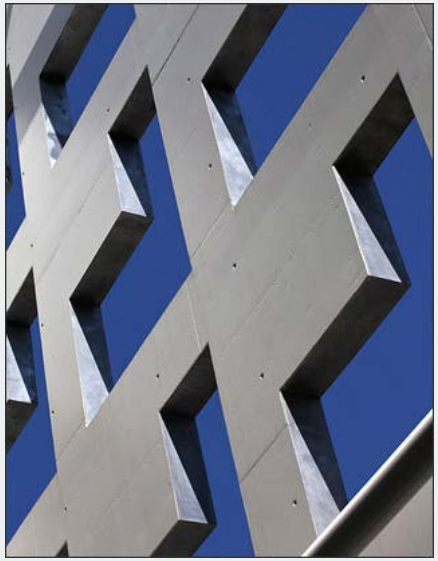
Welcome to ICN2 Annual Report 2013

Welcome to ICN2's Annual Report 2013. Here you will find details on ICN2's activities during 2013, summaries of its structure and functions, relevant statistics and listings on the Institute's scientific output.

Please do not hesitate to contact us should you require more information. We invite you to explore the report using the menu options above, or to return to other sections of ICN2's website using the links below:

- ICN2 Homepage
- Contact Page



Legal Terms

Introduction

These are the General Conditions of Use and Data Privacy Policy for users of the website www.icn2.cat (hereinafter "the Web"), as well as of any other websites or domains operated by the Catalan Institute of Nanoscience and Nanotechnology Foundation (hereinafter, "ICN2").

The User should carefully read these General Conditions before browsing the Web. In any case, accessing the Web will imply full acceptance of the present General Conditions, including the limitations relating to its use, transference, intellectual property and confidentiality.

ICN2, proprietor of this website, is located at: ICN2 building, UAB campus, 08193 Bellaterra (Barcelona), Spain, ID Number G-63277776.

It is essential for ICN2 to guarantee and protect the privacy and confidentiality of users' personal data, according to the current legislation (15/1999 Law on Personal Data Protection) and its implementing regulations.

In order to meet this objective and to protect users' intimacy and privacy, ICN2 has issued this Privacy Policy document so as to provide users with the following information:

- Regarding the collection and processing of personal data.
- Regarding the steps adopted to guarantee the protection of personal data.

Any personal data obtained from the ICN2 network and websites, will be processed in accordance with this Privacy Policy.

Information on personal data collection and uses

General

ICN2 collects personal data information whenever you:

a. Contact us by browsing the web and submit any kind of communication, queries or forms.

b. Contact either by phone, fax or e-mail with any of our departments and/or professionals whose contact details are on the web. This data processing does not apply when this web gives access to the user to different webs through informative links or banners appearing on it. If you, as a user, decide to access any of these websites and provide them with your personal data, you will not be providing ICN2 with this data, but the person in charge of that particular third-party website.

c. Participate in ICN2 queries, surveys and/or communications.

ICN2 can use the information provided by the user for the following general purposes: to satisfy her/his requests and queries, form, to send a mailing and information of her/his interest, to keep her/him informed on the events and activities carried out by the Institute, to improve our services, to contact you and undertake research on behavior in order to keep the website safe and fulfill the corresponding safety conditions.

The user will be responsible for the veracity and ownership of the data provided.

File structure, equipment and information systems

In order to act in accordance with the regulations in force on data security policy, all the personal data contained in or on ICN2's files, computer equipment and information systems that process this information, independently of whether they are owned by ICN2 or by a third party, will submit to the conditions stated in this Privacy Policy.

ICN2 staff and the personnel in charge of processing the data

All ICN2 personnel and third parties that, by means of a contract, might have access to personal data, to computer equipment or information systems, are bound to process the obtained information in accordance with the present Privacy Policy and, in particular, with any confidentiality agreement governing the exchange of information.

Law for the Protection of Data (LOPD) Consent

We inform you that all personal data provided are confidential and will form part of the files maintained by ICN2 in order to be able to undertake corresponding professional, commercial and/or contractual relations established either with ICN2 or with any of its professionals, as well as to keep you informed about our services, relevant aspects of the academic and scientific world and, in particular, the field of nanotechnology.

Sending an email query to ICN2 or any of its personnel implies consent for the sender's personal data to be processed in an automated data file. The user undertakes to provide true, accurate, complete and current data. The user is solely responsible for any loss or damage, direct or indirect which might arise as a consequence of providing someone else´s data, false, inaccurate, incomplete or outdated data.

Rights of access, rectification, cancellation and opposition

The owners of said data may exercise their rights of access, opposition, rectification and cancellation at the following postal address: HR Department, ICN2 building, UAB campus, 08193 Bellaterra (Barcelona), Spain, enclosing a photocopy of their ID card, or by sending an e-mail to: hr@icn.cat, in case that their personal data was provided via e-mail.

Scope of the authorised use of the Web.

The User undertakes to make lawful, diligent, confidential, fair and correct use of any information or content he/she might access through the Web.

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The User must refrain from:
a. - Obtaining ,spreading and / or reusing without previous authorisation, any information owned by ICN2 and / or resulting from the use of the Web, especially when it involves personal data;
b. - Performing any act that might be detrimental to the website itself, to other Users or to ICN2.
The user may not carry out any sabotage or tamper with contents of the Web.

Exclusive rights

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Letter from the Director

2013 was a year of consolidation for the Catalan Institute of Nanoscience and Nanotechnology (ICN2).

The institution has faced and mostly completed the transformation from the former ICN (*Institut Català de Nanotecnologia*) to the new ICN2 (*Institut Català de Nanociència i Nanotecnologia*). This transformation is much deeper than a mere change of name, with the incorporation of the *Consejo Superior de Investigaciones Científicas* (CSIC) to the Board of Trustees of the ICN2 Foundation (joining our previous Patrons: the *Generalitat de Catalunya* and the *Universitat Autònoma de Barcelona*), and the integration of the CSIC groups from the former *Centro Mixto* CIN2 into the structure of ICN2 as the most significant events. This culminates a process started in 2011, which signifies the commitment of our funding Patrons (*Generalitat de Catalunya* and CSIC) joining efforts to build a strong centre of research in Nanoscience and Nanotechnology, taking profit of the strengths of each institution, and enhancing ICN2's scientific potential and impact, economic resources, and competitiveness. Albeit the integration is not yet fully complete, the present Annual Scientific Report could not refer anymore to ICN alone and it represents the first report under the new structure of ICN2.

During 2013, despite of being the year of the start of an incipient economic recovery, the accumulated impact of several years of economic crisis has hit hard on much of the public sector. Our funding patrons have not been immune to these hardships, which in turn have also affected our Institute, precisely in a period of transformation and change in which economic stability and strength was most needed. The impact on the finances of ICN2 was strong, and was combined with the needs to provide service to a larger scientific community after the merging and the need of support the new incoming groups. We were, however, able to revert the situation through an economic plan that has allowed us to continue our activities, complete the merging process, and guarantee the viability of ICN2 in the future with a balanced budget and a stable funding from our patrons.

In March 2013 we completed the moving to the new ICN2 building, which was officially inaugurated on January 20th, 2014, with the presence of **Andreu Mas-Colell** (Minister of Economy and Knowledge of Catalonia, and President of the ICN2 Board of Trustees), **Carmen Vela** (Secretary of State of Research, Development and Innovation of Spain), **Emilio Lora Tamayo** (President of Consejo Superior de Investigaciones Científicas) and **Ferran Sancho** (Rector of the Universitat Autònoma de Barcelona).

The 2013 scientific activity figures are the first ones to show the potential of ICN2. The number of indexed publications (145), with a remarkably high impact factor (6.5), remained notorious despite the complexity of the merging process we are culminating. ICN2 was, again, ranked by the SCIMAGO Institutional Rankings Report for 2013 among the top ten Spanish research institutions for all measures of research excellence (although ICN and CIN2 were still considered as different institutions during the 2007-2011 period: CIN2 and ICN ranked 3rd and 4th respectively in Excellence Rate, the percentage of papers among the 10% most cited in their fields).

In 2013 ICN2 continued to attract competitive grants, which amounted to 47% of the running budget of ICN2. An important highlight is the European Research Council (ERC) Consolidator Grant awarded to ICREA Prof. **Daniel Maspoch**. ICN2 keeps strongly

Prof Pablo Ordejón

Prof Ordejón earned his BSc in Physics (1987) and PhD in Science (1992) at the *Universidad Autónoma de Madrid* (Spain). He worked as a postdoctoral researcher at the University of Illinois at Urbana-Champaign (USA) from 1992 to 1995, and as Assistant Professor at the *Universidad de Oviedo* from 1995 to 1999. In 1999, he obtained a research staff position at the *Institut de Ciència de Materials de Barcelona* of the *Consejo Superior de Investigaciones Científicas* (CSIC), where he is currently Research Professor. Since July 2012, he has served as Director of ICN2, where he also leads the *Simulation and Theory* Research Group.

He has published more than 190 scientific articles, which have received over 17,000 citations (h = 47). Since 2009 he has served as Co-Editor of EPL (formerly *Euro Physics Letters*) and since 2004, as Regional Editor of *physica status solidi*. He was in charge of the Condensed Matter Physics area of the Physics Panel of the Spanish National Scientific Valuation Agency (ANEP), from 2003 to 2006, and the Head of the Physics and Engineering Panel of the Access Committee to the Spanish Supercomputing Network, from 2005 to 2011. He became a Fellow of the American Physical Society in 2005.

His research is focused on the development of efficient methods for electronic structure calculations in large and complex systems, with contributions to the development of techniques for large scale atomistic simulations based on

involved in the development of one of the two European Commission's FET Flagship Programme: the *Graphene Flagship*. The present document shows remarkable figures attracting national and international competitive funding, regardless of the global economic difficulties. Specially worth mentioning is the filing of an application within the Severo Ochoa Centres of Excellence Programme of the Spanish MINECO, which was submitted in December 2013. This application was successful, as was announced during March 2014. This is an outstanding achievement, given the level of competitiveness of these awards, and will signify a qualitative improvement on the research capabilities of ICN2 and a driving force towards collaborative activities between the research groups of our Institute, focused on specific, common objectives on "Nanodevices for Societal Challenges in Life, Energy and ICT".

We continued the strategy put forward in 2012 to promote technological transfer as a key activity of ICN2. The role and resources of the Technology Transfer Office have been strengthened, which is having a significant impact on the transfer results. During 2013, we established a Framework Partnership Agreement with Henkel, under which two projects are being developed that have already produced very promising results. Also, products developed upon know-how transfer agreements between ICN2 and industrial partners (Lucta and Chemipol) have already reached the market, and are producing the first returns from royalties for ICN2. A spin-off company was created in October 2013, that will exploit the results of the research of ICN2 protected by a patent on biogas production.

In summary, 2013 was a year of great activity and results for ICN2. Again, our staff has performed exceptionally well in a period of economic hardship and uncertainties. The completion of the institutional changes leading to the transformation of ICN2, the forecast of a brighter economic situation, and the recent consecution of the Severo Ochoa Award are factors that allow me to be extremely optimistic about the future of our Institute.

I invite you to join me in building this bright future every day, and participate in this collective journey to personal and professional growth.

With my best regards,

Prof. Pablo Ordejón
Director, ICN2

first principles methods like SIESTA. He has also been involved in the study of the fundamental properties of materials at the atomistic level. His current interests include, among many others, electronic transport in nanoscale devices and electronic processes at surfaces. He maintains frequent collaborations with industrial laboratories on the simulation of materials processes at the atomic level.

Organisation

The Institut Català de Nanociència i Nanotecnologia (ICN2) is a non-profit international research institute located in Barcelona, Spain. It was born in 2013, when CSIC joined the Board of Trustees of the former Institut Català de Nanotecnologia (ICN), created in 2003 by the Ministry of Universities, Research and Information Society (DIUE) of the Catalan Government and the Universitat Autònoma de Barcelona (UAB), and with the incorporation of the CSIC groups from the former Centro de Investigación en Nanociencia y Nanotecnología (CIN2), created in 2006 as a joint collaboration between CSIC and ICN.

ICN2 is led by its Director, Dr **Pablo Ordejón**, who reports to the Board of Patrons and is advised by the Scientific Advisory Board, made up of numerous distinguished international scientists.

Research activities are directed by Research Group Leaders - senior scientists of international repute that lead research teams focused on their respective areas of expertise, and that are supported by specialised laboratory engineers and technical and administrative staff.

In 2013, ICN2 comprised 15 Research Groups and 4 Research Divisions, covering different areas of nanoscience and nanotechnology:

Research Groups

- Atomic Manipulation and Spectroscopy Group
- Force Probe Microscopy and Surface Nanoengineering Group
- Inorganic Nanoparticles Group
- Magnetic Nanostructures Group
- Nanobioelectronics and Biosensors Group
- NanoBiosensors and Bioanalytical Applications Group
- Nanostructured Functional Materials Group
- Nanostructured Materials for Photovoltaic Energy Group
- Novel Energy-Oriented Materials Group
- Oxide Nanoelectronics Group
- Phononic and Photonics Nanostructures Group
- Physics and Engineering of Nanodevices Group
- Supramolecular Nanochemistry and Materials Group (NANO^{UP})
- Theoretical and Computational Nanoscience Group
- Theory and Simulation Group

Technical Development and Support

- Electron Microscopy Division
- Nanofabrication Division
- Nanomaterials Growth Division
- Nanoscience Instrument Development Division

Research and Technical Development

Research Groups

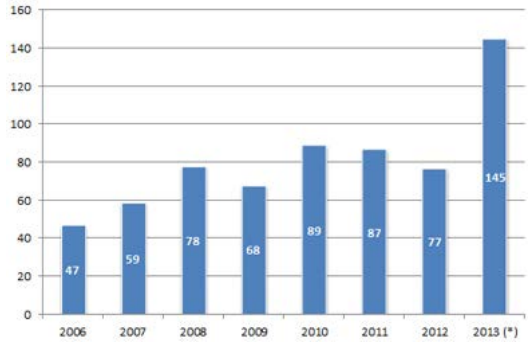
- Atomic Manipulation and Spectroscopy Group
- Force Probe Microscopy and Surface Nanoengineering Group
- Inorganic Nanoparticles Group
- Magnetic Nanostructures Group
- Nanobioelectronics and Biosensors Group
- NanoBiosensors and Bioanalytical Applications Group
- Nanostructured Functional Materials Group
- Nanostructured Materials for Photovoltaic Energy Group
- Novel Energy-Oriented Materials Group
- Oxide Nanoelectronics Group
- Phononic and Photonics Nanostructures Group
- Physics and Engineering of Nanodevices Group
- Supramolecular Nanochemistry and Materials Group (NANO^{UP})
- Theoretical and Computational Nanoscience Group
- Theory and Simulation Group

Technical Development and Support

- Electron Microscopy Division
- Nanofabrication Division
- Nanomaterials Growth Division
- Nanoscience Instrument Development Division

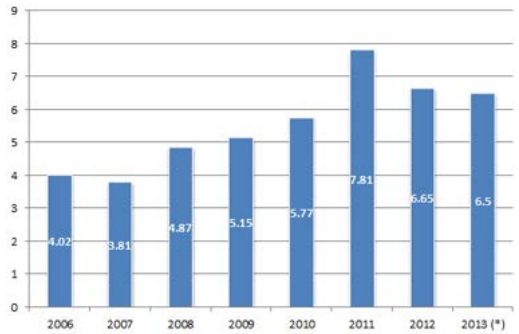
Publications

Evolution of number of indexed publications at ICN2



(*) 2013 figures include CSIC Groups' information for the first time

Evolution of average impact factor at ICN2



(*) 2013 figures include CSIC Groups' information for the first time

Impact factor (2013)

Top 10 journals

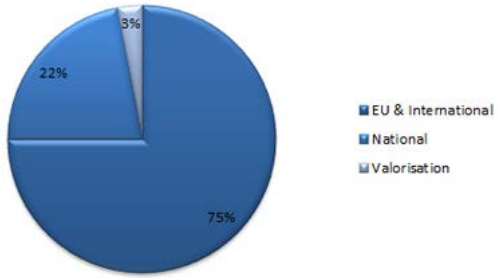
Journal	IF	# articles
Nature Materials	35.75	2 (1 selected for cover)
Nature Nanotechnology	31.17	2
Chemical Society Reviews	24.89	1
Nature Chemistry	21.76	1
Annual Review of Materials Res.	16.18	1
Advanced Materials	14.83	4
Angewandte Chemie - Int. Ed.	13.73	1
Nano Letters	13.03	4
ACS Nano	12.06	2
Energy and Environmental Science	11.65	1

Projects

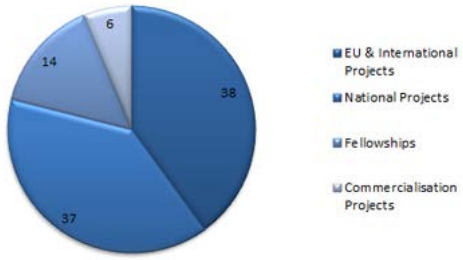
Competitive research funding is vital for ICN2's financial viability and serves as an indicator of the quality and international competitiveness of the Institute's research. In 2013 competitive funding continued to stem in a high percentage from EU & International research projects.

The breakdown of competitive funding at ICN2 for 2013 is illustrated in the pie chart below:

Breakdown of Competitive Funding in 2013



Number of Active Competitive Projects at ICN2: 2013



You can view the detailed information about projects in the Appendices or in each Group's information.

Management and Services

ICN2's Management and Services team performs a wide range of functions and provides numerous support services to the Institute's Research Groups. Its members are distributed in six departments: ***Finance***, ***Information Technologies***, ***Human Resources & Education***, ***General Services***, ***Technology Transfer***, *and* ***Marketing and Communication***. *Additionally, the* ***Strategy*** *Department reports directly to the Director.*

Each department has been designed and scaled to provide services to the whole ICN2 community, including 15 Research Groups and 4 Technical Divisions. The merger process involving ICN and CIN2 resulted in a reinforced administrative structure, well-placed to manage ICN2's needs.

Human Resources & Education

ICN2's HR policies are a key competitive advantage in recruiting international talent. During 2013, the Human Resources Department made all the necessary arrangements for a total of 316 people having their activity at ICN2 (including full-time personnel, visiting researchers, interns and students). More information in the People of the ICN2 section.

Finances

All ICN2 financial management is supported by SAP, and the Finances team has been expanded to serve the 15 Research Groups and 4 Technical Divisions that configure ICN2. More information in the Finance section.

Information Technologies

In 2013, the IT department implemented the infrastructure for ICN2's new headquarters (network, IP communications, firewalls, etc.). The Department provides support to all ICN2.

General Services

During 2013, the General Services department coordinated the relocation of Groups and equipment to the new headquarters. By the end of 2013, the ICN2 building was fully operative, including its maintenance infrastructure, Risk Prevention plan and with over 40 laboratories fully operational.

Technology Transfer

ICN2's Technology Transfer Department offers a specialised service to support technology transfer within ICN2. Some of the major goals achieved by the Department in 2013 are: 11 active families of patent applications; 2 new EP patents, 1 PCT extension filed and 1 patent entered into national phase; Assessment of 5 technologies completed or in process, two filed for patent; A fourth know-how license agreement was signed.

More details in the Technology Transfer section.

Marketing and Communication

The Marketing and Communication Department promoted a museum exhibition on Nanotechnology, Dimensió Nano. It was inaugurated in 2012 and partly financed by FECYT and in collaboration with the museum mNACTEC, in Terrassa, Spain. In addition to the exhibition, which will run until late 2014 and then itinerate to other points around Catalonia, the Department also developed a series of classroom activities and training sessions for school teachers. The Department also offered internal services in Translation, Illustration, and in Graphic Design, to improve the standard of all major publications and public materials produced by ICN2 scientists. This Department is heavily involved in the implementation of the new ICN2 image and working on internal cohesion tasks.

More details in the Public Outreach section.

Strategy

The Strategy Department was established in early 2013 to:

- Develop the strategic plan and implement associated actions.
- Identify and pursue strategic funding, collaboration and industrial opportunities, locally and internationally.
- Strengthen ties and collaborations with other CERCA centres and local entities.
- Support internal cross-departmental actions to improve productivity and efficiency.

The Strategy Manager Reports directly to the Director, liaises closely with Group Leaders and Department heads; Participates in various committees and meetings to help achieve unified vision and consensus priorities for key issues; Represents the Director at institutional forums/events when Director is not available.

Some of the main activities developed in 2013 by the Stratedy Department are:

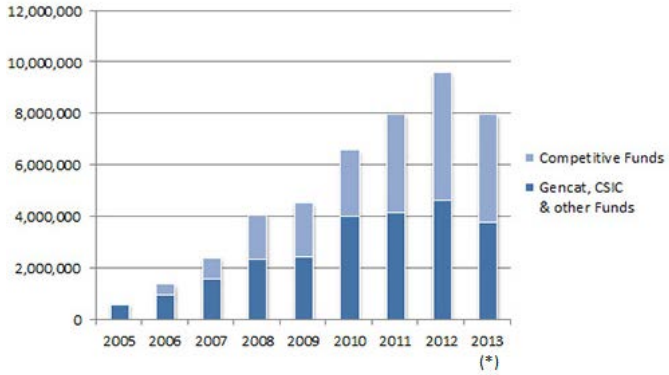
- Coordination of ICN2 Severo Ochoa proposal.
- Coordination of ICN2 CERCA evaluation submission.
- Production of 1st internal draft of ICN2 Strategic Plan.
- Submission of ICN2 comments to RIS3CAT.
- Coordination of ongoing process to establish BCNanoMet in Barcelona KEY.
- Representing ICN2 at B30 and CiT forums.
- Review of all 2014 H2020 calls, alerting Groups and Departments to relevant opportunities.
- Secretary of the Barcelona Nanotechnology Cluster - Bellaterra (BNC-b) committee.
- Presenting ICN2 to international/institutional visitors (1-2 per month on average).
- Supporting Technology Transfer, Projects and Communications Departments in key actions and planning.

Financial Accounts 2013

The Institute's operating budget comprises revenues from contributions by public administrations and agencies, from competitive grants, and from companies (via Technology Transfer). These revenues fund the operational activities of the Institute. The main items are Personnel Costs, General Operating Expenses and Depreciation (of equipment and facilities).

In 2013 the competitive operating funds were €4.2 million, while the operative funds from the Generalitat de Catalunya (Catalan Government), CSIC and other Funds were €3.8 million.

Evolution of ICN2 Operating Funds:



(*) Only 2013 numbers include information from CSIC.

Facilities and Equipment

In 2013 ICN2's total accumulated investment including scientific equipment, common services and general infrastructure was €16,253,024. Investment for the year 2013 was €768,146.

The main scientific, technical and IT equipment acquired comprised:

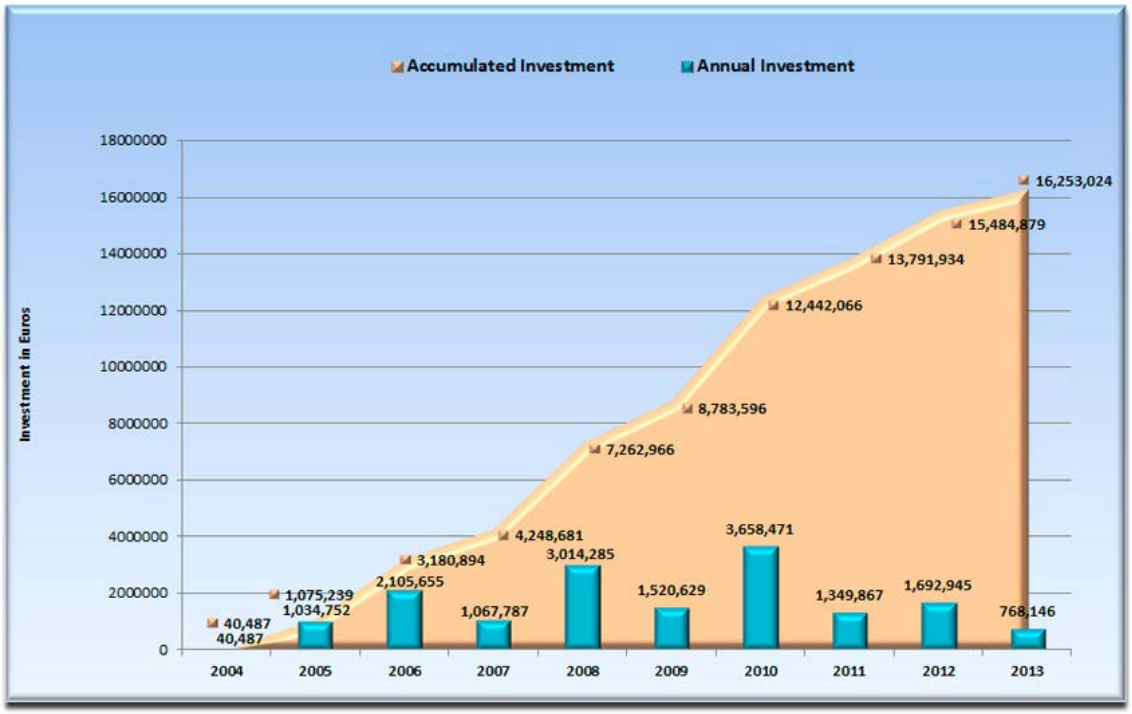
- Multi-chamber Molecular Beam Epitaxy System
- Seebeck Coefficient Measurement RT-800ºC
- Plasma Cleaning System
- Electronics for AFM Control
- Sputtering System
- NIRQUEST512-2.2 Spectrometer, 900-2200 NM

Equipments funded with FEDER Funds:

- ICN PAT
- LEICA DM2700 M - Optical Microscope
- LEICA MC170 HD Camera
- LEICA LED300 EstereoMicroscope
- Leica EM ACE600 - High Vacuum Cover
- Struers Minitom precision cut-off machine
- Struers LaboPol-5 polishing machine
- Temperature Regulator
- Hotplate

FEDER Fondo Europeo de Desarrollo Regional

Evolution of ICN2 total Investments (2004-2013)


Accumulated Investment
Annual Investment
Investment in Euros
18000000
16000000
14000000
12000000
10000000
8000000
6000000
4000000
2000000
0
40,487
40,487
1,075,239
1,034,752
3,180,894
2,105,655
4,248,681
1,067,787
7,262,966
3,014,285
8,783,596
1,520,629
12,442,066
3,658,471
13,791,934
1,349,867
15,484,879
1,692,945
16,253,024
768,146
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013

Technology Transfer

In 2013 the Technology Transfer Office furthered its efforts to maximise the commercialisation of ICN2´s research results through intellectual property and patents, commercial contracts, public sector collaborations, and other endeavours.

INTELLECTUAL PROPERTY AND SPIN-OFFS

- A total of 11 families of patent applications were active in 2013.
- 2 new EP patents, 1 PCT extensions filed and 1 patent entered into national phase.
- Assessment of 5 technologies completed or in process, two filed for patent.
- A fourth know-how license agreement was signed with the company Desinfección Profesional, S.L. (Despro) regarding encapsulation of biocides to extend their effect.
- The Framework Partnership Agreement previously undertaken with HENKEL led to two R&D projects starting in May 2013.
- One spin-off company named Applied Nanoparticles, S.L. was created in October 2013. The licensing to the new company of ICN2´s patent on Biogas Production (Ref. ICN PAT 07/09) is under negotiation.

COMMERCIAL CONTRACTS

- 9 license discussions took place.
- R&D project agreements signed during 2013 include companies such as: Henkel, Lucta, Acciona Agua, Iberdrola, Chemipol and IGTP.

PUBLIC SECTOR R&D PROJECTS & CONTRACTS

- 1 new INNPACTO valorisation project granted.
- 7 active competitive valorisation projects: 1 RecerCaixa, 3 INNPACTO, 1 Cellex Foundation, 1 GRO with SAMSUNG and 1 PROVA'T.

OTHER HIGHLIGHTS

- 2 commercial products ready to be launched during 2014 from Lucta and Chemipol.
- Participation in main sector trade fairs: ImagineNano in Bilbao, EuroNanoforum in Dublin, Trends in Nanotechnology in Sevilla, ACC1O Innovation and Investment Forums, KIM Conference, 7th AIN, Connect-EU, NNT2013 Congress in Barcelona.

Public Outreach

Beyond ICN2's principal mission to be a centre of scientific excellence and frontier research in Nanoscience and Nanotechnology, the Institute also has a social responsibility in Scientific Dissemination and Education. As a publicly-funded research institute, ICN2 is committed to serving, and engaging with, the public at all levels.

Sparking the interest of young people in Nanoscience and Nanotechnology, and providing them with the tools they need to pursue careers in these fields, is paramount in ensuring ICN2's future success in the research arena. Furthermore, educating the general public about these areas is essential to guaranteeing that they can understand the implications of the Institute's research and its consequent developments.

HIGHLIGHTS 2013

- **Dimensió Nano:** ICN2, Recrea, La Mandarina de Newton and the museum mNACTEC created a multimedia exhibit dedicated to introducing Nanoscience and Nanotechnology to the public. Dimensió Nano was inaugurated at the Museum in June 2012 and is slated to run until late 2014.
- **ESCOLAB:** Groups of secondary school children visited ICN2 labs to learn about Nanoscience and Nanotechnology and to ask researchers questions.
- **Joves i Ciència:** High school students performed short research stays in the laboratories of ICN2 research groups during summer 2013.
- **Professors i Ciència 2013:** A group of nearly 20 secondary school teachers visited ICN2 to learn about Nanoscience and Nanotechnology, visit the Institute's labs and learn science experiments for use in the classroom.

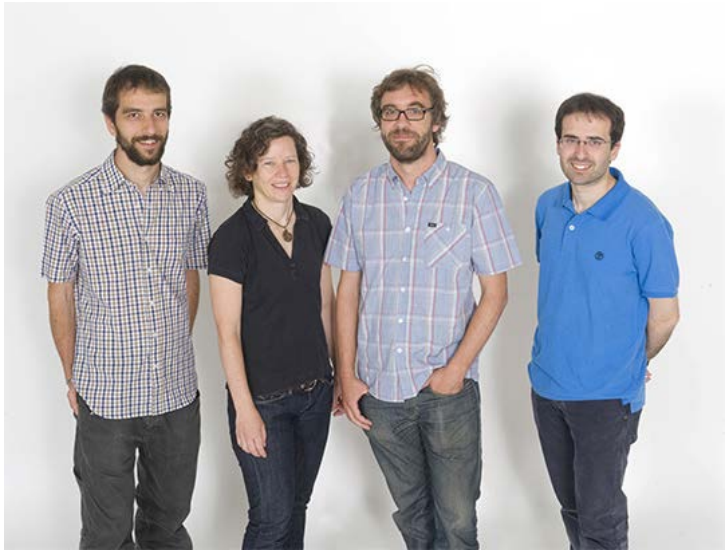
Appendix

These appendices offer more detailed information on ICN2 activities.

- Personnel (alphabetical)
- Personnel (by department)
- Publications ICN2 2013
- Active Competitive Projects in 2013
- Theses 2013

Atomic Manipulation and Spectroscopy Group

Led by Aitor Mugarza, the Atomic Manipulation and Spectroscopy Group, investigates the quantum properties of electrons in low-dimensional materials, seeking to control the interplay among the structural, electronic and magnetic properties of nanoscale systems. The Group combines Scanning Tunnelling Microscopy (STM) techniques with Synchrotron Radiation Spectroscopy in order to link microscopic phenomena to macroscopic observables relevant to understanding and designing new materials and devices.



To access the Group's website, click here

NEW PROJECTS & MILESTONES IN 2013

In 2013 the Atomic Manipulation and Spectroscopy Group focused on three main objectives.

A long-term research goal in the field of new materials concerns the **synthesis and study of hybrid metal-organic layers for magnetoelectronic applications**. For example, local probe investigations have revealed: i) how the electrical and magnetic properties of individual molecules change in function of their proximity to a metal; ii) how to tailor the epitaxial growth of nano-sized graphene islands on a nickel substrate; and iii) how such graphene islands may act as spin filters for electrons.

A shorter-term research goal concerns a proposal for **developing a non-volatile fast magnetic memory for power efficient and scalable microprocessors**. This proposal, based on fundamental observations done at ICN2, has evolved into a consortium

Aitor Mugarza
Atomic and Manipulation Spectroscopy Group Leader

Dr. Aitor Mugarza earned his BS degree in Physics in 1997 and his PhD in Physics in 2002, both at the University of Basque Country. After his doctoral studies, he worked as a postdoctoral scientist at the Lawrence Berkeley National Laboratory, USA, and at the Institut de Ciència de Materials de Barcelona, until joining ICN in 2007 with a Ramon y Cajal Fellowship. In 2013, he was appointed Group Leader of the Atomic Manipulation and Spectroscopy Group. His research focuses on Electronic Properties in Low Dimensional Materials, Molecular Electronics, Scanning Probe Microscopy, and Soft X-ray and Photoelectron Spectroscopy.

Group Members

Mugarza, Aitor, *Tenure Track Group Leader*

Gambardella, Pietro, *Research Professor*

Alvarado, Santos Francisco, *Visiting Scientist*

Avci, Can Onur, *Doctoral Student*

Garello, Kevin, *Postdoctoral Researcher*

Gastaldo, Michele, *Doctoral Student*

Ghosh, Abhijit, *Postdoctoral Researcher*

Godey, Sylvie, *Technician*

Krull, Cornelius, *Postdoctoral Researcher*

Nistor, Corneliu, *Postdoctoral Researcher*

Ollé, Marc, *Doctoral Student*

Schirone, Stefano, *Doctoral Student*

composed of leading EU players (Spintec, the Karlsruhe Institute of Technology, LETI and Singulus GmbH), which has received funding for 3 years to demonstrate the feasibility of the project and fabricate the first memory prototype.

A third objective was to set a new research line focused on the **study of electron scattering in nanostructured materials**. Understanding the mechanisms behind different scattering phenomena is of paramount importance both for fundamental knowledge and the design of novel electronic nanodevices. The Group focused in recently discovered 2D materials such as graphene and topological insulators, where scattering is characterised by the entanglement between orbital momentum and pseudospin (in graphene) or spin (in topological insulators), resulting in exotic charge and spin transport properties. The Group investigates the scattering phenomena in 2D systems using quantum resonators with controlled geometry, such as nanoislands or atomic steps.

To view the full list of active research projects in 2013, click here

KEY PUBLICATIONS & CONTRIBUTIONS IN 2013

Publications:

- **Site- and orbital-dependent charge donation and spin manipulation in electron-doped metal phthalocyanines**, C. Krull, R. Robles, A. Mugarza, P. Gambardella *Nature Materials* **12**, 337-343 (2013)
- **Symmetry and magnitude of spin-orbit torques in ferromagnetic heterostructures**, K. Garello, I.M. Miron, C.O. Avci, F. Freimuth, Y. Mokrousov, S. Blugel, S. Auffret, O. Boulle, G. Gaudin, P. Gambardella *Nature Nanothec.* **8**, 587-593 (2013)
- **Scattering of surface electrons by isolated steps versus periodic step arrays**, J. E. Ortega, J. Lobo-Checa, G. Peschel, S. Schirone, Z. M. Abd El-Fattah, M. Matena, F. Schiller, P. Borghetti, P. Gambardella, and A. Mugarza *Phys. Rev. B.* **87**, 115425 (2013)
- **Observation of out-of-plane unidirectional anisotropy in MgO-capped planar nanowire arrays of Fe**, Arora, S.K., O'Dowd, B.J. , Polishchuk, D.M. , Tovstolytkin, A.I. , Thakur, P. , Brookes, N.B. , Ballesteros, B. , Gambardella, P. , Shvets, I.V. *J. Appl. Phys.*, **114 (13)**,133903 (2013)
- **Magnetization Reversal Behaviour of Planar Nanowire Arrays of Fe**, Arora, S.K., O'Dowd, B. J., Thakur, P., Brookes, N.B., Ballesteros, B., Gambardella, P., Shvets I.V. *Curr. Nanosci.*, **9**, 609-614 (2013)

Contributions:

- *Growth and Dynamics of Graphene Nanoislands on Ni(111)*, **LMA Users Meeting 2013**, Zaragoza (Spain), 11/06/2013, Gustavo Ceballos, (Invited speaker)
- *Electronic properties of self-organized and molecular systems*, **Summer School Nanoscience Ile de France**, Paris (France), jun-13, A.Mugarza, (Invited speaker)
- *Inducing new molecular properties at the metallic interface*, **ImagineNano 2013**, Bilbao (Spain), abr-13, A.Mugarza, (Invited speaker)
- *Manipulating electronic and magnetic properties of single molecules at the metallic interface*, **XXXII National Meeting on Condensed Matter Physics**, São Paulo, (Brazil), may-13, A.Mugarza, (Invited speaker)
- *Site and orbital-dependent charge donation and spin manipulation in metal-organic complexes*, **WE-Heraeus-Seminar on Interactions with the Nanoworld: Local Probes with High Time, Energy and Force Resolution, Bad Honnef**, bonn (Germany), nov-13, P. Gambardella, (Invited speaker)

- **58th Magnetism and Magnetic Materials Conference (MMM)**, Denver (USA), nov-13, P. Gambardella, (Invited speaker)
- *Magnetism and Spintronics*, **Italian National Conference on Condensed Matter Physics**, Milano (Italy), sep-13, P. Gambardella, (Invited speaker)
- **12th Joint MMM/Intermag Conference**, Chicago (USA), ene-13, K. Garello, I. M. Miron, C. Onur Avci, A. Ghosh, F. Freimuth, Y. Mokrousov, S. Blügel, S. Auffret, O. Boulle, G. Gaudin, and P. Gambardella, (Invited speaker)
- **Spin-Orbit Torque" Workshop 2013**, Kaust (Arabia Saoudi), feb-13, K. Garello, I. M. Miron, C. Onur Avci, A. Ghosh, F. Freimuth, Y. Mokrousov, S. Blügel, S. Auffret, O. Boulle, G. Gaudin, and P. Gambardella, (Invited speaker)
- **International Conference MAMA-Trend: Trends Challenges and Emergent New Phenomena in Multi-functional Materials**, Sorrento (Italy), may-13, K. Garello, I. M. Miron, C. Onur Avci, A. Ghosh, F. Freimuth, Y. Mokrousov, S. Blügel, S. Auffret, O. Boulle, G. Gaudin, and P. Gambardella, (Invited speaker)
- **Workshop on New Trends in Topological Insulators**, Sant Feliu de Guixols (Spain), jun-13, S. Schirone, J. Lobo-Checa, G. Peschel, R. Piquerel, F. Schiller, P. Gambardella, J. E. Ortega, and A. Mugarza, (Poster)
- **Workshop on New Trends in Topological Insulators**, Sant Feliu de Guixols (Spain), jun-13, S. Schirone,G. Peschel, R. Piquerel, P. Gambardella, A. Mugarza, (Poster)
- **Colloque Louis Neel**, Tours (France), mar-13, K. Garello, I. M. Miron, C. Onur Avci, A. Ghosh, F. Freimuth, Y. Mokrousov, S. Blügel, S. Auffret, O. Boulle, G. Gaudin, and P. Gambardella, (Poster)
- *Electron scattering and spin polarization at the graphene/Ni(111) interface*, **International Conference on Nanoscience and Nanotechnology (ICN+T)**, Paris (France), sep-13, A. Mugarza; A. Garcia-Lekue; T. Balashov; M. Ollé; G. Ceballos; A. Arnau; P. Gambardella; D. Sánchez-Portal, (Oral presentation)
- *Electron scattering and spin polarization at the graphene/Ni(111) interface*, **Deutsche Physikalische Gesellschaft (DPG) Spring Meeting**, Regensburg (Germany), mar-13, A. Mugarza; A. Garcia-Lekue; T. Balashov; M. Ollé; G. Ceballos; A. Arnau; P. Gambardella; D. Sánchez-Portal, (Oral presentation)
- **ImagineNano**, Bilbao (Spain), abr-13, C. Krull, R. Robles, A. Mugarza and P. Gambardella, (Oral presentation)
- **ImagineNano**, Bilbao (Spain), abr-13, M. Ollé, G. Ceballos, D. Serrate, A. Mugarza and P. Gambardella, (Oral presentation)
- **International Conference on Nanoscience and Nanotechnology (ICN+T)**, Paris (France), sep-13, A. Garcia-Lekue, T. Balashov, M. Ollé, G. Ceballos, A. Arnau, P. Gambardella, D. Sánchez-Portal and A. Mugarza, (Oral presentation)
- **International Conference on Nanoscience and Nanotechnology (ICN+T)**, Paris (France), sep-13, M. Ollé, G. Ceballos, D. Serrate, A. Mugarza and P. Gambardella, (Oral presentation)
- **Deutsche Physikalische Gesellschaft (DPG) Spring Meeting**, Regensburg (Germany), mar-13, C. Krull, R. Robles, A. Mugarza and P. Gambardella., (Oral presentation)
- **International Conference MaMa Trend: Trends Challenges and Emergent New Phenomena in Multi-functional Materials**, Sorrento (Italy), may-13, C. O. Avci, K. Garello, M. Miron, G. Gaudin, S. Auffret, and P. Gambardella, (Oral presentation)

- **Joint European Magnetic Symposia**, Rhodes (Greece), ago-13, C. O. Avci, K. Garello, M. Miron, G. Gaudin, and P. Gambardella, (Oral presentation)

- **International Conference on Nanoscale Magnetism**, Istanbul (Turkey), sep-13, C. O. Avci, K. Garello, M. Miron, G. Gaudin, and P. Gambardella, (Oral presentation)

MERITS AND AWARDS 2013

- **Publication of the thesis of C. Krull** by Springer in their selection of "Outstanding Ph.D. Research".

