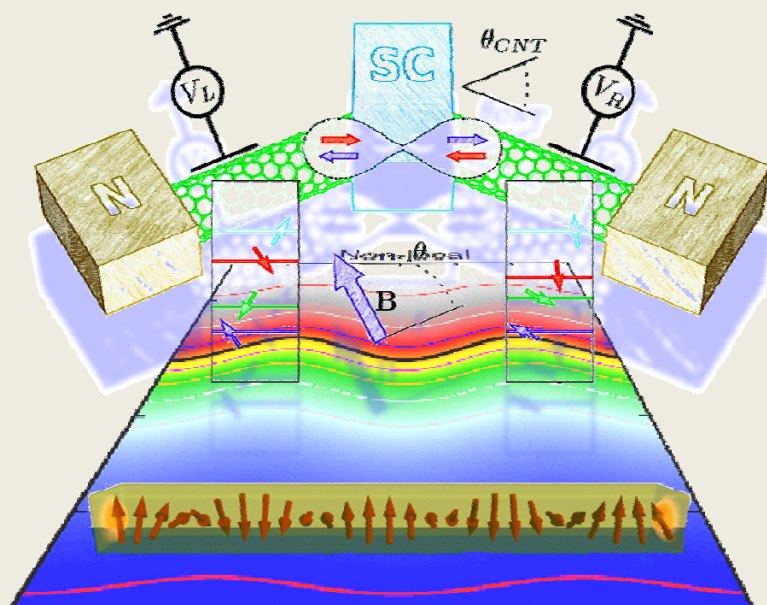


# Instituto Universitario de Ciencia de Materiales Nicolás Cabrera

Activity report 2013



INC  
INSTITUTO NICOLÁS CABRERA

excelencia Campus Internacional  
UAM  
CSIC+

UA  
UNIVERSIDAD AUTÓNOMA  
DE MADRID

FACULTAD DE  
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# Welcome

Dear reader:

Here we put together some of the activities of the Nicolás Cabrera Institute during past year, and list publications of the members of the INC. The Nicolás Cabrera Summer School has been once more our most important activity. I congratulate the organizers for the successful organization. The next Summer School will be celebrated from 14th to 18th of July, 2014. Invited speakers are available on the web of the [School](#) and I invite all of you to take part in this event.

During 2013 we remembered D. Nicolás Cabrera's Sanchez and dedicated him the colloquium "Frontiers of Condensed Matter Physics". D. Nicolás Cabrera was born February 12, 1913, and we celebrated the century of his birthday with a talk given by his son, Prof. Blás Cabrera (Stanford). The colloquium is organized with the support of the Foundation of BBVA (FBBVA), and we will continue with this initiative during next years. Talks are available in our [youtube](#) channel.

Our PhD students have had a large participation in the Institute's activities. During the young researchers meeting, the prize to the best article published during 2013 was awarded. We have also organized again the prizes for undergraduate students, who have provided to us with [seven videos](#) in which they explain our research to the general public.

Finally, I want to invite all the members of the INC to use the support center for scientific dissemination of our University. Often, writing a text for the general public explaining our last article seems tedious or difficult. But it is an important labor. These documents, available then on the internet, benefit all of us, attract students to our laboratories and help policy makers understanding the relevance of our scientific activities.

I thank you for your interest in our Institute, and wish you an enjoyable reading of these pages,

Hermann Suderow

Director of the INC

# Nicolás Cabrera Summer School

The Nicolás Cabrera Summer School is celebrated annually since 1994, and is supported by the program "Frontiers of Science and Technology " of [FBBVA](#) since 2002.



FBBVA issued a press release and made several [videos](#) about 2013 Summer School.

2013 Summer School was directed by Pedro José de Pablo Gómez and Fernando Moreno-Herrero and was entitled "Biomolecules and Single Molecule Techniques". It was held from 21 to 26 July 2013 in Miraflores de la Sierra. The main objective was to present topical single molecule techniques and associated theoretical approaches to understand relevant biological problems to young students. The program consisted in 22 invited researchers. 13 gave *keynote* talks and two one hour lectures about theory and experiment of a given technique. 9 speakers presented important recent advances in short half an hour talks.

The following topics were discussed:

- Atomic Force Microscopy
- Optical Tweezers..
- Magnetic tweezers.
- Techniques for superresolution in fluorescence..
- Physical properties of DNA and RNA
- Mechanics and visualization of molecular engines.

In total, 70 persons participated in the Summer School. Among them, 48 were foreign students from Brazil, Cuba, The United States, India, Sudan, Iran, Germany, Holland, Poland, Italy, Switzerland, United Kingdom. 16 of 22 invited speakers were also foreign. The talks covered topics of the current relevance. Lecturers were available during the whole school and the students enjoyed a relaxed working atmosphere, being able to interact easily with invited speakers. Numerous informal discussions were realized. Participants enlarged considerably their scientific network. During the whole school, students started numerous discussions with invited speakers. Three poster sessions were organized. In order to motivate the youngest students, three prizes were granted to the best posters.

