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WEEKLY CALENDAR

November 27, 2006

General Seminar

"Solving the Problem of Motion: It's no longer just academic"

3:40PM / Thursday, 30 November 2006 / Room 109

[Refreshments served at 3:15 PM in Room 229 Nicholson]

Host: Dr. Jorge Pullin

Ira Rothstein, Ph.D.

Carnegie Mellon University

Consider one of the most rudimentary problems in physics. Drop a mass (m) at rest from a height (d) above the surface of the earth, and calculate its position as a function of time y(t). The solution y(t) = d - 1/2gt2, taught in Freshman physics, is an excellent approximation to the solution. Suppose, however, that we wish to be more exact. There are multiple sources of corrections to this solution. Standard ideas in general relativity allow one correct for relativistic effects. However, a closer look reveals that there are many more complications. For instance, the mass will not be point-like, and will radiate gravitational waves. It will also deform under the influence of the gravitational field. These effects are intertwined their inclusion can make the problem of solving for the trajectory intractable. In the past, solving this problem was only of academic interest, but the next generation of gravity wave detectors will rely upon its solution. In this talk, I will discuss how one can use ideas developed for statistical mechanics and quantum field theory to solve this "problem of motion" in a systematic fashion.

Materials Science & Engineering Seminar

"Electrical Spin Detection in Semiconductors"

3:40PM / Wednesday, 29 November 2006 / Room E-130 Howe-Russell

Host: Dr. John DiTusa

Paul Crowel, Ph.D.

University of Minnesota

In the last several years, there has been significant progress in achieving efficient electrical spin injection from ferromagnetic metals into semiconductors. In contrast, electrical spin detection has been a more significant obstacle. I will discuss recent experiments that have addressed this difficulty, leading to a definitive demonstration of electrical spin detection in Fe/GaAs heterostructures. In the first set of experiments [1], spin-polarized electrons are injected into the semiconductor under reverse bias and imaged using Kerr microscopy. This approach allows for a complete characterization of spin injection and transport in the presence of a transverse magnetic field. Precession and dephasing are observed in the channel, and the sign of the injected spins can be determined. In a second set of experiments [2], we demonstrate that the spin accumulation generated under forward bias can be detected electrically. As in the optical experiments, the spin detection signal is suppressed in a transverse magnetic field, demonstrating a Hanle effect. These results imply that Fe/GaAs Schottky tunnel contacts can function as both spin injectors and detectors. I will discuss recent experiments in which both of these functions are realized in a single device.

[1] S. A. Crooker et al., Science 309, 2191 (2005).
[2] X. Lou et al., Phys. Rev. Lett. 96, 176603 (2006)

Congratulations To

Dr. Joel Tohline for being appointed by the AIP and the IEEE-Computer Society as an editor of the Visualizations department for their technical magazine *Computing in Science and Engineering*. The constituent readerships that CiSE serves include scientists and engineers from many disciplines as well as applied mathematicians and computer professionals, whose collaboration drives the cutting edge of computational science and education.

Dr. Philip Adams for being elected a Fellow of the American Physical Society. His citation is as follows:

"For his major contributions to the understanding of high field superconductivity and two dimensional electron localization."

Election to Fellowship in the American Physical Society is limited to no more than one half of one percent of the membership.

Dr. Jorge Pullin, for being elected a Fellow of the American Association for the Advancement of Science (AAAS).

Reminder:

There will be a Steering Committee meeting Tuesday, November 28, 2006 at 3:40 p.m. in Room 201.

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