- **Site- and orbital-dependent charge donation and spin manipulation in electron-doped metal phthalocyanines,** C. Krull, R. Robles, A. Mugarza, P. Gambardella. *Cover for Nature Materials 12, 337-343 (2013)*

THESIS 2013

- **Doctorand:** Marc Olle
  Title: Graphene Nanoislands on Ni(11)
  Defense Date: 10/06/2013 - ICN2
  Director: P. Gambardella y G. Ceballos

Force Probe Microscopy and Surface Nanoengineering Group

Led by Dr. Jordi Fraxedas, the Force Probe Microscopy and Surface Nanoengineering Group investigates 2D interfacial phenomena arising from the nanostructuration of surfaces and from the interaction of molecules with surfaces. The Group uses advanced techniques such as Force Probe Microscopy and synchrotron-radiation based electron spectroscopies.

NEW PROJECTS & MILESTONES IN 2013

The Group participates in several projects at the European and Spanish level that started in 2013. Within the EU FP7 the Group is involved in **advanced AFM instrumentation** and in **directed self-assembly of block co-polymers** in collaboration with leading European Universities and companies. In the first case, a prototype of an AFM head is being designed which should be able to be operated in industrial environment with a robot arm at high speed (3 MHz) and providing real-time information on the mechanical properties of surfaces of industrial interest (plastic injection, solar cells, etc.). In the second case the interfacial mechanisms of self-assembly are being investigated at the fundamental level in order to better address the future use of new smaller polymers.

At the Spanish level the Group participates in two projects focused towards the **tailoring of the affinity of water to surfaces** and to **micro/nanofluidics using carbon-based materials** (nanotubes and graphene), respectively. The main objective is to be able to control the dynamics of water at different interfaces, i.e., structuring water as ice at temperatures above 0 degrees C and inducing mass transport via electrokinetic processes.

To view the full list of active research projects in 2013, click here

KEY PUBLICATIONS & CONTRIBUTIONS IN 2013

Dr. rer. nat. Jordi Fraxedas
Group Leader

Jordi Fraxedas (Tarragona, 1962) graduated in Physics from the University of Zaragoza (Spain) in 1985 and obtained his Ph.D. (Dr. rer. nat.) in 1990 from the University of Stuttgart (Germany). His thesis work was performed at the Max Planck Institut für Festkörperforschung and at the Berliner Speicherring für Synchrotronstrahlung (BESSY), under the supervision of Prof. M. Cardona. After a post-doctoral position at the European Synchrotron Radiation Facility (ESRF) in Grenoble (France) and an Established Researcher position at the European Laboratory for Particle Physics (CERN) in Geneva (Switzerland), he joined the Solid State Research Institute of Barcelona (ICMAB) of the Spanish Research Council (CSIC) in 1995 and worked as a Chercheur associé at the Centre National de la Recherche Scientifique (CNRS) in 2002.

His research activity is focused on interfacial phenomena and surface science. He has co-authored more than 100 peer-reviewed scientific articles and published the books entitled Molecular Organic Materials: From Molecules to Crystalline Solids (Cambridge University Press, 2006) and Water at Interfaces: A Molecular Approach (Taylor and Francis CRC, 2014).

Group Members

Fraxedas, Jordi, *CSIC Research Scientist*

Esplandiu, María José, *CSIC Tenured Scientist*

Verdaguer, Albert, *CSIC Tenured Scientist*

Amadei, Carlo Alberto, *CSIC Visiting Doctoral Student*

Evangelio, Laura, *CSIC Visiting Doctoral Student*

Santos, Sergi, *CSIC Visiting Postdoctoral*

Publications:

- **Ultrasensitive force detection with a nanotube mechanical resonator**, Moser, J.; Güttinger, J.; Eichler, A.; Esplandiu, M.J.; Liu, D.E.; Dykman, M.I.; Bachtold, A. *Nature Nanotechnology*, **8**, 493-496 (2013)
- **Imaging the Proton Concentration and Mapping the Spatial Distribution of the Electric Field of Catalytic Micropumps**, Afshar Farniya, A.; Esplandiu, M. J. ; Reguera, D.; Bachtold, A. *Phys. Rev. Lett.* **111**,168301 (2013)
- **Minimal Invasiveness and Spectroscopy-Like Footprints for the Characterization of Heterogeneous Nanoscale Wetting in Ambient Conditions**, Amadei, C.A.; Santos, S.; Pehkonen, S.O.; Verdaguer, A.; Chiesa, M. *Journal of Physical Chemistry C*, **117**, 20815 - 20819 (2013)
- **Size dependent transitions in nanoscale dissipation**, Santos, S.; Amadei, C.A.; Verdaguer, A.; Chiesa, M. *Journal of Physical Chemistry C*, **117**, 10615 - 10622 (2013)
- **Colloidal Solutions of Organic Conductive Nanoparticles**, de Caro, D.; Souque, M.; Faulmann, C.; Coppel, Y.; Valade, L.; Fraxedas, J.; Vendier, O.; Courtade, F. *Langmuir*, **29**, 8983 (2013)
- **Communication: Growing room temperature ice with graphene**, Verdaguer, A.; Segura, J.J.; Lopez-Mir, L., Sauthier, G.; Fraxedas, J. *Journal of Chemical Physics*, **138**, 12 (2013)
- **Nanoparticles of Molecule-based Conductors**, de Caro, D.; Valade, L.; Faulmann, C.; Jacob, K.; Van Dorsselaer, D.; Chtioui, I.; Salmon, L.; Sabbar, A.; El Hajjaji, S.; Pérez, E.; Franceschi S.;Fraxedas, J. *New J. Chem.*, **37**, 3331 (2013)
- **Aqueous Alteration vs. Shock in Villalbeto de la Pena Polymict Chondritic Breccia**, Trigo-Rodriguez, J. M.; Moyano-Cambero, C. E. ; Martinez-Jimenez, M.; Fraxedas, J.; Alonso-Azcarate, J. *Meteoritics & Planetary Science*, **48**, A349 (2013)
- **Surface screening of written ferroelectric domains in ambient conditions**, Segura, J.J.; Domingo, N.; Fraxedas, J.; Verdaguer, A. *Journal of Applied Physics*, **113**,187213 (2013)

Contributions:

- *Understanding the freezing of water on surfaces at the nanoscale to control ice formation at the macroscale*, **3rd International Conference on Nanotek & Expo**, Las Vegas (USA), Dec 2013, A. Verdaguer, (Invited)
- *Amplitude-Modulation AFM-derived Heights in air: How high is high ?*, **Microscopy at the Frontiers of Science (mfs2013)**, Tarragona (Spain), Sep. 2013, A. Verdaguer, G. Sauthier and J. Fraxedas, (Oral)
- *Aqueous alteration phases in CR, CM AND CI chondrites: evidence for hydrothermal activity in their parent bodies and implications for Marco Polo-R sample return mission*, **International Symposium on Astrobiological and cosmochemical implications of Marco Polo-R sampling of a primitive asteroid**, Barcelona (Spain), 16 Jan, J. M. Trigo-Rodríguez, C. E. Moyano-Cambero, J. Fraxedas, (Oral)

OTHER HIGHLIGHTS IN 2013

Dr. J. Fraxedas chaired, together with Prof. J. Arbiol (ICMAB-CSIC), the International Congress Microscopy at the Frontiers of Science 2013 in Tarragona (September 2013).

Researcher

Inorganic Nanoparticles Group

The Inorganic Nanoparticles Group, led by ICREA Prof Víctor Puntes, works on the synthesis, characterisation and application of engineered inorganic nanoparticles. By controlling the size, shape and structure of the inorganic core, and selectively linking biologically active molecules to the nanoparticle surface (either during synthesis or afterwards, once the nanoparticles have been introduced into a biological environment), the Group seeks nanoparticles that target, or otherwise interact with, specific systems (biological, medical, materials, etc.). The Group places special emphasis on the safety, scale-up, applicability and other aspects of nanoparticle engineering and design.

To access the Group's website, click here

NEW PROJECTS & MILESTONES IN 2013

In 2013 the Inorganic Nanoparticles Group completed several of its on-going projects, such as VALTEC Vacunes, and began many new ones, such as "Cerium Oxide nanoparticles as a new therapeutic tool for tissue regeneration in liver diseases" from Fundació La Marató de TV3.

The Group licensed out its patent WO 2010/069941 (Bioconjugated gold nanoparticles for drug delivery in cancer treatment) to the recently created biotech company Nanotargeting S.L. The research behind this initiative was published in a comprehensive paper on the **use of nanoparticles for drug delivery** (specifically, gold nanoparticles to detoxify cisplatin) in the open access journal PLoS ONE, and the creation of the company received widespread media coverage (Spanish national TV [RTVE], and the Catalan newspapers *La Vanguardia* and *Ara*).

The Group was also awarded a new FP7 project entitled "*Framework to respond to regulatory needs of future nanomaterials and market*" (FutureNanoNeeds)", which is slated to begin in January 2014.

ICREA Prof Víctor F. Puntes
Group Leader

ICREA Research Prof Víctor F. Puntes' work spans the full breadth of nanoparticle research: synthesis, conjugation and characterisation of inorganic nanoparticles; nanotoxicology and nanosafety; and myriad applications for sectors including medicine and environment.

Prof Puntes completed his undergraduate studies in Chemical Engineering and Materials Science at the Université Louis Pasteur Strasbourg (France) and at the Universitat Autònoma de Barcelona (UAB). In 1998, he earned his PhD in Physics from the Universitat de Barcelona (UB), working with Prof. Xavier Batlle and Prof Amilcar Labarta on Giant Magnetoresistance in granular alloys. He then spent more than 3 years at the University of California, Berkeley, and the Lawrence Berkeley National Laboratory (LBNL), in the groups of Prof Paul Alivisatos and Prof Kannan Krishnan, working on the synthesis and control of nanostructures. In 2003 he returned to Catalonia with a Ramón y Cajal research position at the University of Barcelona, and in 2005 obtained an ICREA Professorship at ICN to create the Inorganic Nanoparticles Group, which he presently heads.

By the end of 2013, Prof Puntes held 110 peer-reviewed publications and over 6,000 total citations. He is also well-known for his work in science dissemination among the general public, his industrial and commercial efforts, and for his endeavours linking science and art.

Group Members

F. Puntes, Víctor, *ICREA Research Professor and Group Leader*

Busquets, Martí, *Doctoral Student*

Casals, Eudald, *Laboratory Engineer*

Comenge, Joan, *Doctoral Student*

To view the full list of active research projects in 2013, click here

KEY PUBLICATIONS & CONTRIBUTIONS IN 2013

Publications:

- **Absence of CeSites in Chemically Active Colloidal Ceria Nanoparticles**, Cafun, J. - D., Kvashnina, K. O., Casals, E., Puntes, V. F., & Glatzel, P *ACS NANO* (2013)
- **Altered characteristics of silica nanoparticles in bovine and human serum: the importance of nanomaterial characterization prior to its toxicological evaluation**, Izak-Nau, E., Voetz, M., Eiden, S., Duschl, A., & Puntes, V. F. *Particle and Fibre Toxicology*,**1**, 56. (2013)
- **Spontaneous formation of hollow cobalt oxide nanoparticles by the Kirkendall effect at room temperature at the water-air interface**, Varón, M., Ojea-Jimenez, I., Arbiol, J., Balcells, L., Martínez, B., & Puntes, V. F. *Nanoscale*,**6**, 2429-2436. (2013)
- **Engineered Inorganic Nanoparticles for Drug Delivery Applications**, Ojea-Jiménez I.; Comenge J.; García-Fernández L.; Megson Z.A.; Casals E.; Puntes V.F. *Current Drug Metabolism*, **14**, 518-530 (2013)
- **Interaction of differently functionalized fluorescent silica nanoparticles with neural stem- and tissue-type cells**, Izak-Nau, E., Kenesei, K., Murali, K., Voetz, M., Eiden, S., Puntes, V. F., et al *Nanotoxicology*, , 1-11. (2013)
- **Dipolar Magnetism in Ordered and Disordered Low-Dimensional Nanoparticle Assemblies**, Varón, M., Beleggia, M., Kasama, T., Harrison, R. J., Dunin-Borkowski, R. E., Puntes, V. F. *Sci. Rep.* (2013)
- **Radiochemical synthesis of 105gAg-labelled silver nanoparticles.**, Ichedef, C., Simonelli, F., Holzwarth, U., Bagaria, J. P., Puntes, V. F., Cotogno, G., et al *Journal of nanoparticle research*, **15**, 2073 (2013)
- **Characterizing Nanoparticles Reactivity: Structure-Photocatalytic Activity Relationship**, Piella, J., Bastús, N. G., Casals, E., & Puntes, V. *J. Phys.: Conf. Ser.*,, 012040. (2013)
- **Exploring release and recovery of nanomaterials from commercial polymeric nanocomposites**, Busquets-Fité, M., Fernandez, E., Janer, G., Vilar, G., Vázquez-Campos, S., Zanasca, R., et al. (2013) *J. Phys.: Conf. Ser.*,, 012048 (2013)
- **Monitoring migration and transformation of nanomaterials in polymeric composites during accelerated aging**, Vilar, G., Fernández-Rosas, E., Puntes, V., Jamier, V., Aubouy, L., & Vázquez-Campos, S. *J. Phys.: Conf. Ser.*,, 012044. (2013)
- **Stability of polymer encapsulated quantum dots in cell culture media.**, Ojea-Jiménez, I., Piella, J., Nguyen, T. - L., Bestetti, A., Ryan, A. D., & Puntes, V. *J. Phys.: Conf. Ser.*,, 012009 (2013)
- **The social context of nanotechnology and regulating its uncertainty: A nanotechnologist approach**, Jamier, V., Gispert, I., & Puntes, V. *J. Phys.: Conf. Ser.*,, 012059. (2013)

Contributions:

- *"B-Debate on "Nanotechnologies in Health: current challenges and future prospects"."*, **B-Debate on "Nanotechnologies in Health: current challenges and future prospects"**, Barcelona (Spain), oct-13, Puntes , Víctor F., (Discussion panel)
- *"Detoxifying Antitumoral Drugs via Nanoconjugation: The Case of Gold Nanoparticles*

Gòmez, Neus, *Juan de la Cierva Researcher*

Goy, Sonia, *Visiting Doctoral Student*

Guardia, Pablo, *Doctoral Student*

Kenesei, Kata, *Visiting Doctoral Student*

Kumarasamy, Murali, *Visiting Doctoral Student*

Lòpez, Cecilia, *Group Project Manager*

Li, Yang, *Visiting Doctoral Student*

Megson, Zoe, *Doctoral Student*

Merkoçi, Florind, *Technician*

Moreno, Laura, *Visiting Student*

Patarroyo, Javier, *Doctoral Student*

Piella, Jordi, *Doctoral Student*

Rubio, Sofia, *Doctoral Student*

Sabir, Nadeem, *Visiting Doctoral Student*

Schultz, Carolin, *Visiting Doctoral Student*

Tran Thi Thanh, Ngoc, *Doctoral Student*

Yudina, Tetyana, *Doctoral Student*

and Cisplatin", **NanoSpain - NanoBioMed 2013.**, Bilbao (Spain), abr-13, Puntes , Víctor F., (Oral presentation)

- *"Functional inorganic nanoparticles"*, **MAGNIFYCO Workshop**, Barcelona (Spain), feb-13, Puntes , Víctor F., (Oral presentation)
- *"Nanocrystals 2.0: The next generation"*, **Christmas Symposium, Chemistry department ETZH**, Zurich (Switzerland), dic-13, Puntes , Víctor F., (Oral presentation)
- *"Nanoparticles safety by design"*, **Serenade annual meeting**, Provance (France), jul-13, Puntes , Víctor F., (Oral presentation)
- *"Proyecto BIOGÁS+"*, **Jornada "Energía y Emprendimiento: de la investigación a la creación de empresas"**, Barcelona (Spain), nov-13, Puntes , Víctor F., (Oral presentation)
- *"Designing nanobots to fight Cancer"*, **E-MRS Spring Meeting**, Strasbourg (France), may-13, Puntes , Víctor F., (Oral presentation)

OTHER HIGHLIGHTS IN 2013

Dissemination Activities

Public Awareness of Science has been a central interest of the Group since its beginnings. The activities developed include: talks to non-specialised audiences, internet platforms, science and art videos and science divulgation videos, science museum exhibitions, electronic and hardcopy books and other platforms including art exhibitions (the more recent being at the AC gallery, Madrid and La casa del Libro, San Francisco) on NP microscopy images and television/radio interviews. The Group also won the 2011 FOTCIENCIA edition.

The Group takes also part in several local education projects such as Escolab and Joves i Ciencia (2009-2013). Its members routinely offer talks in primary and secondary schools (Barcelona, Cervelló, Villasar) and Victor Puntes often participates in panels and debates such as: Round table discussion on "Safety and Society".

THESES 2013

- **Doctorand:** Joan Comenge
  Title: Gold Nanoparticles as Drug Delivery Agents: Detoxifying the chemotherapeutic Drug Cisplatin*
  Defense Date: 18/07/2013
  Director: Prof. Victor Puntes, Dr. Esther Boix
- **Doctorand:** Lorena García
  Title: Introducing gold nanoparticle bioconjugates within the biological machinery
  Defense Date: 19/07/2013
  Director: Prof. Victor Puntes

Magnetic Nanostructures Group

Led by Prof Josep Nogués, the Magnetic Nanostructures Group seeks to improve the functional properties of diverse types of magnetic nanostructures. The group combines state-of-the-art lithography and chemical synthesis with structural, morphological and magnetic characterisation to perform research in three areas: Lithographed Magnetic Nanostructures; Magnetic Nanoparticles; and Other Magnetic Systems.

To access the Group's website, click here

NEW PROJECTS & MILESTONES IN 2013

In 2013, the Group continued working on the study of **core/shell nanoparticles and magnetic nanostructures** in the context of various on-going projects (MAGTUNE and ONDA). Moreover, the Group advanced in the study of **magnetic nanowires to be used for molecule manipulation** within the MANAQA project.

It also started working on novel exchange coupled nanostructures in the framework of the COEFNANO project (COupling EFfects in magnetic patterned NANOstructures). The COEFNANO project is a multinational project (Spain, France, USA, Chile, Brazil and Argentina) aimed at achieving a comprehensive knowledge of **magnetically coupled systems of reduced dimensionality**. Spin configuration, magnetic and electrical properties of antiferromagnetic, ferromagnetic and superconducting heterostructures are investigated in both continuous thin films and patterned nanostructures with well controlled geometry and dimensions from few nanometers to micron sizes.

To view the full list of active research projects in 2013, click here

ICREA Prof Josep Nogués
Group Leader

Prof Nogués earned his BSc from the Universitat Autònoma de Barcelona (UAB), in Spain, in 1986. After obtaining his PhD at the Royal Institute of Technology in Stockholm, Sweden, in 1993, he moved to the University of California San Diego for post-doctoral studies. In 1997 he returned to UAB. He is currently an ICREA Research Professor and Group Leader of ICN's Magnetic Nanostructures Group. Dr Nogués has published over 205 articles (including 7 reviews), and has more than 10,500 citations and an h-index of 44. He has authored two patents and given over 145 invited talks.

Group Members

Nogués, Josep, *ICREA Research Professor and Group Leader*

Gòmez, Alejandro, *Postdoctoral Researcher*

Gubanova, Nadezhda, *Visiting Doctoral Student*

Lòpez-Barberá, José Francisco, *Postdoctoral Researcher*

Menendez Dalmau, Enric, *Visiting Postdoctoral Researcher*

KEY PUBLICATIONS & CONTRIBUTIONS IN 2013

Publications:

- **Resolving material-specific structures within Fe_3O_4 | γ-Mn_2O_3 core | shell nanoparticles using anomalous small-angle X-ray scattering**, Krycka, K.L.; Borchers, J.A.; Salazar-Alvarez, G.; López-Ortega, A.; Estrader, M.; Estradé, S.; Winkler, E.; Zysler, R.D.; Sort, J.; Peiró, F.; Baró, M.D.; Kao, C.-C.; Nogués, J., *ACS Nano*, **7**, 921-931 (2013)

- **Robust antiferromagnetic coupling in hard-soft bi-magnetic core/shell nanoparticles**, M. Estrader, A. López-Ortega, S. Estradé, I. V. Golosovsky, G. Salazar-Alvarez, M. Vasilakaki, K.N. Trohidou, M. Varela, D.C. Stanley, M. Sinko, M. J. Pechan D. J. Keavney, F. Peiró, S. Suriñach1, M. D. Baró, J. Nogués, *Nature Communications*, **4**, 2960 (2013)

- **Tuning the magneto-optical response of nanosize ferromagnetic Ni disks using the phase of localized plasmons**, N. Maccaferri, A. Berger, S. Bonetti, V. Bonanni, M. Kataja, Q.H. Qin, S. van Dijken, Z. Pirzadeh, A. Dmitriev, J. Nogués, J. Åkerman, P. Vavassori, *Physical Review Letters*, **111**, 167401 (2013)

- **Controlled 3D-coating of the pores of highly-ordered mesoporous antiferromagnetic Co3O4 replicas with ferrimagnetic FexCo3-xO4 nanolayers**, E. Pellicer, M. Cabo, A. López-Ortega, M. Estrader, L. Yedra, S. Estradé, F. Peiró, Z. Saghie, P. Midgley, E. Rossinyol, I.V. Golosovsky, A. Mayoral, J.D. Prades, S. Suriñach, M.D. Baró, J. Sort, J. Nogués, *Nanoscale*, **5**, 5561-5567 (2013)

- **Ordered Arrays of Ferromagnetic, Compositionally-Graded Cu1-x-Nix Alloy Nanopillars by Template-Assisted Electrodeposition**, A. Varea, S. Pané, S. Gerstl, M.A. Zeeshan, B. Özkale, B.J. Nelson, S. Suriñach, M.D. Baró, J. Nogués, J. Sort, E. Pellicer, *Journal of Materials Chemistry C.*, **1**, 7215-7221 (2013)

- **Improving the magnetic properties of Co-CoO systems by designed oxygen implantation profiles**, Menéndez, E.; Demeter, J.; Eyken, J.V.; Nawrocki, P.; Jedryka, E.; Wójcik, M.; Lopez-Barbera, J.F.; Nogués, J.; Vantomme, A.; Temst, K., *ACS applied materials & interfaces*, **5**, 4320-4327 (2013)

- **Magnetic Properties of Single Crystalline Expanded Austenite Obtained by Plasma Nitriding of Austenitic Stainless Steel Single Crystals**, E. Menéndez, C. Templier, P. Garcia-Ramirez, J. Santiso, A. Vantomme, K. Temst, J. Noguéseacute;, *ACS Applied Materials and Interfaces*, **5**, 10118-10126 (2013)

- **Mesoporous Oxide-Diluted Magnetic Semiconductors Prepared by Co Implantation in Nanocast 3D-Ordered In2O3-y Materials**, Pellicer, Eva; Menendez, Enric; Fornell, Jordina; Nogues, Josep; Vantomme, Andre; Temst, Kristiaan; Sort, Jordi, *Journal of Physical Chemistry C*, **117**, 10615-10623 (2013)

- **Polarizability and magnetoplasmonic properties of magnetic general nanoellipsoids**, Maccaferri, Nicolo; Gonzalez-Diaz, Juan B.; Bonetti, Stefano; Berger, Andreas; Kataja, Mikko; van Dijken, Sebastiaan; Nogues, Josep; Bonanni, Valentina; Pirzadeh, Zhaleh; Dmitriev, Alexandre; Akerman, Johan; Vavassori, Paolo, *Optics Express*, **21, 8**, 9875-9889 (2013)

- **Correlating material-specific layers and magnetic distributions within onion-like Fe3O4/MnO/gamma-Mn2O3 core/shell nanoparticles**, Krycka, K. L.; Borchers, J. A.; Laver, M.; Salazar-Alvarez, G.; Lopez-Ortega, A.; Estrader, M.; Surinach, S.; Baro, M. D.; Sort, J.; Nogues, J., *Journal of Applied Physics*, **113, 17**, 17B531 (2013)

Contributions:

- *"Antiferromagnetic coupling in ferrimagnetic hard-soft core/shell nanoparticles"*,

International Conference on Nanoscale Magnetism, Istanbul (Turkey), sep-13, (Oral presentation)

- *"Antiferromagnetic coupling in ferromagnetic hard-soft core/shell nanoparticles"*, **Energy Materials Nanotechnology East Meeting**, Beijing (China), jul-13, (Oral presentation)
- *"Design and synthesis of multi.alloy/hybrid 1D nanoeachitectures for magnetic and bilogical applications"*, **ISMANAM**, Torino (Italy), jul-13, (Oral presentation)
- *"Electrodeposited quaternary nanowires with large hardness and tunable magnetic response"*, **International Conference on Processing and manufacturing of Advanced Materials (THERMEC)**, Las Vegas (United States), dic-13, (Oral presentation)
- *"Magnetoplasminic effects in pure ferromagnetic nanostructures"*, **Euro Asian Symposium Trends in Magnetism : Nanomagnetism.**, Vladivostok (Russia), sep-13, (Oral presentation)
- *"Magnetoplasminic effects in pure ferromagnetic nanostructures"*, **Donostia International Conference on Nanoscale Magnetism and Applications**, San Sebastian (Spain), sep-13, (Oral presentation)
- *"Magnetoplasminic effects in tailored pure ferromagnetic nanostructures"*, **Collaborative conference on 3D & Materials Research**, Jeju Island (South Korea), jun-13, (Oral presentation)
- *"Magnetoplasmonic effects in pure ferromagnetic nanostructutres"*, **Joint Conf. on Magnetism and Magnetic Materials and INTERMAG**, Chicago (USA), ene-13, (Oral presentation)
- *"Mesoporous semiconductor 3D ordered architectures prepared by nanocasting: (i) oxide dlited magnetic semiconductors and (ii) photolouminiscent anitidots"*, **ISMANAM**, Torino (Italy), jul-13, (Oral presentation)
- *"Nanocrystalline and nanocomposite Ni-rich electrodeposited films win enhanced functional properties"*, **International Conference on Processing and manufacturing of Advanced Materials (THERMEC)**, Las Vegas (United States), dic-13, (Oral presentation)
- *"Optical nonlinearity in core-shell type oxide protected nanoparticle systems"*, **International Union of Materials Research Societies - International Conference of Advanced Materials**, Qingdao (China), sep-13, (Oral presentation)
- *"Strong exchange coupling in conventional and inverse ferrimagnetic hard/soft and soft/hard core/shell heterostructured nanoparticles",* **American Physical Society Meeting**, Baltimore (USA), mar-13, (Oral presentation)

Nanobioelectronics and Biosensors Group

The Nanobioelectronics and Biosensors Group, led by ICREA Prof Arben Merkoçi, endeavours to integrate nanotechnology methods, tools and materials into sensors, including biosensors, which are low-cost, user-friendly and efficient. The Group exploits nanoparticles, nanotubes, nanochannels, graphene and other nanomaterials for innovative, highly sensitive mass-production platforms for diverse applications in everyday life.

To access the Group's website, click here

NEW PROJECTS & MILESTONES IN 2013

The Nanobioelectronics and Biosensors Group continued with several of its on-going projects and began one new European project:

Sensing toxicants in Marine waters makes Sense using biosensors (SMS).
Reference: 613844 Funded by: European Commission Program: FP7-OCEAN 2013.1

SMS will deliver a novel automated networked system that will enable real-time in situ monitoring of marine water chemical and ecological status in coastal areas by the detection of a series of contaminants regulated by the Marine Strategy Framework Directive (MSFD). SMS will design a multi-modular apparatus that will host in a single unit-the Main Box (MB)-a Sampling Module and an Analysis Module.

The former will contain sample collection and treatment components, whereas the latter will include four biosensor sub-modules that will enable detection and measurement of algal toxins and their associated algal species; several hazardous compounds (tributyltin, diuron and pentaBDPE); sulphonamides and a series of standard water quality parameters. The MB will be equipped with a communication module for real-time data transfer to a control center, where data processing will take place, enabling alarm functionality to Health

ICREA Prof Arben Merkoçi
Group Leader

Prof Arben Merkoçi earned his undergraduate degree in industrial chemistry at the University of Tirana (Albania), where he also obtained his PhD, in the field of Ion-Selective Electrodes. Since 1992 he has worked as a postdoctoral fellow or research professor at Polytechnic University of Budapest (Hungary), University of Ioanina (Greece), Università degli Studi di Padova (Italy), Universitat Politècnica de Catalunya (Spain), Universitat Autònoma de Barcelona (Spain) and New Mexico State University (USA).

He is currently ICREA Research Professor and head of the Nanobioelectronics & Biosensors Group at ICN2, where he researches the integration of biological molecules (DNA, antibodies, cells and enzymes) and other species with micro- and nano-structures of interest for the design of novel sensors and biosensors. Prof Merkoçi has authored around 200 articles, one patent awarded, one patent in application process and has edited special issues of specialized journals of his field including two books.

Group Members

Merkoçi, Arben, *ICREA Research Professor and Group Leader*

Baptista, Luis Miguel, *Doctoral Student*

Cadevall, Miquel, *Visiting Doctoral Student*

Cadkova, Michaela, *Visiting Doctoral Student*

Chalupniak, Andrzej, *Doctoral Student*

Chamorro, Alejandro, *Doctoral Student*

Chamorro, Natalia, *Visiting Student*

Da Silva, Everson Thiago, *Visiting Doctoral Student*

Warning Systems, whenever some critical value exceeds a pre-defined threshold. It will be placed on a floating platform or buoy positioned in loco at defined locations.

SMS will also develop a Specific Marine Pollution Metric that will combine real-time data of pollutant concentrations and water quality parameters, to produce a quantitative assessment of marine water quality. All work will culminate in showcasing the project's results in three demonstration sites: in La Spezia, Italy, in the Slovenian Adriatic Sea and in the Alonissos marine park in Greece.

The consortium brings together skills from industry and academia to address the proposed work program. The record track of the partners is a strong indication that the project will achieve its ambitious objectives and make a lasting impact through its exploitation plan. The technology development and test cases bring together a multi-sectorial team of experts interacting with endusers and marine water stakeholders, demonstrating that ICT, biotechnology and nanotechnology can increase the potential of biosensors for marine applications.

To view the full list of active research projects in 2013, click here

KEY PUBLICATIONS & CONTRIBUTIONS IN 2013

Publications:

- **Paper-based nanobiosensors for diagnostics**, Claudio Parolo, Arben Merkoçi, *Chemical Society Reviews* (2013)
- **Graphene Oxide as a Pathogen-Revealing Agent: Sensing with a Digital-Like Response**, Eden Morales-Narvez, Abdel-Rahim Hassan, and Arben Merkoçi, *Angwandte Chemie*, **52**, 13779-13783 (2013)
- **Micromotor-Based Lab-on-Chip Immunoassays**, Miguel García, Jahir Orozco, Maria Guix , Wei Gao, Sirilak Sattayasamitsathit, Alberto Escarpa, Arben Merkoçi, Joseph Wang, *Nanoscale* (2013)
- **Gold nanoparticles decorated with a ferrocene derivative as a potential shift-based transducing system of interest for sensitive immunosensing**, Abdelmoneim Mars, Claudio Parolo, Noureddine Raouafi, Khaled Boujlel and Arben Merkoçi., *J. Mater. Chem. B*, **1**, 2951-2955 (2013)
- **Multifunctional system based on hybrid nanostructured-rods formation, for sensoremoval applications of Pb2+ as a model toxic metal.**, Adaris Lopez-Marzo, Josefina Pons and Arben Merkoçi, *J. Mater. Chem. A*, 2013,**1**, 13532-13541 (2013)
- **Nanomaterials for bio-functionalized electrodes: recent trends**, Alain Walcarius, Shelley D. Minteer, Joseph Wang, Yuehe Lin and Arben Merkoçi, *J. Mater. Chem. B*,**1, (38)**, 4878-4908 (2013)
- **Simple paper architecture modifications lead to enhanced sensitivity in nanoparticle based lateral flow immunoassay**, Claudio Parolo, Mariana Medina-Sánchez, Alfredo de la Escosura-Muñiz, Arben Merkoçi, *Lab on a Chip* (2013)
- **All-integrated and highly sensitive paper-based device with sample treatment platform for Cd2+ immunodetection in drinking waters**, Adaris María López Marzo , Josefina Pons , Diane A Blake , and Arben Merkoçi, *Anal. Chem.*,**85**, 3532-3538 (2013)
- **Bismuth nanoparticles for phenolic compounds biosensing application**, Carmen C. Mayorga-Martinez, Miquel Cadevall, Maria Guix, Josep Ros, Arben Merkoçi, *Biosensors & Bioelectronics* (2013)
- **Casein modified gold nanoparticles for future theranostic applications**, Marisol Espinoza-Castañeda, Alfredo de la Escosura-Muñiz, Gemma González-Ortiz, Susana

de la Escosura, Alfredo, *Postdoctoral Researcher*

Espinoza, Marisol, *Doctoral Student*

Fattahhesari, Ali, *Visiting Doctoral Student*

Fomitcheva, Anna, *Visiting Student*

Gravagnuolo, Alfredo Maria, *Visiting Doctoral Student*

Guix, Maria, *Doctoral Student*

Hlavata, Lenka, *Visiting Doctoral Student*

Honda, Yuki, *Visiting Doctoral Student*

Hussein, Abdel-Rahim, *Visiting Postdoctoral Researcher*

Kurbanoglu, Sevinç, *Visiting Doctoral Student*

Lòpez, Adaris Maria, *Visiting Doctoral Student*

Malec, Jedrzej Rafal, *Visiting Student*

Mandli, Jihane, *Visiting Doctoral Student*

Mars, Abdelmoneim, *Visiting Doctoral Student*

Martín, Patricia, *Visiting Student*

Mayorga, Carmen, *Postdoctoral Researcher*

Medina, Mariana, *Student*

Miserere, Sandrine, *Postdoctoral Researcher*

Montòn, Helena, *Visiting Doctoral Student*

Morales, Eden, *Postdoctoral Researcher*

Navarro, Guillem, *Visiting Student*

Nunes, Gisele Elias, *Visiting Doctoral Student*

Pérez, Briza, *Visiting Postdoctoral Researcher*

Parolo, Claudio, *Student*

Pino, Flavio, *Visiting Doctoral Student*

Puig, Anna, *Group Project Manager*

Quesada, Daniel, *Visiting Student*

Rabti, Amal, *Visiting Doctoral Student*

Rivas, lourdes Josefina, *Visiting Doctoral Student*

Sánchez, Sonia, *Visiting Student*

Sanli, Serdar, *Visiting Doctoral Student*

Santos, Charlene, *Visiting Doctoral Student*

Soler, Joan Antoni, *Visiting Student*

Zamora, Alejandro, *Visiting Student*

M. Martín-Orúe, José Francisco Pérez, Arben Merkoçi, *Biosensors & Bioelectronics* (2013)

- **Electrochemical Detection of Salmonella using Gold Nanoparticles**, André S. Afonso, Briza P. López, Ronaldo C. Faria, Luiz H.C. Mattoso, Maria M.H. Herrero, Artur X.R. Sagués, Marisa Maltez-da Costa, Arben Merkoçi, *Biosensors & Bioelectronics* (2013)
- **Enhanced lateral flow immunoassay using gold nanoparticles loaded with enzymes**, Claudio Parolo, Alfredo de la Escosura-Muñiz, Arben Merkoçi, *Biosensors & Bioelectronics* (2013)
- **High sensitive gold-nanoparticle based lateral flow immunodevice for Cd2+ detection in drinking waters**, Adaris M. López Marzo, Josefina Pons, Diane A. Blake, Arben Merkoci, *Biosensors & Bioelectronics*. **47 (15)**, 190-198 (2013)
- **Nanochannels for diagnostic of thrombin-related diseases in human blood**, Alfredo de la Escosura-Muñiz, Wilanee Chunglok, Werasak Surareungchai, Arben Merkoçi, *Biosensors & Bioelectronics* (2013)
- **Design, preparation and evaluation of a fixed-orientation antibody/gold nanoparticle conjugate as immunosensing label**, Claudio Parolo , Alfredo de la Escosura-Muñiz , Ester Polo , Valeria Grazu , Jesús M. De La Fuente , and Arben Merkoçi, *ACS Appl. Mater. Interfaces*, **5 (21)**, 10753-10759 (2013)
- **Ion-Directed Assembly of Gold Nanorods: a Strategy for Mercury Detection**, Tiziana Placido, Gemma Aragay, Josefina Pons, Roberto Comparelli, Maria Lucia Curri, Arben Merkoci, *ACS Applied Materials and Interfaces* (2013)
- **Deprotonation Mechanism and Acidity Constants in Aqueous Solution of Flavonols: a Combined Experimental and Theoretical Study**, Ruslán Álvarez-Diduk, María Teresa Ramírez-Silva, Annia Galano, and Arben Merkoçi, *J. Phys. Chem. B*, **117**, 12347-12359 (2013)
- **Nanostructured CaCO3-PEI microparticles for phenol sensing in fluidic microsystem**, Carmen C. Mayorga-Martinez, Lenka Hlavata, Sandrine Miserere, Adaris López- Marzo, Jan Labuda, Josefina Pons and Arben Merkoçi, *Electrophoresis*, **34,(14)**, 2011-2016 (2013)
- **Nanoparticles Based Electroanalysis in Diagnostics Applications**, Arben Merkoçi, *Electroanalysis* (2013)
- **Assembly of Gold Nanorods for Highly Sensitive Detection of Mercury Ions**, Tiziana Placido, Roberto Comparelli, Marinella Striccoli, Angela Agostiano, Arben Merkoçi, M. Lucia Curri., *IEEE Sensors Journal* (2013)
- **Nano-Assembled Supramolecular Films from Chitosan-Stabilized Gold Nanoparticles and Cobalt(II) Phthalocyanine**, Anna T. B. Silva; Andreane G. Coelho; Lourdes C. da S. Lopes; Marccus V. A. Martins; Frank N. Crespilho; Arben Merkoçi; Welter C. da Silva., *Chem. Soc.*, **24(8)**, 1237-1245 (2013)
- **Screen-printed electrodes incorporated in a flow system for the decentralized monitoring of lead, cadmium and copper in natural and wastewater samples**, Güell, R.; Fontàs, C.; Aragay, G.; Merkoçi, A.; Anticó, E., *INT J ENVIRON AN CH* (2013)
- **Paper-based electrodes for nanoparticle detection**, Parolo, C.; Medina-Sánchez, M.; Montón, H.; De La Escosura-Muñiz, A.; Merkoçi, A., *Particle and Particle Systems Characterization*, **30**, 662-666 (2013)