The evaluation of the School by the participants, realized by means of personal interviews, has been very positive. The participants have particularly valued the format " 1 + 1 ". That is, one hour lecture during the morning, with a detailed explanation of the techniques used in his laboratories, and another one hour lecture in the evening of the same day. During the latter hour, students learned about the applications of these techniques to solve concrete scientific problems.

This has made possible to show the students some facets of the research of the lecturers which would not have been covered otherwise. For example, professor Ricardo García of CSIC, explained "I have seen details in the talks of Toshio Ando which I could never listen before in any international meeting". The combination of keynote lectures with short 30 minute talks has been also positively valued.

The lecturers have been:

P.N. Prasad (New York, USA)

P.Nelson (Pennsylvania, USA)

T. Ando ( Kanazawa, Japan)

E. Peterman (Vrije, Amsterdam)

F. Ritort (Barcelona, España)

U. Keyser (Cambridge, UK)

U. Greber (Zurich, Suiza)

F. Mackintosh (Vrije, Amsterdam)

R. García (ICM-CSIC, Madrid, España)

R. Podgornik (Institut Jozef Stefan, Slovenija)

D. Müller (Eidgenössische Technische Hochschule, Zürich)

M. Lakadamyali (ICFO, Barcelona, España)

J. Lipfert (Delft University of Technology, Netherlands)

M. García Mateu (CBM, Severo Ochoa, Madrid, España)

I. Schaap ( Georg August Universität Friedrich Hund, Göttingen, Germany)

A. Raman (Purdue University, USA)

W. Roos (Vrije Universiteit, Amsterdam, The Netherlands)

S. García –Manyes (King's college, London, UK)

C. Carrasco (CNB-CSIC, Madrid, España)

A. Podesta (Università degli Studi di Milano, Italy)

F. Montegazza (Università di Milano-Bicocca, Italy)

B. Ibarra (IMDEA Nanociencia, Madrid, España)

R. García Arias González (IMDEA Nanociencia, Madrid, España)



2013 Summer School in  
Miraflores de la Sierra

# Colloquium

During 2013 we have started the colloquium "Frontiers of Condensed Matter Physics", in collaboration with FBBVA. We have dedicated the colloquium to Prof. Nicolás Cabrera. His son, Prof. Blas Cabrera, gave a conference on February 12, 2013. Prof. Douglas D Osheroff, Nobel prize 1996, also visited the Institute. He gave a colloquium at UAM, a conference at the University of Zaragoza and gave a talk for the general public at [FBBVA's](#) headquarters. Other participants have been S. Zhang and J.C. Davis. The undergraduate students of the UAM and the youngest researchers have positively valued the colloquia, which we will continue celebrating during 2014. The talks are available in our [youtube](#) channel.

**Colloquium Frontiers of Condensed Matter Physics 2013**  
Dedicated to Prof. Nicolás Cabrera (1913-1989)

**Superfluid helium 3: The Discovery**  
D.D. Osheroff (Stanford) **05/02**

When: 5 February at 12h30  
Where: Sala de conferencias, módulo 0, Facultad de Ciencias, UAM  
Douglas D. Osheroff discovered, together with D. Lee and B.C. Richardson, superfluid  $^3\text{He}$ . For this contribution, they shared the 1996 Nobel prize.

Instituto Nicolás Cabrera



**Colloquium Frontiers of Condensed Matter Physics 2013**  
Dedicated to Prof. Nicolás Cabrera (1913-1989)

**Cryogenic detectors to identify the dark matter**  
B. Cabrera (Stanford) **12/02**

When: 12 February at 12h30  
Where: Sala de conferencias, módulo 0, Facultad de Ciencias, UAM  
Blas Cabrera together with Bernard Sadoulet were awarded the 2013 Penrose Prize in Experimental Particle Physics for their contributions to the search for dark matter. He is the son of Prof. Nicolás Cabrera.

Instituto Nicolás Cabrera



**Colloquium Frontiers of Condensed Matter Physics 2013**  
Dedicated to Prof. Nicolás Cabrera (1913-1989)

**Topological insulators**  
S. Zhang (Stanford) **09/07**

When: 9 July at 12h00  
Where: Sala de conferencias, módulo 0, Facultad de Ciencias, UAM  
Shoungping Zhang is Jackson and Wood Professor of Physics in Stanford University. He has been co-director of the 1988 Stanford Center for Spintronics and is recipient of the Oliver Buckley prize 2012 of the American Physical Society, and of the Europhysics prize.

