

# International lecture of Spintronics

Organized by Graduate Program in Spintronics (GP-Spin) and  
ERATO Spin Quantum Rectification (ERATO-SQR)

## “Electrons, spins, magnons and surfaces”

**SPEAKER: Professor Dr. Ricardo Ibarra**

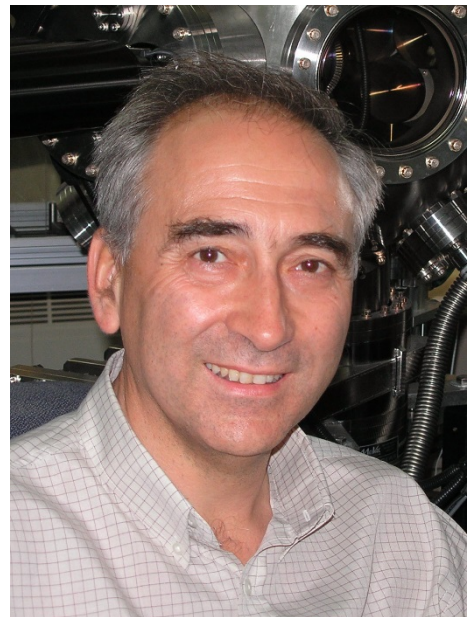
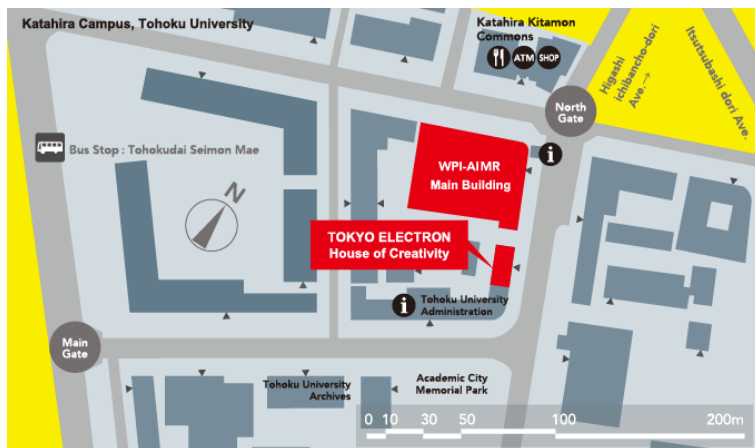
Institute of Nanoscience of Aragón Laboratory of Advanced Microscopies  
Condensed Mater Physics Department, **University of Zaragoza (Spain)**

*June 14 (Tue) 2016*

*13:30 ~14:30*

*Venue:*

*TOKYO ELECTRON House of Creativity  
3F, Lecture Theater, Katahira Campus*



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Contact

ERATO-SQR HQ [sqr-erato@wpi-aimr.tohoku.ac.jp](mailto:sqr-erato@wpi-aimr.tohoku.ac.jp) Phone: 022-217-6238

*Presentation will be conducted in English. Registration not required.*

# "Electrons, spins, magnons and surfaces"

M. R. Ibarra

Institute of Nanoscience of Aragón  
Laboratory of Advanced Microscopies  
Condensed Matter Physics Department  
**University of Zaragoza (Spain)**

In this talk, I report relevant physical phenomena in the field of spintronics; charge and spin, constitute attributes of electrons that mediate new discovering in condensed matter physics. Two specific ingredients as a strong spin-orbit coupling and the importance of the interfaces, give rise to a variety of physical phenomena. In this talk, I will concentrate in two main subjects: On one part, the role of the Non-Magnetic metal/Ferromagnet interfaces, that give rise to a strong enhancement of the spin Seebeck effect in  $\text{Fe}_3\text{O}_4/\text{Pt}$  multilayer due to the magnon spin currents conversion in electron spin currents and vice versa through the heterostructure. On the other part, the relevance of the surface states in Bi and Bi based compounds. Thin films of Bi provide a nice scenario for the observation of WAL effect in magnetotransport properties. Time reversal symmetry (TRS) protection of surface states (SS) gives rise to the absence of backscattering in topological insulator (TI) as  $\text{Bi}_2\text{Se}_3$ , giving rise to spin-polarized and dissipation-less charge currents. The presence of magnetic adatoms, as Co, at the surface of a TI, can destroy the TR symmetry; this is the case of  $\text{Bi}_2\text{Se}_3$ . However, we have found that in  $\text{Bi}_2\text{Te}_2\text{Se}$ , the surface chemical inhomogeneity (Te/Se) preserves the TRS of the topological SS.

- [1] "Role of the surface states in the magnetotransport properties of ultrathin bismuth films" N. Marcano et al. *Phys Rev. B* 82, 125326 (2010). "Quantitative analysis of the weak anti-localization effect in ultrathin bismuth films" S. Sangiao et al. *EPL*, 95 (2011) 37002
- [2] "Unconventional scaling and significant enhancement of the spin Seebeck effect in multilayers" R. Ramos et al. *Phys. Rev. B Rapid Comm* 92, 220407(R) (2015)
- [3] "Time reversal symmetry protected by chemical disorder in the surface of topological insulator" M.C. Martinez-Velarte et al. under review (2016)