Contributions:

- *"Development of Nanostructurated Platforms for Sensing and Destroying of*

Pollutants", **SJ-NANO2013, Spanish Japanese Bilateral Workshop on Nanotechnologies qand New Materials for Environmental Challenges**, Tokyo (Japan), mar-13, Arben Merkoçi, (Oral presentation)

- *"Nanomaterial-based biosensors for diagnostic, safety and security applications"*, **Nanotecnologie per la sicurezza Premio Nobel per la Pace 2013 alla OPCW: il ruolo della Accademia delle Scienze dell'Istituto di Bologna**, Bologna (Italy), dic-13, Arben Merkoçi, (Oral presentation)
- *"Nanomaterial-based devices for point of care applications"*, **Second Workshop on Nanomedicine**, Bellaterra (Spain), oct-13, Arben Merkoçi, (Oral presentation)
- *"Tunning biosensor response by nanomaterials and signal transducing arquitectures"*, **Advanced Materials World Congress**, Çesme (Turkey), sep-13, Arben Merkoçi, (Oral presentation)
- *"Nanomaterials based biosensors"*, **Summer School of Univ. Rovira Virgili**, Tarragona (Spain), jul-13, Arben Merkoçi, (Oral presentation)
- *"Nanotheranostics: diagnostics and therapies using nanomaterials: Building simple nanomaterial based platforms that signal and evaluate diseases or pollutants"*, **55th ICREA Colloquium**, Barcelona (Spain), jun-13, Arben Merkoçi, (Oral presentation)
- *"Point of care diagnostics using simple nanomaterials based platforms"*, **Invited lecture at Universitat Pompeu Fabra**, Barcelona (Spain), jun-13, Arben Merkoçi, (Oral presentation)
- *"Graphene Based Platforms for Biosensing Applications"*, **Parallel workshop: Applications of Graphene-based Materials, Graphene 2013, ImagineNano Conference**, Bilbao (Spain), abr-13, Eden Morales Narváez; Luis Miguel Baptista Pires; Arben Merkoçi., (Oral presentation)
- *"Nanomaterials based devices in electrochemical bio-sensing technology"*, **10th International Electrochemistry meeting**, Konya (Turkey), sep-13, Arben Merkoçi, (Plenary)
- *"Nanomaterials based electrobiosensing"*, **Internationally Participated Electrochemistry Workshop Nanostructure Modified Electrochemical and Bioelectrochemical Systems**, Mugla (Turkey), jun-13, Arben Merkoçi, (Plenary)
- *"Nanomaterials based platforms for biosensing applications"*, **Sixth International Workshop on Biosensors**, ESSAOUIRA (Morocco), oct-13, Arben Merkoçi, (Plenary)
- *"Simple and efficient nanobiosensing devices using plastic andpaper basedplatforms"*, **XXIV Congresso della Divisione di Chimica Analitica della Societá Chimica Italiana**, Sestri Levante (Italy), sep-13, Arben Merkoçi, (Plenary)
- *"Tunning biosensor response by nanomaterials and signal transducing arquitectures"*, **Advanced Materials World Congress (AMWC 2013)**, Çesme (Turkey), sep-13, Arben Merkoçi, (Plenary)
- *"Lab-on-a-chip for electrochemical magneto-immunoassay for Alzheimer's biomarker detection"*, **MicroTAS2013: 17th International Conference on Miniaturized Systems for Chemistry & Life Sciences**, Freiburg (Germany), oct-13, Mariana Medina; Sandrine Miserere; Edén Morales; Arben Merkoçi, (Poster)
- *"Paper-based electrodes for nanoparticles detection"*, **NNT2013: 12th International Conference on Nanoimprint and Nanoprint Technology 2013**, Barcelona (Spain), oct-13, Claudio Parolo; Mariana Medina; Helena Montón; Alfredo de la Escosura; Arben Merkoçi, (Poster)
- *"Nanostructurated platforms for phenol detection using microfluidic system"*, **XVIIIe Transfrontier Meeting - Sensors and Biosensors**, Alès (France), sep-13, Carmen

C. Martínez; Miquel Cadevall; Lenka Hlavata; Sandrine Miserere; Adaris López; Arben Merkoçi., (Poster)

- *"On-chip magneto-immunoassay for Alzheimer's biomarker electrochemical detection by using QDs as labels."*, **XVIIIe Transfrontier Meeting - Sensors and Biosensors**, Alès (France), sep-13, Mariana Medina; Sandrine Miserere; Edén Morales; Arben Merkoçi, (Poster)
- *"Graphene oxide related forms for biosensing applications"*, **TNT2013: Trends in Nanotechnology International Conference**, Sevilla (Spain), sep-13, Luis Pires, Briza Pérez; Carmen C. Mayorga; Eden Morales; Neus Domingo; María José Esplandiu; Francesc Alzina; Clivia M. Sotomayor; Arben Merkoçi., (Poster)
- *"Prussian blue nanoparticles as novel red-ox specie for sensitive label-free immunosensing using nanochannels: application to parathyroid hormone-related protein (PTHrP) detection"*, **TNT2013: Trends in Nanotechnology International Conference**, Sevilla (Spain), sep-13, Marisol Espinoza; Alfredo de la Escosura; Alejandro Chamorro; Carmen de Torres; Arben Merkoçi, (Poster)
- *"Paper-based electrodes for nanoparticles detection"*, **VINyNA 2013: VI Workshop en Nanociencia y Nanotecnologías Analíticas**, Alcala de Henares (Spain), jul-13, Claudio Parolo; Mariana Medina; Helena Monton; Alfredo de la Escosura; Arben Merkoç, (Poster)
- *"Solid-state nanochannel arrays for electrochemical biosensing"*, **3rd International Conference on Bio-sensing Technology**, Sitges (Spain), jun-13, Alfredo de la Escosura, Arben Merkoçi, (Poster)
- *"Ferrocene-decorated gold nanoparticles immunosensor for sensitive amperometric detection of human immunoglobulin G"*, **ACSD2013: The 2nd International Symposium on Analytical Chemistry for Sustanaible Development**, Marrakech (Morocco), may-13, Abdelmoneim Mars; Noureddine Raouafi; Khaled Boujlel; Arben Merkoçi, (Poster)
- *"Human IgG electrochemical detection in COC microfluidic device"*, **Advances in Biodetection & Biosensors**, Barcelona (Spain), mar-13, Sandrine Miserere; Mariana Medina; Alfredo de la Escosura; Arben Merkoçi, (Poster)
- *"Lateral flow immunoassay designs with improved sensitivities using gold nanoparticles"*, **Advances in Biodetection & Biosensors**, Barcelona (Spain), mar-13, Claudio Parolo; Alfredo de la Escosura; Mariana Medina; Lourdes Rivas; Arben Merkoçi, (Poster)
- *"Nanostructured platforms for phenol detection"*, **Advances in Biodetection & Biosensors**, Barcelona (Spain), mar-13, Carmen C. Mayorga; Miquel Cadevall; Lenka Hlavata; Sandrine Miserere; Adaris López; Josefina Pons; Josep Ros; Arben Merkoçi, (Poster)
- *"Lateral flow immunoassays and paper-based electrodes in diagnostic applications"*, **XVIIIe Transfrontier Meeting - Sensors and Biosensors**, Alès (France), sep-13, Claudio Parolo; Mariana Medina; Helena Monton; Alfredo de la Escosura; Arben Merkoçi, (Oral presentation)
- *"Paper-based nanobiosensors in diagnostics: modulation of lateral flow immunoassay"*, **VINyNA 2013: VI Workshop en Nanociencia y Nanotecnologías Analíticas**, Alcala de Henares (Spain), jul-13, Claudio Parolo; Mariana Medina; Alfredo de la Escosura; Arben Merkoçi, (Oral presentation)
- *"Solid-state nanochannel arrays for electrochemical biosensing"*, **3rd International Conference on Bio-sensing Technology**, Sitges (Spain), may-13, Alfredo de la Escosura, Arben Merkoçi, (Oral presentation)

MERITS AND AWARDS 2013

Prof Arben Merkoçi was awarded with the Nano Award-2013 for notable and outstanding research in the field of nanoscience and nanotechnology. Given during the opening ceremony of the Advanced Materials World Congress held on Septembre 2013, in Çesme, Turkey.

PATENTS

"Sensitive qualitative bioassay using graphene oxide as analyte revealing agent"
Authors: Arben Merkoçi; Eden Morales Narváez.
Institution: FUNDACION PRIVADA INSTITUT CATALA DE NANOTECNOLOGIA
Aplication number: EP 13188693.9.

THESES 2013

- **Doctorand:** Adaris Maria López
  Title: Nanostructured micromaterials and devices for sensing and removing of chemical contaminants
  Defense Date: 20/06/2013 - UAB
  Director: Prof. Arben Merkoçi, Dr. Josefina Pons

- **Doctorand:** Claudio Parolo
  Title: Plastic and paper platforms for nanoparticle based immunosensors
  Defense Date: 26/07/2013 - UAB
  Director: Prof. Arben Merkoçi, Dr. Alfredo de la Escosura

- **Doctorand:** Eden Morales
  Title: Nanomaterials Based Microarray Platforms for biodetection
  Defense Date: 24/07/2013 - UPC
  Director: Prof. Arben Merkoçi

- **Doctorand:** Maria Guix
  Title: Nano/micromaterials and motors in (bio)sensing applications
  Defense Date: 15/07/2013 - UAB
  Director: Prof. Arben Merkoçi

- **Doctorand:** Mariana Medina
  Title: Improved biosensing applications using lab-on-a-chip and other platforms
  Defense Date: 15/11/2013 - Sala de Graus de l'Escola de Postgrau
  Director: Prof. Arben Merkoçi y Dr. Sandrine Miserere

NanoBiosensors and Bioanalytical Applications Group

Led by CSIC Full Professor Laura M. Lechuga, the NanoBiosensors and Bioanalytical Applications Group focuses its activities inside the **Nanomedicine area** and is involved in the development of **novel nanobiosensors devices** based on plasmonics, nanoplasmonics, silicon photonics and optonanomechanics principles, including surface biofunctionalisation, microfluidics and complete lab-on-a-chip integration for point-of-care devices.

The nanobiosensors are applied in clinical diagnostics, environmental control, and genomics and proteomics fields. The research activities range from basic research to technological implementation of complete sensing platforms, leading on to industrial transfer of the Group's research into products.

To access the Group's website, click here

NEW PROJECTS & MILESTONES IN 2013

In the research line of **integrated silicon nanophotonic biosensors**, important milestones were reached for the implementation of a sensitive, affordable, hand-held and portable point-of-care device. The ultrasensitive limit of detection of this technology at the pM-fM level is far beyond the state-of-the-art. A technological transfer plan was initiated in 2013. Several new projects were granted in 2013 related to this research line: the national project EPISENS (TEC2012-34280) “Lab-on-a-chip integration of biophotonic devices to study gene expression alterations in cellular pathways” and two EU projects: BRAAVOO (FP7-OCEAN-201-614010) “Biosensors, Reporters and Algal Autonomous Vessels for Ocean Operation” and POCKET (FP7-ICT-2013-10-610389) “Development of a low-cost point-of-care test for Tuberculosis detection”.

The utility of our nanophotonic biosensing techniques for **real bioanalytical applications** was successfully demonstrated. The Group is focusing in the point-of-care detection of diseases as for example Malaria (collaboration with FIND diagnostics Foundation) or

CSIC Full Professor Laura M Lechuga
Group Leader

Prof. Laura M. Lechuga received her BSc. and MSc. degrees in Chemistry from the University of Cádiz, Spain, in 1985 and 1986, respectively, and her PhD. degree in Chemistry from the University Complutense of Madrid (Spain) in 1992. After spending two years as a Postdoctoral Fellow with the MESA+ Research Institute at the University of Twente (The Netherlands), she joined the National Microelectronics Centre (Spanish National Research Council) in Madrid, Spain, where she got a permanent Tenured Scientist position in 1995. From 1995 to 2007 she was the Head of the Nanobiosensor Group at the National Microelectronics Centre (CNM-CSIC) in Madrid, Spain. Since 2008 she is Full Professor of the Spanish National Research Council (CSIC); since 2012 she is Adjunct Professor at the Dept. of Physics&Technology, at the University of Tromsø (Norway) and since 2013 she is a Visiting professor at the Dept. of Microwaves and Photonics, School of Electrical and Computer Sciences, University of Campinas (Brazil).

Since 2008, Prof. Lechuga is the Head of the Nanobiosensors and Bioanalytical Applications Group in the Centre for Nanoscience and Nanotechnology (CIN2, CSIC) in Barcelona (Spain). The principal focus of her research program is the technological development of photonic (plasmonics and silicon-based) and nanomechanical biosensors, their integration in portable lab-on-a-chip platforms and their application in clinical and environmental diagnostics. She has published over 150 articles, book chapters and conference proceedings, has 8 families of awarded patents at European, US or international level, and has presented more than 90 invited research papers at international level. She has been the driving force for the establishment of one spin-off company in 2004 (SENSIA, SL) and co-founder of a new spin-off in 2010 (BIOD, SL).

Prof. Lechuga is associate editor of the IEEE Photonics Journal, associate editor of the J. Optics and Laser Technology (Elsevier) and is at the Editorial Board of the Journal of Nanobiosensors in Disease Diagnosis. She has been nominated as Fellow of the Optical Society (OSA) in

Tuberculosis (POCKET EU project), early detection of several types of cancer (as colorectal cancer), dry eye disease (INNPACTO national project); early detection of liver complications (CIBER internal project); novel sensor for *in-situ* doping control with a high level of sensitivity and accuracy; monitoring via human fluids of celiac or allergic patients among others (most of them in collaboration with private companies). In the environmental field, the Group is focusing in the early detection of toxic pollutants as pesticides, antibiotics or alga toxins (BRAAVOO EU project).

The Group has successfully initiated in 2013 a new fundamental research line in Molecular Biology using the Group's nanobiosensing technology for the deciphering of alterations in the cellular pathways, including alternative splicing of RNA, epigenetics modifications (as DNA metilation or microRNA release).

To view the full list of active research projects in 2013, click here

KEY PUBLICATIONS & INVITED TALKS IN 2013

Publications:

- **Controlled 3D-coating of the pores of highly-ordered mesoporous antiferromagnetic Co3O4 replicas with ferrimagnetic FexCo3-xO4 nanolayers**, E. Pellicer, M. Cabo, A. López-Ortega, M. Estrader, L. Yedra, S. Estradé, F. Peiró, Z. Saghie, P. Midgley, E. Rossinyol, I.V. Golosovsky, A. Mayoral, J.D. Prades, S. Suriñach, M.D. Baró, J. Sort, J. Nogués, *Nanoscale*, **5**, 5561-5567 (2013)
- **Site-directed antibody immobilization using a protein A-gold binding domain fusion protein for enhanced SPR immunosensing**, De Juan-Franco, E.; Caruz, A.; Pedrajas, J.R.; Lechuga, L.M., *The Analyst*, **138**, 2023 - 2031 (2013)
- **The effects of lipids and surfactants on TLR5-proteoliposome functionality for flagellin detection using surface plasmon resonance biosensing**, Y. Olguín, P. Villalobos, L. G. Carrascosa, M. Young, E. Valdez, L. Lechuga, R. Galindo, *Analytical and Bioanalytical Chemistry*,, 1267-1281 -10.1007/s00216-012-6523-4 (2013)
- **Sensing with magnetic dipolar resonances in semiconductor nanospheres**, B García-Cámara, R Gómez-Medina, JJ Sáenz, B. Sepúlveda, *Optics express*, **21(20)**, 23007-20 (2013)
- **Implementation of a SPR immunosensor for the simultaneous detection of the 22K and 20K hGH isoforms in human serum samples**, De Juan-Franco, E.; Rodríguez-Frade, J.M.; Mellado, M.; Lechuga, L.M., *Talanta*, **114**, 268-275 (2013)
- **Real-time detection of the chemokine CXCL12 in urine samples by surface plasmon resonance**, Vega B, Calle A, Sánchez A, Lechuga LM, Ortiz AM, Armelles G, Rodríguez-Frade JM, Mellado M., *Talanta*, **114**, 268-276 (2013)
- **A comparative study of in-flow and micro-patterning biofunctionalization protocols for nanophotonic silicon-based biosensors**, González-Guerrero, A.B.; Alvarez, M.; Castaño, A.G.; Domínguez, C.; Lechuga, L.M., *Journal of Colloid and Interface Science*, **393**, 402-410 (2013)
- **Spatial Distribution of Optical Near-Fields in Plasmonic Gold Sphere Segment Voids**, M. Schmidt, N. G. Tognalli, M. A. Otte, M. I. Alonso, B. Sepúlveda, A. Fainstein, A. R. Goñi, *Plasmonics*,, 921-930 -10.1007/s11468-013-9491-4 (2013)
- **2012 Breakthroughs in Lab-on-a-chip & Optical biosensors**, Daphné Duval and Laura M. Lechuga, *IEEE Photonics Journal*, 5(2),00906-00906 (2013)
- **Grating couplers integrated on Mach-Zehnder interferometric biosensors operating in the visible range**, Daphné Duval, Johann Osmond, Stefania Dante, Carlos Domínguez, and Laura M. Lechuga, *IEEE Photonics Journal*,, , 3700108/1-8 -

2014, and she is a member of the International Society for Optical Engineering (SPIE), and member of the European Optical Society (EOS). She is a member of Permanent Steering Committees of Advanced Study Course on Optical Chemical Sensors (ASCOS) and Europt(r)ode Conference Series.

Group Members

Lechuga, Laura, *CSIC Full Professor*

Álvarez, Maria Del Mar, *CSIC Postdoctoral Researcher*

Cardeñosa, Mª Cruz, *CSIC Visiting Student*

Dante, Stefania, *FPU Doctoral Student*

Duval, Daphné, *CIBER Postdoctoral Researcher*

Estévez, Maria Carmen, *CSIC Postdoctoral Researcher*

Fariña, David, *CIBER Technician*

Gòmez, Silvia, *CIBER Technician*

González, Ana Belén, *CSIC Postdoctoral Researcher*

Koziel, Marta, *CSIC Visiting Student*

Losoya, Adrian, *CONACYCT PhD. Student*

Márquez, Salomon Elieser, *CONACYCT PhD. Student*

Maldonado, Jesús Manuel, *CONACYCT PhD. Student*

Martínez, Francesc, *CSIC Visiting Student*

Otte, Marinus A., *CSIC Postdoctoral Researcher*

Piña, Ana Patricia, *CSIC Visiting Doctoral Student*

Rodríguez Delgado, Melissa Marlene, *CONACYCT PhD. Student*

Sánchez, César, *Doctoral Student*

Sepúlveda, Borja, *CSIC Tenured Scientist*

Serra, Anna, *CSIC Visiting Student*

Solís, Verónica Iraís, *CONACYCT PhD. Student*

Soler, María, *FPI Doctoral Student*

10.1109/JPHOT.2013.2251873 (2013)

- **Development of a surface plasmon resonance and nanomechanical biosensing hybrid platform for multiparametric reading**, Alvarez, M.; Fariña, D.; Escuela, A.M.; Sendra, J.R.; Lechuga, L.M., *Review of Scientific Instruments*, **84** (2013)

Invited talks:

- *"Nanobiosensing platforms for on-line environmental protection"*, **REPSOL I+D**, Madrid (Spain), feb-13, Laura Mª Lechuga Gómez, (Oral presentation)
- *"Point-of-care nanobiosensors for global health diagnostics: challenges and opportunities."*, **Instituto de Materiales de Madrid (ICMM), CSIC.**, Madrid (Spain), jun-13, Laura Mª Lechuga Gómez, (Oral presentation)
- *"Dispositivos Nanobiosensores para el diagnóstico descentralizado de biomarcadores con alta sensibilidad y en tiempo real."*, **Instituto de Biomedicina de Sevilla (IBIS)**, Sevilla (Spain), jun-13, Laura Mª Lechuga Gómez, (Oral presentation)
- *"Dispositivos nanobiosensores y lab-on-a-chip para el diagnóstico descentralizado"*, **Universidad de León**, León (Spain), jun-13, Laura Mª Lechuga Gómez, (Oral presentation)
- *"Photonic (plasmonics and silicon based) nanobiosensors: design, fabrication & lab-on-chip integration"*, **INAOE.Instituto Nacional de Astrofísica, Óptica y Electrónica**, Puebla (México), sep-13, Laura Mª Lechuga Gómez, (Oral presentation)
- *"Photonic nanomaterials-based biosensors for highly sensitive lab-on-chip platforms."*, **INAOE.Instituto Nacional de Astrofísica, Óptica y Electrónica**, Puebla (México), oct-13, Laura Mª Lechuga Gómez, (Oral presentation)
- *"Nanophotonic lab-on-chip biosensors for ultrasensitive diagnostics"*, **University of Tromso, Artic University of Norway**, Tromso (Norway), nov-13, Laura Mª Lechuga Gómez, (Oral presentation)
- *"Nanomedicine: application of Nanotechnology for improving health."*, **Saint Louis University- Madrid Campus (http://spain.slu.edu).**, Madrid (México), dic-13, Laura Mª Lechuga Gómez, (Oral presentation)
- *"Organized by the EU-"MinaSys" REGPOT project. Lab-on-a-chip integration of Silicon photonic biosensors for advanced point-of-care devices "biochemical SEnsiNg devices & systems for health/food/environmental monitoring""*, **Workshop: MinaSens-MINiAturized**, Athens (Greece), mar-13, Laura Mª Lechuga Gómez, (Oral presentation)
- *"Plasmonic biosensing for deciphering cellular pathways. Special session on plasmonic biosensors."*, **META 2013. 4th International Conference on Metamaterials, Photonic Crystals and Plasmonics.**, Sharjah (United Arab Emirates), mar-13, Laura Mª Lechuga Gómez, (Oral presentation)
- *"Nanobiotecnología: avances diagnósticos y terapéuticos."*, **XXVI Congreso Nacional de la Asociación Española de Técnicos de laboratorio**, Alicante (Spain), may-13, Laura Mª Lechuga Gómez, (Oral presentation)
- *"Plataformas nanobiosensoras para el diagnóstico descentralizado."*, **Foro Científico-tecnológico. Cátedra SAMCA de Nanotecnología: Nanomedicia.**, Zaragoza (Spain), jun-13, Laura Mª Lechuga Gómez, (Oral presentation)
- *"Pushing the limits of plasmonic biosensing in molecular biology."*, **Optical Sensors (SENSORS). Optical Society of America's Topical Meetings on "Advanced Photonics".**, Rio Grande (Puerto Rico), jul-13, Laura Mª Lechuga Gómez, (Oral presentation)

- *"Nanobiosensors based on Nanomaterials."*, **EUROMAT 2013. European Congress and Exhibition on Advanced Materials and Processes.**, Sevilla (Spain), sep-13, Laura Mª Lechuga Gómez, (Oral presentation)

- *"Photonic nanobiosensors for sensitive and label-free detection of DNA and RNA"*, **Workshop "Biosensors for a better environment". Organized by IRTA.**, Barcelona (Spain), sep-13, Laura Mª Lechuga Gómez, (Oral presentation)

- *"Photonic nanomaterials-based biosensors for highly sensitive lab-on-chip platforms."*, **International Conference on Surfaces, Materials and Vacuum. SMCTSM. XXX Congreso Nacional de la Sociedad Mexicana de Ciencia y Tecnología de Superficies y Materiales.**, Mérida (México), sep-13, Laura Mª Lechuga Gómez, (Oral presentation)

- *"Point-of-care nanobiosensors for global health diagnostics: challenges and opportunities"*, **2nd NanoFar Autum School and Workshop, Erasmus Mundus Master.**, Santiago de Compostela (Spain), oct-13, Laura Mª Lechuga Gómez, (Oral presentation)

- *"Nanobiosensors based on optical platforms. Nanofabrication: concepts, techniques and applications in Nanotechnology."*, **Summer School**, Jaca (Spain), jul-13, Borja Sepúlveda Martín, (Oral presentation)

- *"From material to real devices: nanophotonic lab-on-a-chip biosensors for ultrasensitive diagnostics"*, **EUROMAT 2013. European Congress and Exhibition on Advanced Materials and Processes.**, Sevilla (Spain), sep-13, Laura Mª Lechuga Gómez, (Plenary)

- *"Multiplexed configurations in integrated photonic nanointerferometers for ultrasensitive biosensors"*, **OPTOEL'13. VIII Reunión Española de Optoelectróncia**, Madrid (Spain), jul-13, D. Duval, S. Dante, A.B. González and L.M. Lechuga, (Póster)

- *"Xerogel diffraction gratings fabricated by nanoimprint lithography"*, **XVII International Sol-Gel Conference**, Madrid (Spain), ago-13, C. Fernández-Sánchez, V. Auzelyte, E. Carregal-Romero, D. Duval, J. Juvert, V.J. Cadarso, L. M. Lechuga, J. Brugger, A. Llobera, (Póster)

- *"Bimodal waveguide biosensor for the detection of exosomes: an advanced tool for cancer diagnostics"*, **EUROMAT 2013. European Congress and Exhibition on Advanced Materials and Processes.**, Sevilla (Spain), jul-13, Ana Belén González-Guerrero, Stefania Dante, Jordi Berenguer de Felipe, Laura M. Lechuga, (Póster)

- *"Ultra-sensitive silicon interferometric biosensors with linear read-out"*, **EUROMAT 2013. European Congress and Exhibition on Advanced Materials and Processes.**, Sevilla (Spain), jul-13, Stefania Dante, Daphné Duval, Johann Osmond, Laura M. Lechuga, (Póster)

- *"Label-free detection of the human growth hormone using integrated silicon photonic biosensors"*, **Annual convention of Philippine society of biochemistry and molecular biology**, Manila (Philippine), sep-13, A.B. González-Guerrero, J. Martizano and L.M. Lechuga, (Póster)

- *"Multiplexed Integrated Interferometers for advanced Lab-on-a-chip biosensors. Photonics"*, **Optical Sensors (SENSORS). Optical Society of America's Topical Meetings on "Advanced Photonics"**, Rio Grande (Puerto Rico), jul-13, Laura Mª Lechuga Gómez, (Oral presentation)

- *"Biofunctionalization of 3D-silicon nanopillars for biosensing."*, **ECASIA'13. 15th European Conference on Applications of Surface and Interface Analysis**, Cerdeña (Italy), oct-13, Laura Mª Lechuga Gómez, (Oral presentation)

- *"Multiplexed Mach-Zehnder silicon interferometers for highly sensitive biosensing"*, **EUROMAT 2013. European Congress and Exhibition on Advanced Materials and**

Processes., Sevilla (Spain), sep-13, Daphné Michele Duval, (Oral presentation)

- *"Multiplexed Integrated Interferometers for advanced Lab-on-a-chip biosensors"*, **Optical Sensors (SENSORS). Optical Society of America's Topical Meetings on "Advanced Photonics"**, Rio Grande (Puerto Rico), jul-13, D. Duval, D. Grajales, S. Dante, J. Osmond, C. Dominguezand, (Oral presentation)

- *"Biofunctionalization of 3D-silicon nanopillars for biosensing"*, **ECASIA'13. 15th European Conference on Applications of Surface and Interface Analysis**, Cerdeña (Italy), oct-13, S. Gómez-Montes, M. Álvarez, M.C. Estevez, M. Holgado and, (Oral presentation)

- *"Photonic (plasmonics and silicon based) nanobiosensors: design, fabrication & lab-on-chip integration. Congreso Nacional de la Sociedad Mexicana de Ciencia y Tecnología de Superficies y Materiales"*, **International Conference on Surfaces, Materials and Vacuum. SMCTSM. XXX**, Mérida (México), sep-13, Laura Mª Lechuga Gómez, (Tutorial)

OTHER HIGHLIGHTS IN 2013

- Three granted patents in China, Europe and Japan.

- L.M. Lechuga awarded with a Special visiting professor position under the prestigious "Science without borders" program from Brazil.

- L.M. Lechuga is nominated as Associate Editor of Journal of Optics and Laser Technology (Elsevier).

- L. M. Lechuga is nominated as Associate Editor of Journal of IEEE Photonics Journal.

THESES 2013

- **Doctorand:** Elena de juan
  Title: Estrategias de inmovilización de anticuerpos para la detección directa de hormonas mediante Inmunosensores de Resonancia de Plasmón Superficial
  Defense Date: 26/07/2013
  Director: Laura Lechuga

- **Doctorand:** Marinus Albertus Otte Ortiz
  Title: Towards Highly Sensitive and Multiplexed Nanoplasmonic Biosensors
  Defense Date: 15/02/2013 - Auditorio del edificio CIN2
  Director: Borja Sepúlveda

Nanostructured Functional Materials Group

Led by CSIC Full Professor Daniel Ruiz-Molina, the Nanostructured Functional Materials Group (Nanosfun) has focused on the development of new methodologies and processes to assemble (bio)molecules with specificity to generate nanomaterials with a designed property or function. Hierarchical nanomaterials, both bulk or nanostructured on a surface, are produced with controlled structures over different length scales and their properties investigated in terms of possible applications.

The nanostructuration is achieved by different means. Bulk materials in the form of nanoparticles or nanotubes are prepared by means of self-assembly, coordination chemistry and templating techniques. Nanostructuration on surfaces is directed by self-assembly processes assisted by different techniques such as Dip-Pen nanolithography or other soft lithographic techniques such as microcontact printing.

Due to their unique properties, these nanomaterials are expected to have a great impact on different fields such as energy and cost efficient technologies, sensors, memory devices, drug delivery and biomedical applications, among others.

To access the Group's website, click here

NEW PROJECTS & MILESTONES IN 2013

In 2013 Nansofun focused on:

- **Molecules containing catechol (o-dihydroxybenzene) moieties** are at the heart of a myriad of key processes and chemicals found throughout nature. Protective coatings and powerful wet adhesives containing this deceptively simple chemical moiety bear witness to its remarkable versatility, and have been a hot source of inspiration for the development of many biomimetic materials reported recently.

  Nanosfun developed an alternative strategy, published recently in two *Advanced Materials* articles. Chosen catechol monomers bearing specific functions or tags are prepared first, such as hydrophobic moieties in the form of long alkyl side chains, or oleophobic perfluorinated side chains, and subsequently polymerized by a general and simple treatment in methanol-ammonia mixtures in the presence of air. Conceptually speaking, this approach turns upside down the widely-applied biomimetic strategy for the (bio)synthesis of melanin-like materials from catecholamines.

  In addition to a maximisation of the relevant functionality of the coating, materials prepared in this fashion were found to be soluble in selected common organic solvents, as opposed to polydopamine and other melanin-like materials. This opened up the possibility of coating substrates in a controlled and optimal way by *ex-situ* procedures.

- An important activity in **low-temperature physics** deals with the development of new technologies, based on micron-sized devices (microchips) that could replace the complex and bulky refrigerators that are currently used. Magnetic refrigeration based on the use of molecule-based magnetic materials is among the technologies that compete in such a race.

CSIC Full Professor Daniel Ruiz-Molina
Group Leader

Daniel Ruiz-Molina got his PhD on polyradical dendrimers at the Institute of Materials Science of Barcelona (CSIC) with Prof. Jaume Veciana. Afterwards he took a postdoctoral position at the UC San Diego working on single-molecule magnets and molecular switches for three years. Since 2001 he holds a permanent position at the CSIC and more recently at CIN2 - CSIC, where he is heading the Nanostructured Functional Materials group. His main research areas are fabrication of hybrid colloids and surfaces, biomimetic functional nanostructures and micro-/nanoparticles for smart applications and encapsulation/delivery systems.

Group Members

Ruiz, Daniel, *CSIC Research Scientist*

Borges, Marta, *CSIC Visiting Doctoral Student*

García, Beatriz, *CSIC Doctoral Student*

Guardingo, Mireia, *CSIC Doctoral Student*

Massaro, Giuseppina, *CSIC Visiting Doctoral Student*

Nador, Fabiana, *Visiting Postdoctoral Researcher*

Novio, Fernando, *CSIC Juan de la Cierva Researcher*

Roscini, Claudio, *CSIC Postdoctoral Researcher*

Sedò, Josep, *CSIC Project Manager*

Simmchen, Juliane, *CSIC Doctoral Student*

Torres, Hector, *CSIC Visiting Doctoral Student*

Vázquez, Nuria Alexandra, *CSIC Doctoral*

Each magnetic material shows a phenomenon known as the magnetocaloric effect (MCE), whereby the temperature varies in response to the application of an external magnetic field. Magnetic molecules can possess an extraordinarily high MCE in the temperature range close to absolute zero. Besides, the versatility of the molecules is such as to allow “anchoring” them to a surface, forming thin deposits or monolayers. This is a mandatory step for obtaining cooling microchips based on silicon.

However, to date, there was no experimental evidence that the molecules, once deposited on Si, would preserve their magnetic characteristics, and therefore, their ability to cool. In collaboration with a team of researchers from the Institute of Materials Science of Aragón, Institute of Nanoscience of Aragón and the Physical Measurement Service of the University of Zaragoza, Nanosfun achieved this goal for the first time.

The Nanosfun team has deposited gadolinium acetate tetrahydrate on silicon by Dip-Pen Nanolithography (DPN) and measured the surface magnetism at liquid-helium temperatures. The result leaves no doubt: the deposition process does not alter the excellent cooling power of the molecules.

- Nanosfun and UAB researchers have just reported a **new type of fast-response photochromic film that they have developed using oil-filled polymeric cores**. The work appeared in the cover of Advanced Optical Materials (2013; 1(9): 604). The researchers have also applied for a patent PCT/ES2013/070132 for the new fast responsive photochromic materials since they offer improved efficacies to that of existing products in the market, but with lower fabrication costs and improved integration processes.

  The manufacturing of photoprotective coatings are some of the main commercial uses expected for this family of photochromes. Photochromic materials undergo a reversible colour change (usually from a colourless state to a coloured one) upon irradiation by UV-Vis light. They have found niche applications as photoprotective coatings in smart windows and ophthalmic lenses. However, when dispersed in the polymer matrices required for these applications, their colour changes are drastically slower.

  Nanosfun sought to devise a new class of photochromic materials that undergo rapid colour changing even when dispersed in polymeric matrices. They developed a material in which the photochromic component is encapsulated in oil-core, stable polymeric capsules. The encapsulated photochromic component, and the corresponding polymeric matrices (polystyrene, PMMA, etc.) containing the capsules, both change colour 10-times faster than does the photochromic component when it is directly dispersed in into these polymers.

