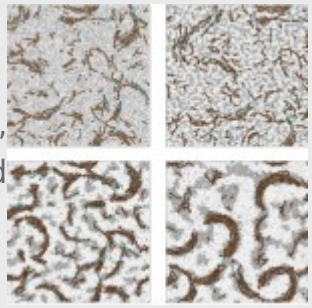
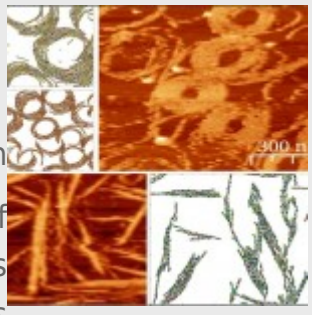
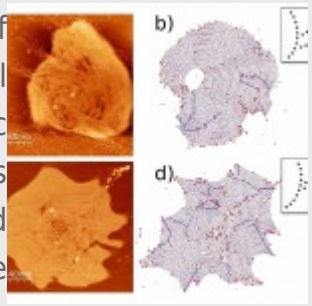
Thesis Defense - Dynamics of the Formation of Rings of Protein Filaments



Place: Seminar room, module 8, Facultad de Ciencias.
When: 11:30AM, Friday, 21st November, 2014.
Program: Defense by Mr. Pablo González de Prado Salas, Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.
Title: Dynamics of the Formation of Rings of Protein Filaments.
Thesis Director: Pedro Tarazona



FtsZ is a protein found in prokaryotes, and it plays an essential role in cell division. It is one of the main components of the Z-ring, the structure responsible for the constriction forces needed to split the cell in two. The details of this important process are still poorly understood.
We have used modelling and Montecarlo simulations of FtsZ filaments on a fine-grained lattice (where monomers occupy several lattice points, allowing for subtle movement). We compare the results with atomic force microscopy images of FtsZ on flat surfaces, with the aim of identifying the essential interactions among proteins that result in the very dynamic aggregates that are found in the experiments. In this thesis project we have focused on the role played by filament torsion and we have explored the importance of controlled anchoring to the membrane with the help of FtsZ mutants.



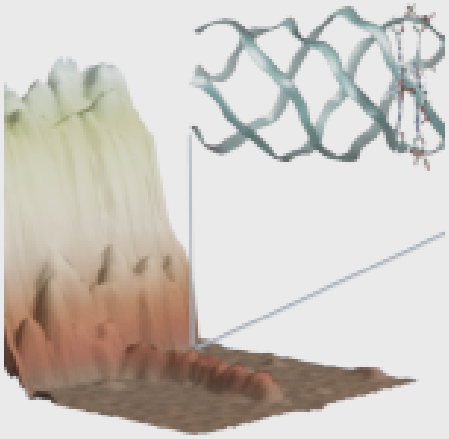
Annual INC Young Researchers Meeting 2014 - La Cristalera

The Young Researchers Meeting is dedicated to those Ph D students and young doctors whose research work has been or is being performed at the Institute Nicolás Cabrera.

Sessions: Oral & Poster
When: 19th december 2014

Where: Cristalera Residence, Miraflores de la Sierra, Madrid, Spain
Location Map
For further details please contact Alfredo Levy Yeyati.

Long-range Charge Transport in Single G-quadruplex DNA Molecules - published in Nature Nanotechnology



A single G4-DNA molecule has been shown to be able to transport charge over very long distances by Livshits et al. whose findings have been published in Nature Nanotechnology.

Abstract:
DNA and DNA-based polymers are of interest in molecular electronics because of their versatile and programmable structures. However, transport measurements have produced a range of seemingly contradictory results due to differences in the measured molecules and experimental set-ups, and transporting significant current through individual DNA-based molecules remains a considerable challenge. Here, we report reproducible charge transport in guanine-quadruplex (G4) DNA molecules adsorbed on a mica substrate. Currents ranging from tens of picoamperes to more than 100 pA were measured in the G4-DNA over distances ranging from tens of nanometres to more than 100 nm. Our experimental results, combined with theoretical modelling, suggest that transport occurs via a thermally activated long-range hopping between multi-tetrad segments. These results could re-ignite interest in DNA-based wires and devices, and in the use of such systems in the development of programmable circuits.
Reference:
Long-range charge transport in single G-quadruplex DNA molecules, G. I. Livshits, A. Stern, D. Rotem, N. Borovok, G. Eidelshtein, A. Migliore, E. Penzo, S. J. Wind, R. Di Felice, S. S. Skourtis, J. C. Cuevas, L. Gurevich, A. B. Kotlyar, D. Porath. Nature Nanotechnology, advanced online publication (October 26th, 2014). DOI: 10.1038/nnano.2014.246.

Electronic Liquid Crystals

INC COLLOQUIUM – OFFICIAL ANNOUNCEMENT

Title: Electronic Liquid Crystals
Speaker: A. P. Mackenzie, Max Planck Institute for Chemical Physics of Solids
Where: Sala de conferencias módulo 00, Facultad de Ciencias.
When: Tuesday 04 November, 12h30
ABSTRACT:

A major development in condensed matter physics over the past twenty years has been the study of collective electronic states that organise into symmetry-lowered configurations similar to those seen in liquid crystals. Empirically, these are often seen in the vicinity of unconventional superconductivity, further heightening interest in the topic. In this talk I will give a kind of ‘progress report’ on where things stand. I will emphasise that although we know much more about these states than we used to, the key outstanding questions are sufficiently important that this will remain a central field of research for the foreseeable future.

