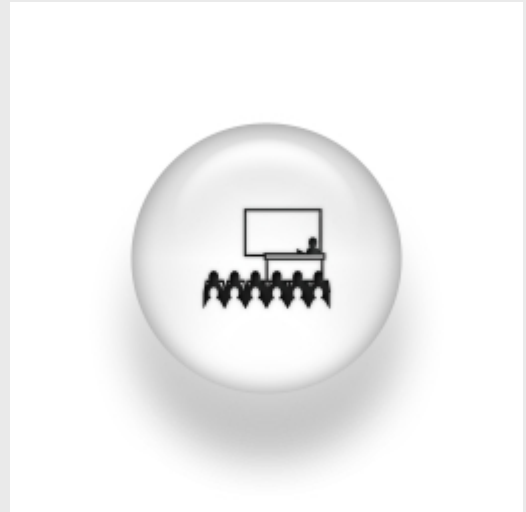


## Phase-controlled transport in periodically-driven optical lattices

Wednesday, 23 March 2011, 12:00-13.00



*Prof. Alfredo Levy Yeyati*

Departamento de Física Teórica de la Materia Condensada, UAM

### ABSTRACT:

Electronic transport at subgap energies between a normal and a superconducting región is possible by means of the so-called Andreev processes. Great progress in the fabrication of hybrid nanostructures combining graphene or carbon nanotubes with superconducting electrodes is allowing to explore Andreev transport in novel situations. In this talk I shall present some recent work by our group on this topic. After discussing briefly the peculiar properties of Andreev reflections in graphene I shall concentrate in the analysis of two recent experiments involving superconductors and carbon nanotubes. I shall first discuss experiments aimed to produce entangled electron pairs from the splitting of Cooper pairs using carbon nanotubes double quantum dots [1]. I shall present microscopic calculations which allow to determine the splitting efficiency in terms of material and geometrical parameters. Finally I shall discuss the appearance of Andreev bound states in carbon nanotubes coupled to superconducting leads and the possibilities opened by its recent experimental detection [2].

[1] L. Herrmann, F. Portier, P. Roche, A. Levy Yeyati, T. Kontos and C. Strunk, *Phys. Rev. Lett.* 104, 026801 (2010).

[2] J.D. Pillet, C.H. L. Quay, P. Morfin, C. Bena, A. Levy Yeyati and P. Joyez, *Nature Phys.* 6, 965–969 (2010).