To view the full list of active research projects in 2013, click here

KEY PUBLICATIONS & INVITED TALKS IN 2013

Publications:

- **Catechol-based biomimetic functional materials**, Sedó, J.; Saiz-Poseu, J.; Busqué, F.; Ruiz-Molina, D., *Advanced Materials*, **25**, 653-701
  BACK COVER PAGE of Advanced Materials 25, issue 19. (2013)

- **Surface-confined molecular coolers for cryogenics**, Lorusso, G.; Jenkins, M.; González-Monje, P.; Arauzo, A.; Sesé, J.; Ruiz-Molina, D.; Roubeau, O.; Evangelisti, M., *Advanced Materials*, **25**, 2984-2988
  FRONT COVER PAGE of Advanced Materials 25, issue 21.
  Also featured by the University of Zaragoza as a press release, European Institute of Molecular Magnetism, Aragón Universidad, Aragón Investiga, europapress.es, SINC, lainformacion.com, Heraldo de Aragón, etc (2013)

Student

Vilasau, Jon, *Postdoctoral Researcher*

Wnuk, Karolina, *CSIC Doctoral Student*

- **Versatile Functional Materials via Direct Polymerization of Catechols**, J. Saiz-Poseu, J. Sedó, J. Hernando, F. Busque, D. Ruiz-Molina, *Advanced Materials*, **25**, 2066-2070 (2013)

- **Coordination polymer nanoparticles in medicine**, Novio, F.; Simmchen, J.; Vázquez-Mera, N.; Amorín-Ferré, L.; Ruiz-Molina, D., *Coordination Chemistry Reviews*, **257**, 2839-2847 (2013)

- **Mn12 single molecule magnets coupled on micro-SQUID sensors: the role of interphases and structural modifications**, E. Bellido, P. González-Monje, A. Repollés, M. Jenkins, J. Sesé, D. Drung, Th. Schurig, K. Awaga, F. Luis, and D. Ruiz-Molina, *Nanoscale*, **5**, 12565-12573 (2013)

- **Encapsulation and release mechanisms in coordination polymer nanoparticles**, Amorín-Ferré, L.; Busqué, F.; Bourdelande, J.L.; Ruiz-Molina, D.; Hernando, J.; Novio, F., *Chemistry - A European Journal*, **19** , 17508-17516 (2013)

- **Robust spin crossover platforms with synchronized spin switch and polymer phase transition**, F. Novio, E. Evangelio, N. Vazquez-Mera, P. González-Monje, E. Bellido, S. Mendes, N. Kehagias, D. Ruiz-Molina, *Sci. Rep.*, **3**, 1708 | DOI: 10.1038/srep01708 (2013)

- **Liquid-Filled Capsules as Fast Responsive Photochromic Materials**, N. Vázquez-Mera, C. Roscini , J. Hernando ,D. Ruiz-Molina, *Adv. Opt. Mat.*, **1**, 631-636 (2013)

Invited talks:

- *"Fast responsive photochromic materials for energy-saving applications"*, **Imaginenano 2013**, Bilbao (Spain), Abril 2013, N. Vázquez, (POSTER)

- *"Bioinspired Catechol-Based Surface Modification: from Oleo-Hydrophobic Coatings to Adhesive Surfaces."*, **European Conference on Hybrid Materials**, Sorrento (Italy), Marzo 2013, M. Guardingo, (POSTER)

- *"Coordination Multifunctional Nanoparticles for theranostics"*, **E-MRS Spring Meeting**, Strasbourg (France), Mayo 2013, F. Novio, (POSTER)

- *"Bioinspired catechol-terminated self-assembled monolayers with enhanced adhesive properties."*, **25th European Conference on Biomaterials**, Madrid (Spain), Septimbre 2013, M. Guardingo, (POSTER)

- *"Functional coordination polymer particles combining encapsulated magnetic nanoparticles and drug release properties"*, **Magnifyco 2013 International Workshop**, Barcelona (Spain), 20-22 Febrero 2013, D. Ruiz-Molina, (ORAL)

- *"Multifunctional Coordination Polymer Particles for Bio-medical application"*, **IMAGINENANO 2013 (Nanobiomed 2013**, Barcelona (Spain), Abril 2013, F. Novio, (ORAL)

- *"Smart bionanostructures and interfaces via direct reaction of functionalized catechols"*, **European Materials Research Society-Spring meeting**, Strasbourg (France), Mayo 2013, D. Ruiz-Molina, (ORAL)

- *"Smart Responsive Coordination Polymer Nanoparticles and their growth @ Surfaces"*, **International Conference on Advanced Complex Inorganic Nanomaterials (ACIN 2013)**, Namur (Belgium), 15-19 Julio, D. Ruiz-Molina, (ORAL)

- *"Coordination Polymer Particles (CPPs) for Theranostics"*, **International Porous and Powder Materials Symposium and Exhibition (PPM 2013)**, Çesme-Izmir (Turkey), September 3th-6th, 2013, F. Novio, (ORAL)

- *"Versatile Bionanostructured Materials via Direct Reaction of Functionalized Catechols"*, **25th European Conference on Biomaterials**, Madrid (Spain), Septimbre

2013, D. Ruiz-Molina, (ORAL)

- *"Surface Functionalization of Coordination Polymer Particles (CPPs) for Medical Uses"*, **25th European Conference on Biomaterials**, Madrid (Spain), Septimbre 2013, F. Novio, (ORAL)
- *"Smart Bioinspired Nanostructures"*, **A way to Smart Europe - COST MP1106 "Smart & Green Interfaces"**, Twente (Holanda), 23-25 April, D. Ruiz-Molina, (Oral presentation)
- *"Multifunctional Coordination Nanoparticles and their growth @ Surfaces"*, **L'Université de Strasbourg**, Strasbourg (France), Mayo 2013, D. Ruiz-Molina, (Oral presentation)
- *"Una visión general de la nanotecnología y sus aplicaciones emergentes: el caso de las nanopartículas para la administración de fármacos y de imagen"*, **I Jornadas Científicas de Técnicos Superiores Sanitarios**, Lloret (Spain), Junio 2013, F. Novio, (Oral presentation)
- *"Catechol?based smart bionanostructures and interfaces"*, **HINT Workshop The interface in hybrid and biohybrid materials : role and characterization**, Madrid (Spain), 2.3 Septiembre 2013, D. Ruiz-Molina, (Oral presentation)
- *"Nanociencia y Nanotecnología. Nanopartículas como elementos teranosticos"*, **Curso de formación en Nanociencia y Nanotecnología.**, Bellaterra (Spain), 2-3 Mayo 2013, F. Novio, (Oral presentation)

OTHER HIGHLIGHTS IN 2013

Awards and Honours:

ASCAMM Innovation Award for the best scientific collaboration that has contributed some ideas or industrial projects based in science and technology transfer best projection. The award was presented at the Industrial Innovation ASCAMM FORUM held on 27 November 2013 in Auditorium CosmoCaixa (Barcelona).

Nanostructured Materials for Photovoltaic Energy Group

Led by Dr. Monica Lira-Cantú, the Nanostructured Materials for Photovoltaic Energy Group focuses on fundamental and applied concepts in the field of photovoltaic and optoelectronic devices. The basic knowledge, manipulation and control of materials properties (electric, electronic, optic) and the synergy with structure at the nanoscale, is considered the basis for the development of highly efficient devices. The Group specialises on the synthesis of nanostructured materials from different solution processing methods at low temperature. The main focus is the fabrication of efficient and highly stable photovoltaic and optoelectronic devices applying low-cost solution processing techniques.

NEW PROJECTS & MILESTONES IN 2013

The Nanostructured Materials for Photovoltaic Energy Group focuses on different objectives, all related to the **development of highly efficient, highly stable and low-cost photovoltaic and optoelectronic devices**:

The synthesis of nanostructured materials, especially those involving transition metal oxides (TMOs) and graphene, applying low-cost and solution processing methods is a mayor goal for the group. TMOs have many possible applications as main active materials or barrier layers, but are also applied as materials for external light management. The application of low-temperature synthesis methods (sol-gel, hydrothermal, SILAR, among many others) permits to tune and control the properties of the final device.

The stability and long lifetime of optoelectronic devices, especially organic solar cells, is a main limitation of these technologies to reach the marketplace. A consortium of more than 90 members, among them 40 internationally-recognized research laboratories and 10 industries from 26 countries, have join an **EU COST Action project related to the stability of organic solar cells**. The project is led by ICN2 trough the Group Leader Monica Lira-Cantú, coordinator of the consortium. The goal is to take advantage of the multiple characterization techniques available from the different partners to elucidate degradation mechanism of these devices and propose disruptive solutions towards highly stable Organic solar cells.

Projects

- TÍTULO: Stable Next-Generation Photovoltaics: Unravelling Degradation Mechanisms of Organic Solar Cells by Complementary Characterization Techniques. StableNextSol. MP1307
  ENTIDAD FINANCIADORA: COST Action –EU
  DURACION: Nov 15 2013- Nov 15 2017
  INVESTIGADOR PRINCIPAL: Monica Lira-Cantú (Coordinator)

- TÍTULO DEL PROYECTO: Flexible small molecule Organic Solar Cells
  ENTIDAD FINANCIADORA: Fundacion Iberdrola
  DURACION DESDE: Nov 2012 – Nov 2013
  INVESTIGADOR/A PRINCIPAL:Irene Gonzalez-Valls/Monica Lira-Cantú

- TÍTULO DEL PROYECTO: Xarxa de Referència en Materials Avançats per a

Dr. Mónica Lira-Cantú
Group Leader

Mónica Lira-Cantú (Chemistry, 1992), obtained a Master and PhD degrees in Materials Science at the Materials Science Institute of Barcelona (ICMAB) / Universitat Autònoma de Barcelona (1995/1997) and completed a postdoctoral work under a contract with the company Schneider Electric/ICMAB (1998). From 1999 to 2001 she worked as permanent Senior Staff Chemist at ExxonMobil Research & Engineering (formerly Mobil Technology Co) in New Jersey (USA) initiating a laboratory on energy related applications. Currently, she is Group Leader of the Nanostructured Materials for Photovoltaic Energy Group (nanostructuredmaterials.icn2.cat) of the Catalan Institute of Nanoscience and Nanotechnology, ICN2.

She received different awards/fellowships as a visiting scientist to the following laboratories: University of Oslo, Norway (2003), Riso National Laboratory, Denmark (2004/2005) and the Center for Advanced Science and Innovation, Japan (2006). She obtained a permanent position in 2007 at the Spanish National Research Council (CSIC, Spain) and started the laboratory on Photovoltaic Energy at CIN2 in 2007. Since then she has directed more than 20 researchers (from Postdocs, PhD students and undergraduate students). She has been the PI of several projects (including national, industrial and European), and she is the principal coordinator of a COST Action Proposal (approved in 2013) related to the study of the stability of Organic solar cells (OPVs).

Her research interests are the synthesis and application of nanostructured materials for stable next-generation thin film solar cells: Perovskite solar cells, Dye sensitized, Hybrid and Organic Solar Cells. Mónica Lira-Cantú has more than 70 published papers, 7 patents and 8 book chapters, h index = 25

Group Members

Lira-Cantú, Mónica, *CSIC Tenured Track Group Leader*

l'Energia Xarmae (Xarmae - Advanced Energy Materials Network)
ENTIDAD FINANCIADORA: Generalitat de Catalunya
DURACION DESDE:Anual desde 2009 - 2014
INVESTIGADOR/A PRINCIPAL:Dr. Juan Ramón Morante
INVESTIGADOR ICN2: Dra. Monica Lira-Cantú

- TÍTULO DEL PROYECTO: CONSOLIDER NANOSELECT Ref. CSD2007-00041 "Materiales avanzados y Nanotecnologías para dispositivos y sistemas eléctricos, electrónicos y magnetoeletrónicos innovadores- NANOSELECT (Nanotechnologic Advanced Materials for electric, electronic and magnetoelectronic innovative sistems and devices - NANOSELECT).
ENTIDAD FINANCIADORA: MEC
DURACION DESDE:2007- 2014
INVESTIGADOR/A PRINCIPAL:Dr.Xavier Obradors
INVESTIGADOR ICN2: Dra. Monica Lira-Cantú

KEY PUBLICATIONS & CONTRIBUTIONS IN 2013

Publications:

- **Low-temperature, solution-processed, layered V2O5 hydrate as the hole-transport layer for stable organic solar cells**, Terán-Escobar, G.; Pampel, J.; Caicedo, J. M.; Lira-Cantú, M, *Energy and Environmental Science*, (2013)
- **A phenyl-capped aniline tetramer for Z907/tert-butylpyridine-based dye-sensitized solar cells and molecular modelling of the device**, Manseki, K.; Yu, Y.; Yanagida, S., *Chemical Communications*,**49**, 1416-1418 (2013)
- **Controlling the microstructure and properties of titania nanopowders for high efficiency dye sensitized solar cells**, Shalan, A.E.; Rashad, M.M.; Yu, Y.; Lira-Cantú, M.; Abdel-Mottaleb, M.S.A., *Electrochimica Acta*, **89**, 469-478 (2013)
- **Comparison of two types of vertically aligned ZnO NRs for highly efficient polymer solar cells**, Gonzalez-Valls, I.; Angmo, D.; Gevorgyan, S.A.; Sebastián Reparaz, J.; Krebs, F.C.; Lira-Cantu, M., *Journal of Polymer Science, Part B: Polymer Physics*, **51**, 272-280 (2013)
- **Synthesis and characterization of mesoporous anatase TiO2 nanostructures via organic acid precursor process for dye-sensitized solar cells applications**, Rashad, M.M.; Shalan, A.E.; Lira-Cantú, M.; Abdel-Mottaleb, M.S.A., *Journal of Industrial and Engineering Chemistry*, **19**, 2052-2059 (2013)
- **A facile low temperature synthesis of TiO2 nanorods for high efficiency dye sensitized solar cells**, Shalan, A.E.; Rashad, M.M.; Yu, Y.; Lira-Cantú, M.; Abdel-Mottaleb, M.S.A., *Applied Physics A*, **110**, 111-122 (2013)
- **Low-cost upscaling compatibility of five different ITO-free architectures for polymer solar cells**, Angmo, D.; Gonzalez-Valls, I.; Veenstra, S.; Verhees, W.; Sapkota, S.; Schiefer, S.; Zimmermann, B.; Galagan, Y.; Sweelssen, J.; Lira-Cantu, M.; Andriessen, R.; Kroon, J.M.; Krebs, F.C., *Journal of Applied Polymer Science*, **130**, 944-954 (2013)

Book chapter:

- Youhai Yu, Gerardo Teran-Escobar, Jose M. Caicedo, Irene Gonzalez-Valls and Monica Lira-Cantu. **Conducting Polymers in Hybrids, Organic and Dye Sensitized Solar Cells.** *Nova Sci. Pub.* Luiz Carlos Almeida Ed. February **2013**, Chapter 10. ISBN: 978-1-62618-119-9

Contributions:

Arfaoui, Khalil Raphael, *CSIC Visiting Doctoral Student*

Caicedo, José Manuel, *CSIC Postdoctoral Researcher*

De Sousa Lima, Francisco Anderson, *CSIC Doctoral Student*

Echavarria Troya, Fernando, *CSIC Doctoral Student*

González-Valls, Irene, *Postdoctoral Researcher*

Terán-Escobar, Gerardo, *CSIC Doctoral Student*

Vanwaelscappel, Auréelie, *CSIC Visiting Doctoral Student*

- *"New D- Pi -A systems for Dye Sensitized Solar Cells"*, **5th Hybrid and Organic Photovoltaic Conference**, Sevilla (Spain), may-13, R. Pérez-Tejada; S. Franco; R. Andreu; J. Garín; J. Orduna; M. Lira-Cantú; Y. Yu, (Poster)

- *"Low-temperature water-based solution-processed VOas hole conductor for inverted organic solar cells: optimization and stability studies"*, **Next-generation Organic Photovoltaics Conference**, Groningen (The Netherlands), jun-13, G. Teran-Escobar, J. Pampel, J.M. Caicedo, M. Lira-Cantu, (Poster)

- *"Stable Next Generation Photovoltaics: Unravelling Degradation Mechanisms of Organic Solar Cells by Complementary Characterization Techniques"*, **COST DC Meeting**, Reykjavik (Iceland), sep-13, M. Lira-Cantu, (Poster)

- *"Low-Temperature Solution Processed Layered VOHydrate as Hole-Transport Layer for Stable Organic Solar Cells"*, **Nanoselect Meeting**, Sant Feliu de Guixols (Spain), jul-13, Gerardo Teran-Escobar, Jonas Pampel, Jose M. Caicedo Roque and Mónica Lira-Cantú, (Poster)

- *"Application of VOXerogel as Hole-Transport Layer in Organic Solar Cells: Towards Low Cost Printed Optoelectronic Devices"*, **NanoApp Nanomaterials and Applications meeting**, Portoroz (Slovenia), sep-13, G. Terán-Escobar, J. Pampel, J. M. Caicedo, M. Lira-Cantú, (Poster)

- *"Stable Next Generation Photovoltaics: Unravelling Degradation Mechanisms of Organic Solar Cells by Complementary Characterization Techniques"*, **International Summit on Organic Photovoltaic Stability ISOS-6**, Chambery (France), dic-13, M. Lira-Cantú, (Poster)

- *"Low-Temperature Solution Processed Layered V_2O_5 Hydrate as Hole-Transport Layer in Stable Organic Solar Cells"*, **Next-generation Organic Photovoltaics**, Groningen (The Netherlands), 2-5 June, Gerardo Teran-Escobar, Jonas Pampel and Monica Lira-Cantu, (Oral presentation)

- *"Application of V_2O_5 Xerogel as Hole-Transport Layer in Organic Solar Cells: Towards Low Cost Printed Optoelectronic Devices"*, **NanoApp Nanomaterials and Applications**, Portoroz (Slovenia), 22-25 September, Gerardo Teran-Escobar, Jonas Pampel and Mónica Lira-Cantú, (Oral presentation)

- *"Stable Next-Generation Photovoltaics: Unraveling Degradation Mechanisms of Organic Solar Cells by Complementary Characterization Techniques"*, **COST Action Meeting**, Reijkavik (Iceland), 14-16 July, Mónica Lira-Cantú, (Oral presentation)

- *"Low?Temperature Solution Processed Layered V_2O_5 Hydrate as Hole?Transport Layer for Stable Organic Solar Cells"*, **Nanoselect Annual Meeting**, Sant Feliu de Guixols (Spain), 14-16 July, Gerardo Teran-Escobar, Jonas Pampel and Mónica Lira-Cantú, (Oral presentation)

- *"Stable Next-Generation Photovoltaics: Unraveling Degradation Mechanisms of Organic Solar Cells by Complementary Characterization Techniques"*, **ISOS-6 Meeting**, Chamberie (France), 6-8 Dec, Mónica Lira-Cantú, (Oral presentation)

OTHER HIGHLIGHTS IN 2013

Awards and Honours:

- Irene Gonzalez-Valls - Iberdrola Foundation. Ayudas a la Investigación en Energía y Medio Ambiente 2012-2013.

- The review article **"Vertically-aligned nanostructures of ZnO for excitonic solar cells: a review"** by Irene Gonzalez-Valls and Mónica Lira-Cantú, has been in the top 10 most cited articles of the journal *Energy & Environmental Science* (impact factor

11.62) since 2009.

THESIS 2013

- **Doctorand:** Gerardo Teran
  Title: Solution-Processed Transition Metal Oxides for Organic Solar Cells
  Defense Date: 05/12/2013 - Auditorio del edificio CIN2
  Director: Dr. Monica Lira-Cantú

- **Doctorand:** Irene González
  Title: Vertically-aligned ZnO Nanostructures for Excitonic Solar Cells.
  Defense Date: 17/06/2013 - ICN2
  Director: Dr. Monica Lira-Cantú

Novel Energy-Oriented Materials Group

Led by CSIC Full Research Professor Pedro Gómez-Romero, the Novel Energy-Oriented Materials Group (NEO-Energy) works in Materials Science, Nanomaterials and Electrochemistry for energy-related applications. It leads various National and European research projects on energy storage and conversion, an increasingly strategic area which urgently needs fundamental improvements. It designs and synthesises new materials, from hybrid nanocomposites and nanostructures to graphene to nanofluids, with a strong emphasis on structural control at the microscale and the meso-nanoscale. This work forms the basis for the development of complex, polymaterial architectures conceived and optimised for use in rechargeable lithium batteries, supercapacitors, fuel cells and solar energy conversion.

NEW PROJECTS & MILESTONES IN 2013

High-performance electrodes for rechargeable lithium batteries. It includes our work on the optimisation of micro- and nanostructures of electroactive inorganic materials such as LiFePO4 with fractal granularity used in electrodes for lithium batteries. Here, we are aiming for low-cost, safe batteries with faster recharging rates (SOMABAT EU Project).

Also related to this topic we are beginning to work on the design of novel electroactive fluids for Redox Flow Batteries.

Hybrid materials as improved electrodes for electrochemical supercapacitors. The boundaries between batteries and capacitors are now quickly blurring. Nanostructure control is of paramount importance for enabling improved high-performance energy storing devices. Thus, we are also developing materials with a highly specific surface, and ultradispersed molecular materials, for applications in electrochemical supercapacitors that have greater power density than that of batteries. Examples of this type of electrodes prepared for the first time in our laboratory include activated carbons or grapheme with polyoxometalates or oxide nanoparticles. (NANOCARHIBE MAT2012 National Project).

Also related with supercapacitors we collaborate with and international consortium led by CEA (France) on the development of nanowire electrodes for energy storage (NEST EU

Prof. Pedro Gómez-Romero

Group Leader

Prof. Pedro Gomez-Romero (B. Sc. and Ms Sc. Universidad de Valencia, Spain. Ph.D. in Chemistry, Georgetown University, USA, 1987, with Distinction). CSIC Researcher since 1990 (ICMAB, 1990-2007). Sabbatical as NATO Senior Research Fellow at the National Renewable Energy Laboratory (Golden, CO, USA, 1998-99). CSIC Full Research Professor (2006-) and Group Leader of NEO-Energy lab at CIN2 (CSIC) (2007-2013) now part of ICN2, directing projects on hybrid organic-inorganic nanostructures, nanocomposite materials for energy storage and conversion (lithium batteries, supercapacitors, PEM FCs, solar-thermal energy, nanofluids). Vicedirector of MATGAS (2010-2014).

Author of 10^2 (ten to the two) scientific publications in refereed international journals. Scientific editor of the book "Functional Hybrid Materials" P. Gómez-Romero, C. Sanchez (Eds.) (Wiley-VCH 2004) and author of two award-winning popular science books. (“Metaevolución. La Tierra en el espejo” Celeste, 2001 and “Un planeta en busca de energía” Síntesis, 2007).

Group Members

Gòmez, Pedro, *CSIC Research Professor*

Ayyad, Omar, *Postdoctoral Researcher*

Caban, Zahilia, *Doctoral Student*

Gòmez-Casaña, Daniel, *CSIC Visiting Student*

García Cortadella, Ramon, *CSIC Visiting Student*

Ruiz, Vanesa, *CSIC Juan de la Cierva Researcher*

Suárez, Julieth, *CSIC Doctoral Student*

Project).

Nanofluids. Finally, the most recent research line in our group deals with the development of nanofluids, including electroactive nanofluids and heat transfer nanofluids for thermal solar energy conversion. This is an internationally emergent research line with implications in fundamental science and application in new technologies such as load-levelling of renewable energies or high temperature (concentration) solar power electricity generation.

Graphene. The new kid in the Nanocarbon town is the subject of our interest too. We work on large scale methods for the preparation of grapheme and its use in the synthesis of nanohybrid materials.

KEY PUBLICATIONS & CONTRIBUTIONS IN 2013

Publications:

- **Voltage Dependence of Carbon-Based Supercapacitors for Pseudocapacitance Quantification**, V. Ruiz, S. Roldán, I. Villa, C. Blanc, and R. Santamaria, *Electrochimica Acta, A*, **95**, 225 - 229 (2013)
- **Fractal porosity in metals synthesized by a simple combustion reaction**, Gómez-Romero, P.; Fraile, J.; Ballesteros, B., *RSC Advances*, **3**, 2351 - 2354 (2013)
- **Incorporation of benzimidazolium ionic liquid in proton exchange membranes ABPBI-H3PO4**, Hernández Carrillo, R.; Suarez-Guevara, J.; Torres-González, L.C.; Gómez-Romero, P.; Sánchez, E.M., *Journal of Molecular Liquids*, **181**, 115-120 (2013)
- **Organic-Inorganic Hybrid Materials for Supercapacitors**, V. Ruiz; J. Suárez-Guevara; P. Gomez-Romero, *ECS transactions*, **50**, 117-123 (2013)
- **Rechargeable Batteries: From Hybrid Materials to Devices**, P. Gomez-Romero; V. Ruiz; J. Suarez-Guevara; O. Ayyad; D. Muñoz-Rojas, *ECS transactions*, **50**, 29-35 (2013)

Contributions:

- *"Energy Storage: From Hybrid Devices to Hybrid Materials."*, **14th International Conference (Advanced Batteries, Accumulators and Fuel Cells) [ABAF 14th]**, Brno (Rep. Checa), 13-Aug, Gómez-Romero, Pedro, (Plenary)
- *"AQUEOUS ASYMMETRIC SUPERCAPACITORS WITH INCREASED VOLTAGE BASED ON CABON-PHOSPHOTUNGSTATE HYBRID MATERIALS (Poster)"*, **XXII INTERNATIONAL MATERIALS RESEARCH CONGRESS 2013, Cancún, Mexico, 11-15 August 2013.**, Mexico (México), 13-Aug, Jullieth Suárez-Guevara; Vanesa Ruiz; Pedro Gomez-Romero, (Poster)
- *"Hybrid Organic-Inorganic Materials for Supercapacitors"*, **XXII INTERNATIONAL MATERIALS RESEARCH CONGRESS 2013**, Cancún (México), 13-Aug, Vanesa Ruiz; Jullieth Suárez-Guevara; Pedro Gomez-Romero, (Poster)
- *"Energy Storage: Hybrid Materials, Hybrid Electrodes and Hybrid Devices"*, **XXII INTERNATIONAL MATERIALS RESEARCH CONGRESS 2013 - Symposium C. "Advanced Materials and Technologies for Energy Storage Devices"**, Cancún (México), 11-Aug, Gómez-Romero, Pedro, (Invited Talk)

OTHER HIGHLIGHTS IN 2013

Dissemination Activities:

- Round Table “Nanomateriales y Nanotecnologia”. VII Jornada AIN “Aplicaciones Industriales de la Nanotecnología”, Casa Llotja de Mar, Barcelona, 1 de Octubre de **2013**.
- Conference “De los nanómetros a los teravatios. Revoluciones pendientes para el nuevo modelo energético” como contribución a la asignatura Nanociencia y Sociedad (prof. Jordi Pascual). del Grado de Nanociencia de la UAB. 2 de Octubre de **2013**.
- Speaker at Sao Paulo School of Advanced Sciences on Electrochemistry, Energy Conversion and Storage (SPASECS), “Energy storage: from hybrid materials to hybrid electrodes... and back “ Instituto de Quimica, Universidade de Sao Paulo, Sao Paulo, Brasil. 7-14 Dec. **2013**.
- "Energía verde para un planeta azul” Museo de la Ciencia de Barcelona, Cosmocaixa, Barcelona. 21 feb **2013**.
- "Historia de los materiales del futuro” Caixaforum Lleida, Lleida. 26 feb **2013**.
- Conferencia "Energía verde para un planeta azul" V Diada de la Ciencia i la Tecnologia, Escola Pia de Caldes de Montbui, 1 Marzo **2013**.
- "Energía verde para un planeta azul” Matins de la Ciència. Museo de la Ciencia de Barcelona, Cosmocaixa, Barcelona. 19 Nov **2013**.
- "La ciencia inesperada. Historia de los descubrimientos que nadie buscó" as part of Science Week. l'INS Frederic Martí Carreras de Palafrugell (Girona) 21 Nov **2013**.
- "H2Ohhh. Lo que no sabemos del agua pero nos gustaría averiguar" as part of Science Week. Instituto de Enseñanza Secundaria IES Joaquima Pla i Farreras de Sant Cugat (Barcelona) 18 Nov **2013**.

Oxide Nanoelectronics Group

Led by ICREA Research Professor Gustau Catalán, the Oxide Nanoelectronics Group explores emerging physical phenomena in oxide-based electronic materials at the nanoscale; in other words, we study how the functional properties of oxides change when they are made to be very thin or very small. The Group's current research concentrates on two topics: (i)Nanodomains & Domain Walls, and (ii) Strain & Strain Gradient effects (piezoelectricity, piezoresistance, flexoelectricity). These are studied in connection to two main groups of materials: ferroelectrics and multiferroics, on one hand, and oxides with metal-insulator transitions on the other.

Researchers in the Oxide Nanoelectronics Group use characterization techniques such as Atomic Force Microscopy (AFM), Impedance and Dynamic Mechanical Analysis, and digital holographic interferometry for the measurement of electromechanical deformations. They also use thin film fabrication techniques such as pulsed laser deposition and radiofrequency sputtering. Our group aims to span the full range of research from very fundamental investigations of “cool but not yet technologically relevant” effects all the way to market-ready prototype devices, made in collaboration with a partner company, IGSresearch.

NEW PROJECTS & MILESTONES IN 2013

Last year marked the beginning of the **ERC Starting Grant project for the study of flexoelectricity**. We have hired a new PhD student (Kumara Cordero) and a new postdoctoral research assistant (Dr Umesh Bhaksar), who will be working on fundamental properties and applications of oxide-based flexoelectricity. We have also purchased two

ICREA Professor Gustau Catalán
Group Leader

Prof Gustau Catalán earned his BSc in Physics at the Universitat de Barcelona (1997), and his PhD in Physics at Queen's University of Belfast (2001). He then took research positions at the Mediterranean Institute for Advanced Studies (2002-2004), the University of Groningen (2004-2005) and the University of Cambridge (2005-2009). In 2009 he joined CIN2 as an ICREA Research Professor and Group Leader of the Oxide Nanoelectronics (ON) Laboratory, and three years later he transferred his research to ICN. Both Institutions recently joined their efforts and became ICN2, where he continues to lead the Group. In 2012, he earned an ERC Starting Grant to set up in Barcelona the world’s first dedicated laboratory of nanoflexoelectricity.

Group Members

Catalán, Gustavo, *ICREA Research Professor and Group Leader*

Cordero, Rohíni Kuma, *Doctoral Student*

Domingo, Neus, *Ramon y Cajal Researcher*

Lòpez, Laura, *Doctoral Student*

Narváez, Jackeline, *CSIC Doctoral Student in transition to ICN*

Sareminaeini, Sahar, *Visiting Student*

unique scientific instruments: a cryogenic atomic force microscope capable of nanoscale-resolution measurements from 5K to 350K, and a digital holographic interferometer for the measurement of sub-nanometric voltage-induced deformations. As of March 2014, these two facilities are now successfully installed in our laboratory.

On the scientific front, we have adapted the DMA (dynamic mechanical analysis) tool for measuring flexoelectricity in ceramics and single crystals, and our PhD student, Jackeline Narváez, has produced her first article (**Origin of the enhanced flexoelectricity of relaxor ferroelectrics**, J. Narvaez and G.Catalan, *Appl. Phys. Lett.*,**104**, 162903 (2014)) and her first international talk (International Meeting on Ferroelectricity 2013, Krakow) reporting the mechanism that generates giant flexoelectricity in relaxor ferroelectrics. In parallel, we have also continued our research on nanodomains and interfaces, with Dr Neus Domingo reporting the discovery of spontaneous and self-ordered surface-layer nanodomains in single crystals of multiferroic $BiFeO_3$ (J. Appl. Phys. 2013).

KEY PUBLICATIONS & CONTRIBUTIONS IN 2013

Publications:

- **Flexoelectric Effect in Solids**, Pavlo Zubko, Gustau Catalan, Alexander K. Tagantsev, *Annual Review of Materials Research*, **43**, 387-421 (2013)
- **Thickness scaling of ferroelastic domains in $PbTiO_3$ films on $DyScO_3$**, Nesterov, O.; Matzen, S.; Magen, C.; Vlooswijk, A.H.G.; Catalan, G.; Noheda, B., *Applied Physics Letters*, **103** (2013)
- **Local properties of the surface layer(s) of $BiFeO_3$ single crystals**, Domingo, N.; Narvaez, J.; Alexe, M.; Catalan, G., *Journal of Applied Physics*, **113**,187220 (2013)
- **La máquina de escribir más pequeña del mundo**, Gustau Catalan, *Investigación y Ciencia*. **436**, 13-14 (2013)

Contributions:

- *"Origin of giant flexoelectricity in relaxor ferroelectrics"*, **13th International Meeting on Ferroelectricity (IMF)**, Krakow (Poland), sep-13, J. Narváez, (Oral presentation)
- *"Magnetoresistance on Multiferroic Domain Walls"*, **IX International Workshop on Nanomagnetism and Superconductivity**, Coma-ruga (Spain), July 1-5, N.Domingo, S.Farokhipoor, B.Noheda, G. Catalan, (Oral presentation)
- *"Flexoelectricity: from the macroscale to the nanoscale - and back"*, **JSAP-MRS Joint Meeting (Japanese Society of Applied Physics+Materials Research Society)**, Kyoto (Japan), Sep 17, Catalán Bernabé, Gustau, (Invited Talk)
- *"Flexoelectricity and domain wall nanoelectronics"*, **European Materials Reseach Society (EMRS) Spring Meeting**, Strasbourg (France), May 30, Catalán Bernabé, Gustau, (Invited Talk)
- *"Flexoelectricity: what is it, and why should we care about it"*, **Universite Catholique de Lovaine**, Lovaine (Belgium), Oct 1st, Catalán Bernabé, Gustau, (Stresstronics Research Seminar)

DISSEMINATION ACTIVITIES

- Article in "El Pais" about the brain drain in Spain: "Cerebros de ida y vuelta", Published 13/05/2013
- Article in "Investigación y Ciencia" (Spanish edition of Scientific American) about our recent discovery, published in Science, of a mechanism that allows mechanical writing

of ferroelectrically-stored information: "La maquina de escribir más pequeña del mundo" (Investigación y Ciencia, vol. 436, pp13-14 (Jan. 2013).

- Xerrada sobre Nanociència i Nanotecnologia a l'Institut de Secundaria "Barres i Ones", Badalona, en el marc del Dia de la Ciencia a les Escoles. Títol "El tamany sí que importa". 27/11/2013

PATENTS

Provisional Application for US Patent Cover: "Reversal of ferroelectric polarization by mechanical pressure". Registration number 62291. Authors: Alexei Gruverman, Haidong Lu, Gustau Catalan.

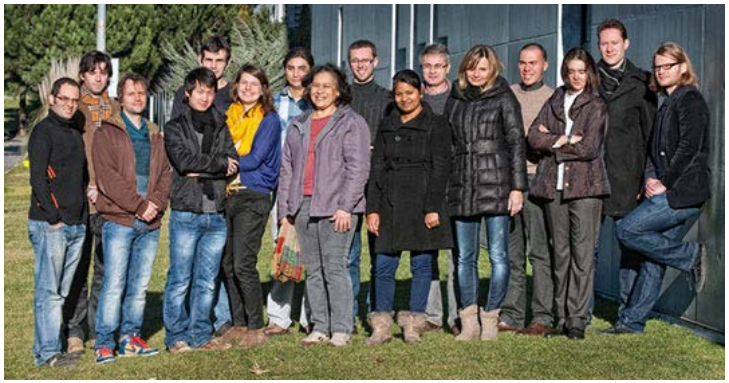
OTHER HIGHLIGHTS IN 2013

The Group organized the **Leverhulme Workshop on Oxide Nanoferroics**, the fourth and final meeting of an on-going world-wide collaboration involving groups at the forefront of oxide nanoferroics research. (Workshop program available here)
Place: Banyalbufar, Mallorca, (Spain)
Date: January 10-12, 2013
Coordinated by: ICN2 Oxide Nanoelectronics Group
Sponsors: The Leverhulme Trust

Phononic and Photonic Nanostructures Group

Led by Prof Dr Clivia M Sotomayor Torres, the Phononic and Photonic Nanostructures Group carries out research at the cross roads between nanotechnology and dispersion relation engineering. Our aim is to develop new concepts for multi-state variables based on the engineered interactions between electrons and phonons, photons and phonons, in device-like structures.

One particular interest is thermal transport in the nanoscale to study of heat management in nanoelectronics, the role of phonons in noise and dissipation in nano-scale systems. Our experimental research is anchored in novel nanofabrication methods and their metrology. The latter is essential to set up standards in manufacturing to ease the uptake of nanotechnology products. In our research we use state of the art optical spectroscopy methods and develop new techniques to reach the nanoscale in thermal transport.



To access the Group's website, click here

NEW PROJECTS & MILESTONES IN 2013

The Group completed five of its on-going projects: NANO-TEC (Ecosystems Technology and Design for Nanoelectronics), LAMAND (Large Area Molecularly Assembled Nanopatterns for Devices), NANOPOWER (Nanoscale energy management for powering ICT devices), NANOFUNCTION (Beyond CMOS Nanodevices for Adding Functionalities to CMOS) and SEAL (Semiconductor Equipment Assessment Leveraging Innovation).

It began five new projects: MERGING (Membrane-based phonon engineering for energy harvesting), PLAST4FUTURE (Injection moulding production technology for multi-functional nano-structured plastic components enabled by Nano Imprint Lithography), TAPHOR (Tailoring Acoustic Phonon Dispersion Relations), EUPHONON (Building a European NanoPhononics Community) and QUANTIHEAT (Quantitative scanning probe microscopy techniques for heat transfer management in nanomaterials and nanodevices).

MERGING aims to design a compact thermoelectric module to harvest the energy of devices to be used in applications requiring heterogeneous integration packaging

ICREA Prof Clivia M Sotomayor Torres
Group Leader

ICREA Research Professor Dr Clivia M. Sotomayor Torres was awarded her PhD in Physics in 1984 by Manchester University (UK). She then held tenured academic appointments at St. Andrews and Glasgow Universities in the UK and became a C4 professor at Wuppertal University (Germany) in 1996. She was a research professor at University College Cork, Tyndall National Institute (Ireland) from 2004 to 2008. Since May 2007 she is ICREA Research Professor based at the Catalan Institute of Nanotechnology (ICN), now ICN2.

Clivia has received awards from the Royal Society of Edinburgh, the Nuffield Foundation and an Amelia Earhart Fellowship from ZONTA International (USA). She is author of over 400 scientific publications and has edited six books (Researcher ID; E-8418-2010, Hirsch index 37, over 5100 citations). She leads a strong team working on phonon engineering and is actively engaged in European-level research. She serves in Scientific Advisory Committees in Nanoscience and Nanotechnology in France and Italy.

Group Members

Sotomayor, Clivia, *ICREA Research Professor and Group Leader*

Alzina, Francesc, *Senior Researcher*

Arias, Noèlia, *Group Project Manager*

Armstrong, Eileen, *Visiting Doctoral Student*

Bernal, Monica Emperatriz, *Visiting Doctoral Student*

Bhansali, Sweta, *Doctoral Student*

Chávez, Emigdio, *Doctoral Student*

Delgado Simao, Claudia, *Postdoctoral Researcher*

techniques leading to small size, integrability and high thermoelectric efficiency.

The methods and technologies developed will enable nm-scale control of energy generation and heat flow. This will impact on on-chip and in-package energy management that is of crucial importance for future technologies. Especially, our targets contribute to (a) on-chip harvesting of thermoelectricity and (b) management of heat flow in the applications of heterogeneous integration and nanoelectronics.

KEY PUBLICATIONS & INVITED TALKS IN 2013

Publications:

- **Nanoscale imaging of InN segregation and polymorphism in single vertically aligned InGaN/GaN multi quantum well nanorods by tip-enhanced Raman scattering**, E. Poliani, M. R. Wagner, J. S. Reparaz, M. Mandl, M. Strassburg, X. Kong, A. Trampert, C. M. Sotomayor Torres, A. Hoffmann, and J. Maultzsch, *Nano Letters* (2013)
- **Direct Measurement of Room-Temperature Nondiffusive Thermal Transport Over Micron Distances in a Silicon Membrane**, J. A. Johnson, A. A. Maznev, J. Cuffe, J. K. Eliason, A. J. Minnich, T. Kehoe, C. M. Sotomayor Torres, G. Chen, and K. A. Nelson, *Physical Review Letters* (2013)
- **Lifetimes of confined acoustic phonons in ultra-thin silicon membranes**, J. Cuffe, O. Ristow, E. Chávez, A. Shchepetov, P-O. Chapuis, F. Alzina, M. Hettich, M. Prunnila, J. Ahopelto, T. Dekorsy, and C. M. Sotomayor Torres, *Physical Review Letters* (2013)
- **Electrical Detection of Spin Precession in Freely Suspended Graphene Spin Valves on Cross-Linked Poly(methyl methacrylate)**, Neumann, J. Van de Vondel, G. Bridoux, M. V. Costache, F. Alzina, C. M. Sotomayor Torres, and S. O. Valenzuela, *Small*, **9**, 156-160 (2013)
- **Metallic nanoparticles enhanced the spontaneous emission of semiconductor nanocrystals embedded in nanoimprinted photonic crystals**, V. Reboud , G. Lévêque , M. Striccoli , T. Placido , A. Panniello , M. L. Curri , J. A. Alducin , T. Kehoe , N. Kehagias , D. Mecerreyes , S. Newcomb , D. Iacopino , G. Redmond, and C. M. Sotomayor Torres, *Nanoscale*, 5, 239-245 (2013)
- **Fabrication of highly ordered sub-20 nm silicon nanopillars by block copolymer lithography combined with resist design**, M. Salaun, M. Zelsmann, S. Archambault, D. Borah, N. Kehagias, C. Simao, O. Lorret, M. T. Shaw, C. M. Sotomayor Torres and M. A. Morris, *Journal of Materials Chemistry*, **1**, 3544-3550 (2013)
- **Core-Shell Tin Oxide, Indium Oxide, and Indium Tin Oxide Nanoparticles on Silicon with Tunable Dispersion: Electrochemical and Structural Characteristics as a Hybrid Li-Ion Battery Anode**, M. J. Osiak, E. Armstrong, T. Kennedy, C. M. Sotomayor Torres , K. M. Ryan, and C. O'Dwyer, *ACS Applied Materials and Interfaces* (2013)
- **Epitaxial growth of visible to infra-red transparent conducting In2O3 nanodot dispersions and reversible charge storage as a Li-ion battery anode**, M. Osiak, W. Khunsin, E. Armstrong, T. Kennedy, C. M. Sotomayor Torres, K. M. Ryan, and C. O'Dwyer, *Nanotechnology* (2013)
- **Er-doped light emitting slot waveguides monolithically integrated in a silicon photonic chip**, Ramírez, J.M.; Ferrarese Lupi, F.; Berencén, Y.; Anopchenko, A.; Colonna, J.P.; Jambois, O.; Fedeli, J.M.; Pavesi, L.; Prtljaga, N.; Rivallin, P.; Tengattini, A.; Navarro-Urrios, D.; Garrido, B., *Nanotechnology*, **24**, 115202 (2013)
- **Lasing in nanoimprinted two-dimensional photonic crystal band-edge lasers**, V.

