Institute for Molecular & Nanoscale Innovation
Division of Engineering

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Thursday, February 14, 2008

Silicon Spintronics

Despite Silicon's intrinsic advantages for spintronics, even the basic elements of spin transport had not been achieved in this semiconductor until recently.[1] I will discuss the specific challenges associated with spin injection and detection in Silicon (Si), and our unique solution, employing ballistic hot-electron transport through nano-scale ferromagnetic metal "polarizers". Using this technique, we have observed unprecedented coherence in spin precession measurements, and extracted very long spin lifetimes of conduction electrons traveling over macroscopic distances.[2] Whereas transistor scaling limits will soon suppress progress in microelectronics using Si, spintronics may secure this semiconductor's dominance for the future.

[1] Ian Appelbaum, B.Q. Huang, and D.J. Monsma, "Electronic measurement and control of spin transport in silicon," Nature 447, 295 (2007) [2] B.Q. Huang, D.J. Monsma, and Ian Appelbaum, "Coherent spin transport through a 350-micron-thick silicon wafer," Phys. Rev. Lett. 99,
177209 (2007).

Bio: Ian Appelbaum obtained his B.S. in Physics and Mathematics at Rensselaer Polytechnic Institute, and Ph.D. in Physics at the Massachusetts Institute of Technology. After spending one year as a postdoctoral fellow at Harvard University's Division of Engineering and Applied Sciences, he is currently an Assistant Professor of Electrical Engineering at the University of Delaware.

Barus & Holley Room 190
10:00 – 11:00 am