Instituto Nicolás Cabrera



**Colloquium Frontiers of Condensed Matter Physics 2013**  
Dedicated to Prof. Nicolás Cabrera (1913-1989)

**The quest of High  $T_c$  superconductivity**  
J.C. Davis (Cornell) **05/11**

When: 05 November at 12h30  
Where: Sala de conferencias, módulo 0, Facultad de Ciencias, UAM  
J.C. Seamus Davis is James Gilbert White Distinguished Professor in Cornell University. He received 2005 the Fritz London Memorial prize for his work on superfluid helium 3 and prize for his work on superfluid helium 2 and prize for his work on superconductors. Since 2010 he is member of the National Academy of Sciences.

Instituto Nicolás Cabrera



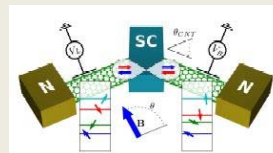
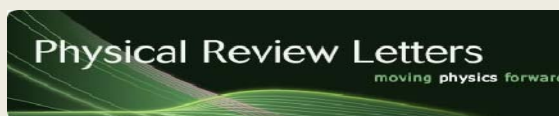


# Science in the INC

The articles of the members of the INC are in the web page of the Institute. We have emphasized here a few publications.

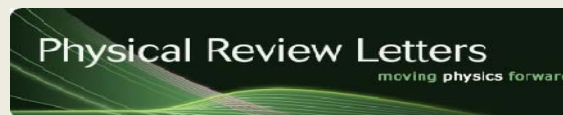
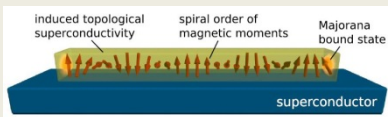
**Entanglement Detection from Conductance Measurements in Carbon Nanotube Cooper Pair Splitters**, B. Braunecker, P. Buset, A. Levy Yeyati, *Physical Review Letters*, **111**, 136806, (2013).

Spin-orbit interaction provides a spin filtering effect in carbon nanotube based Cooper pair splitters that allows us to determine spin correlators directly from current measurements. The spin filtering axes are tunable by a global external magnetic field. By a bending of the nanotube, the filtering axes on both sides of the Cooper pair splitter become sufficiently different that a test of entanglement of the injected Cooper pairs through a Bell-like inequality can be implemented.



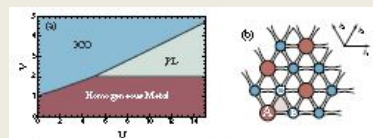
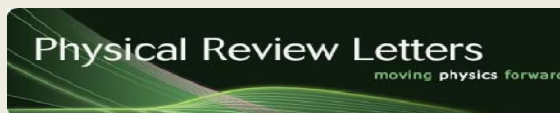
**Interplay between Classical Magnetic Moments and Suprconductivity in Quantum One-Dimensional Conductors: Toward a Self-Sustained Topological Majorana Phase**, B. Braunecker, P. Simon, *Physical Review Letters*, **111**, 147202, (2013).

We study a one-dimensional interacting electronic liquid coupled to a 1D array of classical magnetic moments and to a superconductor. We show that at low energy and temperature the magnetic moments and the electrons become strongly entangled and that a magnetic spiral structure emerges.



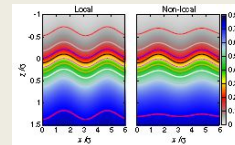
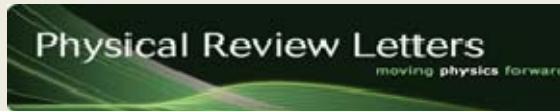
**Emergent Heavy Fermion Behavior at the Wigner-Mott Transition**, J. Merino, A. Ralko, S. Fratini, *Physical Review Letters*, **111**, 126403, (2013).

We study charge ordering driven by Coulomb interactions on triangular lattices relevant to the Wigner-Mott transition in two dimensions. Dynamical mean-field theory reveals the pinball liquid phase, a charge ordered metallic phase containing quasilocalized (pins) coexisting with itinerant (balls) electrons.



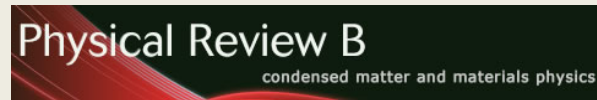
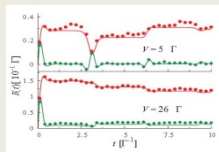
**Intrinsic Fluid Interfaces and Nonlocality**, Eva M. Fernández, E. Chacón, P. Tarazona, A.O. Parry and C. Rascón, *Physical Review Letters*, **111**, 096104, (2013).