Fernández, Ariadna, *Doctoral Student*

Francone, Achille, *Postdoctoral Researcher*

García, Yamila, *Postdoctoral Researcher*

Gomis, Jordi, *Postdoctoral Researcher*

Graczykowski, Bartlomiej, *Postdoctoral Researcher*

Guillotel, Erwan, *Group Project Manager*

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Kirchhoff, Alexandra, *Visiting Student*

Kreuzer, Martin, *Postdoctoral Researcher*

May, Patrick, *Postdoctoral Researcher*

Navarro, Daniel, *Postdoctoral Researcher*

Reparaz, Juan Sebastián, *Postdoctoral Researcher*

Ruiz, Yasser Bruno, *Visiting Doctoral Student*

Sledzinska, Marianna, *Laboratory Engineer*

Wagner, Markus, *Postdoctoral Researcher*

Reboud, J. Romero-Vivas, P. Lovera, N. Kehagias, T. Kehoe, G. Redmond, and C. M. Sotomayor Torres, *Applied Physics Letters* (2013)

- **Ultra-Thin Free-Standing Single Crystalline Silicon Membranes With Strain Control**, A. Shchepetov, M. Prunnila, F. Alzina, L. Schneider, J. Cuffe, H. Jiang, E. I. Kauppinen, C. M. Sotomayor Torres, J. Ahopelto, *Applied Physics Letters* (2013)

- **Soft-graphoepitaxy using nanoimprinted polyhedral oligomeric silsesquioxane substrates for the directed self-assembly of PS-b-PDMS**, D. Borah, C. Simao, R. Senthamaraikannan, S. Rasappa, A. Francone, O. Lorret, M. Salaun, B. Kosmala, N. Kehagias, M. Zelsmann, C. M. Sotomayor Torres, and M. A. Morris, *European Polymer Journal*, DOI: 10.1016/j.eurpolymj.2013.08.011 (2013)

- **Toward a 1.54 μm Electrically Driven Erbium-Doped Silicon Slot Waveguide and Optical Amplifier**, Tengattini, A.; Gandolfi, D.; Prtljaga, N.; Anopchenko, A.; Ramirez, J.M.; Lupi, F.F.; Berencen, Y.; Navarro-Urrios, D.; Rivallin, P.; Surana, K.; Garrido, B.; Fedeli, J.-M.; Pavesi, L., *Journal of Lightwave Technology*, **31**, 391-397 (2013)

- **Laser emission in Nd3+ doped barium-titanium-silicate microspheres under continuous and chopped wave pumping in a non-coupled pumping scheme**, L. L. Martín, D. Navarro-Urrios, F. Ferrarese-Lupi, C. Perez-Rodríguez, I. R. Martín, J. Montserrat, C. Dominguez, B. Garrido, and N. Capuj, *LASER PHYS* (2013)

- **Global stability of protein folding from an empirical free energy function**, Y. B. Ruiz-Blanco, Y.Marrero-Poncea, W. Paza, Y. García, J. Salgado, *J THEOR BIOL* (2013)

- **Comparison of two types of vertically aligned ZnO NRs for highly efficient polymer solar cells**, Gonzalez-Valls, I.; Angmo, D.; Gevorgyan, S.A.; Sebastián Reparaz, J.; Krebs, F.C.; Lira-Cantu, M., *Journal of Polymer Science, Part B: Polymer Physics*, **51**, 272-280 (2013)

- **Martensitic phase transition in Cu-14%Al-4%Ni shape memory alloys studied by Brillouin light scattering**, B. Graczykowski, S. Mielcarek, T. Breczewski, M. L. No, J. San-Juan, and B. Mroz, *Smart Materials and Structures* (2013)

- **Influence of reactant type on the Sr incorporation grade and structural characteristics of Ba1?xSrxTiO3 (x=0-1) grown by sol-gel-hydrothermal synthesis**, S. Fuentes, E. Chávez, L. Padilla-Campos, D.E. Diaz-Droguette, *Ceramics International*, **39**, 8823-8831 (2013)

- **Epitaxial growth of an antireflective, conductive, graded index ITO nanowire layer**, C. O'Dwyer, and C. Sotomayor Torres, *Frontier in Physics*, doi: 10.3389/fphy.2013.00018 (2013)

- **Flexural mode dispersion in ultra-thin Ge membranes**, E. Chávez, J. Gomis-Bresco, F. Alzina, J.S. Reparaz, V.A. Shah, M. Myronov, D.R. Leadley, and C.M. Sotomayor Torres, *IEEE Ultimate Integration on Silicon (ULIS), 2013 14th International Conference on Silicon (ULIS)* (2013)

- **MBE Growth and Structural and Electrochemical Characterization of Tin Oxide and Indium Tin Oxide Nanoparticles Grown on Silicon for Li-ion Battery Anodes**, M. Osiak, E. Armstrong, T. Kennedy, C. M. Sotomayor Torres, K. Ryan and C. O'Dwyer, *ECS Transaction* (2013)

- **Non local corrections to the electronic structure of non ideal electron gases: the case of graphene and tyrosine**, Y. García, J. Cuffe, F. Alzina and C. M. Sotomayor Torres, *Journal of Modern Physics* (2013)

- **Rechargeable Li-ion battery anode of indium oxide with visible to infra-red transparency**, M Osiak, W Khunsin, E Armstrong, T Kennedy, C M Sotomayor Torres, K M Ryan and C O'Dwyer, *ECS Transactions*, **53 (6)**, 53-61 (2013)

- **Spatial mapping of exciton lifetimes in single ZnO nanowires**, J. S. Reparaz, G. Callsen, M. R. Wagner, F. Güell, J. R. Morante, C. M. Sotomayor Torres, and A. Hoffmann, *Applied Physics Letters Materials* (2013)

- **Synthesis and structural characterization of nanocrystalline BaTiO3 at various calcination temperatures**, S. Fuentes, F. Céspedes, P. Muñoz, E. Chávez, and L. Padilla-Campos, *Journal of the Chilean Chemical Society* (2013)

Invited talks:

- **ImagineNano 2013**, Bilbao (Spain), abr-13, C. Simão, W. Khunsin, J. Gomis, T. Kehoe, D. Tuchapsky,N. Kehagias, A. Amann, and C. M. Sotomayor Torres, (Oral presentation)

- *"Thermal conductivity in Si ultrathin membranes"*, **First Int Conference on Phononics and Thermal Energy Sciences**, Shanghai. (China), oct-13, Sotomayor Torres , Clivia Marfa, (Oral presentation)

- *"Thermal Conductivity in Ultra-thin Si Membranes: Phonon Dispersion Relation and Lifetime Contributions"*, **MRS Spring meeting 2013**, San Francisco (USA), abr-13, E. Chávez, J. Cuffe, A. Shchepetov, P.-O. Chapuis, E. H. El Boudouti, F. Alzina, T. Kehoe, J. Gomis-Bresco, D. Dudek, Y. Pennec, B. Djafari-Rouhani, M. Prunnila, O. Ristow, M. Hettich, T. Dekorsy, J. Ahopelto, and C. Sotomayor , (Oral presentation)

- *"Ultra-Thin Free-Standing Silicon Membranes for Investigation of Thermal properties of Low-Dimensional Systems"*, **ImagineNano 2013**, Bilbao (Spain), abr-13, A. Shchepetov, M. Prunnila, F. Alzina, L. Schneider, J. Cuffe, H. Jiang, E. I. Kauppinen, C. M. Sotomayor Torres and J. Ahopelto, (Oral presentation)

- *"Towards PhoXonic Crystals: Optomechanics in Corrugated Beams"*, **Progress In Electromagnetics Research Symposium 2013**, Stockholm (Sweden), ago-13, D. Navarro-Urrios, J. Gomis-Bresco, M. Oudich, F. Alzina, Alejandro Martinez, A. Griol, D. Puerto, Y. Pennec, S. El-Jallal, Bahram Djafari-Rouhani, and C. Sotomayor Torres, (Oral presentation)

- *"Confined phonons and thermal conductivity in Si ultra-thin membranes"*, **CECAM workshop on Nanophononics**, Bremen (Germany), ago-13, F. Alzina Sureda, E. Chavez, J. S. Reparaz, J. Gomis-Bresco, M. R. Wagner, B. Graczykowski, J. Cuffe, A. Shchepetov, M. Prunnila, J. Ahopelto, and C. Sotomayor Torres, (Oral presentation)

- *"Phonons in Silicon Free-Standing Membranes: From Slow Phonons to Engineering Thermal Conductivity"*, **MRS Fall meeting 2013**, Boston (USA), dic-13, C. M. Sotomayor Torres, F. Alzina, E. Chavez, S. Reparaz, J. Gomis-Bresco, M. R. Wagner, B. Graczykowski, J. Cuffe, A. Shchepetov, M. Prunilla, and J. Ahopelto, (Oral presentation)

- *"Directed Self-assembly of Block Copolymers by Solvent Assisted Nanoimprint Lithography for Alternative Lithographic Masks"*, **MRS Spring meeting 2013**, San Francisco (USA), abr-13, C. D. Simao, N. Kehagias, M. Salaun, M. Zelsmann, B. Kosmala, M. A. Morris, and C. Sotomayor Torres, (Poster)

- *"1D Phononic Corrugated Cavities in Si Nanobeams: Design of the Confined Modes in a Full Band gap"*, **Phononics 2013**, Sharm El-Sheikh (Egypt), jun-13, J. Gomis-Bresco, D. Navarro-Urrios,A. Griol, D. Puerto, A. Martinez, F. Alzina, and C. M. Sotomayor-Torres, (Poster)

- *"Beyond CMOS: NANO-TEC project recommendations for research in nanoelectronics"*, **Euronanoforum 2013**, Dublin (Ireland), jun-13, C. M. Sotomayor Torres, J. Ahopelto, M. W. M. Graef, P. Grabiec, T. Swahn, G. Wendin, D. Winkler, G. Fagas, A. Cappy, and G. Larrieu, (Poster)

- *"Flexural mode dispersion in ultra-thin Ge membranes"*, **ULIS 2013 Conference**, Warwick (United Kingdom), abr-13, E. Chávez, J. Gomis-Bresco, F. Alzina, J.S. Reparaz, , V.A. Shah, M. Myronov, D.R. Leadley, and C. M. Sotomayor Torres, (Poster)

- *"Modelling of Thermal Properties in Silicon Nanostructures"*, **MRS Spring meeting 2013**, San Francisco (USA), abr-13, E. Chávez, J. Cuffe, F. Alsina, J. S. Reparaz, C. Sotomayor Torres., (Poster)

- *"Nanometrology of Sub-20 nm 2D Features from BCPs Self-assembly by NIL Technology"*, **26th International Microprocesses and Nanotechnology Conference**, Sapporo, Hokkaido (Japan), nov-13, Sotomayor Torres , Clivia Marfa, (Poster)

- *"Si and Ge Membranes Investigated through Raman Thermometry: The Role of Phonon Boundary Scattering and Phonon Confinement in 2D Systems"*, **Phononics 2013**, Sharm El-Sheikh (Egypt), jun-13, J. S. Reparaz, E. Chavez, J. Gomis-Bresco, M. R. Wagner, J. Cuffe, V. A. Shah, M. Myronov, D. R. Leadley, A. Shchepetov, M. Prunnila, J. Ahopelto, F. Alzina and C. M. Sotomayor Torres, (Poster)

- *"Strong thickness-dependent and large thermoelectric effect in lightly doped Nb:SrTiO3 thin films"*, **E-MRS Spring Meeting**, Strasbourg (France), may-13, S. Bhansali, W. Khunsin, J. S. Reparaz, J. Roqueta, J. Santiso, P. O. Vaccaro, M. Garriga, M. I. Alonso, A. R. Goñi, B. Abad Mayor, P. Díaz-Chao, M. Martin-Gonzalez, and C. M. Sotomayor Torres, (Poster)

- *"Directed Self-assembly of Block Copolymers by Solvent Assisted Nanoimprint Lithography for Alternative Lithographic Masks"*, **MRS Spring meeting 2013**, San Francisco (USA), may-13, C. D. Simao, N. Kehagias, M. Salaun, M. Zelsmann, B. Kosmala, M. A. Morris, and C. Sotomayor Torres, (Poster)

- *"Free-standing silicon membranes: a tool to investigate thermal properties of low-dimensional systems"*, **CECAM workshop on Nanophononics**, Bremen (Germany), ago-13, J. Ahopelto, A. Shchepetov, M. Prunnila, F. Alzina, L. Schneider, J. Cuffe, H. Jiang, E. I. Kauppinen, and C. M. Sotomayor Torres., (Poster)

- *"Strong thickness-dependent and large thermoelectric effect in lightly doped Nb:SrTiO3 thin films"*, **CECAM workshop on Nanophononics**, Bremen (Germany), ago-13, J. Ahopelto, A. Shchepetov, M. Prunnila, F. Alzina, L. Schneider, J. Cuffe, H. Jiang, E. I. Kauppinen, and C. M. Sotomayor Torres., (Poster)

- *"Tuning of the Surface Acoustic Waves in Silicon Phononic Crystals"*, **EMRS Fall 2013**, Warsaw (Poland), sep-13, M.Sledzinska, B. Graczykowski, N. Kehagias, F. Alzina and C. M. Sotomayor Torres, (Poster)

- *"Thermal conductivity reduction in Si and Ge free-standing membranes investigated using Raman thermometry"*, **Therminic 2013**, Berlin (Germany), sep-13, J. S. Reparaz, E. Chávez-Ángel, J. Gomis-Bresco, M. R. Wagner, J. Cuffe, V. A. Shah, M. Myronov, D. R. Leadley, A. Shchepetov, M. Prunnila, J. Ahopelto, F. Alzina, and C. M. Sotomayor, (Poster)

- *"SrTiO3 thin films as highly efficient thermoelectric materials"*, **Therminic 2013**, Berlin (Germany), sep-13, J. S. Reparaz, S. Bhansali, W. Khunsin, M. R. Wagner, J. Roqueta, J. Santiso, M. Garriga, M. I. Alonso, A. R. Goñi, B. Abad Mayor, P. Díaz-Chao, M. Martin-Gonzalez, and C. M. Sotomayor Torres, (Poster)

- *"Experimental Study of the Structural Aspects of the Synthesis of Nanocrystalline SrTiO3:Fe"*, **ASME 2013 International Mechanical Engineering**, San Diego (USA), nov-13, S. Fuentes, P. Muñoz, E. Veloso, and E. Chávez-Ángel., (Poster)

- *"Understanding Phonon Boundary Scattering from Temperature-Dependent Measurements of Thermal Conductivity in Nanoscale Silicon Membranes"*, **MRS Fall meeting 2013**, Boston (USA), dic-13, J. K. Eliason, E. Chavez-Angel, J. Cuffe, S.

Reparaz, A. Maznev, K. Collins, A. Shchepetov, M. Prunnila, J. Ahopelto, C. M. Sotomayor Torres, G. Chen, and K. A. Nelson, (Poster)

- *"Geometrical Confinement Effects and Order Quantification of Periodic Nanostructures Obtained by Directed Self-Assembly of Low Molecular Weight Block Copolymers"*, **MRS Fall meeting 2013**, Boston (USA), dic-13, C. C. D. Simao, W. Khunsin, N. Kehagias, M. Zelsmann, M. A. Morris, C. M. Sotomayor Torres, (Poster)

- *"Acoustic phonon dynamics in free-standing silicon and germanium membranes"*, **E-MRS Spring Meeting**, Strasbourg (France), may-13, M. R. Wagner, E. Chavez, J. Gomis-Bresco, J. S. Reparaz, V. A. Shah, M. Myronov, D. R. Leadley, A. Shchepetov, M. Prunnila, J. Ahopelto, F. Alzina, and C.M. Sotomayor-Torres., (Oral presentation)

- *"Determination of the thermal conductivity of Si and Ge thin membranes through Raman thermometry"*, **E-MRS Spring Meeting**, Strasbourg (France), may-13, J. S. Reparaz, E. Chavez, J. Gomis-Bresco, M. R. Wagner, J. Cuffe, V. A. Shah, M. Myronov, D. R. Leadley, A. Shchepetov, M. Prunnila, J. Ahopelto, F. Alzina, and C. M. Sotomayor Torres., (Oral presentation)

- *"Influence of Low Dimensionality on the Thermal Properties of Si, Ge, and SiNx Thin Membranes by Means of Optical and Electrical Techniques"*, **MRS Spring meeting 2013**, San Francisco (USA), abr-13, S. Reparaz, E. Chávez, W. Khunsin, J. Cuffe, M. Sledzinska, L. Naehle, V. Shahd, E. Parker, A. Shchepetovd, M. Prunnila, J. Ahopelto, F. Alsina, C. Sotomayor Torres, (Oral presentation)

- *"Metal-oxide thin films as high efficiency thermoelectric materials"*, **ImagineNano 2013**, Bilbao (Spain), abr-13, S. Bhansali, W. Khunsin, J. S. Reparaz, J. Roqueta, J. Santiso, P. O. Vaccaro, M. Garriga, M. I. Alonso, A. R. Goñi, B. Abad Mayor, P. Díaz-Chao, M. Martin-Gonzalez, J. Loureiro, I. Ferreira, and C. M. Sotomayor Torres., (Oral presentation)

- *"Nanoscale imaging of indium segregation and polymorphism in single vertically aligned InGaN/GaN quantum well nanorods by tip enhanced Raman spectroscopy"*, **E-MRS Spring Meeting**, Strasbourg (France), may-13, M. R. Wagner, E. Poliani, J. S. Reparaz, M. Mandl, M. Strassburg, A. Trampert, C. M. Sotomayor Torres, A. Hoffmann, and J. Maultzsch, (Oral presentation)

- *"Optomechanical coupling in 1D corrugated structures with complete dual photonic and phononic band gap"*, **ImagineNano 2013**, Bilbao (Spain), abr-13, J. Gomis-Bresco, D. Navarro-Urrios, M. Oudich, A. Griol, D. Puerto, A. Martínez, S. ElJallal, Y. Pennec, B. Djafari-Rouhani, F. Alzina1 and C. M. Sotomayor Torres, (Oral presentation)

- *"Outcomes of NANOTEC project"*, **ULIS 2013 Conference**, Warwick (United Kingdom), abr-13, C. M. Sotomayor Torres, (Oral presentation)

- *"Phonon Confinement in Silicon Ridges as a Probe of 2D Thermal Constrictions"*, **MRS Spring meeting 2013**, San Francisco (USA), abr-13, P.-O. Chapuis, A. Shchepetov, M. Prunnila, L. Schneider, J. Ahopelto, and C. Sotomayor Torres, (Oral presentation)

- *"Thermal Conductivity of nm-scale Membranes by Raman Thermometry"*, **26th International Microprocesses and Nanotechnology Conference**, Sapporo, Hokkaido (Japan), nov-13, Sotomayor Torres , Clivia Marfa, (Oral presentation)

- *"Thermal properties of silicon ultra-thin membranes: A theoretical and experimental approach"*, **ImagineNano 2013**, Bilbao (Spain), abr-13, E. Chávez, J.S. Reparaz, J. Cuffe, J. Gomis-Bresco, M. R. Wagner, A. Shchepetov, M. Prunnila, J. Ahopelto, F. Alzina and C. M. Sotomayor Torres, (Oral presentation)

- *"Dimension and positional metrology approaches in nanotechnology"*, **Imaginenano**

2013, Bilbao (Spain), abr-13, C. Simão, W. Khunsin, J. Gomis, T. Kehoe, D. Tuchapsky,N. Kehagias, A. Amann, and C. M. Sotomayor Torres, (Oral presentation)

- *"Rechargeable Li-ion battery anode of indium oxide with visible to infra-red transparency"*, **223rd ESC meeting**, Toronto (Canada), may-13, M. Osiak, W. Khunsin, E. Armstrong, T. Kennedy, C. Sotomayor Torres, K. M. Ryan, and C. O'Dwyer, (Oral presentation)

- *"Directed Self-Assembly of Block Copolymers by in situ solvent vapors assisted Nanoimprint Lithography"*, **10th International Conference on Nanosciences and Nanotechnologies 2013**, Thessaloniki (Greece), jul-13, C. Simão, N. Kehagias, A. Franconce, M. Salaün, M. Zelsmann, M., (Oral presentation)

- *"Acoustic phonons propagation in ultrathin Si membranes under biaxial stress field"*, **Workshop on Quantitative Micro and Nano Thermal Imaging and Analysis 2013**, Reims (France), jul-13, B. Graczykowski, J. Gomis-Bresco, F. Alzina, A. Shchepetov, M. Prunnila, J. Ahopelto, and C. M. Sotomayor Torres, (Oral presentation)

- *"Hypersonic phonon propagation in prestressed ultra-thin Si membranes"*, **E-MRS Fall Meeting,**, Warsaw (Poland), sep-13, B. Graczykowski , J. Gomis-Bresco, F. Alzina, E. Chavez, S. Reparaz, A. Shchepetov, M. Prunnila, J. Ahopelto, and C. M. Sotomayor Torres, (Oral presentation)

- *"Nanoscale thermal transport and phonon dynamics in ultra-thin Si based nanostructures"*, **Therminic 2013**, Berlin (Germany), sep-13, M. R. Wagner, E. Chávez, J. Gomis-Bresco, J. S. Reparaz, A. Shchepetov, M. Prunnila, J. Ahopelto, F. Alzina, and C.M. Sotomayor Torres, (Oral presentation)

- *"Self-assembled large area ordered nanodot arrays by solvent-assisted nanoimprint of a block copolymer"*, **12th International Conference on Nanoimprint & Nanoprint Technology NNT**, Barcelona (Spain), oct-13, C. Simao, N. Kehagias. W. Khunsin, and C. Sotomayor Torres., (Oral presentation)

- *"Modelling of thermal rectification in Si and Ge thin films"*, **ASME 2013 International Mechanical Engineering**, San Diego (USA), nov-13, E. Chávez Ángel, F. Alzina, and Clivia M. Sotomayor Torres, (Oral presentation)

- *"Impact of boundary scattering on nanoscale thermal transport properties in ultra-thin Si-based nanostructures"*, **ASME 2013 International Mechanical Engineering**, San Diego (USA), nov-13, M. R. Wagner, E. Chávez Ángel, J. Gomis Bresco, J. Sebastian Reparaz, A. Shchepetov, M. Prunnila, J. Ahopelto, F. Alzina Sureda, and C. M. Sotomayor Torres, (Oral presentation)

- *"Raman thermometry as contactless method for thermal conductivity determination: The case of thermal conductivity reduction in Si and Ge free-standing membranes"*, **ASME 2013 International Mechanical Engineering**, San Diego (USA), nov-13, S. Reparaz, E. Chávez Ángel, J. Gomis Bresco, M. R. Wagner, J. Cuffe, V. Shah, M. Myronov, D. Leadley, A. Shchepetov, M. Prunnila, J. Ahopelto, F. Alzina Sureda, C. M. Sotomayor Torres, (Oral presentation)

- *"Thermal Conductivity of Nanoscale Silicon Membranes"*, **ASME 2013 International Mechanical Engineering**, San Diego (USA), nov-13, J. Cuffe, J. K. Eliason, A. Maznev, G. Chen, K. A. Nelson, J. Johnson, A. Shchepetov, M. Prunnila, J. Ahopelto, and C. M. Sotomayor Torres., (Oral presentation)

- *"Coherent Phonon Spectroscopy for Understanding Thermal Transport in Nanostructures"*, **MRS Fall meeting 2013**, Boston (USA), dic-13, A. A. Maznev, F. Hofmann, J. K. Eliason, J. Cuffe, J. Garg, R. Jia, A. Jandl, M. Bulsara, E. A. Fitzgerald, G. Chen, C. M. Sotomayor Torres, and K. Nelson, (Oral presentation)

- *"Phonon Mean Free Path Reconstruction from Thermal Conductivity Measurements of Nanoscale Silicon Membranes"*, **MRS Fall meeting 2013**, Boston (USA), dic-13, J. Cuffe, J. K. Eliason, A. Maznev, K. Collins, A. Shchepetov, M. Prunnila, J. Ahopelto,

C. M. Sotomayor Torres, G. Chen, and K. Nelson, (Oral presentation)

OTHER HIGHLIGHTS IN 2013

The article “Lasing in nanoimprinted two-dimensional photonic crystal band-edge lasers” by V. Reboud et al. made the cover of Applied Physics Letters, 102 (7) on Feb. 18 2013.

Physics and Engineering of Nanodevices Group

Led by ICREA Prof Sergio O. Valenzuela, the Physics and Engineering of Nanodevices Group focuses on the development of novel devices, primarily spintronics, designed to gain insight into the physical properties of materials at the nanoscale. The Group combines state-of-the-art lithographic and chemical methods with magnetic and electrical transport characterisation.

NEW PROJECTS & MILESTONES IN 2013

In 2012 Prof Valenzuela was awarded an **ERC Starting Grant to investigate the spin properties of materials with large spin-orbit interaction**, in particular topological insulators. The project (SPINBOUND) was launched in February 2013. In addition, the Physics and Engineering of Nanodevices Group continued its work on two on-going projects (Transporte de espines y dinámica de la magnetización en nanoestructuras; and NANOFUNCTION) and has been active in Training Networks; in particular it will host a researcher (Frédéric Bonell) with a Marie Curie project (STIFNANO) which was awarded in 2013 to work on the electronic properties of ferromagnet / topological insulators heterostructures.

KEY PUBLICATIONS & CONTRIBUTIONS IN 2013

Publications:

- **Electrical Detection of Spin Precession in Freely Suspended Graphene Spin Valves on Cross-Linked Poly(methyl methacrylate)**, Neumann, J. Van de Vondel, G. Bridoux, M. V. Costache, F. Alzina, C. M. Sotomayor Torres, and S. O. Valenzuela, *Small*, **9**, 156-160 (2013)

ICREA Research Professor
Sergio O. Valenzuela
Group Leader

Prof. Valenzuela obtained his PhD in Physics in 2001 at the University of Buenos Aires, Argentina, and went on to be a Postdoctoral Fellow and Research Associate at Harvard University, and a Research Scientist at the Massachusetts Institute of Technology (MIT). Since July 2008, Prof. Valenzuela has been an ICREA Research Professor as well as Group Leader of ICN's, now ICN2's, Physics and Engineering of Nanoelectronic Devices Group. Since September 2008 he has also served as Associate Professor at the Physics department of the Universitat Autònoma de Barcelona (UAB).

Prof Valenzuela's research is focused on the unique properties of materials in samples with nanoscale dimensions. Such studies are motivated both by their intrinsic scientific interest and by their potential importance for electronic applications, and they rely on innovative devices or innovative implementations of known devices. Recent research has encompassed spintronics, quantum computation with superconducting circuits, and nanoelectromechanical systems (NEMS).

Prof. Valenzuela received the 2009 IUPAP Young Scientist Prize in Magnetism for his contributions to the field of spintronics, and was awarded an ERC Starting Grant in 2012. He has authored over 40 papers, three patents and four books or book chapters.

Group Members

Valenzuela, Sergio, *ICREA Research Professor and Group Leader*

Bonell, Frédéric, *Marie Curie Postdoctoral Researcher*

Costache, Marius Vasile, *Ramon y Cajal Researcher*

Lòpez, Christian, *Visiting Student*

- **Enhanced spin accumulation at room temperature in graphene spin valves with amorphous carbon interfacial layers**, Neumann, I.; Costache, M. V.; Bridoux, G.; Sierra, J. F.; Valenzuela, S. O., *Appl. Phys. Lett.*. **103**, 112401 (2013)

- **Fingerprints of Inelastic Transport at the Surface of the Topological Insulator Bi_2Se_3: Role of Electron-Phonon Coupling**, M.V. Costache, I. Neumann, J.F. Sierra, V. Marinova, M. Gospodinov, S. Roche, and S.O. Valenzuela, *Phys. Rev. Lett.*, (On-Line) (2013)

Book Chapters

- **Lateral Metallic Nanostructures for Spintronics**
  Marius V. Costache, Bart J. van Wees and Sergio O. Valenzuela
  in *One dimensional Nanostructures. Principles and Applications*, edited by T. Zhai and J. Yao, John Wiley & Sons (New Jersey, USA 2013)

Contributions:

- *"Electrical isolation of the magnon-drag thermoelectric effect"*, **2013 Spring Meeting, European Materials Research Society (E-MRS)**, Strasbourg (France), may-27 , Valenzuela , Sergio O., (Invited talk)

- *"Isolation of the magnon-drag in metallic ferromagnets"*, **9th International Workshop on Nanomagnetism and Superconductivity at the Nanoscale**, Comarruga (Spain), June-01, Valenzuela , Sergio O., (Invited talk)

- *"Magnon drag thermopile"*, **LAW3M**, Buenos Aires (Argentina), Apr-08, Valenzuela , Sergio O., (Invited talk)

- *"Magnon drag thermopile"*, **APS March Meeting**, Baltimore (USA), March-18, Valenzuela , Sergio O., (Invited talk)

- *"Spin caloritronics"*, **The European School on Magnetism**, Cargese (France), March-08, Valenzuela , Sergio O., (Invited talk)

- *"Magnon drag thermopile"*, **12th Joint MMM/Intermag Conference**, Chicago (USA), Jan-14-18, Costache, Marius, (Invited Talk for the Symposium)

DISSEMINATION ACTIVITIES

- Co-organizer, Workshop New Trends in Topological Insulators (Sant Feliu de Guixols, June 2013)

- *"Perspectives on Spintronics"*, UAB Physics dept. (Bellaterra)

Neumann, Ingmar, *Doctoral Student*

Raes, Bart, *Postdoctoral Researcher*

Sierra, Juan Francisco, *Postdoctoral Researcher*

Supramolecular NanoChemistry and Materials Group

Led by ICREA Research Professor Daniel Maspoch, the Supramolecular NanoChemistry and Materials Group (NANO^{UP}), was founded in 2011. It aims to control the supramolecular assembly of molecules, biomolecules, metal ions and nanoscale building blocks at the nanometre level for the design and synthesis of novel functional materials, mainly of the family of porous metal-organic frameworks (MOFs) and liposomes. The Group employs Supramolecular Chemistry as its central approach to explore new materials with potential applications in diverse areas of interest, such as Biomedicine, Energy and Environment. They are also interested on high-resolution tip-based lithographic techniques, such as Dip-Pen Nanolithography (DPN), to control the positioning, synthesis, growth and orientation of supramolecular nanostructures on surfaces.

To access the Group's website, click here

NEW PROJECTS & MILESTONES IN 2013

In 2013, NANO^{UP} Group completed one of its on-going projects (**BIOCIDE2LIFE**, Micro- and Nanoencapsulated Biocides: the next generation of Disinfectants with Short + Long-2Life Antimicrobial Activity) and began two new ones: "**MOFINP Starting Grant**: Multifunctional Hybrid Nanoparticle Pairs made from Metal-Organic Frameworks and Inorganic Nanoparticles", an AACC supported by MINECO, and "**MOFs@bio**: Design and Synthesis of Metal Organic-Frameworks (MOFs) at the Nanoscale Regime for Advanced Biomedical Applications", a PLAN NACIONAL supported by MINECO.

In addition, Prof Maspoch has been awarded the prestigious **ERC Consolidator for the project "InanoMOF: Multifunctional micro- and nanostructures assembled from nanoscale metal-organic frameworks and inorganic nanoparticles"**, that will begin in 2014. The Group continued its development of customised micro- and nanoencapsulation technologies for companies. It progressed on four existing industrial alliances, one of them leading to the signature of a Technology Transfer Contract, and established one new

ICREA Prof. Daniel Maspoch
Group Leader

Born in l'Escala (Girona) in 1976. He graduated in chemistry at the Universitat de Girona and obtained his PhD in materials science at the Universitat Autònoma de Barcelona & Institut de Ciència de Materials de Barcelona. He then moved to Northwestern University, where he worked as a postdoctoral fellow in the group of professor Chad A. Mirkin. He moved back to the Institut Català de Nanotecnologia (ICN), now ICN2, thanks to a Ramón y Cajal contract, where he founded the Supramolecular NanoChemistry & Materials Group. Since September 2011, he is ICREA Research Professor and Group Leader at the ICN2. He is recipient of an European Research Council (ERC) Consolidator Grant.

Prof Maspoch has authored 63 scientific publications, 5 book chapters and 7 patents, and has established 10 contracts with private companies, including 3 successful transfers of in-house technology for immediate application to consumer products.

Group Members

Maspoch, Daniel, *ICREA Research Professor and Group Leader*

Ariñez, Javier, *Doctoral Student*

Ayala, Abraham, *Doctoral Student*

Burneo, Ivan Patricio, *Doctoral Student*

Cano, Antonia Maria, *Postdoctoral Researcher*

Carbonell, Carlos, *Laboratory Engineer*

Carné, Arnau, *Doctoral Student*

Ciardi, Agnese, *Visiting Student*

del Pozo, Marc, *Visiting Student*

Espín, Jordi, *Doctoral Student*

contract.

KEY PUBLICATIONS & CONTRIBUTIONS IN 2013

Publications:

- **A spray-drying strategy for synthesis of nanoscale metal-organic frameworks and their assembly into hollow superstructures**, A. Carné-Sánchez, I. Imaz, M. Cano-Sarabia, D. Maspoch., *Nature Chemistry*, **5**, 203-211 (2013)
- **Relaxometry Studies of a Highly Stable Nanoscale Metal-Organic Framework Made of Cu(II), Gd(III), and the Macrocyclic DOTP**, A. Carné-Sánchez, C. S. Bonnet, I. Imaz, J. Lorenzo, É. Toth, D. Maspoch, *Journal of the American Chemical Society*,**135**, 17711-17714 (2013)
- **Femtolitre chemistry assisted by microfluidic pen lithography**, C. Carbonell, K. C. Stylianou, J. Hernando, E. Evangelio, S. A. Barnett, S. Nettikadan, I. Imaz, D. Maspoch, *Nature Comm.*, **4**, 2173 (2013)
- **"Dual-Template" Synthesis of One-Dimensional Conductive Nanoparticle Superstructures from Coordination Metal-Peptide Polymer Crystals**, M. Rubio-Martínez, J. Puigmartí-Luis, I. Imaz, P. S. Dittrich, D. Maspoch, *Small*, **9**, 4160-4167 (2013)
- **Self-assembled tetragonal prismatic molecular cage highly selective for anionic pi guests**, GArcía-Simón C.; Garcia-Borrás M.; Gómez L.; Garcia-Bosch, I.; Osuna, S.; Swart, M.; Luis, J.M.; Rovira, C.; Almeida, M.; Imaz, I.; Maspoch, D.; Costas, M.; Ribas, X., *Chemistry - A European Journal*, **19**, 1445-1456 (2013)
- **Tetradihydrobenzoquinonate and tetrachloranilate Zr(IV) complexes: Single-crystal-to-single-crystal phase transition and open-framework behavior for K4Zr(DBQ)4**, Imaz, I.; Mouchaham, G.; Roques, N.; Brandès, S.; Sutter, J.-P., *Inorganic Chemistry*, **52, 19**, 11237-11243 (2013)
- **A Novel Liposome-Based Nanocarrier Loaded with an LPS-dsRNA Cocktail for Fish Innate Immune System Stimulation**, A. Ruyra, M. Cano-Sarabia, S. A. MacKenzie, D. Maspoch, N. Roher, *Plos One 2013*, **8**, 10, e76338 (2013)
- **Extended H-bond networks based on guanidinium H-donors and [Zr(A) 4]4- H-acceptor units: Modulation of the assemblage and guest accessible volume by chemical design (A = oxalate, dihydrobenzoquinonate, chloranilate)**, Mouchaham, G.; Roques, N.; Duhayon, C.; Imaz, I.; Sutter, J.-P., *New Journal of Chemistry*, **37**, 3476-3487 (2013)

Contributions:

- *"Microscopía confocal para el seguimiento de química en femtolitros, asistida por litografía basada en sonda"*, **Jornadas de Microscopía Confocal aplicada a materiales, UAB**, Barcelona (Spain), apr-13, C. Carbonell, D. Maspoch, (Oral presentation)
- *"Nanochemistry is in the air and on surfaces: Synthesis and assembly of Nanoscale Metal-Organic Frameworks"*, **Institute of Nuclear Chemistry and Technology**, Warsaw (Poland), may-13, D. Maspoch, (Oral presentation)
- *"Nanoscale Metal-Organic Frameworks: Synthesis and Assembly in the Air and on Surfaces"*, **XXXIV Reunion Bienal Real Sociedad Española de Química**, Santander (Spain), sep-13, D. Maspoch, (Oral presentation)
- *"Controlled Growth of Metal-Organic Frameworks on Surfaces using Microfluidic-Pen Lithography"*, **Third International Conference on Multifunctional, Hybrid and**

Evangelio, Maria Emilia, *Postdoctoral Researcher*

Fabregat, Clara, *Visiting Student*

García, Sonia, *Postdoctoral Researcher*

González, Marta, *Group Project Manager*

Imaz, Inhar, *Ramon y Cajal Researcher*

Kahsay, Adane, *Visiting Student*

Mejías, Nereida, *Technician*

Navarro, Joana, *Visiting Student*

Rubio, Marta, *Doctoral Student*

Ruyra, Àngels, *Doctoral Student*

Sáez, Adrian, *Visiting Student*

Stylianou, Kyriakos, *Postdoctoral Researcher*

Vila, Marc, *Visiting Student*

Nanomaterials, Sorrento (Italy), mar-13, K. C. Stylianou, C.Carbonell, I.Imaz, D.Maspoch, (Poster)

- *"Liposomes as Novel Immunostimulant Delivery System in Aquaculture"*, **ImagineNano 2013**, Bilbao (Spain), apr-13, M. Cano-Sarabia, À. Ruyra, S. MacKenzie, N. Roher, D. Maspoch, (Poster)
- *"Metal-Organic Frameworks for Biomedical Applications"*, **ImagineNano 2013**, Bilbao (Spain), apr-13, J. Ariñez, A.Carné, A. Yazdi, I. Imaz, J. Lorenzo, C. Bonet, D. Maspoch, (Poster)
- *"Metal-Organic Frameworks for Biomedical Applications"*, **Workshop on Nanomedicine (UABCEI)**, Bellaterra (Spain), oct-13, D. Maspoch, (Poster)
- *"Micro- and Nanoencapsulation: Solutions for Industrial Applications"*, **Vth training School on Bioencapsulation**, Nantes (France), apr-13, M. Cano-Sarabia, S. García, N. Mejias, D. Maspoch, (Poster)
- *"Near-Infrared Emitting Lanthanide Nanoscale MOFs for biological imaging"*, **ICBIC 16**, Grenoble (France), jul-13, E. Evangelio, A. Foucault-Collet, S. V. Eliseeva, M. Allix, E. Veron, A. Yazdi, A. Carné, K. A. White, K. A. Gogick, I. Imaz, D. Maspoch, N. L. Rosi, S. Petoud, (Poster)
- *"One-dimensional metal-amino acid and metal-peptide nanostructures and their use as templates for inorganic nanoparticle superstructure synthesis"*, **Third International Conference on Multifunctional, Hybrid and Nanomaterials**, Sorrento (Italy), mar-13, M.Rubio-Martínez, J.Puigmartí-Luis, I.Imaz, D.Maspoch, (Poster)
- *"One-dimensional metal-amino acid and metal-peptide nanostructures and their use as templates for inorganic nanoparticle superstructure synthesis"*, **ImagineNano 2013**, Bilbao (Spain), apr-13, M. Rubio-Martínez, J. Puigmartí-Luis, I. Imaz, D. Maspoch, (Poster)
- *"Toxicity, Uptake and Gene expression studies of liposomes used as vaccine delivery systems in aquaculture"*, **ImagineNano 2013.**, Bilbao (Spain), apr-13, D. Maspoch, (Poster)
- *"Femtolitre Chemistry assisted by Microfluidic Pen Lithography (MPL)"*, **EUROMAT 2013**, Seville (Spain), jul-13, K. Stylianou, D. Maspoch, (Oral presentation)
- *"Femtolitre Chemistry assisted by Microfluidic Pen Lithography (MPL)"*, **International MOF Symposium 2013**, Dresden (Germany), sep-13, K. Stylianou, D. Maspoch, (Oral presentation)
- *"Liposomes as Novel Immunostimulant Delivery System in Aquaculture"*, **19th International Symposium on Microencapsulation**, Pamplona (Spain), sep-13, M. Cano-Sarabia, À. Ruyra, S. MacKenzie, N. Roher, D. Maspoch*, (Oral presentation)
- *"Liposomes as Novel Immunostimulant Delivery System in Aquaculture"*, **ImagineNano 2013**, Bilbao (Spain), apr-13, M. Cano-Sarabia, À. Ruyra, S. MacKenzie, N. Roher, D. Maspoch, (Oral presentation)
- *"Massive production of nanoMOFs by spray-drying"*, **ImagineNano 2013**, Bilbao (Spain), apr-13, I. Imaz, A. Carné, M. Cano, D. Maspoch, (Oral presentation)

MERITS AND AWARDS 2013

Prof Dr Daniel Maspoch, ICREA Research Professor and Leader of the Supramolecular NanoChemistry & Materials Group, awarded one of the 312 ERC Consolidator Grants granted by the European Commission in 2013.

