Recent publications

Astrophysics

The First Nova Explosions

The nature of nova explosions in the most primitive stellar binaries has been uncovered. A new study shows that primordial novae display a larger nuclear activity than classical novae, leading to a new type of explosion, halfway between a supernova and a nova. The work has been performed by Jordi José and co-workers (UPC-CSIC), and will be published in the Astrophysical Journal Letters.

Chemical Physics

The dynamics of polymers

Molecular dynamics simulations have been used to evaluate the conformational dynamics of amorphous polyethylene. The study has shown that the overall torsional functions are dominated by slow events, whereas the ones associated with the isomeric states correspond to the short time dynamics. This study was performed by Manel Canales and Gemma Sesé, and was published in the Journal of Chemical Physics in 2006.

Biophysics

A role for noise in cells

A functional role of noise has been proposed at the level of gene regulation in the stress response of bacteria. The study, performed by J. Garcia-Ojalvo and co-workers, appeared in Science on March 23, 2007.

Meteorology

Inferring weather processes from dust

The chemical composition of African dust delivered by red rains at Montseny (Barcelona) was used to distinguish between eastern and western air fluxes from 1983 to 2002. The work was performed by Marta Alarcón and co-workers, and appeared in the Journal of Geophysical Research in March 2007.
Our postdocs

Anuj Parikh, nuclear astrophysicist

“My experience so far as a postdoctoral associate with the UPC has been excellent. In these 4 months at the EUETIB, I have found the professors, support staff and students to be unfailingly kind and helpful. Jordi José and I are currently watching the progress of the first stage of our study on the impact of nuclear physics uncertainties in X-Ray Bursts simulations (that is, thermonuclear flashes on the surface of neutron stars in binary stellar systems). We plan to use the results from this project to propose new measurements of key nuclear reactions that we find to be important.”

Antoni Pons, nonlinear physicist

“The brain is one of the most complex systems in Nature, and is still poorly understood. However, new experimental and theoretical tools are allowing scientists to improve their understanding of many aspects of brain dynamics. Our research in the FEN department is focused in the abnormal degradation of synchronization in the brain, which leads to Alzheimer’s disease. We model the synchronization properties of multichannel electroencephalographic (EEG) signals obtained experimentally by Jose Luis Cantero at the University Pablo de Olavide in Sevilla. Our goal is to develop a realistic model that can distinguish healthy subjects from those who will develop the pathology in the mid term, allowing us to design a procedure that permits an early diagnosis.”

Anuj Parikh obtained his PhD in physics from Yale University (USA) in 2006, and arrived in Barcelona in December of that same year, financed in part by funds from the Department.

Antoni Pons obtained his PhD in physics from the University of Barcelona in 2004. After spending two years as a postdoctoral researcher in Northeastern Univ. (USA), he arrived in Terrassa in February 2007, financed in part by the Department.

Highly cited papers

R. Pastor-Satorras and A. Vespignani
“Epidemic spreading in scale-free networks”, Physical Review Letters 84, 3200 (2001), 393 citations

“The key observation of this paper was to realize that the proper substrate for the propagation of computer viruses is not a regular lattice, as previously assumed, but a complex network with a scale-free topology, with many elements connected to a few neighbors, and a few elements with a large number of connections (hubs). We showed that the epidemic threshold is in this case vanishingly small due to the effect of the hubs. These results also shed light on the behavior of human diseases such as AIDS, which spreads in a virtual network of sexual contacts also characterized by a scale-free nature.”

Romualdo Pastor-Satorras, associate professor at FEN

R. Rey and J. T. Hynes

“This paper was the first to solve theoretically the mechanism of vibrational relaxation of a poliatomic molecule immersed in a liquid. Its impact stems from the fact that the techniques introduced have been used in many other systems, and also because water is obviously a system of high interest.”

Rossend Rey, associate professor at FEN

COURSES BY VISITING PROFESSORS


- Dr. Pedro Velarde (Instituto de Fusión Nuclear de Madrid): “Métodos de malla adaptativa en fluidodinámica y transporte de radiación” (May 11-18, 2007).

- Dr. S. Capaccioli (University of Pisa, SOFT): “What Can We Learn by Squeezing a Liquid? Pressure as an Alternative Pathway to Glass Transition” (May 21-30, 2007).

- Dr. Yuri Kivshar (Australian National University): “Nonlinear wave physics in photonic structures and metamaterials” (May 22-24, 2007).

- Dr. Roland Diehl (Max-Planck-Institut für extraterrestrische Physik): “Nuclear astrophysics with cosmic gamma-ray observations” (June 4-15, 2007).

- Argos Chair in Nuclear Security. Created in 2004 by an agreement between the Spanish Nuclear Security Council and the Section of Nuclear Engineering of the FEN Department, the Argos Chair provides funding for undergraduate and PhD thesis on the area of Nuclear Security. For more information, see http://www-sen.upc.es

FUNDING

- “Glassy Liquids Under Pressure: Fundamentals And Applications”, European Science Foundation, coordinated by Josep Lluis Tamari.

- Agreement with ITER organization for safety studies related to ITER Generic Site Safety Report (Javier Dies).

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