We present results of an extensive molecular dynamics simulation of the structure and fluctuations of a liquid-gas interface, close to its triple point, in a system with cutoff Lennard-Jones interactions. The equilibrium density profile, averaged and (shape dependent) constrained intrinsic density profiles together with the fluctuations of the interfacial shape are extracted using an intrinsic sampling method.



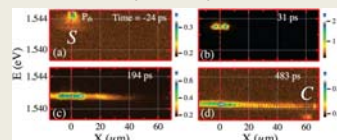
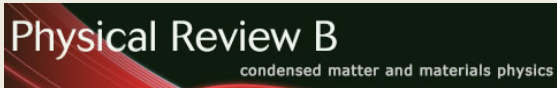
**Long Transient Dynamics in the Anderson-Holstein model out of equilibrium**, K.F. Albrecht, A. Martin Rodero, R.C. Monreal, L.Mühlbacher and A Levy Yeyati, *Physical Review B* **87**, 085127, (2013).

We calculate the time-dependent nonequilibrium current through a single-level quantum dot strongly coupled to a vibrational mode. The nonequilibrium real-time dynamics caused by an instantaneous coupling of the leads to the quantum dot is discussed using an approximate method.



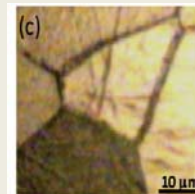
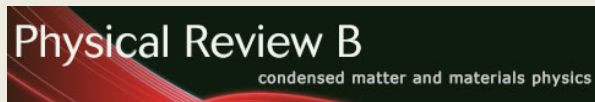
**Energy Relaxation of Exciton-polariton Condensates in Quasi-one Dimensional Microcavities**, C. Anton, T.C.H. Liew, G. Tosi, M.D. Martín, T. Gao, Z. Hatzopoulos, P.S. Eldridge, P.G.Savvidis, and L. Viña, *Physical Review B* **88**, 035313 (2013)

We present a time-resolved study of energy relaxation and trapping dynamics of polariton condensates in a semiconductor microcavity ridge. The combination of two nonresonant, pulsed laser sources in a GaAs ridge-shaped microcavity gives rise to profuse quantum phenomena where the repulsive potentials created by the lasers allow the modulation and control of the polariton flow.



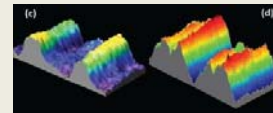
**Narrow Inhomogeneous and Homogeneous Optical Linewidths in a Rare Earth Doped Transparent Ceramic, A. Ferrier, C.W. Thiel, B. Turmino, B. Tumino, M.O. Ramirez, L.E. Bausá, R.L. Cone, A. Ikesue, and Ph. Goldner, Physical Review B **87**, 041102, (2013).**

Inhomogeneous and homogeneous linewidth are reported in a  $\text{Eu}^{3+}$  doped transparent  $\text{Y}_2\text{O}_3$  ceramic for the  $7\text{F}_0\text{-}5\text{D}_0$  transition, using high-resolution coherent spectroscopy. The 8.7-GHz inhomogeneous linewidth is close to that of single crystals, as is the 59-kHz homogeneous linewidth at 3 K ( $T_2 = 5.4 \mu\text{s}$ ).



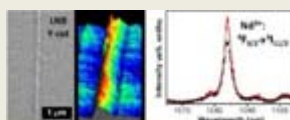
**Spontaneous Emission and Nonlinear Response Enhancement by Silver Nanoparticles in  $\text{Nd}^{3+}$ -Doped Periodically Poled  $\text{LiNbO}_3$  Laser Crystal, E. Yraola, P. Molina, J.L. Plaza, M.O. Ramírez, and L.E. Bausá, Advanced Materials, **25**, 910, (2013).**

Periodic arrays of silver nanoparticles on a  $\text{Nd}^{3+}$ -doped periodically poled ferroelectric laser crystal are selectively self-assembled by photochemical methods. By exploiting the unique features of plasmonic nanostructures to concentrate electromagnetic fields, an enhancement of  $\text{Nd}^{3+}$  luminescence is demonstrated as well as a remarkable increase of the quadratic nonlinear second harmonic generation by a factor of 20, which occurs with the periodicity of the metallic arrays.



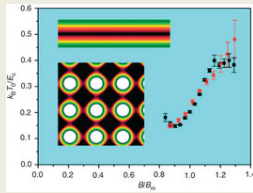
**Selective Plasmon Enhancement of the  $1.08 \mu\text{m}$   $\text{Nd}^{3+}$  Laser Stark, Transition by Tailoring Ag Nanoparticles Chains on a PPLN Y-cut, P. Molina, E. Yraola, M.O. Ramírez, J.L.Plaza, C. de las Heras and L.E. Bausá, Nano Letters, **13**, 4931 (2013).**

Selective photoluminescence enhancement of the specific  $\text{Nd}^{3+}$  Stark transition for which laser gain has been obtained in  $\text{Nd}^{3+}/\text{LiNbO}_3$  is demonstrated by means of plasmonic resonances with the appropriate symmetry configuration. By using the nonpolar Y-cut of a periodically poled  $\text{LiNbO}_3$  crystal as platform for photoreduction of metallic nanostructures, periodically distributed chains of Ag nanoparticles oriented parallel to the ferroelectric c-axis are obtained.