DISSEMINATION ACTIVITIES

NANOUP is actively participating in communication programs to create awareness among the general public about research and its implications for citizens. In 2013, NANOUP participated in a new short-term project for the 2013 edition of Joves i Ciència, in the Escolab program as well as in the training of undergraduate students.

PATENTS

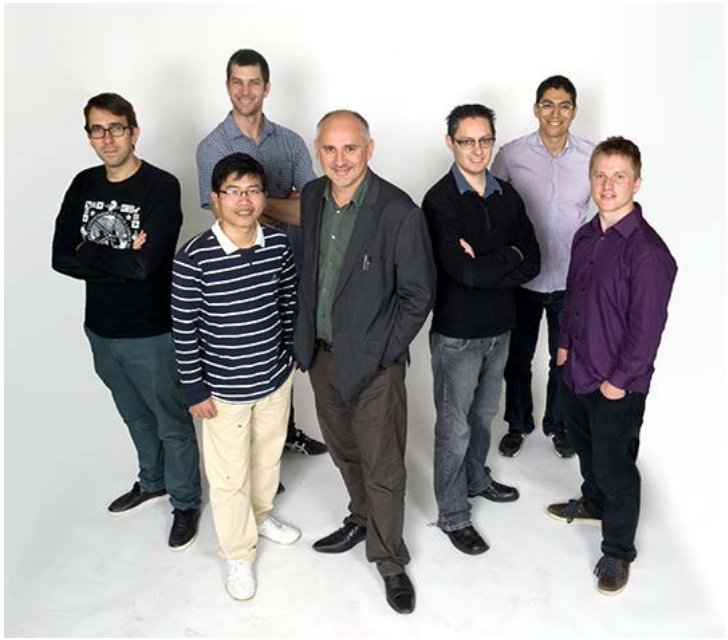
Technology Transfer Contract under the research project “Microencapsulated biocides for long-lasting activity”, September 2013.

OTHER HIGHLIGHTS IN 2013

- *Relaxometry Studies of a Highly Stable Nanoscale Metal−Organic Framework Made of Cu(II), Gd(III), and the Macrocyclic DOTP,* Carné-Sánchez, C. S. Bonnet, I. Imaz, J. Lorenzo, É. Toth, D. Maspoch, **J. Am. Chem. Soc. 2013**, 135, 47, 17711-17714.
- *"Dual-Template" Synthesis of One-Dimensional Conductive Nanoparticle Superstructures from Coordination Metal–Peptide Polymer Crystals,* M. Rubio-Martínez, J. Puigmartí-Luis, I. Imaz, P. S. Dittrich, D. Maspoch, **Small 2013**, 9, 24, 4160-4167.
- *A Novel Liposome-Based Nanocarrier Loaded with an LPS-dsRNA Cocktail for Fish Innate Immune System Stimulation,* A. Ruyra, M. Cano-Sarabia, S. A. MacKenzie, D. Maspoch, N. Roher, **Plos One 2013**, 8, 10, e76338.

Theoretical and Computational Nanoscience Group

Led by ICREA Prof Stephan Roche, the Theoretical and Computational Nanosciences Group theoretically explores exotic quantum transport phenomena in low-dimensional structures and complex materials with main focus on graphene and topological insulators. It aims to understand the effects of chemical and topological disorders, as well as electron-phonon coupling and spin-orbit interactions, on quantum interferences, localisation phenomena and decoherence mechanisms. Methodological developments target innovative approaches to tackle with charge, spin and phonon quantum transport as well as multiscale device simulation.



NEW PROJECTS & MILESTONES IN 2013

In 2013, the Theoretical and Computational Nanosciences Group participates in the successful project entitled **GRAPHENE CP-CSA for the European Community's FET Flagship Programme**, which has received 2.5 years of funding. The Consortium encompasses some 80 partners, including companies such as Airbus, Nokia and Texas Instruments, together with leading European research groups in graphene, including those of the four Nobel Laureates members of the GRAPHENE Scientific Advisory Board. S. Roche has been elected Deputy of the GRAPHENE SPINTRONICS Workpackage and together with the WP leader Prof. Bart van Wees from Gröningen University, they are coordinating the research of spintronics in relation with the Graphene Flagship roadmap.

ICREA Prof Stephan Roche
Group Leader

Prof Stephan Roche studied Theoretical Physics at the Université Joseph-Fourier (UJF) and the École Normale Supérieure (ENS) in France, and then received a PhD in Physics in 1996, at the French National Centre for Scientific Research (CNRS). After several postdoctoral stays in Japan and Spain (under the support of the Japanese JSPS and the European Commission), he was appointed Assistant a Professor at UJF, in 2000, and then as a Researcher at the Commissariat à l'Energie Atomique (CEA), in 2004. The same year, he received the "Habilitation à diriger des recherches" from UJF. During his stay at the Institute of Nanosciences and Cryogenics (INAC) at CEA, he coordinated the Quantum Simulation Platform of the programme CHEMTRONICS and was involved in the preparation of the programme NANOSIMULATION CEA. In 2009, he was awarded the Friedrich Wilhelm Bessel prize by the Alexander Von-Humboldt Foundation (Germany) and worked 6 months at the Technische Universitat Dresden.

Prof Roche is currently ICREA Research Professor at UAB and head of the Theoretical and Computational Nanoscience Group at ICN. His research focuses on the theoretical understanding of quantum transport phenomena from the molecular to the mesoscopic scales in materials such as graphene, topological insulators and organic matter. He has authored over 100 articles (more than 40 published in Phys. Rev. Lett. and Nano. Lett.), and 10 books or book chapters.

Group Members

Roche, Stephan, *ICREA Research Professor and Group Leader*

Barrios, Jose Eduardo, *Visiting Postdoctoral Researcher*

Brandbyge, Mads, *Visiting Scientist*

The Group has also received financial support from **Samsung**, through its Open innovation Programme, for a research project on **graphene device simulation**, entitled “Multiscale simulation of charge transport properties in polycrystalline graphene”. The project is performed in collaboration with Prof David Jimenez of the Universitat Autònoma de Barcelona, and includes two fully dedicated postdoctoral researchers funded by Samsung. Several advances have been made in the simulation of graphene-based field effect transistors. The funding has been renewed for one more year (2013-2014).

KEY PUBLICATIONS & CONTRIBUTIONS IN 2013

Publications:

- **Scaling Properties of Charge Transport in Polycrystalline Graphene**, Dinh Van Tuan, Jani Kotakoski, Thibaud Louvet, Frank Ortmann, Jannik C. Meyer, and Stephan Roche, *Nano Letters*. **13 (4)**, pp 1730-1735 (2013)
- **Broken Symmetries, Zero-energy Modes and Quantum Transport in Disordered Graphene: From Supermetallic to Insulating Regimes**, Alessandro Cresti, Frank Ortmann, Thibaud Louvet, Dinh Van Tuan, and Stephan Roche, *Physical Review Letters*. **vol 110**, page 196601 (2013)
- **Proximity effects induced in graphene by magnetic insulators: First-principles calculations on spin filtering and exchange-splitting gaps**, Yang, H.X.; Hallal, A.; Terrade, D.; Waintal, X.; Roche, S.; Chshiev, M., *Physical Review Letters*, **110** (2013)
- **Splitting of the Zero-Energy Landau Level and Universal Dissipative Conductivity at Critical Points in Disordered Graphene**, Frank Ortmann and Stephan Roche, *Physical Review Letters*. **110**, 086602 (2013)
- **Highly defective graphene: A key prototype of 2D anderson insulators**, Aurélien Lherbier, Stephan Roche , Oscar A. Restrepo, Yann-Michel Niquet , Arnaud Delcorte, and Jean-Christophe Charlier, *Nano Research*. **6, (5)**,326-334 (2013)
- **Non-perturbative effects of laser illumination on the electrical properties of graphene nanoribbons**, Hernan L Calvo, Pablo M Perez-Piskunow, Horacio M Pastawski, Stephan Roche, and Luis E F Foa Torres, *J. Phys.: Condens. Matter.*, **Vol 25**, p. 144202 (2013)
- **Multiscale simulation of carbon nanotube transistors**, Maneux, C.; Fregonese, S.; Zimmer, T.; Retailleau, S.; Nguyen, H.N.; Querlioz, D.; Bournel, A.; Dollfus, P.; Triozon, F.; Niquet, Y.M.; Roche, S., *Solid-State Electronics*, **89**, 26-67 (2013)
- **Transport Fingerprints at Graphene Superlattice Dirac Points Induced by Boron-Nitride Substrate**, R. Martinez-Gordillo, S. Roche, F. Ortmann, and M. Pruneda, *Physical Review B*. **89**, 161401(R) (2014)

Contributions:

- *“Fundamentals of Graphene electronic and transport properties”*, **Onassis Foundation Lecture Series**, HERAKLION (Greece), jul-13, S. Roche, (Oral presentation)
- *“Graphene for Nanoelectronics and Spintronics”*, **ECI conference on carbon-based nanomaterials**, Hualien, Taiwan (China), nov-13, S. Roche, (Oral presentation)
- *“Modelling realistic graphene-based materials: case of polycrystalline graphene”*, **Frontiers of Graphene Science and Technology**, Oviedo (Spain), nov-13, S. Roche, (Oral presentation)
- *“Polycrystalline graphene, Magnetism and spin transport”*, **Graphene Symposium 2013**, Seoul (Korea, Republic of (South Korea)), jul-13, S. Roche, (Oral presentation)

Cresti, Alessandro, *Visiting Scientist*

Cummings, Aron, *Postdoctoral Researcher*

Dinh, Van Tuan, *Doctoral Student*

Ferrer, Nicolás, *Undergraduate*

Leconte, Nicolas, *Postdoctoral Researcher*

Ortmann, Frank, *Senior Researcher*

Pérez, Pablo Matias, *Visiting Doctoral Student*

Pedersen, Jesper Goor, *Visiting Postdoctoral Researcher*

Rasmussen, Jesper, *Visiting Doctoral Student*

Soriano, David, *Postdoctoral Researcher*

- *"Spin relaxation phenomena in Graphene"*, **Closing meeting- Spanish Graphene workshop**, Madrid (Spain), abr-13, S. Roche, (Oral presentation)
- *"Spintronics in Graphene"*, **Graphene Brazil 2013**, Armacão dos Buzios (Brazil), sep-13, S. Roche, (Oral presentation)
- *"Tackling with Non-perturbative Transport Phenomena in Nanotubes and Graphene, driven by electron-phonon and electron-photon interactions"*, **International Symposium on CCTN13: Computational Challenges and Tools for Nanotubes (CCTN13)**, Tallinn (Estonia), jun-13, S. Roche, (Oral presentation)
- *"Transport in Polycrystalline graphene and spin relaxation"*, **NT13: Fourteenth International Conference on the Science and Application of Nanotubes**, Espoo (Finland), jun-13, S. Roche, (Oral presentation)
- *"Novel Spin relaxation mechanism in Graphene"*, **New Diamond and Nanocarbon (NDNC2013)**, Singapore (Singapore), may-13, S. Roche, (Keynote speaker)
- *"Quantum Transport in Disordered Graphene :Scaling Properties and Spin relaxation Mechanisms"*, **NANOPORTUGAL 2013**, Porto (Portugal), feb-13, S. Roche, (Keynote speaker)

MERITS AND AWARDS 2013

ICREA Prof. S. Roche became a member of the Editorial Board of the newly launched *2D Materials*, a new scientific journal from IOP Science, electronic only, which aims at covering the wide field of two dimensional materials including graphene.

DISSEMINATION ACTIVITIES

- 12-jul-2013. **Graphene Research at ICN and in Cataluña (Global context). SAIT-SAMSUNG** - www.sait.samsung.co.kr/. Korea, Republic of (South Korea)
  Roche , Stephan
- 25-juny-2013. **European Union Flagship Projects: Graphene**. Universidad Internacional Menéndez Pelayo. Spain
  Roche , Stephan
- 11-març-2013 - 14-març-2013. **Quantum simulation for Nanoscience**. Graduate. Technical University of Denmark -DTU. Copenhagen. Denmark
  Roche, Stephan
- 28-gen-2013 - 31-gen-2013. **Quantum Transport in Mesoscopic Physics** (Master of Nanoscience UAB). Graduate.
  UAB. Barcelona. Spain
  Roche, Stephan

Theory and Simulation Group

The Theory and Simulation Group is composed of three permanent scientists: Prof. Pablo Ordejon (group leader, CSIC Research Professor), Dr. Nicolas Lorente (CSIC's Researcher), and Dr. Miguel Pruneda (CSIC's Tenured Scientist). The group focuses on simulations of materials and processes at the nanoscale, with two main groups of activities: (i) the development of theoretical methods, numerical algorithms and simulation codes (the main activity in this aspect being the development of the SIESTA package), and (ii) the study of of specific problems in nanoscience, with applications in surface science, low-dimensional materials, or molecular electronics.

NEW PROJECTS & MILESTONES IN 2013

In 2013 the group has continued the study of the interface of molecules, clusters, and nanostructures with metals. Such studies are of great interest in fields like supramolecular chemistry, catalysis, molecular electronics, and data storage. In particular, we have shown how chemical doping offers a promising mechanism to locally manipulate charge and spin of individual molecules with unprecedented spatial resolution. We have also studied the formation of chiral supramolecular pentamers. These pentamers are able to self-assemble to form large ordered arrays, covering big areas of a gold surface using motifs with five-fold symmetry.

The group has also focused in new 2D materials. On one hand, pristine monolayers of MoS_2 were studied and a new tight-binding model to describe its electronic properties proposed. On the other hand, a number of hybrid heterostructures has been analysed. Vertical stacks of graphene and BN revealed a wealth of surprising physical properties, with the appearance of new superlattice Dirac points that affect the electronic transport properties. These were studied with large-scale DFT calculations, but also with a simplified tight-binding model which was later applied to the study of transport properties within the Kubo formalism developed by Prof. Stephan Roche. Finally, coplanar heterostructures of different 2D materials were examined, in search for novel interfacial effects due to polarity discontinuities, similar to those observed at the interfaces of complex oxides.

Projects

- *"Dispositivos moleculares"* (MAT2012–38318–C03–02)
- *"Simulaciones atomisticas de primeros principios: metodologa y aplicaciones a sistemas complejos"* (FIS201237549C0502)
- *"Atomic Scale and single Molecule Logic gate Technologies (ATMOL)"* (270028, FP7-ICT)

KEY PUBLICATIONS & INVITED TALKS IN 2013

Publications:

- **Imaging the dynamics of individually adsorbed molecules**, Schaffert, J.; Cottin, M.C.; Sonntag, A.; Karacuban, H.; Bobisch, C.A.; Lorente, N.; Gauyacq, J.-P.; Möller,

Prof Pablo Ordejón
Group Leader

Prof Ordejón earned his BSc in Physics (1987) and PhD in Science (1992) at the Universidad Autónoma de Madrid (Spain). He worked as a postdoctoral researcher at the University of Illinois at Urbana-Champaign (USA) from 1992 to 1995, and as Assistant Professor at the Universidad de Oviedo from 1995 to 1999. In 1999, he obtained a research staff position at the Institut de Ciència de Materials de Barcelona of the Consejo Superior de Investigaciones Científicas (CSIC), where he is currently Research Professor. Since July 2012, he has served as Director of ICN2, where he also leads the *Simulation and Theory* Research Group.

He has published more than 190 scientific articles, which have received over 17,000 citations (h = 47). Since 2009 he has served as Co-Editor of EPL (formerly Euro Physics Letters) and since 2004, as Regional Editor of physica status solidi. He was in charge of the Condensed Matter Physics area of the Physics Panel of the Spanish National Scientific Valuation Agency (ANEP), from 2003 to 2006, and the Head of the Physics and Engineering Panel of the Access Committee to the Spanish Supercomputing Network, from 2005 to 2011. He became a Fellow of the American Physical Society in 2005.

His research is focused on the development of efficient methods for electronic structure calculations in large and complex systems, with contributions to the development of techniques for large scale atomistic simulations based on first principles methods like SIESTA. He has also been involved in the study of the fundamental properties of materials at the atomistic level. His current interests include, among many others, electronic transport in nanoscale devices and electronic processes at surfaces. He maintains frequent collaborations with industrial laboratories on the simulation of materials processes at the atomic level.

Group Members

R., *Nature Materials*, **12**, 223-227 (2013)

- **Adsorption site determination of a molecular monolayer via inelastic tunneling**, Wegner, D.; Yamachika, R.; Zhang, X.; Wang, Y.; Crommie, M.F.; Lorente, N., *Nano Letters*, **13**, 2346-2350 (2013)
- **Surface-state engineering for interconnects on H-passivated Si(100)**, Kepenekian, M.; Robles, R.; Joachim, C.; Lorente, N., *Nano Letters*, **13**, 1192-1195 (2013)
- **Level alignment of a prototypical photocatalytic system: Methanol on TiO2(110)**, Migani, A.; Mowbray, D.J.; Iacomino, A.; Zhao, J.; Petek, H.; Rubio, A., *Journal of the American Chemical Society*, **135**, 11429-11432 (2013)
- **Surface-supported supramolecular pentamers**, Karan, S.; Wang, Y.; Robles, R.; Lorente, N.; Berndt, R., *Journal of the American Chemical Society*, **135**, 14004-14007 (2013)
- **Nitrogen-doped graphitic nanoribbons: Synthesis, characterization, and transport**, Ortiz-Medina, J.; García-Betancourt, M.L.; Jia, X.; Martínez-Gordillo, R.; Pelagio-Flores, M.A.; Swanson, D.; Elías, A.L.; Gutiérrez, H.R.; Gracia-Espino, E.; Meunier, V.; Owens, J.; Sumpter, B.G.; Cruz-Silva, E.; Rodríguez-Macías, F.J.; Lõpez-Urías, F.; Muñoz-Sandoval, E.; Dresselhaus, M.S.; Terrones, H.; Terrones, M., *ADV FUNCT MATER* (2013)
- **Correlation-mediated processes for electron-induced switching between Néel states of Fe antiferromagnetic chains**, Gauyacq, J.-P.; Yaro, S.M.; Cartoixá, X.; Lorente, N., *Physical Review Letters*, **110** (2013)
- **Gold and methane: A noble combination for delicate oxidation**, Mowbray, D.J.; Migani, A.; Walther, G.; Cardamone, D.M.; Rubio, A., *Journal of Physical Chemistry Letters*, **4**, 3006-3012 (2013)
- **Leakage current in atomic-size surface interconnects**, Kepenekian, M.; Robles, R.; Joachim, C.; Lorente, N., *Applied Physics Letters*, **103** (2013)
- **Tight-binding model and direct-gap/indirect-gap transition in single-layer and multilayer MoS2**, Cappelluti, E.; Roldán, R.; Silva-Guillén, J.A.; Ordejón, P.; Guinea, F., *Physical Review B - Condensed Matter and Materials Physics*, **88** (2013)
- **Magnetic reversal of a quantum nanoferromagnet**, Gauyacq, J.P.; Lorente, N., *Physical Review B - Condensed Matter and Materials Physics*, **9**, 609-614 (2013)
- **studied by scanning tunneling microscopy and first-principles theory**, Chinchore, A.V.; Wang, K.; Shi, M.; Mandru, A.; Liu, Y.; Haider, M.; Smith, A.R.; Ferrari, V.; Barral, M.A.; Ordejón, P., *Physical Review B - Condensed Matter and Materials Physics*, **87** (2013)
- **Tunneling electron induced rotation of a copper phthalocyanine molecule on Cu(111)**, Schaffert, J.; Cottin, M.C.; Sonntag, A.; Bobisch, C.A.; Möller, R.; Gauyacq, J.-P.; Lorente, N., *Physical Review B - Condensed Matter and Materials Physics*, **103**, 161603 (2013)
- **Electron transport through dangling-bond silicon wires on H-passivated Si(100)**, Kepenekian, M.; Novaes, F.D.; Robles, R.; Monturet, S.; Kawai, H.; Joachim, C.; Lorente, N., *Journal of Physics Condensed Matter*, **25** (2013)
- **Modelling the growth of ZnO thin films by PVD methods and the effects of post-annealing**, Blackwell, S.; Smith, R.; Kenny, S.D.; Walls, J.M.; Sanz-Navarro, C.F., *Journal of Physics Condensed Matter*, **25** (2013)
- **Vibrational transition rule during a through-bond electron transfer process**,

Ordejón, Pablo, *CSIC Full Professor*

Abufager, Paula, *Visiting Postdoctoral Researcher*

Alonso, José Miguel, *CSIC Tenured Scientist*

Andersen, Nick Papior, *CSIC Visiting Postdoctoral Researcher*

Boskovic, Desanka, *CSIC Doctoral Student*

González, Silvia, *CSIC Visiting Senior Researcher*

Huhs, Georg, *Visiting Doctoral Student*

Kepenekian, Mikaël, *Postdoctoral Researcher*

Lorente, Nicolás, *CSIC Research Scientist*

Martínez Gordillo, Rafael, *CSIC Doctoral Student*

Migani, Annapaola, *CSIC Ramon y Cajal Researcher*

Pérez, Miguel Angel, *CSIC Doctoral Student*

Robles, Roberto, *CSIC Postdoctoral Researcher*

Silva, José Angel, *CSIC Doctoral Student*

Troiano, Gustavo Feliciano, *Visiting Postdoctoral Researcher*

Monturet, S.; Kepenekian, M.; Robles, R.; Lorente, N.; Joachim, C., *Chemical Physics Letters*, **567**, 1-5 (2013)

- **Controlled manipulation of single atoms and small molecules using the scanning tunnelling microscope**, Morgenstern, K.; Lorente, N.; Rieder, K.-H., (2013)

Book Chapters:

- **Simulations of Constant Current STM Images of Open-Shell Systems**
  M. Kepenekian, R. Robles, R. Korytár, N. Lorente
  in *Imaging and Manipulating Molecular Orbitals*, edited by L. Grill and C. Joachim (Springer, Berlin, 2013), p.117

- **First-Principles Simulations of Electronic Transport in Dangling-Bond Wires**
  M. Kepenekian, R. Robles, N. Lorente
  in *Architecture and Design of Molecule Logic Gates and Atom Circuits*, edited by N. Lorente and C. Joachim (Springer, Berlin, 2013), p.137

Invited talks:

- *"Advanced Modeling of Hole and Electron Acceptor States for Methanol on TiO_2"*, **Institut de Qu□mica Te□rica i Computacional - UB seminar and conferences**, Barcelona (Spain), 20 February 2013, Annapaola Migani, (Oral presentation)

- *"Density functional modelling of oxygen defect formation in CeO_2 nanoparticles and thier aggregates in one- and two-dimensional arrays"*, **Ceria Symposium**, Barcelona (Spain), 7 October 2013, Annapaola Migani, (Oral presentation)

- *"Electronic structure simulations of magnetic molecules displaying the Kondo effect"*, **Chinanano 2013**, Beijing (China), Sept 2013, N. Lorente, (Oral presentation)

- *"Layered and two-dimensional materials explored from first-principles"*, **Trends in Nanotechnology** , Sevilla (Spain), Sept 2013, P. Ordejón, (Oral presentation)

- *"Large scale ab-initio simulations in Nanoscience"*, **XXXIV Bienal de la Real Sociedad Española de Química**, Santander (Spain), Sept 2013, P. Ordejón, (Oral presentation)

DISSEMINATION ACTIVITIES

- Workshop Organization "*Controlled Atomic Dynamics on Solid Surfaces: Atom and Molecular Manipulation*" at Unidad de Física de Materiales, San Sebastian, May 2013 (N. Lorente)

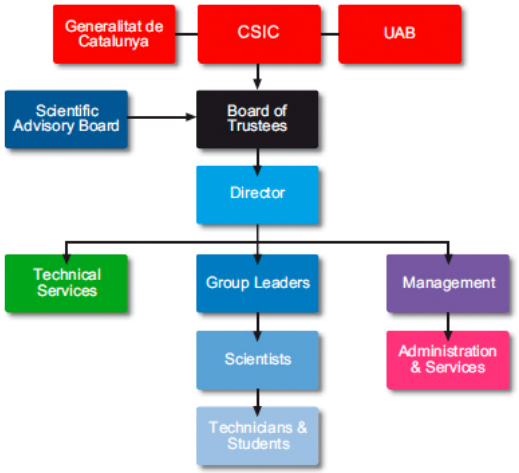
- Several talks at the "*Scanning Probe Microscopy & Quantum Materials Workshop*" in Vancouver, Canada. Jun 2013. (N. Lorente)

- "Advanced Modeling of Hole and Electron Acceptor States for Methanol on TiO2", *Theoretical Chemistry in Spain Told by Women*, Tarragona (Spain), Jan 2013, (Annapaola Migani, Invited Talk)

THESIS 2013

- **Doctorand:** Miguel Angel Pérez Osorio
  Title: Development and application of ab initio methods for the study of electronic excitations in molecules and extended solids: GW approximation and constrained DFT.
  Defense Date: 22/01/2013 - Auditorio del edificio CIN2
  Director: Pablo Ordejón y Miguel Alonso Pruneda

Organisational Chart



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Minister of Economy and Knowledge, Generalitat de Catalunya.

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Scientific Advisory Board 2013
People of ICN2

Scientific Advisory Board 2013

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Prof Ernst Meyer
Professor, Institut für Physik, University of Basel; Basel, Switzerland

Prof Anthony Turner
Head of Biosensors & Bioelectronics Centre IFM, Linköping University; Linköping, Sweden

Organisation
Organisational Chart
Board of Patrons
Scientific Advisory Board 2013
People of ICN2

People of the ICN2

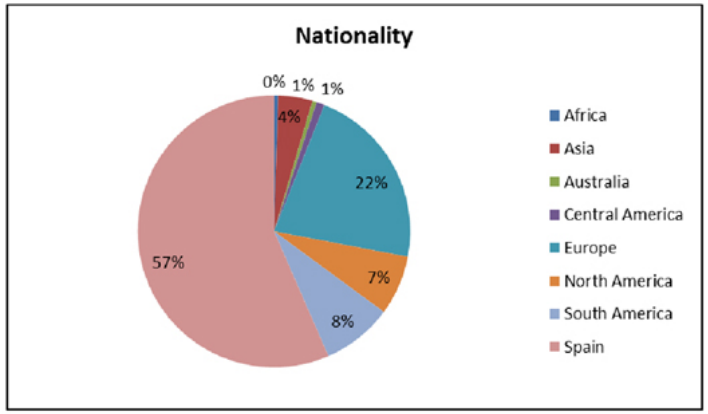
ICN2 is defined by its people. From senior researchers to administration staff, ICN2 personnel work as a team, contributing their creativity, energy, dedication and hard work to further the Institute.

ICN2 prides itself on being an attractor of talent, seeking to provide an environment and an image of excellence that draws talented scientists, technicians and support personnel from around the world. The Institute has succeeded in this endeavour, as embodied in its highly-qualified scientific staff and demonstrated by its high level of scientific output. Many researchers who have completed a doctoral thesis or post-doctoral stay at ICN2 have moved on to highly prestigious institutes such as Harvard, Yale, the Max Planck institutes, CNRS and CEA. Thus, ICN2 is continuously offering new positions for junior scientists.

Over the course of 2013, ICN2 engaged an annual average workforce of 194 people. Recruitment reached an historic peak, as the Institute fully consolidated its management and administrative teams and met its human resources objectives.

Job role	Female	Male	Total
Direction		2.2	2.2
Group Leader	3.0	11.0	14.0
Division Leader	1.0	3.0	4.0
Senior Researcher	1.0	4.8	5.8
R y C Researcher	2.0	2.0	4.0
Postdoctoral Researcher	11.6	25.7	37.3
Doctoral Student	19.1	17.5	36.6
Visiting Postdoctoral Researcher	1.7	1.9	3.6
Visiting Student	17.7	21.0	38.8
Management & Services	20.1	13.8	33.9
Technical & Laboratory	4.0	10.6	14.6
Total			**194.4**

ICN2 is an equal opportunity employer and seeks a workforce diverse in age, culture nationality and gender. By the end of 2013, ICN2 personnel represented multiple nationalities; women comprised an important percentage of all personnel (Graphs are based on Annual Average).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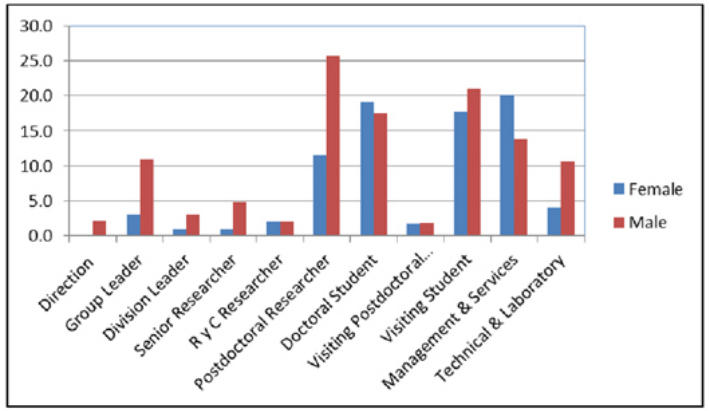
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15.0
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Direction
Group Leader
Division Leader
Senior Researcher
R y C Researcher
Postdoctoral Researcher
Doctoral Student
Visiting Postdoctoral...
Visiting Student
Management & Services
Technical & Laboratory
Female
Male

Electron Microscopy Division

Led by Dr Belén Ballesteros, the Electron Microscopy Division employs electron microscopy techniques for Nanoscience and Nanotechnology research and applications. The Division's chief objective is to provide scientific and technical support to ICN2's Research Groups and to neighbouring research centres, as well as to develop and implement novel techniques. The laboratory has been selected by FEI as a Centre of Reference for development of joint experiments and workshops related with Electron Microscopy.

NEW PROJECTS & MILESTONES IN 2013

After the installation of the electron microscopes in 2012, the Electron Microscopy Division consolidated its scientific-technical support activities during 2013, providing support both to internal users and to external institutes and companies.

Besides, installation of sample preparation equipment acquired within the project "Adquisición de equipamiento para preparación de muestras para su observación por microscopía electrónica" (2010 INFRAS BB) took place during 2013. The acquired equipment, partially funded by the European Regional Development Fund (ERDF), includes a plasma cleaner, a high resolution sputter coater, a polishing system, a diamond disk saw, an optical microscope, among others.

The Division welcomed as a new member technician Francisco Belarre, specialist in electron microscopy sample preparation, and had two visiting PhD students during 2013: Houmam Kafa (Kings College London, UK) and Cinzia Spinato (CNRS, Strasbourg, France).

Lastly, the Division carried on with the on-going project "Nanocapsules for targeted delivery of radioactivity" (2011 RADEL BB), which involves eleven partners across Europe

Dr Belén Ballesteros
Division Leader

Dr Belén Ballesteros earned her BSc in Chemistry with Honours at the Universitat Autònoma de Barcelona (UAB) in 2001 and obtained her PhD in 2006 at the Institut de Ciència de Materials de Barcelona (ICMAB-CSIC). During her doctoral studies she carried out research stays at various European universities, including University of Twente (Netherlands), University of Oslo (Norway), University of Saint Andrews (UK) and Universidad de la Laguna (Spain). In July 2006 she began postdoctoral work at the University of Oxford, where she worked in Electron Microscopy Imaging and Nanoanalysis of carbon nanotubes, inorganic nanotubes and related materials. Since April 2009 she has led the Electron Microscopy Division at ICN2.

Division Members

Ballesteros, Belén, *Division Leader*

Belarre, Francisco Javier, *Technician*

Kafa, Houmam, *Visiting PhD student*

Pach, Elzbieta, *Doctoral Student*

Rosado, Marcos, *Technician*

Spinato, Cinzia, *Visiting PhD student*

and in which Mrs Pach is working. The network focuses on the Design, Synthesis, Characterisation and Pharmacological Studies of radioactive nanocapsules for medical diagnosis and therapy. The Division's role is to characterise by Electron Microscopy the functional nanomaterials generated in the project.

KEY PUBLICATIONS & INVITED TALKS IN 2013

Publications:

- **Fractal porosity in metals synthesized by a simple combustion reaction**, Gómez-Romero, P.; Fraile, J.; Ballesteros, B., *RSC Advances*, **3**, 2351 - 2354 (2013)
- **Observation of out-of-plane unidirectional anisotropy in MgO-capped planar nanowire arrays of Fe**, Arora, S.K., O'Dowd, B.J. , Polishchuk, D.M. , Tovstolytkin, A.I. , Thakur, P. , Brookes, N.B. , Ballesteros, B. , Gambardella, P. , Shvets, I.V. , *J. Appl. Phys.*, **114 (13)**,133903 (2013)
- **Effect of laser radiation on multi-wall carbon nanotubes: Study of shell structure and immobilization process**, György, E.; Pérez Del Pino, A.; Roqueta, J.; Ballesteros, B.; Cabana, L.; Tobias, G., *IoP Journal of Physics: Conference Series*. **395 (1)**, 012105 (2013)
- **Magnetization Reversal Behaviour of Planar Nanowire Arrays of Fe**, Arora, S.K., O'Dowd, B. J., Thakur, P., Brookes, N.B., Ballesteros, B., Gambardella, P., Shvets I.V., *Curr. Nanosci.*, **9**, 609-614 (2013)

Invited talks:

- *"Electron microscopy investigation of filled and functionalized carbon nanotubes"*, **MICROSCOPY AT THE FRONTIERS OF SCIENCE**, Tarragona (Spain), 17-20th September 2013, Elzbieta Pach; Marcos Rosado; Magdalena Kierkowicz; Markus Martincic; Gerard Tobias; Belén Ballesteros, (Oral)
- *"Extreme high resolution scanning electron microscopy"*, **MICROSCOPY AT THE FRONTIERS OF SCIENCE**, Tarragona (Spain), 17-20th September 2013, Marcos Rosado; Elzbieta Pach; Belén Ballesteros, (Poster)
- *"Electron Microscopy Studies of Carbon Nanocapsules for Targeted Delivery of Radioactivity"*, **NANOMEDICINE SCHOOL**, Trieste (Italy), 9-11th September 2013, Elzbieta Pach; Belén Ballesteros, (Poster)
- *"Electron Microscopy Studies of Carbon Nanocapsules for Targeted Delivery of Radioactivity"*, **EMAT WORKSHOP ON TRANSMISSION ELECTRON MICROSCOPY**, Antwerp (Belgium), 10-21th June 2013, Elzbieta Pach; Belén Ballesteros, (Poster)

DISSEMINATION ACTIVITIES

The Electron Microscopy Division actively participated in the outreach activities organized by the ICN2, such as the programs "Escolab", "Professors i Ciència" and the "ICN2 open day".

OTHER HIGHLIGHTS IN 2013

Belén Ballesteros participated in the organization of the conference MICROSCOPY AT THE FRONTIERS OF SCIENCE which took place in Tarragona (Spain), 17-20th September 2013.

Nanofabrication Division

Formed in 2010 and led by Dr Nikolaos Kehagias, the Nanofabrication Division focuses on the design and development of Nanofabrication methods and techniques for Nanoscience and Nanotechnology research and applications. The Division's mission is two-fold: to create and provide a flexible Nanofabrication platform for processing diverse materials and substrates; and to provide high-quality services to both internal and external users.

An important task of the Division is to provide process development, and/or prototyping of novel nanostructures and devices, to enable Technology Transfer to commercial foundries. For ICN2's Nanofabrication Division, the right combination of lithography techniques and materials is essential to help researchers achieve high-impact results.

