeB, Py and NM=Pt, Ta, W). I will discuss recent efforts to replace the metallic layers with complex oxides with coupled spin, electron and lattice degrees of freedom providing opportunity for new device functionality. Large spin-charge conversion, low damping, and small resonance linewidth are essential constituents for the development of energy efficient oscillators. In this regard half-metallic perovskite ferromagnet, $La_{0.67}Sr_{0.33}MnO_3$ (LSMO) films are studied as the magnetic free layers combined with transition metal oxides such as iridates (e.g. IrO_2 and $CaIrO_3$) and $NdNiO_3$ as the spin-orbit torque layer. $NdNiO_3$ (NNO) exhibits a first-order metal-insulator transition centered near 200K in bulk. We observe thickness and temperature dependent modulation of spin-charge conversion through the phase transition of NNO and harness the disorder in NNO to generate a pronounced enhancement of the inverse spin Hall effect signal at the transition temperature. IrO_2 and $CaIrO_3$ have topological band structures providing significant enhancement of the spin to charge conversion with spin Hall angles exceeding 1 for $CaIrO_3$. Finally, progress towards an all-oxide nano-oscillator will be discussed. This work is supported by the U.S. Department of Energy under Grant No. DE-SC0019273.

Séminaire organisé dans le cadre du programme interdisciplinaire MAT-PULSE