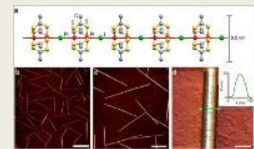
Magnetic field-induced dissipation-free state in superconducting nanostructures, R. Córdoba, T.I. Baturina, J. Sesé, A. Yu Mironov, J.M. De Teresa, M.R. Ibarra, D.A. Nasimov, A.K. Gutakovskii, A.V. Latyshev, I. Guillamón, H. Suderow, S. Vieira, M.R. Baklanov, J.J. Palacios and V.M. Vinokur, *Nature Communications* **4**, 143, (2013).

A superconductor in a magnetic field acquires a finite electrical resistance caused by vortex motion. A quest to immobilize vortices and recover zero resistance at high fields made intense studies of vortex pinning one of the mainstays of superconducting research.



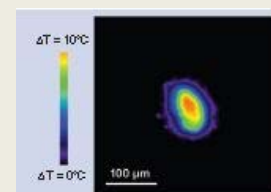
Intrinsic electrical conductivity of nanostructured metal-organic polymer chains, C. Hermosa, J.V. Alvarez, M-R Azani, C.J. Gomez García, M. Fritz, J.M Soler, J. Gómez-Herrero, C. Gómez-Navarro y F. Zamora, *Nature Communications* **4**, 1709, (2013).

One-dimensional conductive polymers are attractive materials because of their potential in flexible and transparent electronics. Despite years of research, on the macro- and nano-scale, structural disorder represents the major hurdle in achieving high conductivities.



Fluorescent nanothermometers provide controlled plasmonic-mediated intracellular hyperthermia, L. Martínez Maestro, P. Haro-Gonzalez, M. C. Iglesias de la Cruz; F. Sanz-Rodríguez, A. Juarranz, J. García Solé and D. Jaque, *Nanomedicine* **8**, 379-388, (2013).

This article demonstrates how controlled hyperthermia at the cellular level can be achieved. Materials & methods: The method is based on the simultaneous intracellular incorporation of fluorescence nanothermometers (CdSe quantum dots) and metallic nanoheaters (gold nanorods).



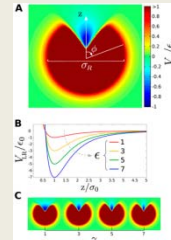
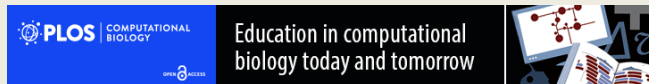
Smad2 and Smad3 cooperate and antagonize simultaneously in vertebrate neurogenesis, D. G. Míguez, E. Gil-Guiñón, S. Pons, E. Martí, *Journal of Cell Science*, **126**, 5335, (2013).

The transforming growth factor beta (TGF- $\beta$ ) pathway plays key roles in development and cancer. (TGF- $\beta$ ) signaling converges on the Smad2 and Smad3 effectors, which can either cooperate or antagonize to regulate their transcriptional targets.



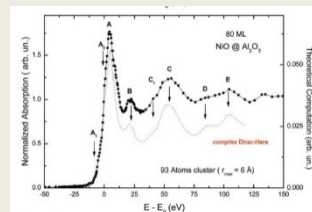
A Tunable Coarse-Grained Model for Ligand-Receptor Interaction, T. Ruiz-Herrero, J. Estrada, R. Guantes, D.G. Miguez, *Plos Computational Biology*, **9**, 1003274, (2013).

Cell-surface receptors are the most common target for therapeutic drugs. The design and optimization of next generation synthetic drugs require a detailed understanding of the interaction with their corresponding receptors.



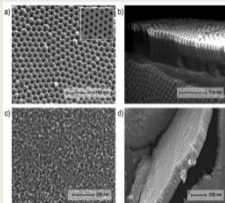
X-ray absorption study of the local structure at the NiO/oxide Interfaces, J. Preda, L. Soriano, D. Díaz-Fernández, G. Domínguez Cañizares, A. Gutiérrez, G.R. Castro and J. Chaboy, *Journal of Synchrotron Radiation*, **20**, 635, (2013).

This work reports an X-ray absorption near-edge structure (XANES) spectroscopy study at the Ni K-edge in the early stages of growth of NiO on nonordered SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub> and MgO thin films substrates. Two different coverages of NiO on the substrates have been studied.