To access the Group's website, click here

NEW PROJECTS & MILESTONES IN 2013

In 2012 ICN's Nanofabrication Division Leader Dr Kehagias, together with colleagues at the company PTMTEC Oy (Finland), has developed a desk-top Roll-to-Roll Ultraviolet Light-Assisted Nanoimprint Lithography Machine. This one-of-a-kind machine enables meter-per-meter production of nanoscale devices and components.

The Division completed a research collaboration with the technology centre CETEMMSA, aimed at replacing indium tin oxide (ITO), the dominant transparent conductor currently on the market. They developed alternative transparent electrodes based on nano-imprinted metallic grids to support inkjet-printed organic solar cells.

It also began the new project "Moulding Production Technology for multifunctional structured plastic components enabled by nanoimprint lithography" (Plast4Future), part of the European Commission's Seventh Framework Programme (FP7).

Lastly, ICN's Nanofabrication Division began negotiations with a multinational company on a possible new research accord on roll-to-roll (R2R) nanofabrication.

SERVICES

ICN2's Nanofabrication Division offers diverse services to internal and external users for applications in Nanoelectronics, Nanophononics, Nanophotonics, Spintronics, Nanobioelectronics and Biosensors:

Lithography:

- Thermal and UV nanoimprinting - Obducat 3 inch
- Hot embossing machine
- UV nanoimprinting module
- SEM/Litho - FEI/Raith

Dr Nikos Kehagias
Division Leader

Dr Nikos Kehagias earned a BSc in Physics from Aristotle University in Thessaloniki (Greece), in 2002; an MS in Physics of Laser Communications, from Essex University (UK), in 2003; and a PhD from the National University of Ireland, Cork, in 2007, where he continued to work as a postdoctoral fellow until May 2008. At that point he joined ICN (now ICN2) as a member of the Phononic and Photonic Nanostructures Group. Since July 2010 he has led the Nanofabrication Division at ICN2. Dr Kehagias has co-authored more than 30 scientific journal articles, plus two book chapters in the field of Nanofabrication and Nanoimprint Lithography. He has pioneered the use of Reverse Ultraviolet Light-Assisted Nanoimprint Lithography (RUVNIL) as an alternative nanolithography technique.

Division Members

Kehagias, Nikolaos, *Division Leader*

Francone, Achille Leo, *Postdoctoral Researcher*

Medina, Juan Ignacio, *Laboratory Engineer*

- Self-assembly growth set-up
- Roll to Roll UV-light-assisted nanoimprinting tool
- Reverse gravure coating
- CNI thermal nanoimprinting tool

Deposition:

- E-beam evaporator 1 (Au, Ag, Al, Cr, Ti, Pt, Al2O3) - AJA International
- ITO-Molecular beam epitaxy
- Sputter (Au) coater - Edmunds
- Spin coater - Laurel

Characterisation:

- Atomic force microscope - Veeco Instruments
- Optical microscope - Nikon Eclipse LV100
- Gold-ball bonder - Delvotek

General:

- Plasma cleaner - PVA Tepla PS210
- Oven - Memmert
- Hot plates
- Microwave annealing

KEY PUBLICATIONS & CONTRIBUTIONS IN 2013

Publications:

- **Metallic nanoparticles enhanced the spontaneous emission of semiconductor nanocrystals embedded in nanoimprinted photonic crystals**, V. Reboud , G. Lévêque , M. Striccoli , T. Placido , A. Panniello , M. L. Curri , J. A. Alducin , T. Kehoe , N. Kehagias , D. Mecerreyes , S. Newcomb , D. Iacopino , G. Redmond, and C. M. Sotomayor Torres, *Nanoscale*, 5, 239-245 (2013)
- **Fabrication of highly ordered sub-20 nm silicon nanopillars by block copolymer lithography combined with resist design**, M. Salaun, M. Zelsmann, S. Archambault, D. Borah, N. Kehagias, C. Simao, O. Lorret, M. T. Shaw, C. M. Sotomayor Torres and M. A. Morris, *Journal of Materials Chemistry*, **1**, 3544-3550 (2013)
- **Lasing in nanoimprinted two-dimensional photonic crystal band-edge lasers**, V. Reboud, J. Romero-Vivas, P. Lovera, N. Kehagias, T. Kehoe, G. Redmond, and C. M. Sotomayor Torres, *Applied Physics Letters* (2013)
- **Robust spin crossover platforms with synchronized spin switch and polymer phase transition**, F. Novio, E. Evangelio, N. Vazquez-Mera, P. González-Monje, E. Bellido, S. Mendes, N. Kehagias, D. Ruiz-Molina, *Sci. Rep.*, **3**, 1708 | DOI: 10.1038/srep01708 (2013)
- **Soft-graphoepitaxy using nanoimprinted polyhedral oligomeric silsesquioxane substrates for the directed self-assembly of PS-b-PDMS**, D. Borah, C. Simao, R. Senthamaraikannan, S. Rasappa, A. Francone, O. Lorret, M. Salaun, B. Kosmala, N.

Kehagias, M. Zelsmann, C. M. Sotomayor Torres, and M. A. Morris, *European Polymer Journal*, DOI: 10.1016/j.eurpolymj.2013.08.011 (2013)

Contributions:

- *"Dimension and positional metrology approaches in nanotechnology"*, **Imaginenano 2013**, Bilbao (Spain), abr-13, C. Simão, W. Khunsin, J. Gomis, T. Kehoe, D. Tuchapsky,N. Kehagias, A. Amann, and C. M. Sotomayor Torres, (Oral presentation)
- *"Alternative Nanofabrication techniques"*, **Material Science department, University of Patra**, Patra (Greece), 17-Dec, Nikolaos Kehagias, (Invited Talk)
- *"Advanced nanomanufacturing: from parallel to continuous processes for sub 50 nm structuring"*, **Institute of Microelectronics (IMEL),NCSR "Demokritos"**, Athens (Greece), 16-May, Nikolaos Kehagias, (Invited Talk)
- *"Nanoimprint Lithography"*, **7th International Summer schools on Nanoscience and Nanotechnologies, Organic Electronics and Nanomedicine**, Thessaloniki (Greece), 6-13-Jul, Nikos Kehagias, (Invited Talk)

DISSEMINATION ACTIVITIES

- C. Simão, W. Khunsin, N. Kehagias, C. M. Sotomayor Torres, ***"Self-assembled large area ordered nanodot arrays by solvent-assisted nanoimprint of a block copolymer"***, 12th International Conference on Nanoimprint & Nanoprint Technology, 21-23 October, Barcelona, Spain
- A. Francone, C. Delgado, N. Kehagias, C. M. Sotomayor Torres, ***"Advanced manufacturing techniques for mass production of nano scale structures"***, 12th International Conference on Nanoimprint & Nanoprint Technology, 21-23 October, Barcelona, Spain
- C. Simão, N. Kehagias, A. Franconne, M. Salaun, M. Zelsmann, M. Morris, C. M. Sotomayor Torres, ***"Directed self-assembly of block copolymer by in situ solvent vapor assisted nanoimprint lithography"***, Nanosciences and Nanotechnologies conference, 9-12 July, Thessaloniki, Greece, (2013)
- C. D. Simão, N. Kehagias, M. Salaun, M. Zelsmann, B. Kosmala, M. A. Morris, and C. Sotomayor Torres, ***"Directed Self-assembly of Block Copolymers by Solvent Assisted Nanoimprint Lithography for Alternative Lithographic Masks"***, MRS Spring meeting 2013, San Francisco, United States (2013)

Nanomaterials Growth Division

Led by CSIC Tenured scientist Dr. Jose Santiso, the Nanomaterials Growth Division is devoted to carry out collaborative research in the field of Thin Film Deposition and Nanomaterials Characterisation.

NEW PROJECTS & MILESTONES IN 2013

In 2013 the Nanomaterials Growth Division continued working in three closed-related main objectives:

- **Thin film deposition of epitaxial oxide materials by means of pulsed Laser deposition technique**. In this case our division produces films for a large number of groups within the ICN2, in close collaboration with these groups. In some cases the thin film deposition required the use of Reflection high energy electron diffraction (RHEED). Our division carries out the preliminary structure characterisation concerning mostly X-Ray diffraction. (Some of the ICN2 group leaders who we collaborate with are: G. Catalan, J. Fraxedas, S. Valenzuela, C. Sotomayor-Torres, J. Nogués)

- **Investigation of the interplay between strain relaxation phenomena and functional properties in complex oxide films**. Development of novel methods for the X-ray diffraction and diffuse scattering characterisation of microstructure features in epitaxial thin films. These included in-plane diffraction, GISAXS analysis, as well as 3D reciprocal space mapping (this last type of analysis required the use of synchrotron radiation source: at BM25-ESRF and KMC2-Bessy). Most of the work is carried out in collaboration with Institut de Ciència de Materials de Barcelona (ICMAB). The microstructure investigation is completed by HRTEM characterisation.

- **Study of fundamental aspects of ionic and electronic charge and mass transport in the electrical characterisation of thin films of layered oxide materials and multilayers, for their use as components in intermediate temperature SOFCs**. We are particularly interested in surface and interfacial oxygen exchange phenomena in order to obtain enhanced oxygen transport performance. Development of novel characterisation tools of the oxygen surface exchange kinetics.

KEY PUBLICATIONS & INVITED TALKS IN 2013

Publications:

- R. Moreno, P. García, J. Zapata, J. Roqueta, J. Chaigneau and J. Santiso, *Chemistry of Materials* (2013)

- F. Sandiumenge, J. Santiso, Ll. Balcells, Z. Konstantinovic, J. Roqueta, A. Pomar, J. P. Espinós, and B. Martínez, *Physical Review Letters* (2013)

- **Self-assembled pit arrays as templates for the integration of Au nanocrystals in oxide surfaces**, Konstantinovic , Z.; Sandiumenge, F.; Santiso, J.; Balcells, L.; Martínez, B., *Nanoscale*, **5**, 1001- 1008 (2013)

CSIC Scientist Dr. Jose Santiso
Division Leader

Dr. Jose Santiso earned his BS degree in Physics at the Universitat Autònoma de Barcelona (UAB), Spain, in 1988 and obtained his PhD from the University of Barcelona (UB) in 1993. After his doctoral studies, he worked as a Visiting Scientist at Cambridge University, UK from 1994 to 1996. After this stage he joined the Material Science Institute (ICMAB) as a research associate and became CSIC staff scientist in 2002. In 2007 he moved to CIN2 as leader of the Pulsed Laser Deposition and Nanoionics Group Nanomaterials Growth Division, which recently turned into the ICN2 Nanomaterials Growth Division that he also leads. In 2012 he received the Somiya Award of the International Union of Materials Research Society (IUMRS) for his contribution to Solid State Ionics.

Division Members

Santiso, José, *CSIC Tenured Scientist*

Bagués Salg, Núria, *CSIC Doctoral Student*

Moreno, Roberto, *CSIC Doctoral Student*

Roqueta, Jaume, *CSIC Technician*

Zapata, James Arturo, *CSIC Visiting Doctoral Student*

- **Anisotropic 18O tracer diffusion in epitaxial films of GdBaCo2O5+δ cathode material with different orientations**, Zapata, J.; Burriel, M.; García, P.; Kilner, J.A.; Santiso, J., *Journal of Materials Chemistry A*, **1** 7408-7414 (2013)

- **Magnetic Properties of Single Crystalline Expanded Austenite Obtained by Plasma Nitriding of Austenitic Stainless Steel Single Crystals**, E. Menéndez, C. Templier, P. Garcia-Ramirez, J. Santiso, A. Vantomme, K. Temst, J. Noguéseacute;, *ACS Applied Materials and Interfaces*, **5**, 10118-10126 (2013)

- J. Santiso, Ll. Balcells, Z. Konstantinovic, J. Roqueta, P. Ferrer, A. Pomar, B. Martínez and F. Sandiumenge, *CrystEngComm* (2013)

- **Processing and immobilization of chondroitin-4-sulphate by UV laser radiation**, Gyorgy E.; Pérez del Pino, A.; Roqueta, J.; Sánchez C.; Oliva, A.G., *Colloids and Surfaces B: Biointerfaces*, **104**, 169-173 (2013)

- **Surface-induced dechlorination of FeOEP-Cl** on Cu(111)**, Van Vörden, D.; Lange, M.; Schaffert, J.; Cottin, M.C.; Schmuck, M.; Robles, R.; Wende, H.; Bobisch, C.A.; Möller, R., *Chemphyschem : a European journal of chemical physics and physical chemistry*, **14**, 3472-3475 (2013)

- I. Moder, G. Garcia, J. Santiso, J. Moodera, G. Miao, A. F. Lopeandía, J. Rodriguez-Viejo, *Thin Solid Films* (2013)

Invited talks:

- *"Metal-oxide thin films as high efficiency thermoelectric materials"*, **ImagineNano 2013**, Bilbao (Spain), abr-13, S. Bhansali, W. Khunsin, J. S. Reparaz, J. Roqueta, J. Santiso, P. O. Vaccaro, M. Garriga, M. I. Alonso, A. R. Goñi, B. Abad Mayor, P. Díaz-Chao, M. Martin-Gonzalez, J. Loureiro, I. Ferreira, and C. M. Sotomayor Torres., (Oral presentation)

- *"Diversity of strain-driven microstructures in ultrathin La0.7Sr0.3MnO3 epitaxial films"*, **THERMEC 2013, International Conference on Processing and Manufacturing of Advanced Materials, Symposium Fuel Cells, Hydrogen Storage Technologies, Batteries, Supercapacitors & Thermoelectric Materials**, Las Vegas (US), 2-6 Dec, 2013, J. Santiso, (Invited)

- *"Surface Mobility Tuning of Nanostructured Self-Organization: from Mound Formation to Step Flow Growth"*, **MRS Fall meeting 2013, Symposium P: Emergent Electron Transport Properties at Complex Oxide Interfaces**, Boston (US), 2-6 Dec, 2013, J. Roqueta, (Oral)

- *"Strain engineered microstructures in La0.7Sr0.3MnO3 epitaxial films"*, **EUROMAT, Symposium E1.III Materials for Energy: Fuel Cells**, Sevilla (Spain), 8-15 September, J. Santiso, (Invited)

- *"Thin films of mixed ionic-electronic conducting materials for Solid Oxide Fuel Cells"*, **E-MRS Fall Meeting 2013, Symposium B**, Warsaw (Poland), 16-19 September, J. Santiso, (Oral)

- *"Oxygen Chemical Diffusion across Epitaxial Oxide Interfaces: A Mixed Electronic Ionic Semiconductor Model"*, **JEMS 2013 Joint European Magnetic Symposia**, Rhodes (Greece), 25-30 August 2013, Z. Konstantinovic, (Oral)

- *"Thin films of mixed ionic-electronic conducting materials for Solid Oxide Fuel Cells cathodes"*, **NANOSELECT Annual Meeting 2013**, Sant Feliu de Guixols (Spain), 14-16 July, 2013, J. Santiso, (Oral)

Nanoscience Instrument Development Division

The Nanoscience Instrument Development Division, formed in 2010 and led by Dr Gustavo Ceballos, focuses on the design, development, improvement and deployment of advanced, state-of-the-art instruments for Nanoscience and Nanotechnology. It aims to create an integrated scientific and technical platform with a highly qualified multidisciplinary team that can address challenging instrumental projects in basic Nanoscience research as well as for Nanotechnology applications. The Division acts as an active collaborator for on-going experimental research efforts within ICN2 and, with neighbouring research institutions, develops new leading-edge instruments and techniques and provides valuable support for commercial development of the scientific instruments that it develops.

To access the Group's website, click here

NEW PROJECTS & MILESTONES IN 2013

Dr Ceballos is leading al the integrated scientific-technical support at the ICN2 (The Scientific-Technical Divisions and the core common equipment platform).

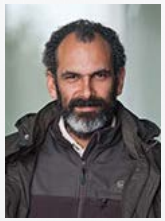
SERVICES

The Division provides scientific and technical assistance in Applied Physics; Precision Instrumentation; Microengineering; Nanotechnology; Metrology, Scientific Computing; and 3D-design of precision devices, to address challenging instrumental projects in basic Nanoscience research as well as for applied technology.

KEY PUBLICATIONS & INVITED TALKS IN 2013

Invited talks:

- *"Growth and Dynamics of Graphene Nanoislands on Ni(111)"*, **LMA Users Meeting 2013**, Zaragoza (Spain), 11/06/2013, Gustavo Ceballos, (Invited speaker)



Dr Gustavo Ceballos
Division Leader

Dr Gustavo Ceballos earned his BSc in Chemistry at the Central University of Venezuela in 1989. He obtained his PhD in 1996 at the Institut für Physikalische und Theoretische Chemie der Universität Bonn, Germany. In 1997 he moved to the Institut für Experimentalphysik der Freie Universität Berlin for postdoctoral studies, and from 2001 to 2002, worked at the Low-Temperature Scanning Tunnelling Microscopy (STM) Group at the Fritz-Haber-Institut der Max-Planck-Gesellschaft, also in Berlin. From 2002 to 2006 he was Research Scientist at the XSTM and Low-Temperature STM of Nanostructures Division at the Laboratorio Nazionale TASC-INFM, Trieste, Italy. In 2006 he joined ICN (now ICN2) as a Senior Scientist, where he eventually created the Nanoscience Instrument Development Division and where he actively participates in the research of the Atomic Manipulation and Spectroscopy Group.

Throughout his career, when endeavouring to perform new experiments, Dr Ceballos has frequently had to modify existing instruments or experimental setups, or develop new ones.

Division Members

Ceballos, Gustavo, *Division Leader*

Maymò, Marc, *Laboratory Engineer*

Active Competitive Projects in 2013

ATOMIC MANIPULATION AND SPECTROSCOPY GROUP PROJECTS

Project Title: Materiales con efecto espin-orbita amplificados para espintronica
Duration: 01/01/2011 - 30/06/2014
Scope: National
Principal Researcher at ICN2: Pietro GAMBARDELLA
Funding: MINECO
Call: PLAN NACIONAL

Project Title: Nanoscale Magnetization Dynamics NOMAD
Duration: 01/09/2008 - 31/08/2013
Scope: European
Principal Researcher at ICN2: Pietro GAMBARDELLA
Funding: CE
Call: 2007-ERC-St

Project Title: SGR
Duration: 04/08/2009 - 30/04/2014
Scope: National
Principal Researcher at ICN2: Pietro GAMBARDELLA
Funding: AGAUR
Call: SGR

Project Title: Spin Orbit Torque memory for cache & multicore processor applications
Duration: 01/10/2012 - 30/06/2013
Scope: European

Principal Researcher at ICN2: Pietro GAMBARDELLA
Funding: CE
Call: FP7-ICT-2011-8

FORCE PROBE MICROSCOPY AND SURFACE NANOENGINEERING GROUP PROJECTS

Project Title: Afinidad y estructura del agua interfacial sobre superficies nanoestructuradas en condiciones ambientales
Duration: 01/01/2013 - 31/12/2015
Scope:
Principal Researcher at ICN2: Albert VERDAGUER
Funding: MINECO
Call:

Project Title: Automated In-line Metrology for Nanoscale Production
Duration: 01/03/2013 - 31/6/2016
Scope:
Principal Researcher at ICN2: Jordi FRAXEDAS
Funding: UE
Call: NMP-2012-SME

INORGANIC NANOPARTICLES GROUP PROJECTS

Project Title: A pan European infraestructure for quality in nanomaterials safety testing
Duration: 01/02/2011 - 31/01/2015
Scope: European
Principal Researcher at ICN2: Victor F. PUNTES
Funding: CE
Call: FP7-INFRASTRUCTURES-2010-1.1.31

Project Title: Assessment and mitigation of nano-enabled product risks on human and environmental health: Development of new strategies and creation of a web-based guidance tool for nanotech industries.
Duration: 01/11/2013 - 30/04/2017
Scope: European
Principal Researcher at ICN2: Victor F. PUNTES
Funding: CE
Call: FP7-NMP.2013.1.3-1

Project Title: Cerium Oxide nanoparticles as a new therapeutic tool for tissue regeneration in liver diseases
Duration: 14/01/2013 - 13/01/2016
Scope: National
Principal Researcher at ICN2: Victor F. PUNTES
Funding: LA MARATO TV3
Call: LA MARATO TV3

Project Title: Desarrollo de Estrategias para Síntesis de Nanocristales Inorgánicos Multi-componente Complejos con Propiedades Físico-Químicas Ajustables
Duration: 01/02/2013 - 31/01/2016
Scope: National
Principal Researcher at ICN2: Victor F. PUNTES
Funding: MINECO
Call: PLAN NACIONAL

Project Title: Developing New Strategies for the Production of Viable Hybrid Nanocrystals with Applicability in Energy Conversion and (Photo)catalysis
Duration: 01/12/2012 - 30/11/2015

Scope: European
Principal Researcher at ICN2: Victor F. PUNTES
Funding: CE
Call: FP7-PEOPLE-2012-CIG

Project Title: NanoTOES-Nanotechnology: Training Of Experts in Safety
Duration: 01/11/2010 - 31/10/2014
Scope: European
Principal Researcher at ICN2: Victor F. PUNTES
Funding: CE
Call: FP7-PEOPLE-2010-ITN

Project Title: SGR
Duration: 28/09/2009 - 30/04/2014
Scope: National
Principal Researcher at ICN2: Victor F. PUNTES
Funding: AGAUR
Call: SGR

Project Title: Toxicological impact of nanomaterials derived from processing, weathering and recycling of polymer nanocomposites used in various industrial applications
Duration: 01/05/2010 - 30/04/2013
Scope: European
Principal Researcher at ICN2: Victor F. PUNTES
Funding: CE
Call: FP7-NMP-ENV-2009

MAGNETIC NANOSTRUCTURES GROUP PROJECTS

Project Title: Coupling effects in magnetic systems of reduced dimensionality
Duration: 01/01/2013 - 31/12/2016
Scope: European
Principal Researcher at ICN2: Josep NOGUES
Funding: CE
Call: FP7-PEOPLE-2012-IRSES

Project Title: Modulación de las propiedades magnéticas de nanopartículas y estructuras litografiadas, mediante parámetros intrínsecos y extrínsecos
Duration: 01/01/2011 - 30/06/2014
Scope: National
Principal Researcher at ICN2: Josep NOGUES
Funding: MINECO
Call: PLAN NACIONAL

Project Title: Ordered hetero- and Nano-structures with Epitaxial Dielectrics for magnetic and electronics Applications
Duration: 15/06/2010 - 14/06/2014
Scope: European
Principal Researcher at ICN2: Josep NOGUES
Funding: CE
Call: FP7-PEOPLE-2009-IRSES

NANOBIOELECTRONICS AND BIOSENSORS GROUP PROJECTS

Project Title: Development of Electrochemical Peptide Nanosensors for protein and antibody detection.
Duration: 01/05/2012 - 30/04/2015
Scope: European

Principal Researcher at ICN2: Arben MERKOÇI
Funding: CE
Call: FP7-PEOPLE-2011-IRSES

Project Title: Evaluación del receptor sensor de calcio como potencial nuevo gen supresor de tumores y diana terapéutica en neuroblastoma
Duration: 01/01/2011 - 31/12/2013
Scope: National
Principal Researcher at ICN2: Arben MERKOÇI
Funding: CELLEX
Call: N/A

Project Title: Multifunctional Nanoplatforms For High Sensitive Pollution Control And Purification Of Water
Duration: 01/12/2010 - 30/11/2013
Scope: National
Principal Researcher at ICN2: Arben MERKOÇI
Funding: MINECO
Call: PROYECTOS INTERNACIONALES

Project Title: Nanomateriales con alta capacidad de reconocimiento modulable electrónicamente, tipo on-off,para su aplicación en biosensores
Duration: 01/01/2012 - 31/12/2014
Scope: National
Principal Researcher at ICN2: Arben MERKOÇI
Funding: MINECO
Call: PLAN NACIONAL

Project Title: Nanoparticle-based Sensors for Detection of Chemical and Biological Threats
Duration: 22/06/2010 - 22/06/2013
Scope: International
Principal Researcher at ICN2: Arben MERKOÇI
Funding: NATO
Call: N/A

Project Title: Nanosystems for early Diagnosis of Neurodegenerative Diseases
Duration: 01/09/2010 - 31/08/2015
Scope: European
Principal Researcher at ICN2: Arben MERKOÇI
Funding: CE
Call: FP7-NMP-2009-LARGE-3

Project Title: Point of care diagnostics for rapid and cheap pathogen detection of companion animals
Duration: 01/09/2012 - 31/08/2014
Scope: European
Principal Researcher at ICN2: Arben MERKOÇI
Funding: CE
Call: FP7-SME-2012

Project Title: Sensing toxicants in Marine waters makes Sense using biosensors
Duration: 01/12/2013 - 31/08/2017
Scope: European
Principal Researcher at ICN2: Arben MERKOÇI
Funding: CE
Call: FP7-OCEAN-2013-1

Project Title: SGR
Duration: 10/09/2009 - 30/04/2014

Scope: National
Principal Researcher at ICN2: Arben MERKOÇI
Funding: AGAUR
Call: SGR

NANOBIOSENSORS AND BIOANALYTICAL APPLICATIONS GROUP PROJECTS

Project Title: Biosensors, Reporters and Algal Autonomous Vessels for Ocean Operation (BRAVOO)
Duration: 01/12/2013 - 01/12/2016
Scope:
Principal Researcher at ICN2: Lechuga Gomez, Laura Mª
Funding: UE
Call: UE

Project Title: Development of a low-cost point-of care test for Tuberculosis detection (POCKET)
Duration: 01/11/2013 - 01/11/2016
Scope:
Principal Researcher at ICN2: Lechuga Gomez, Laura Mª
Funding: UE, ICT-10-3.3
Call: UE, ICT-10-3.3

Project Title: Dispositivos nanofotonicos basados en plasmonica y nanoplasmonica para aplicaciones biosensoras multiplexadas de alta sensibilidad
Duration: 16/11/2009 - 15/11/2014
Scope:
Principal Researcher at ICN2: Lechuga Gomez, Laura Mª
Funding: Ministerio de Ciencia e Innovacion
Call: SUBPROGRAMA RAMÓN Y CAJAL

Project Title: Fabricacion de matrices de micropuentes huecos para aplicaciones biosensoras
Duration: 01/08/2012 - 30/05/2013
Scope:
Principal Researcher at ICN2: Lechuga Gomez, Laura Mª
Funding: Ministerio de Ciencia e Innovacion
Call: Proyecto GICSERV 8B (Contract NGG-234)

Project Title: INNovacion y desarrollo de sistemas portatiles de deteccion BIOlogica Optica de alta eficiencia (INNBIOD)
Duration: 01/12/2011 - 31/12/2014
Scope:
Principal Researcher at ICN2: Lechuga Gomez, Laura Mª
Funding: Ministerio de Ciencia e Innovacion
Call: Subprograma INNPACTO. Ministerio de Ciencia e Innovación

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Project Title: Lab-on-a-chip integration of biophotonic devices to study gene expression alterations in cellular pathways (EPISENS)
Duration: 01/01/2013 - 31/12/2015
Scope:
Principal Researcher at ICN2: Lechuga Gomez, Laura Mª
Funding: Ministerio de Ciencia e Innovacion
Call: Programa de Tecnología Electrónica y Comunicaciones PN de I+D+I

Project Title: PISTAS CELULARES DUROTACTICAS PARA LA DETECCION IN VIVO DE INTERACCIONES ENTRE LIGANDOS Y RECEPTORES DE MEMBRANA
Duration: 20/12/2011 - 19/12/2013
Scope:
Principal Researcher at ICN2: Lechuga Gomez, Laura Mª
Funding: Ministerio de Ciencia e Innovacion

Call: AYUDAS PARA LA REALIZACIÓN DE PROYECTOS DE INVESTIGACIÓN Y ACCIONES COMPLEMENTARIAS, SUBPROGRAMA DE ACCIONES COMPLEMENTARIAS A PROYECTOS DE INVESTIGACIÓN FUNDAMENTAL NO ORIENTADA. EXPLORA

Project Title: Specific Finantial support to the research activities of nanoB2A Group
Duration: 01/01/2012 - 01/01/2017
Scope:
Principal Researcher at ICN2: Lechuga Gomez, Laura Mª
Funding: Instituciones Privadas
Call:

NANOSTRUCTURED FUNCTIONAL MATERIALS GROUP PROJECTS

Project Title: Dispositivos moleculares
Duration: 01/01/2013 - 31/12/2015
Scope:
Principal Researcher at ICN2: D. Ruiz-Molina
Funding: Ministerio de Economía y competitividad
Call: 2012

NANOSTRUCTURED MATERIALS FOR PHOTOVOLTAIC ENERGY GROUP PROJECTS

Project Title: Flexible small molecule Organic Solar Cells
Duration: 01/11/2012 - 01/11/2013
Scope:
Principal Researcher at ICN2: Monica Lira-Cantú
Funding: Fundación Iberdrola
Call:

Project Title: Materiales avanzados y Nanotecnologías para dispositivos y sistemas eléctricos, electrónicos y magnetoeletrónicos innovadores-NANOSELECT
Duration: 2007 - 2014
Scope: National
Principal Researcher at ICN2: Monica Lira-Cantú
Funding: MEC
Call:

Project Title: Stable Next-Generation Photovoltaics: Unravelling Degradation Mechanisms of Organic Solar Cells by Complementary Characterization Techniques
Duration: 01/11/2013 - 01/11/2017
Scope: European
Principal Researcher at ICN2: Monica Lira-Cantú
Funding: EU
Call:

Project Title: Xarxa de Referència en Materials Avançats per a l'Energia Xarmae
Duration: 2009 - 2014
Scope: National
Principal Researcher at ICN2: Monica Lira-Cantú
Funding: Generalitat de Catalunya
Call:

NOVEL ENERGY-ORIENTED MATERIALS GROUP PROJECTS

Project Title: Development of novel SOlid MAterials for high power Li polymer BATteries
Duration: 2010 - 2013

Scope: European
Principal Researcher at ICN2: Pedro Gómez-Romero
Funding: CE
Call: FP7-2010-GC-ELECTROCHEMICAL-STORAGE - Sustainable automotive electrochemical storage (NMP)

Project Title: Materiales Nanoestructurados de Carbono e Híbridos para Almacenamiento de Energía
Duration: 2013 - 2015
Scope: National
Principal Researcher at ICN2: Pedro Gómez-Romero
Funding: MINECO
Call: Plan Nacional 2012

Project Title: Nanowires for Enery Storage
Duration: 2012 - 2015
Scope: European
Principal Researcher at ICN2: Pedro Gómez-Romero
Funding: CE
Call: FP7-ENERGY-2012-1-2STAGE - Energy Call - Part 1

OXIDE NANOELECTRONICS GROUP PROJECTS

Project Title: Flexoelectricity
Duration: 01/01/2013 - 31/12/2017
Scope: European
Principal Researcher at ICN2: Gustau CATALAN
Funding: CE
Call: ERC-2012-StG_20111012

PHONONIC AND PHOTONIC NANOSTRUCTURES GROUP PROJECTS

Project Title: Beyond CMOS Nanodevices for adding functionalities to CMOS
Duration: 01/09/2010 - 31/08/2013
Scope: European
Principal Researcher at ICN2: Clivia SOTOMAYOR
Funding: CE
Call: FP7-ICT-2009-call no 5

Project Title: Building a European NanoPhononics Community
Duration: 01/11/2013 - 31/10/2014
Scope: European
Principal Researcher at ICN2: Clivia SOTOMAYOR
Funding: CE
Call: FP7-ICT-2013-10

Project Title: Carbon based smart systems for wireless applications
Duration: 01/09/2012 - 31/08/2015
Scope: European
Principal Researcher at ICN2: Clivia SOTOMAYOR
Funding: CE
Call: FP7-ICT-2011-8

Project Title: Diseño de las Relaciones de Dispersión de Fonónes Acústicos
Duration: 01/02/2013 - 31/01/2016
Scope: National
Principal Researcher at ICN2: Clivia SOTOMAYOR
Funding: MINECO

Call: PLAN NACIONAL

Project Title: ECOSYSTEMS TECHNOLOGY and DESIGN for NANOELECTRONICS
Duration: 01/09/2010 - 28/02/2013
Scope: European
Principal Researcher at ICN2: Clivia SOTOMAYOR
Funding: CE
Call: FP7-ICT-2009-5

Project Title: Injection moulding production technology for multi-functional nano-structured plastic components enabled by Nano Imprint Lithography
Duration: 01/01/2013 - 31/12/2015
Scope: European
Principal Researcher at ICN2: Clivia SOTOMAYOR
Funding: CE
Call: FP7-2012-NMP-ICT-FoF

Project Title: Innovative Nano and Micro Technologies for Advanced Thermo and Mechanical Interfaces.
Duration: 01/09/2012 - 31/08/2015
Scope: European
Principal Researcher at ICN2: Clivia SOTOMAYOR
Funding: CE
Call: FP7-ICT-2011-8

Project Title: Large Area Molecularly Assembled Nanopatterns for Devices
Duration: 01/07/2010 - 30/06/2013
Scope: European
Principal Researcher at ICN2: Clivia SOTOMAYOR
Funding: CE
Call: FP7-NMP-2009-SMALL-3

Project Title: Membrane-based phonon engineering for energy harvesting
Duration: 01/01/2013 - 31/12/2015
Scope: European
Principal Researcher at ICN2: Clivia SOTOMAYOR
Funding: CE
Call: FP7-ENERGY-2012-1-2STAGE

Project Title: Nanoscale energy management for powering ICT devices
Duration: 01/08/2010 - 31/07/2013
Scope: European
Principal Researcher at ICN2: Clivia SOTOMAYOR
Funding: CE
Call: FP7-ICT-2009-5

Project Title: Nanostructured ThermoElectric Systems for Green Transport & Energy Efficient applications
Duration: 01/07/2011 - 30/06/2014
Scope: National
Principal Researcher at ICN2: Clivia SOTOMAYOR
Funding: MINECO/CE
Call: ENIAC

Project Title: QUANTItative scanning probe microscopy techniques for HEAT transfer management in nanomaterials and nanodevices
Duration: 01/12/2013 - 30/11/2017
Scope: European

Principal Researcher at ICN2: Clivia SOTOMAYOR
Funding: CE
Call: FP7-NMP-2013-LARGE-7

Project Title: Semiconductor Equipment Assessment Leveraging Innovation
Duration: 01/06/2010 - 30/09/2013
Scope: European
Principal Researcher at ICN2: Clivia SOTOMAYOR
Funding: CE
Call: FP7-ICT-2009-5

Project Title: SGR
Duration: 18/07/2009 - 30/04/2014
Scope: National
Principal Researcher at ICN2: Clivia SOTOMAYOR
Funding: AGAUR
Call: SGR

Project Title: Tailoring Electronic and Phononic Properties of Nanomaterials: Towards Improved Thermoelectricity (nanoTHERM)
Duration: 27/12/2010 - 26/12/2015
Scope: National
Principal Researcher at ICN2: Clivia SOTOMAYOR
Funding: MINECO
Call: CONSOLIDER

PHYSICS AND ENGINEERING OF NANOELECTRONIC DEVICES GROUP PROJECTS

Project Title: Beyond CMOS Nanodevices for adding functionalities to CMOS
Duration: 01/09/2010 - 31/08/2013
Scope: European
Principal Researcher at ICN2: Sergio VALENZUELA
Funding: CE
Call: FP7-ICT-2009-call no 5

Project Title: Exploring the spin physics at the boundaries of materials with strong spin orbit interaction
Duration: 01/02/2013 - 31/01/2018
Scope: European
Principal Researcher at ICN2: Sergio VALENZUELA
Funding: CE
Call: ERC-2012-STG_20111012

Project Title: New Trends on Topological Insulators
Duration: 03/06/2013 - 06/06/2013
Scope: International
Principal Researcher at ICN2: Sergio VALENZUELA
Funding: AFOSR
Call: N/A

Project Title: Transporte De Espines Y Dinamica De La Magnetizacion En Nanoestructuras
Duration: 01/01/2011 - 31/12/2013
Scope: National
Principal Researcher at ICN2: Sergio VALENZUELA
Funding: MINECO
Call: PLAN NACIONAL

SUPRAMOLECULAR NANOCHEMISTRY AND MATERIALS GROUP PROJECTS

Project Title: Desarrollo de una nueva generación de productos biocidas con efecto inmediato, remanente y capacidad para reducir la transferencia de microorganismos
Duration: 15/07/2012 - 16/07/2015
Scope: National
Principal Researcher at ICN2: Daniel MASPOCH
Funding: MINECO
Call: INNPACTO

Project Title: Diseño y Síntesis de Metal-Organic Frameworks Nanoscópicos para Aplicaciones Biomédicas Avanzadas
Duration: 01/02/2013 - 31/01/2016
Scope: National
Principal Researcher at ICN2: Daniel MASPOCH
Funding: MINECO
Call: PLAN NACIONAL

Project Title: Micro- and Nanoencapsulated Biocides: the next generation of Disinfectants with Short + Long-2Life Antimicrobial Activity
Duration: 01/01/2012 - 31/12/2013
Scope: National
Principal Researcher at ICN2: Daniel MASPOCH
Funding: CERCA
Call: PROVA'T

Project Title: Seguretat alimentaria: Desenvolupament de noves tecnologies basades en bacteriòfags pel control de la salmonel.losi
Duration: 01/01/2011 - 30/11/2013
Scope: National
Principal Researcher at ICN2: Daniel MASPOCH
Funding: RECERCAIXA
Call: RECERCAIXA

Project Title: Starting Grant: Multifunctional Hybrid Nanoparticle Pairs made from Metal-Organic Frameworks and Inorganic Nanoparticles
Duration: 01/01/2013 - 30/06/2014
Scope: National
Principal Researcher at ICN2: Daniel MASPOCH
Funding: MINECO
Call: AACC MODALIDAD E

Project Title: Validacion de la encapsulación de principios activos en micro y nanoparticulas metalorgánicas y su uso para la fabricación de desinfectantes de larga duracion
Duration: 01/06/2010 - 31/05/2013
Scope: National
Principal Researcher at ICN2: Daniel MASPOCH
Funding: MINECO
Call: TRACE

Project Title: Valorització d'un còctel fàgic mitjançant tècniques de nanoencapsulació pel control de la salmonel.losi
Duration: 14/01/2011 - 30/11/2013
Scope: National
Principal Researcher at ICN2: Daniel MASPOCH
Funding: AGAUR
Call: VALOR

THEORETICAL AND COMPUTATIONAL NANOSCIENCE GROUP PROJECTS

Project Title: Graphene-Based Revolutions in ICT And Beyond

Duration: 01/10/2013 - 31/03/2016
Scope: European
Principal Researcher at ICN2: Stephan ROCHE
Funding: CE
Call: FP7-ICT-2013-FET-F

Project Title: Multiscale simulation of charge transport properties in polycrystalline graphene
Duration: 01/01/2013 - 31/12/2013
Scope: International
Principal Researcher at ICN2: Stephan ROCHE
Funding: SAMSUNG
Call: GRO 2012 (SAMSUNG)

Project Title: Simulación Multi-escala de transporte cuántico en grafeno y aislantes topológicos
Duration: 01/02/2013 - 31/01/2016
Scope: National
Principal Researcher at ICN2: Stephan ROCHE
Funding: MINECO
Call: PLAN NACIONAL

Project Title: Workshop on 'New Trends in Topological Insulators'
Duration: 03/06/2013 - 06/06/2013
Scope: European
Principal Researcher at ICN2: Stephan ROCHE
Funding: ESF (European Science Foundation)
Call: ESF activity entitled 'Advanced Concepts in ab-initio Simulations of Materials'

THEORY AND SIMULATION GROUP PROJECTS

Project Title: Atomic Scale and single Molecule Logic gate Technologies (ATMOL)
Duration: -
Scope:
Principal Researcher at ICN2: Pablo Ordejón
Funding:
Call: 270028, FP7-ICT

Project Title: Dispositivos moleculares
Duration: -
Scope:
Principal Researcher at ICN2: Pablo Ordejón
Funding:
Call: MAT2012-38318-C03-02

Project Title: Simulaciones atomisticas de primeros principios: metodologa y aplicaciones a sistemas complejos
Duration: -
Scope:
Principal Researcher at ICN2: Pablo Ordejón
Funding:
Call: FIS201237549C0502

ELECTRON MICROSCOPY DIVISION PROJECTS

Project Title:
Duration: 01/01/2012 - 31/12/2014
Scope: National

Principal Researcher at ICN2:
Funding: MINECO
Call: PROGRAMA TÉCNICOS DE APOYO

Project Title: Adquisición de equipamiento para preparación de muestras para su observación por microscopía electrónica
Duration: 01/01/2011 - 31/12/2013
Scope: National
Principal Researcher at ICN2: Gustavo CEBALLOS
Funding: MINECO
Call: INFRAESTRUCTURAS CIENTÍFICO TECNOLÓGICAS

Project Title: Nanocapsules for targeted delivery of radioactivity
Duration: 01/02/2012 - 31/01/2016
Scope: European
Principal Researcher at ICN2: Gustavo CEBALLOS
Funding: CE
Call: FP7-PEOPLE-2011-ITN

NANOMATERIALS GROWTH DIVISION PROJECTS

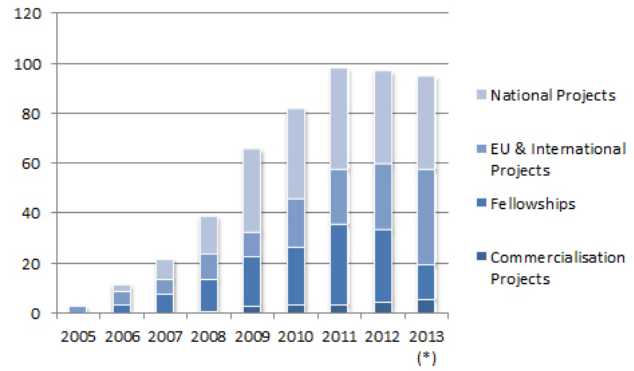
Project Title: Aspectos fundamentales del crecimiento epitaxial de heterostructuras de óxidos y mecanismos de relajación que controlan su nanoestructura y transporte iónico-electrónico
Duration: 01/01/2008 - 01/12/2014
Scope:
Principal Researcher at ICN2: Jose Santiso
Funding: MICINN
Call:

Project Title: Funcionalización Superficial de Materiales para Aplicaciones de Alto Valor Añadido
Duration: 01/01/2012 - 01/12/2014
Scope:
Principal Researcher at ICN2: Jose Santiso
Funding: MICINN
Call:

International Competitiveness

Among ICN2's principal objectives is to be highly competitive at the international level, both in the quality of the science it produces and the levels of competitive funding that it secures through national and international grants and fellowships and through commercialisation accords with companies. To date, ICN2 has obtained competitive funding from numerous entities, including the European Commission; the Spanish Ministry of Economy and Competitiveness (MINECO); ACC1Ó; and the Catalan Agency for Administration of University and Research Grants (AGAUR).

