ΓΕΝΙΚΟ ΣΕΜΙΝΑΡΙΟ ΤΜΗΜΑΤΟΣ ΦΥΣΙΚΗΣ

PHYSICS COLLOQUIUM

Thursday, 5 November 2009
17:00-18:00

3rd Floor Seminar Room

"*Next Generation Spintronics*"

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Abstract

The goal of spintronics – spin-electronics – is to control the electron flow by coupling to the electron spin. The success story of spintronics is the giant magnetoresistance (GMR) effect in metallic magnetic multilayer structures. It was experimentally discovered in 1988 by Grunberg and Fert (Nobel Prize 2007) and now is used ubiquitously for magnetic sensing in myriads of electronic devices. Soon thereafter, Datta and Das theoretically proposed a spin-field effect transistor (S-FET), analogous to the conventional FET but relying on spin-orbit induced spin rotation for the control of the current. The simplicity and the beauty of the idea precipitated tremendous experimental and theoretical activity in semiconductor spintronics, even if it has not led yet to practical applications. In this talk I will present some of the exciting new science that has been emerging recently in the field of spintronics, including (Quantum) Spin Hall Effect, Quantum Valley Hall Effect, and atomic-scale tuning of Magnetism in transition metal oxide heterostructures. I will also describe some of the conceptually new applications that these phenomena may lead to.