Hexagonally-arranged-nanoporous and continuous NiO films with varying electrical conductivity, A. Gutierrez, G. Domínguez-Cañizares, J.A. Jiménez, I. Preda, D. Díaz-Fernández, F. Jimenez-Villacorta, G.R. Castro, J. Chaboy, L. Soriano, *Applied Surface Science* **276**, 832, (2013).

In this work we present an *in situ* X-ray photoelectron spectroscopy (XPS) study of the growth of NiO on highly ordered pyrolytic graphite (HOPG). The XPS spectra were measured as a function of the equivalent NiO coverage.



# The Institute and the Young researchers

The Young researchers meeting 2013 was held in December 2013 in Miraflores de la Sierra with the participation of PhD students of the INC. The award “Young Researchers in materials science prize” was given to Carlos Antón for his work “Energy Relaxation of exciton-polariton”, made in collaboration with the member of the INC Luis Viña. This work was published in Physical Review B (Phys.Rev.B 88, 035313(2013)). The panel, appointed by the steering committee of the INC, included professors S. Vieira, J.M. Calleja and J. Merino. They met on December 3, 2013 and proposed, following rules of the prize, the winning candidate. The jury reached its decision unanimously after carefully analyzing the information submitted by applicants. They took into account the quality of the work, the scientific prestige of the magazine where it has been published, and the fact that the candidate is the first author.

The jury was very impressed by the excellent quality of the works presented by the applicants. As a matter of fact, they proposed the INC to specifically mention to another student, L. Martínez Maestro, for the outstanding quality of the work she submitted to the prize. The INC agreed to this request, and will modify next calls of the prize to include a second prize.



C. Antón receives the prize “Young Researchers Prize in Materials Science”.

During the day our PhD students presented the following talks, and several posters.

*“Effect of grain size and disorder on conductive NiO thin films”* Guillermo Domínguez (Department of Applied Physic).

- *“Entanglement generation, manipulation and detection in waveguide QED.”* Carlos González Ballesteros (Department of Condensed Matter Physics).

- *“The interplay between mechanics and stability of viral cages”* Mercedes Hernando (Department of Condensed

Matter Theory).

- *“Quantum coherence of light-matter condensates that have never seen each other”*, Carlos Antón Solanas (Department of Materials Physics).
- *“Fluorescent Nanothermometers provide controlled Plasmonic Mediated Intracellular Hyperthermia”*, Laura Martínez Maestro (Department of Materials Physics).
- *“Magnetoresistance and Kondo Effect in Manganese Phthalocyanine”*, María Soriano (Department of Condensed Matter Physics).
- *“Emitters of N-photon states”*, Carlos Sánchez Muñoz (Department of Condensed Matter Physics).
- *“Polarized emission from a wire-like polariton condensates”*, Jorge Cuadra Véliz (Department of Materials Physics).
- *“Diseño de patrones en silicio poroso mediante haces de iones para estudios celulares”*, Esther Punzón Quijona (Department of Applied Physic).

# Seminars and Workshops

During 2013, we organized the following seminars:

Tuesday, September 10, 2013, "Field-controlled Dirac Fermions in the Vortex-Lattice Cores of quasi 2D Superconductor", Tsofar Maniv, Technion.

Tuesday, November 21, 2013, "Fluorescent and photovoltaic SiC: a new research field", Mikael Syväjärvi, Linköping, Semiconductor Energy and Environmental Materials research

Tuesday, November 28, 2013, "Interactions between nanoemitters and plasmonic structures/ antennas and self organized gratings.", Prof. Agnes Maitre, Institut des NanoSciences de Paris, Université Pierre et Marie Curie Paris.



# INC prize for Physics students

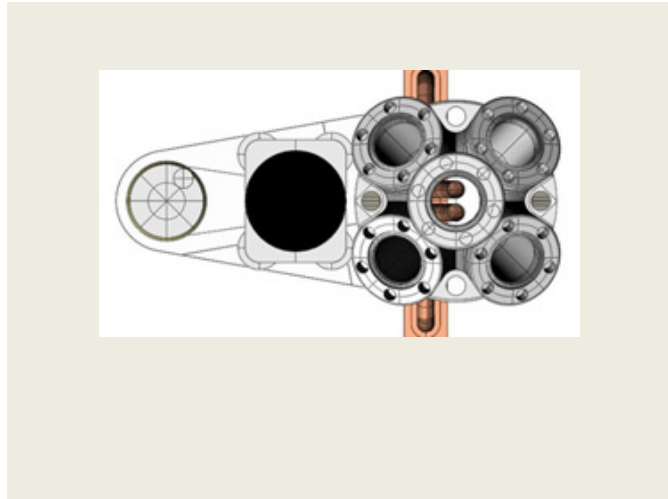
The Nicolás Cabrera Institute granted seven prizes for physics students of UAM. The aim of this action was to attract students of physics to the research groups and to disseminate our scientific work. The students worked for three months with members of the Institute to produce written and audio-visual dissemination material. The material is available in the web of the INC and in [youtube](#). Students present some of the more topical research subjects of the INC. Some of these students are already working at the laboratories of the Institute. The Institute granted special prizes to three students for the exceptional quality of the work they presented. The students and tutors who took part in this initiative have been:

