



FENOMEN

NEWSLETTER OF THE DEPARTMENT OF PHYSICS AND NUCLEAR ENGINEERING

NEWS

2010 FEN POSTDOC-TORAL FELLOWSHIP

A postdoctoral position in any area of physics is available. The position will be co-financed by the Department and by the host research group. The application deadline is June 15th, and a decision will be made by June 30th. Interested candidates should contact a research group of the Department within their area of expertise. A list of research groups can be found at <http://dfen.upc.edu>

UPCOMING EVENTS

- The Quantum Liquids group of SIMCON organizes the “XXVI Trobades Científiques de la Mediterrània” in Maó (Menorca), from September 30 to October 2, 2010. The Workshop focuses on the topic “Correlations in Quantum Gases” and will discuss recent developments in the field of quantum gases, specially in situations where correlations play an increasing role.

<http://www.fen.upc.edu/menorca2010>

- The ESF-COST High-Level Research Conference “Future Internet and Society: A Complex Systems Perspective” is being organized by R. Pastor-Satorras at Acquafrredda di Maratea, Italy, on October 2-7, 2010.

<http://www.esf.org/conferences/10341>

- The fourth edition of the “Noise in Life” international conference will take place at the Centro de Ciencias de Benasque Pedro Pascual, on October 25-29, 2010. Organized by J. Garcia-Ojalvo, it aims to discuss recent advances in establishing the functional roles of randomness in living organisms.

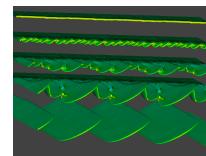
<http://benasque.org/2010noise>

Recent publications

Materials Science

Cracking the crack

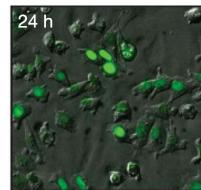
Fracture is a phenomenon that leads to function failure in all sorts of materials. However, the mechanism by which it occurs is not well understood. Shedding light in this direction, A.J. Pons and a colleague from the US have created a 3D model for the propagation of cracks in brittle materials subject to mixed mode loading conditions. Their model, based on the phase-field approach, bridges different length scales for the first time, and predicts a coarsening of fracture lancets that is observed experimentally. It was published in *Nature* on March 4, 2010.



Cognitive Sciences

The language of color

Human color categorization displays certain universal patterns among populations. This is the result of the World Color Survey data set, which analyzed color naming in 110 nonindustrial societies. Comparing simulation of artificial agents to the empirical data, A. Baronchelli and colleagues from Germany and Italy have identified the perceptual constraint that generates such patterns. The work was published in the *Proceedings of the National Academy of Sciences of the USA* in February 9, 2010.



Materials Science

A giant caloric response

Standard cooling devices rely on the compression of hazardous gases. As an ecological alternative, efforts are being made to find solid-state materials that show giant caloric effects near room temperature. Most work so far has studied caloric effects induced by a magnetic field, but now researchers from the GCM group with colleagues from the UB have

shown that comparable results can be obtained applying a moderate hydrostatic pressure to a magnetic shape-memory alloy. These findings were published in *Nature Materials* on April 4, 2010.

Biological Sciences

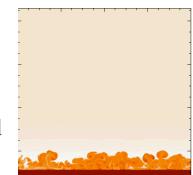
Talking cells

Just like people in a community, cells transmit information between them. One of the most important communication routes in mammalian cells is the Notch-Delta signaling pathway. Using a combination of single-cell measurements and theoretical analysis, J. Garcia-Ojalvo and colleagues from the US have discovered that cells use the Notch-Delta system not only to transmit signals, but also to decide which cell must speak and which must listen. The research has been published in *Nature* on May 6, 2010.

Astronomy

Metals in novae

The origin of metal enhancements observed in the ejecta from classical nova explosions has puzzled theoreticians for 40 years. Now J. Casanova, J. José, and colleagues have shown that Kelvin-Helmholtz instabilities can naturally lead to self-enrichment of the solar-like envelopes with material from the outermost layers of the underlying white dwarf, at levels in agreement with observations. Their results, which rely on 2D hydrodynamic simulations, appeared in *Astronomy & Astrophysics Letters* in April 2010.



Landau's legacy at FEN

L. D. Landau was a prominent physicist who made fundamental contributions to many areas of theoretical physics. He was awarded the 1962 Nobel Prize in Physics for his theory of superfluidity. Landau was the principal founder of a great tradition of theoretical physics in the former Soviet Union, sometimes referred to as the "Landau school".



Landau's group in Moscow (1956), with Pitaevskii (2nd from the left in the back row) and Landau (4th from the left in the front row).

On Thursday April 22, 2010, and invited by Gregory Astrakharchik, Prof L. P. Pitaevskii from the University of Trento (Italy) and the Kapitza Institute for Physical Problems (Russia) gave the talk "Landau as a teacher", in which he explained his experience of being a PhD student in Landau's department during the 1955-1962 period.

POSTDOC POSITION IN ASTROPHYSICS

A 3-year postdoctoral contract is launched in the framework of the Project "Physics of compact objects: explosive nucleosynthesis and evolution", as part of the ESF Eurocores Program EuroGENESIS. The selected candidates will work in computational and/or nuclear astrophysics. Experience in nuclear physics and/or cosmochemistry would also be valued. Applications, including a detailed CV with a list of publications and three reference letters, should be sent electronically to Dr. Jordi José (jordi.jose@upc.edu), no later than May 20th, 2010. The starting date for the

position is expected to be by late June 2010.

PHD THESES

- Fermín Moreno Guzmán. Advisor: Jordi José (November 25, 2009).
- Ruben Martín Cabezón Gómez. Advisor: Domingo García Senz (April 21, 2010).

A NEW HOME IN THE WEB

Our department has a new website:
<http://dfen.upc.edu>

The website contains a full account of our research and teaching activities, and includes an agenda that lists all events going on in the department. Most of the

Side Note

New materials for cleaner cars

The SEAT-ETSEIB chair is funding the Medea Project for the generation of new particle filters and catalytic converters applicable to automobile exhausts. In particular, the project aims to develop a titanium oxide and aluminium-based new material with



refractory foam characteristics. Initial tests with the material, which is obtained by ceramic replication, are already being carried out at SEAT's Technical Center.

The project, led by J.A. Cusidó, is being conducted to help fulfill the 2015 European environmental regulations on particle emissions by motor vehicles.

FEN research groups have also created new websites that can be reached from the department's page.

MORE NEWS

- Trinitat Pradell became Full University Professor on March 2, 2010.
- Cristina Masoller and Jordi García-Ojalvo have received the 2009 ICREA Academia award.

Edited by

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