



**ΓΕΝΙΚΟ ΣΕΜΙΝΑΡΙΟ ΤΜΗΜΑΤΟΣ ΦΥΣΙΚΗΣ**

**PHYSICS COLLOQUIUM**

**Thursday, 7 April 2011**

**17:00 -18:00**

**3<sup>rd</sup> Floor Seminar Room**

**“Importance of ab initio approach to fundamental and applied research:Semiconductor spintronics”**

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**Abstract**

The rapid advance in experimental techniques for materials growth and characterization has created new possibilities to engineer material properties for novel technologies. At the same time, it is often difficult to obtain detailed information about nanoscale processes. Hence, the interpretation and design of new experiments requires modern theories, with predictive capability, that treats in detail the specific chemistry and atomic structure of complex materials. In this talk I will present examples of development and application of such theories taken from my own research. First, I will describe how our first-principles electron-transport studies combined with parametrized modeling uncovered the origin of strong bias dependence and magnetic anisotropy in ferromagnet/semiconductor tunnel junctions. Then, I will show how our recent developments of the Quasiparticle self-consistent GW method allow for an accurate ab initio description of a much wider class of materials than was previously possible. Application to semiconductors revealed novel spin-orbit splittings in strained and confined geometries.