- Medina Manresa, Jaime María, tutor Pablo Pernas Martino: "[Grafeno, el material del futuro](#)".
- Lara Astiago, Manuel, tutora Francesca María Marchetti: "[BEC-BCS crossover](#)".
- Crespo Cepeda, José Luis, tutor, Juan José Palacios: "[Topological Insulators](#)".
- Bandera Bielicka, Paloma, tutora Adriana Gil: "[Colaboración Empresa-Universidad](#)".
- Benito Llorens, José, tutor Hermann Suderow: "[Crecimiento y caracterización de cristales superconductores](#)".
- Riesco Álvarez, Roberto, tutora Carmen Aragón López: "[Materiales Ferroeléctricos](#)".
- Elvira Rodríguez, Iris, tutora Luisa Bausa: "[Procesos de conversión de frecuencias](#)".



# Training courses

During 2013 we offered the “Vacuum course”, together with Oerlikon-Leybold Vacuum. The course has been followed by eleven students, technicians and PhD students of the UAM, CSIC and staff of other research centers and companies. The aim is to offer an introduction to the basic principles of the vacuum systems.



# Publications

**P. Molina, E. Yraola, M. Ramirez, et al:** *Selective Plasmon Enhancement of the 1.08  $\mu\text{m}$  Nd<sup>3+</sup> Laser Stark Transition by Tailoring Ag Nanoparticles Chains on a PPLN Y-cut*  
Nano Letters, **13**, 4931, (2013)

**A. Fente, H. Suderow, S. Viera, et al:** *Low temperature magnetic transitions of single crystal HoBi*  
Solid State Communications, **172**, 59, (2013).

**P. San-Jose, E. Prada.** *Helical networks in twisted bilayer graphene under interlayer bias*  
Physical Review B, **88**, 121408; (2013).

**B. Braunecker, P. Burset, A. Levy Yeyati:** *Entanglement Detection from Conductance Measurements in Carbon Nanotube Cooper Pair Splitters.*  
Physical Review Letters, **111**, 136806, (2013)

**A. Gutierrez-Rubio, T. Stauber, F. Guinea:** *Transverse current response of graphene at finite temperature: plasmons and absorption*  
Journal of Optics, **15**, 114005, (2013).

**B. Braunecker, P. Simon:** *Interplay between Classical Magnetic Moments and*

*supraconductivity in Quantum One-Dimensional Conductors: Toward a Self-Sustained Topological Majorana Phase.*  
Physical Review Letters, **111**, 147292, (2013).

**MJ. Capitan, J. Alvarez, Yang Wang, et al.** *Onset of Chiral Adenine Surface Growth*  
Chemphyschem, **14**, 3294, (2013).

**B. García-Cámara, R. Gomez-Medina, JJ. Saenz:** *Sensing with magnetic dipolar resonances in semiconductor nanospheres.*  
Optics Express, **21**, 23007, (2013)

**J. Merino, A. Ralko, S. Fratini:** *Emergent Heavy Fermion Behavior at the Wigner-Mott Transition*  
Physical Review Letters, **111**, 126403, (2013).

**Eva. M. Fernández, E. Chacón, P. Tarazona, et al:** *Intrinsic Fluid Interfaces and Nonlocality.*  
Physical Review Letters, **11**, 096104, (2013).

**A. Castellanos-Gomez, G. Rubio-Bollinger, M. Garnica, et al.** *Highly reproducible low temperature scanning tunneling microscopy and spectroscopy with in situ prepared tips.*  
Ultramicroscopy, **122**, 1

(2013).

**B. del Rosal, Chen Sun, D.N. Loufakis, et al:** *Thermal loading in flow-through electroporation microfluidic devices.*  
RSC Publishing, Lab Chip, **13**, 3119, (2013).

**A. Maldonado, S. Vieira, H. Suderow.** *Supercurrent on a vortex core in 2H-NbSe<sub>2</sub>: Current-driven scanning tunneling spectroscopy measurement.*  
Physical Review B **88**, 064518, (2013).

**A. Castellanos-Gómez, G. Rubio-Bollinger, S. Barja, et al:** *Periodic spatial variation of the electron-phonon interaction in epitaxial graphene on Ru(0001).*  
Applied. Physics Letters. **102**, 063114, (2013).