How Mesoscopic Superconductivity is Changing Astronomical Observation

INC COLLOQUIUM – Official announcement

Title: How mesoscopic superconductivity is changing astronomical observation
Speaker: T.M. Klapwijk, Kavli Institute of Nanoscience, Delft University of Technology
Where: Sala de seminarios módulo 03, planta 5, Facultad de Ciencias.
When: Monday 06 October, 12.00
ABSTRACT:

Superconductivity is a very rich and intriguing phenomenon, which continues to pose challenging questions in condensed matter physics. Although it is over 100 years old its range of applications is limited. The most well-known are the superconducting wires, which are used for powerful cooled magnets for science experiments and MRI. Another branch is formed by superconducting electronics of which quantum computation is currently a very promising research-area, and which relies heavily on nanotechnology. A less widely known application with high impact is in astronomical instruments. I will discuss how superconductivity has served astrochemistry through the Herschel Space Telescope, and continue to do through the Atacama Large Millimeter Array. In addition I will discuss how superconducting resonators are evolving towards a multi-pixel camera in the THz range and to an on-chip spectrometer, both for astronomical observations.

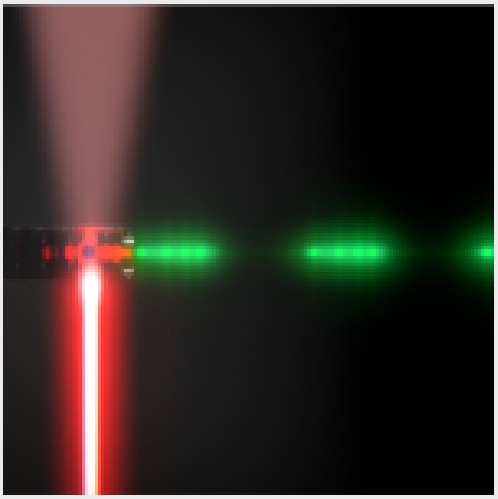
Doors Open Day - Jornadas de Divulgación de la Investigación en Física en la UAM

The Department of Theoretical Condensed Matter Physics organizes on Friday, 3rd October 2014 a doors open day for Physics students at UAM.
This action is part of the "Jornadas de Divulgación de la Investigación en Física en la UAM" which aims to introduce students to the physics research carried out at UAM.
Doors Open Day
Program: Friday, 3rd October 2014 from 09.45-12.30 PM.
Place: module 5, 5th floor.
Event Flyer: Jornadas de Divulgación de la Investigación en Física en la UAM

Francisco J. García-Vidal included in Thomson Reuters 2014 Compilation of Most Influential Authors

Using indicators taken from InCites Essential Science Indicators, a subset of the Web of Science, Thomson Reuters has launched Highly Cited Researchers which highlights some of the hottest researchers of the last decade from around the world. Researchers have earned this distinction by writing the greatest numbers of reports officially designated by Essential Science Indicators as Highly Cited Papers—ranking among the top 1% most cited for their subject field and year of publication—between 2002 and 2012. Thus, the listings of Highly Cited Researchers feature authors whose published work in their specialty areas has consistently been judged by peers to be of particular significance and utility. This new compilation includes influential thinkers in 21 main fields of science and the social sciences.
We congratulate Professor Francisco J. García-Vidal who has earned a place on this list in the category of Physics. Read more …

Emitters of N-photon bundles - published in Nature Photonics



A new type of light has been theorized by C. Sánchez Muñoz et al. whose findings have been published in Nature Photonics.

Abstract:
Controlling the output of a light emitter is one of the basic tasks in photonics, with landmarks such as the development of the laser and single-photon sources. The ever growing range of quantum applications is making it increasingly important to diversify the available quantum sources. Here, we propose a cavity quantum electrodynamics scheme to realize emitters that release their energy in groups (or 'bundles') of N photons (where N is an integer). Close to 100% of two-photon emission and 90% of three-photon emission is shown to be within reach of state-of-the-art samples. The emission can be tuned with the system parameters so that the device behaves as a laser or as an N-photon gun. Here, we develop the theoretical formalism to characterize such emitters, with the bundle statistics arising as an extension of the fundamental correlation functions of quantum optics. These emitters will be useful for quantum information processing and for medical applications.

Elections to the Head of Department

The elections to the Head of Department will be held on Wednesday, 18th of June, 2014.

Place: Seminars room, module 5 (5th floor), Department of Theoretical Condensed Matter Physics, Faculty of Science.
Further information concerning electoral process and electoral calendar (in Spanish).

Convocatoria/Resultado de elecciones a director de departamento

- Convocatoria y calendario electoral
- Proclamación de candidatos a director del Departamento de Física Teórica de la Materia Materia Condensada
- Resultado elecciones a Director del Departamento de Física Teórica de la Materia Materia Condensada

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Particle Physics On a Chip: the Search for Majorana Fermions

INC COLLOQUIUM – OFFICIAL ANNOUNCEMENT

Title: Particle Physics On a Chip: the Search for Majorana Fermions
Speaker: Leo Kouwenhoven, Delft Univ. of Technology.
Where: Sala de conferencias módulo 0, Facultad de Ciencias.
When: Thursday 29 May, 12:h00
ABSTRACT:

Majorana fermions were predicted in 1937 by Ettore Majorana in Rome. These are particles with the mysterious property that they are equal to their anti-particles. This defining property immediately implies that these “Majoranas’ have zero charge and zero energy. Ongoing searches for detecting Majoranas occur in the context of high-energy physics and dark matter, but yet without success. Simultaneously, condensed matter theorists proposed specially designed electronics that can host Majoranas. This insight led to a successful experiment that has the signature of a Majorana, potentially the key to developing a quantum computer.