**M. Maragkou, C. Sanchez-Muñoz, S. Lazic, et al:** *Bichromatic dressing of a quantum dot detected by a remote second quantum dot*  
Physical Review B, **88**, 075309, (2013)

**T. Pérez-Castañeda, J. Azpeitia, J. Hanco, et al:** *Low-Temperature Specific Heat of Graphite and CeSb<sub>2</sub>: Validation of a Quasi-adiabatic Continuous Method.*  
Journal of Low Temperature Physics, **173**, 4, (2013).

- M.O. Ramirez, P. Molina, L. Mateos, et al:** *Pr<sup>3+</sup>-Based Fluorescent TiO<sub>2</sub> Split Ring Resonator-Like Crystalline Microstructures.* Science of Advanced Materials, **5**, 921, (2013).
- M.I. Marques, J.J. Saenz:** *Comment on "Scattering Forces from the Curl of the Spin Angular Momentum of a Light Field" Reply.* Physical Review Letters, **111**, 059302, (2013).
- Mikel Sanz, Mohamed Oujia, E. Rebollar, et al:** *Stoichiometric magnetite grown by infrared nanosecond pulsed laser deposition.* Applied Surface Science, **282**, 642, (2013).
- C. Anton, T.C.H. Liew, G. Tosi, et al:** *Energy relaxation of exciton-polariton condensates in quasi-one-dimensional microcavities.* Physical Review B, **88**, 035313, (2013).
- A. Scholz, T. Stauber, J. Schielemann:** *Plasmons and screening in a monolayer of MoS<sub>2</sub>.* Physical Review B, **88**, 035135, (2013).
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- P. Albella, M. Ammeen Poyli, M.K.Schmidt:** *Low Loss Electric and Magnetic Field-Enhanced Spectroscopy with Subwavelength Silicon Dimers.* Journal of Physical Chemistry C, **117**, 13573, (2013).
- M. Douas, M.L. Marques, P.A. Serena:** *Identification of water content in nanocavities.* Nanoscale Research Letters, **8**, 171, (2013).
- R. Spano, J. Cuadra, C. Ling, et al:** *Build up of off-diagonal long-range order in microcavity exciton-polaritons across the parametric threshold.* Optics Express, **21**, 10792, (2013).
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- David G. Miguez:** *Network nonlinearities in drug treatment .* Interdisciplinary Sciences-Computational Life Sciences, **5**, 85, (2013).
- J.A. Galvis, H. Suderow, S. Vieira, et al:** *Scanning tunneling microscopy in the superconductor LaSb<sub>2</sub>.* Physical Review B, **87**, 214504, (2013).
- A. Gutierrez, G. Domínguez-Cañizares, J.A. Jiménez, et al:** *Hexagonally-arranged-nanoporous and continuous NiO films with varying electrical conductivity.* Applied Surface Science **276**, 832, (2013).
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- U. Rocha, C.J.da Silva, W. Ferreira Silva; et al:** *Subtissue Thermal Sensing Based on Neodymium-Doped LaF<sub>3</sub> Nanoparticles*. *ACS NANO* **7**, 1188-1199, (2013).
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- E.M. Fernandez, E. Chacon, P. Tarazona:** *Capillary wave spectrum at adsorbed liquid films* *Physical Review B*, **86**, 085401 (2012).
- E. Yraola, P. Molina, J.L. Plaza, et al:** *Spontaneous Emission and Nonlinear Response Enhancement by Silver Nanoparticles in Nd<sup>3+</sup>-Doped Periodically Poled LiNbO<sub>3</sub>LaserCrystal* *Advanced Materials*, **25**, 910-915, (2013).
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Physical Review B, **88**, 195403, (2013).

**R. Bernardo-Gavito, A. Serrano, M.A. Garcia, et al:** *Local Characterization of the optical properties of annealed Au films on glass substrates.*

Journal of Applied Physics, **114**, 164313, (2013).

**T. Ruiz-Herrero, J. Estrada, R. Guantes, et al:** *A tunable Coarse-Grained Model for ligand-Receptor Interaction.*

Journal Plos Computational Biology, **9**,1003274, (2013).

**M. Saade, I. Gutiérrez-Vallejo, G. Le Dréau, et al:** *Sonic Hedgehog Signaling Switches the Mode of Division in the Developing Nervous System.*

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**C. Hermosa, J.V. Alvarez, M-R Azani, et al:** *Intrinsic electrical conductivity of nanostructures metal-organic polymer chains.*

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Journal of the American Ceramic Society **96**, 1783, (2013).

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Journal of Applied Physics, **114**, 213905, (2013).

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IEEE Transactions on Magnetic, **49**, 7, (2013).

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Physical Review B, **88**, 121408, (2013)





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