Number of competitive active projects

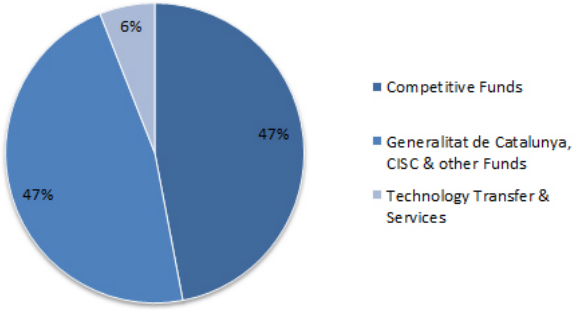


(*) Only 2013 numbers include information from CSIC.

Income

ICN2's total operating funds in 2013 were €8,002,458.

Breakdown of ICN2 Operating Funds in 2013

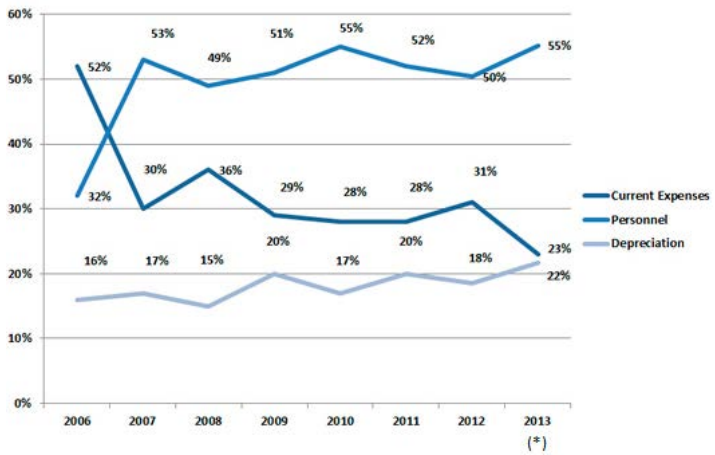


Expenses

In 2013 total expenditure at ICN2 was €8,473,919. Expenses are classified as follows:

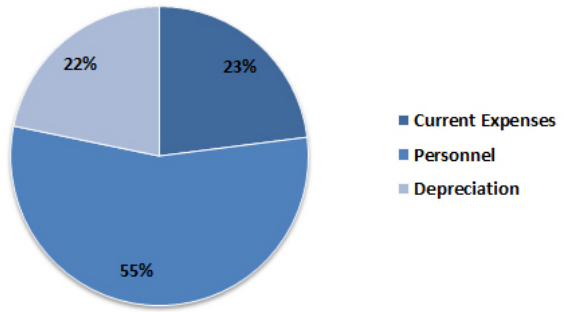
- **Project Expenses:** These fund Research, and Technology Transfer. They comprise Current Expenses, Personnel Costs, and Depreciation.
- **Ordinary Expenses:** These fund management structure and services. They comprise Current Expenditure, Personnel Costs and Depreciation.

Evolution of expenses: 2006 to 2013



(*) Only 2013 numbers include information from CSIC.

Expenses 2013


22%
23%
55%
Current Expenses
Personnel
Depreciation

Personnel (Alphabetical)

Surname	First Name	Position	Department
Álvarez	Maria Del Mar	CSIC Postdoctoral Researcher	NanoBiosensors and Bioanalytical Applications Group
Abufager	Paula	Visiting Postdoctoral Researcher	Theory and Simulation Group
Alonso	José Miguel	CSIC Tenured Scientist	Theory and Simulation Group
Alvarado	Santos Francisco	Visiting Scientist	Atomic Manipulation and Spectroscopy Group
Alzina	Francesc	Senior Researcher	Phononic and Photonic Nanostructures Group
Amadei	Carlo Alberto	CSIC Visiting Doctoral Student	Force Probe Microscopy & Surface Nanoengineering Group
Andersen	Nick Papior	CSIC Visiting Postdoctoral Researcher	Theory and Simulation Group
Arfaoui	Khalil Raphael	CSIC Visiting Doctoral Student	Nanostructured Materials for Photovoltaic Energy Group
Argemi	Alex	Scientific Communication Manager	Management and Services - Communication
Ariñez	Javier	Doctoral Student	Supramolecular NanoChemistry & Materials Group
Arias	Noèlia	Group Project Manager	Phononic and Photonic Nanostructures Group
Armstrong	Eileen	Visiting Doctoral Student	Phononic and Photonic Nanostructures Group
Avci	Can Onur	Doctoral Student	Atomic Manipulation and Spectroscopy Group
Ayala	Abraham	Doctoral Student	Supramolecular NanoChemistry & Materials Group
Ayyad	Omar	Postdoctoral Researcher	Novel Energy-Oriented Materials Group
Bagués Salg	Núria	CSIC Doctoral Student	Nanomaterials Growth Division
Ballesteros	Belén	Division Leader	Electron Microscopy Division
Baptista	Luis Miguel	Doctoral Student	Nanobioelectronics and Biosensors Group
Barrios	Jose Eduardo	Visiting Postdoctoral Researcher	Theoretical and Computational Nanoscience Group
Belarre	Francisco Javier	Technician	Electron Microscopy Division
Bellafont	Lluís	ICN2 Manager	Management and Services - Finance
Bernal	Monica Emperatriz	Visiting Doctoral Student	Phononic and Photonic Nanostructures Group
Bhansali	Sweta	Doctoral Student	Phononic and Photonic Nanostructures Group
Bonell	Frédéric	Marie Curie Postdoctoral Researcher	Physics and Engineering of Nanodevices Group
Borges	Marta	CSIC Visiting Doctoral Student	Nanostructured Functional Materials Group

Borrisé	Xavier	Technician	Common Equipment
Boskovic	Desanka	CSIC Doctoral Student	Theory and Simulation Group
Brandbyge	Mads	Visiting Scientist	Theoretical and Computational Nanoscience Group
Burneo	Ivan Patricio	Doctoral Student	Supramolecular NanoChemistry & Materials Group
Busquets	Martí	Doctoral Student	Inorganic Nanoparticles Group
Caño	Inmaculada	Travel and Expenses Services	Management and Services - Finance
Caban	Zahilia	Doctoral Student	Novel Energy-Oriented Materials Group
Cadevall	Miquel	Visiting Doctoral Student	Nanobioelectronics and Biosensors Group
Cadkova	Michaela	Visiting Doctoral Student	Nanobioelectronics and Biosensors Group
Caicedo	José Manuel	CSIC Postdoctoral Researcher	Nanostructured Materials for Photovoltaic Energy Group
Camarero	Laura	Assistant	Management and Services - Finance
Cano	Antonia Maria	Postdoctoral Researcher	Supramolecular NanoChemistry & Materials Group
Carbonell	Carlos	Laboratory Engineer	Supramolecular NanoChemistry & Materials Group
Cardeñosa	Mª Cruz	CSIC Visiting Student	NanoBiosensors and Bioanalytical Applications Group
Carné	Arnau	Doctoral Student	Supramolecular NanoChemistry & Materials Group
Carreras	Miriam	Visiting Student	Management and Services - Communication
Casals	Eudald	Laboratory Engineer	Inorganic Nanoparticles Group
Catalán	Gustavo	ICREA Research Professor and Group Leader	Oxide Nanoelectronics Group
Ceballos	Gustavo	Head of the Core Facilities	Core Research Support Facilities
Ceballos	Gustavo	Division Leader	Nanoscience Instrument Development Division
Chávez	Emigdio	Doctoral Student	Phononic and Photonic Nanostructures Group
Chalupniak	Andrzej	Doctoral Student	Nanobioelectronics and Biosensors Group
Chamorro	Alejandro	Doctoral Student	Nanobioelectronics and Biosensors Group
Chamorro	Natalia	Visiting Student	Nanobioelectronics and Biosensors Group
Ciardi	Agnese	Visiting Student	Supramolecular NanoChemistry & Materials Group
Collados	Mireia	Human Resources Officer	Management and Services - HR and Education
Comenge	Joan	Doctoral Student	Inorganic Nanoparticles Group
Cordero	Rohíni Kuma	Doctoral Student	Oxide Nanoelectronics Group
Corominas	Marc	Assistant	Management and Services - Finance
Costache	Marius Vasile	Ramon y Cajal Researcher	Physics and Engineering of Nanodevices Group
Cresti	Alessandro	Visiting Scientist	Theoretical and Computational Nanoscience Group
Cummings	Aron	Postdoctoral Researcher	Theoretical and Computational Nanoscience Group
Da Silva	Everson Thiago	Visiting Doctoral Student	Nanobioelectronics and Biosensors Group
Dante	Stefania	FPU Doctoral Student	NanoBiosensors and Bioanalytical Applications Group
de la Escosura	Alfredo	Postdoctoral Researcher	Nanobioelectronics and Biosensors Group

de la Osa	Ana	Events Officer	Management and Services - Communication
De Sousa Lima	Francisco Anderson	CSIC Doctoral Student	Nanostructured Materials for Photovoltaic Energy Group
del Pozo	Marc	Visiting Student	Supramolecular NanoChemistry & Materials Group
Del Rey	Alfonso	Technological Transfer Officer	Management and Services - Technology Transfer
Delgado Simao	Claudia	Postdoctoral Researcher	Phononic and Photonic Nanostructures Group
Dinh	Van Tuan	Doctoral Student	Theoretical and Computational Nanoscience Group
Domínguez	Carlos Germán	Maintenance Technician	Management and Services - General Services
Domene	Sandra	Purchasing Services	Management and Services - Finance
Domingo	Neus	Ramon y Cajal Researcher	Oxide Nanoelectronics Group
Duval	Daphné	CIBER Postdoctoral Researcher	NanoBiosensors and Bioanalytical Applications Group
Echavarria Troya	Fernando	CSIC Doctoral Student	Nanostructured Materials for Photovoltaic Energy Group
Espín	Jordi	Doctoral Student	Supramolecular NanoChemistry & Materials Group
Espinoza	Marisol	Doctoral Student	Nanobioelectronics and Biosensors Group
Esplandiu	María José	CSIC Tenured Scientist	Force Probe Microscopy & Surface Nanoengineering Group
Estévez	Maria Carmen	CSIC Postdoctoral Researcher	NanoBiosensors and Bioanalytical Applications Group
Evangelio	Maria Emilia	Postdoctoral Researcher	Supramolecular NanoChemistry & Materials Group
Evangelio	Laura	CSIC Visiting Doctoral Student	Force Probe Microscopy & Surface Nanoengineering Group
F. Puntes	Víctor	ICREA Research Professor and Group Leader	Inorganic Nanoparticles Group
Fabregat	Clara	Visiting Student	Supramolecular NanoChemistry & Materials Group
Fariña	David	CIBER Technician	NanoBiosensors and Bioanalytical Applications Group
Fattahhesari	Ali	Visiting Doctoral Student	Nanobioelectronics and Biosensors Group
Fernández	Ariadna	Doctoral Student	Phononic and Photonic Nanostructures Group
Ferrer	Nicolás	Undergraduate	Theoretical and Computational Nanoscience Group
Fomitcheva	Anna	Visiting Student	Nanobioelectronics and Biosensors Group
Francesch	Astrid	Assistant	Management and Services - General Services
Franco	Ruth	Accountant	Management and Services - Finance
Francone	Achille Leo	Postdoctoral Researcher	Nanofabrication Division
Francone	Achille	Postdoctoral Researcher	Phononic and Photonic Nanostructures Group
Fraxedas	Jordi	CSIC Research Scientist	Force Probe Microscopy & Surface Nanoengineering Group
Gòmez	Silvia	CIBER Technician	NanoBiosensors and Bioanalytical Applications Group
Gòmez	Pedro	CSIC Research Professor	Novel Energy-Oriented Materials Group
Gòmez	Neus	Juan de la Cierva Researcher	Inorganic Nanoparticles Group
Gòmez	Alejandro	Postdoctoral Researcher	Magnetic Nanostructures Group

Gòmez-Casaña	Daniel	CSIC Visiting Student	Novel Energy-Oriented Materials Group
Gambardella	Pietro	Research Professor	Atomic Manipulation and Spectroscopy Group
García	Pablo	Technician	Common Equipment
García	Sonia	Postdoctoral Researcher	Supramolecular NanoChemistry & Materials Group
García	Beatriz	CSIC Doctoral Student	Nanostructured Functional Materials Group
García	Yamila	Postdoctoral Researcher	Phononic and Photonic Nanostructures Group
García Cortadella	Ramon	CSIC Visiting Student	Novel Energy-Oriented Materials Group
Garc&#65533;a	Pablo	Technician	Core Research Support Facilities
Garello	Kevin	Postdoctoral Researcher	Atomic Manipulation and Spectroscopy Group
Garrés	Montserrat	Internal Communication Officer	Management and Services - HR and Education
Gastaldo	Michele	Doctoral Student	Atomic Manipulation and Spectroscopy Group
Ghosh	Abhijit	Postdoctoral Researcher	Atomic Manipulation and Spectroscopy Group
Godey	Sylvie	Technician	Atomic Manipulation and Spectroscopy Group
Gomis	Jordi	Postdoctoral Researcher	Phononic and Photonic Nanostructures Group
González	Silvia	CSIC Visiting Senior Researcher	Theory and Simulation Group
González	Ana Belén	CSIC Postdoctoral Researcher	NanoBiosensors and Bioanalytical Applications Group
González	Marta	Group Project Manager	Supramolecular NanoChemistry & Materials Group
González-Valls	Irene	Postdoctoral Researcher	Nanostructured Materials for Photovoltaic Energy Group
Goy	Sonia	Visiting Doctoral Student	Inorganic Nanoparticles Group
Graczykowski	Bartlomiej	Postdoctoral Researcher	Phononic and Photonic Nanostructures Group
Granadero	Cristina	Director's Assistant	Management and Services
Gravagnuolo	Alfredo Maria	Visiting Doctoral Student	Nanobioelectronics and Biosensors Group
Gros	Pau	Visiting Student	Management and Services - Communication
Guardia	Pablo	Doctoral Student	Inorganic Nanoparticles Group
Guardingo	Mireia	CSIC Doctoral Student	Nanostructured Functional Materials Group
Gubanova	Nadezhda	Visiting Doctoral Student	Magnetic Nanostructures Group
Guillotel	Erwan	Group Project Manager	Phononic and Photonic Nanostructures Group
Guix	Maria	Doctoral Student	Nanobioelectronics and Biosensors Group
Hernando	Jordi	IT Assistant	Management and Services - IT
Hlavata	Lenka	Visiting Doctoral Student	Nanobioelectronics and Biosensors Group
Hoflich	Manfred	IT Client Services	Management and Services - IT
Honda	Yuki	Visiting Doctoral Student	Nanobioelectronics and Biosensors Group
Huhs	Georg	Visiting Doctoral Student	Theory and Simulation Group
Hussein	Abdel-Rahim	Visiting Postdoctoral Researcher	Nanobioelectronics and Biosensors Group
Ilzarbe	Francesc Xavier	Junior IT Officer	Management and Services - IT
Imaz	Inhar	Ramon y Cajal Researcher	Supramolecular NanoChemistry & Materials Group

Jamier	Vincent	Project Manager	Management and Services - Technology Transfer
Kafa	Houmam	Visiting PhD student	Electron Microscopy Division
Kahsay	Adane	Visiting Student	Supramolecular NanoChemistry & Materials Group
Kehagias	Nikolaos	Division Leader	Nanofabrication Division
Kenesei	Kata	Visiting Doctoral Student	Inorganic Nanoparticles Group
Kepenekian	Mikaël	Postdoctoral Researcher	Theory and Simulation Group
Khunsin	Worawut	Postdoctoral Researcher	Phononic and Photonic Nanostructures Group
Kirchhoff	Alexandra	Visiting Student	Phononic and Photonic Nanostructures Group
Kogon	Boaz	Strategy Manager	Management and Services - Strategy
Koziel	Marta	CSIC Visiting Student	NanoBiosensors and Bioanalytical Applications Group
Kreuzer	Martin	Postdoctoral Researcher	Phononic and Photonic Nanostructures Group
Krull	Cornelius	Postdoctoral Researcher	Atomic Manipulation and Spectroscopy Group
Kumarasamy	Murali	Visiting Doctoral Student	Inorganic Nanoparticles Group
Kurbanoglu	Sevinç	Visiting Doctoral Student	Nanobioelectronics and Biosensors Group
Lòpez	Christian	Visiting Student	Physics and Engineering of Nanodevices Group
Lòpez	Cecilia	Group Project Manager	Inorganic Nanoparticles Group
Lòpez	Laura	Doctoral Student	Oxide Nanoelectronics Group
Lòpez	Adaris Maria	Visiting Doctoral Student	Nanobioelectronics and Biosensors Group
Lòpez	Cristina	Technological Transfer Officer	Management and Services - Technology Transfer
Lòpez-Barberá	José Francisco	Postdoctoral Researcher	Magnetic Nanostructures Group
Lamine	Ly	Receptionist	Management and Services - General Services
Lechuga	Laura	CSIC Full Professor	NanoBiosensors and Bioanalytical Applications Group
Leconte	Nicolas	Postdoctoral Researcher	Theoretical and Computational Nanoscience Group
Li	Yang	Visiting Doctoral Student	Inorganic Nanoparticles Group
Lira-Cantú	Mónica	CSIC Tenured Track Group Leader	Nanostructured Materials for Photovoltaic Energy Group
Lizcano	David	IT Manager	Management and Services - IT
Lorente	Nicolás	CSIC Research Scientist	Theory and Simulation Group
Losoya	Adrian	CONACYCT PhD. Student	NanoBiosensors and Bioanalytical Applications Group
Márquez	Salomon Elieser	CONACYCT PhD. Student	NanoBiosensors and Bioanalytical Applications Group
Macià	Antonio	IT Network and Security Engineer	Management and Services - IT
Maldonado	Jesús Manuel	CONACYCT PhD. Student	NanoBiosensors and Bioanalytical Applications Group
Malec	Jedrzej Rafal	Visiting Student	Nanobioelectronics and Biosensors Group
Mandli	Jihane	Visiting Doctoral Student	Nanobioelectronics and Biosensors Group
Mars	Abdelmoneim	Visiting Doctoral Student	Nanobioelectronics and Biosensors Group
Martí	Mireia	Projects Department Manager	Management and Services - Projects

Martín	Patricia	Visiting Student	Nanobioelectronics and Biosensors Group
Martínez	Francesc	CSIC Visiting Student	NanoBiosensors and Bioanalytical Applications Group
Martínez Gordillo	Rafael	CSIC Doctoral Student	Theory and Simulation Group
Marte	Juan Luis	Technician	Core Research Support Facilities
Maspoch	Daniel	ICREA Research Professor and Group Leader	Supramolecular NanoChemistry & Materials Group
Massaro	Giuseppina	CSIC Visiting Doctoral Student	Nanostructured Functional Materials Group
May	Patrick	Postdoctoral Researcher	Phononic and Photonic Nanostructures Group
Maymò	Marc	Laboratory Engineer	Nanoscience Instrument Development Division
Mayorga	Carmen	Postdoctoral Researcher	Nanobioelectronics and Biosensors Group
Medina	Mariana	Student	Nanobioelectronics and Biosensors Group
Medina	Juan Ignacio	Laboratory Engineer	Nanofabrication Division
Megson	Zoe	Doctoral Student	Inorganic Nanoparticles Group
Mejías	Nereida	Technician	Supramolecular NanoChemistry & Materials Group
Menendez Dalmau	Enric	Visiting Postdoctoral Researcher	Magnetic Nanostructures Group
Merkoçi	Florind	Technician	Inorganic Nanoparticles Group
Merkoçi	Arben	ICREA Research Professor and Group Leader	Nanobioelectronics and Biosensors Group
Migani	Annapaola	CSIC Ramon y Cajal Researcher	Theory and Simulation Group
Miserere	Sandrine	Postdoctoral Researcher	Nanobioelectronics and Biosensors Group
Montòn	Helena	Visiting Doctoral Student	Nanobioelectronics and Biosensors Group
Morales	Eden	Postdoctoral Researcher	Nanobioelectronics and Biosensors Group
Moreno	Laura	Visiting Student	Inorganic Nanoparticles Group
Moreno	Roberto	CSIC Doctoral Student	Nanomaterials Growth Division
Mugarza	Aitor	Tenure Track Group Leader	Atomic Manipulation and Spectroscopy Group
Nador	Fabiana	Visiting Postdoctoral Researcher	Nanostructured Functional Materials Group
Narváez	Jackeline	CSIC Doctoral Student in transition to ICN	Oxide Nanoelectronics Group
Navarro	Joana	Visiting Student	Supramolecular NanoChemistry & Materials Group
Navarro	Daniel	Postdoctoral Researcher	Phononic and Photonic Nanostructures Group
Navarro	Guillem	Visiting Student	Nanobioelectronics and Biosensors Group
Neumann	Ingmar	Doctoral Student	Physics and Engineering of Nanodevices Group
Nieto	Emma	Finance and TT Project Management	Management and Services - Finance
Nistor	Corneliu	Postdoctoral Researcher	Atomic Manipulation and Spectroscopy Group
Nogués	Josep	ICREA Research Professor and Group Leader	Magnetic Nanostructures Group
Novio	Fernando	CSIC Juan de la Cierva Researcher	Nanostructured Functional Materials Group

Nunes	Gisele Elias	Visiting Doctoral Student	Nanobioelectronics and Biosensors Group
Ollé	Marc	Doctoral Student	Atomic Manipulation and Spectroscopy Group
Oneca	Raquel	Assistant	Management and Services - HR and Education
Ordejón	Pablo	CSIC Full Professor	Theory and Simulation Group
Ortmann	Frank	Senior Researcher	Theoretical and Computational Nanoscience Group
Otte	Marinus A.	CSIC Postdoctoral Researcher	NanoBiosensors and Bioanalytical Applications Group
Pérez	Pablo Matias	Visiting Doctoral Student	Theoretical and Computational Nanoscience Group
Pérez	Rocio	Human Resources Manager	Management and Services - HR and Education
Pérez	Briza	Visiting Postdoctoral Researcher	Nanobioelectronics and Biosensors Group
Pérez	Miguel Angel	CSIC Doctoral Student	Theory and Simulation Group
Pach	Elzbieta	Doctoral Student	Electron Microscopy Division
Parolo	Claudio	Student	Nanobioelectronics and Biosensors Group
Patarroyo	Javier	Doctoral Student	Inorganic Nanoparticles Group
Pedersen	Jesper Goor	Visiting Postdoctoral Researcher	Theoretical and Computational Nanoscience Group
Piña	Ana Patricia	CSIC Visiting Doctoral Student	NanoBiosensors and Bioanalytical Applications Group
Picazo	Gemma	Visiting Student	Management and Services - Communication
Piella	Jordi	Doctoral Student	Inorganic Nanoparticles Group
Pino	Flavio	Visiting Doctoral Student	Nanobioelectronics and Biosensors Group
Puig	Anna	Group Project Manager	Nanobioelectronics and Biosensors Group
Quesada	Daniel	Visiting Student	Nanobioelectronics and Biosensors Group
Qushair	Gregory	Scientific Communication Officer	Management and Services - Communication
Rabti	Amal	Visiting Doctoral Student	Nanobioelectronics and Biosensors Group
Raes	Bart	Postdoctoral Researcher	Physics and Engineering of Nanodevices Group
Rasmussen	Jesper	Visiting Doctoral Student	Theoretical and Computational Nanoscience Group
Reparaz	Juan Sebastián	Postdoctoral Researcher	Phononic and Photonic Nanostructures Group
Reverter	Jordi	Technology Transfer Manager	Management and Services - Technology Transfer
Rivas	lourdes Josefina	Visiting Doctoral Student	Nanobioelectronics and Biosensors Group
Rivas	David	IT Network and Security Engineer	Management and Services - IT
Robles	Roberto	CSIC Postdoctoral Researcher	Theory and Simulation Group
Roche	Stephan	ICREA Research Professor and Group Leader	Theoretical and Computational Nanoscience Group
Rodríguez	Anabel	Human Resources Officer	Management and Services - HR and Education
Rodríguez Delgado	Melissa Marlene	CONACYCT PhD. Student	NanoBiosensors and Bioanalytical Applications Group
Roqueta	Jaume	CSIC Technician	Nanomaterials Growth Division
Ros	Xavier	General Services Manager	Management and Services - General Services
Rosado	Marcos	Technician	Electron Microscopy Division

Roscini	Claudio	CSIC Postdoctoral Researcher	Nanostructured Functional Materials Group
Rubio	Sofia	Doctoral Student	Inorganic Nanoparticles Group
Rubio	Marta	Doctoral Student	Supramolecular NanoChemistry & Materials Group
Ruiz	Daniel	CSIC Research Scientist	Nanostructured Functional Materials Group
Ruiz	Vanesa	CSIC Juan de la Cierva Researcher	Novel Energy-Oriented Materials Group
Ruiz	Yasser Bruno	Visiting Doctoral Student	Phononic and Photonic Nanostructures Group
Ruyra	Àngels	Doctoral Student	Supramolecular NanoChemistry & Materials Group
Sáez	Adrian	Visiting Student	Supramolecular NanoChemistry & Materials Group
Sánchez	César	Doctoral Student	NanoBiosensors and Bioanalytical Applications Group
Sánchez	Sonia	Visiting Student	Nanobioelectronics and Biosensors Group
Sabir	Nadeem	Visiting Doctoral Student	Inorganic Nanoparticles Group
Saiz	Javier	Technician	Core Research Support Facilities
Saiz	Javier	Technician	Common Equipment
Sanli	Serdar	Visiting Doctoral Student	Nanobioelectronics and Biosensors Group
Santiso	José	CSIC Tenured Scientist	Nanomaterials Growth Division
Santos	Sergi	CSIC Visiting Postdoctoral Researcher	Force Probe Microscopy & Surface Nanoengineering Group
Santos	Charlene	Visiting Doctoral Student	Nanobioelectronics and Biosensors Group
Sareminaeini	Sahar	Visiting Student	Oxide Nanoelectronics Group
Sauthier	Guillaume	Technician	Common Equipment
Sauthier	Guillaume	Technician	Core Research Support Facilities
Schirone	Stefano	Doctoral Student	Atomic Manipulation and Spectroscopy Group
Schultz	Carolin	Visiting Doctoral Student	Inorganic Nanoparticles Group
Sedò	Josep	CSIC Project Manager	Nanostructured Functional Materials Group
Sepúlveda	Borja	CSIC Tenured Scientist	NanoBiosensors and Bioanalytical Applications Group
Serra	Anna	CSIC Visiting Student	NanoBiosensors and Bioanalytical Applications Group
Sierra	Juan Francisco	Postdoctoral Researcher	Physics and Engineering of Nanodevices Group
Silva	José Angel	CSIC Doctoral Student	Theory and Simulation Group
Simmchen	Juliane	CSIC Doctoral Student	Nanostructured Functional Materials Group
Sledzinska	Marianna	Laboratory Engineer	Phononic and Photonic Nanostructures Group
Solís	Verónica Iraís	CONACYCT PhD. Student	NanoBiosensors and Bioanalytical Applications Group
Soler	Joan Antoni	Visiting Student	Nanobioelectronics and Biosensors Group
Soler	María	FPI Doctoral Student	NanoBiosensors and Bioanalytical Applications Group
Soriano	David	Postdoctoral Researcher	Theoretical and Computational Nanoscience Group
Sotomayor	Clivia	ICREA Research Professor and Group Leader	Phononic and Photonic Nanostructures Group

Spinato	Cinzia	Visiting PhD student	Electron Microscopy Division
Stylianou	Kyriakos	Postdoctoral Researcher	Supramolecular NanoChemistry & Materials Group
Suárez	Julieth	CSIC Doctoral Student	Novel Energy-Oriented Materials Group
Terán-Escobar	Gerardo	CSIC Doctoral Student	Nanostructured Materials for Photovoltaic Energy Group
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Torres	Dámaso	Webmaster and Graphic Designer	Management and Services - Communication
Torres	Hector	CSIC Visiting Doctoral Student	Nanostructured Functional Materials Group
Tran Thi Thanh	Ngoc	Doctoral Student	Inorganic Nanoparticles Group
Troiano	Gustavo Feliciano	Visiting Postdoctoral Researcher	Theory and Simulation Group
Vázquez	Nuria Alexandra	CSIC Doctoral Student	Nanostructured Functional Materials Group
Valenzuela	Sergio	ICREA Research Professor and Group Leader	Physics and Engineering of Nanodevices Group
Valenzuela	Francisco Javier	Maintenance Technician	Management and Services - General Services
Vanwaelscappel	Auréelie	CSIC Visiting Doctoral Student	Nanostructured Materials for Photovoltaic Energy Group
Vela	Judit	Finance Director	Management and Services - Finance
Verdaguer	Albert	CSIC Tenured Scientist	Force Probe Microscopy & Surface Nanoengineering Group
Vila	Marc	Visiting Student	Supramolecular NanoChemistry & Materials Group
Vilasau	Jon	Postdoctoral Researcher	Nanostructured Functional Materials Group
Wagner	Markus	Postdoctoral Researcher	Phononic and Photonic Nanostructures Group
Wnuk	Karolina	CSIC Doctoral Student	Nanostructured Functional Materials Group
Yudina	Tetyana	Doctoral Student	Inorganic Nanoparticles Group
Zárate	Ángela	CSIC Administration	Management and Services - Finance
Zamora	Alejandro	Visiting Student	Nanobioelectronics and Biosensors Group
Zapata	James Arturo	CSIC Visiting Doctoral Student	Nanomaterials Growth Division

Personnel (By Department)

Department	Surname	First Name	Position
Director's Office			
	Ordejón	Pablo	ICN2 Director
	Granadero	Cristina	Director's Assistant
Atomic Manipulation and Spectroscopy Group			
	Mugarza	Aitor	Tenure Track Group Leader
	Gambardella	Pietro	Research Professor
	Alvarado	Santos Francisco	Visiting Scientist
	Avci	Can Onur	Doctoral Student
	Garello	Kevin	Postdoctoral Researcher
	Gastaldo	Michele	Doctoral Student
	Ghosh	Abhijit	Postdoctoral Researcher
	Godey	Sylvie	Technician
	Krull	Cornelius	Postdoctoral Researcher
	Nistor	Corneliu	Postdoctoral Researcher
	Ollé	Marc	Doctoral Student
	Schirone	Stefano	Doctoral Student
Force Probe Microscopy and Surface Nanoengineering Group			
	Fraxedas	Jordi	CSIC Research Scientist
	Esplandiu	María José	CSIC Tenured Scientist
	Verdaguer	Albert	CSIC Tenured Scientist
	Amadei	Carlo Alberto	CSIC Visiting Doctoral Student
	Evangelio	Laura	CSIC Visiting Doctoral Student
	Santos	Sergi	CSIC Visiting Postdoctoral Researcher
Inorganic Nanoparticles Group			
	F. Puntes	Víctor	ICREA Research Professor and Group Leader
	Busquets	Martí	Doctoral Student

	Casals	Eudald	Laboratory Engineer
	Comenge	Joan	Doctoral Student
	Gòmez	Neus	Juan de la Cierva Researcher
	Goy	Sonia	Visiting Doctoral Student
	Guardia	Pablo	Doctoral Student
	Kenesei	Kata	Visiting Doctoral Student
	Kumarasamy	Murali	Visiting Doctoral Student
	Lòpez	Cecilia	Group Project Manager
	Li	Yang	Visiting Doctoral Student
	Megson	Zoe	Doctoral Student
	Merkoçi	Florind	Technician
	Moreno	Laura	Visiting Student
	Patarroyo	Javier	Doctoral Student
	Piella	Jordi	Doctoral Student
	Rubio	Sofia	Doctoral Student
	Sabir	Nadeem	Visiting Doctoral Student
	Schultz	Carolin	Visiting Doctoral Student
	Tran Thi Thanh	Ngoc	Doctoral Student
	Yudina	Tetyana	Doctoral Student
Nanostructured Materials for Photovoltaic Energy Group			
	Lira-Cantú	Mónica	CSIC Tenured Track Group Leader
	Arfaoui	Khalil Raphael	CSIC Visiting Doctoral Student
	Caicedo	José Manuel	CSIC Postdoctoral Researcher
	De Sousa Lima	Francisco Anderson	CSIC Doctoral Student
	Echavarria Troya	Fernando	CSIC Doctoral Student
	González-Valls	Irene	Postdoctoral Researcher
	Terán-Escobar	Gerardo	CSIC Doctoral Student
	Vanwaelscappel	Auréelie	CSIC Visiting Doctoral Student
Magnetic Nanostructures Group			
	Nogués	Josep	ICREA Research Professor and Group Leader
	Gòmez	Alejandro	Postdoctoral Researcher
	Gubanova	Nadezhda	Visiting Doctoral Student
	Lòpez-Barberá	José Francisco	Postdoctoral Researcher
	Menendez Dalmau	Enric	Visiting Postdoctoral Researcher
Nanobioelectronics and Biosensors Group			
	Merkoçi	Arben	ICREA Research Professor and Group Leader

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Cadevall	Miquel	Visiting Doctoral Student
Cadkova	Michaela	Visiting Doctoral Student
Chalupniak	Andrzej	Doctoral Student
Chamorro	Natalia	Visiting Student
Chamorro	Alejandro	Doctoral Student
Da Silva	Everson Thiago	Visiting Doctoral Student
de la Escosura	Alfredo	Postdoctoral Researcher
Espinoza	Marisol	Doctoral Student
Fattahhesari	Ali	Visiting Doctoral Student
Fomitcheva	Anna	Visiting Student
Gravagnuolo	Alfredo Maria	Visiting Doctoral Student
Guix	Maria	Doctoral Student
Hlavata	Lenka	Visiting Doctoral Student
Honda	Yuki	Visiting Doctoral Student
Hussein	Abdel-Rahim	Visiting Postdoctoral Researcher
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Lòpez	Adaris Maria	Visiting Doctoral Student
Malec	Jedrzej Rafal	Visiting Student
Mandli	Jihane	Visiting Doctoral Student
Mars	Abdelmoneim	Visiting Doctoral Student
Martín	Patricia	Visiting Student
Mayorga	Carmen	Postdoctoral Researcher
Medina	Mariana	Student
Miserere	Sandrine	Postdoctoral Researcher
Montòn	Helena	Visiting Doctoral Student
Morales	Eden	Postdoctoral Researcher
Navarro	Guillem	Visiting Student
Nunes	Gisele Elias	Visiting Doctoral Student
Pérez	Briza	Visiting Postdoctoral Researcher
Parolo	Claudio	Student
Pino	Flavio	Visiting Doctoral Student
Puig	Anna	Group Project Manager
Quesada	Daniel	Visiting Student
Rabti	Amal	Visiting Doctoral Student

	Rivas	lourdes Josefina	Visiting Doctoral Student
	Sánchez	Sonia	Visiting Student
	Sanli	Serdar	Visiting Doctoral Student
	Santos	Charlene	Visiting Doctoral Student
	Soler	Joan Antoni	Visiting Student
	Zamora	Alejandro	Visiting Student
NanoBiosensors and Bioanalytical Applications Group			
	Lechuga	Laura	CSIC Full Professor
	Álvarez	Maria Del Mar	CSIC Postdoctoral Researcher
	Cardeñosa	Mª Cruz	CSIC Visiting Student
	Dante	Stefania	FPU Doctoral Student
	Duval	Daphné	CIBER Postdoctoral Researcher
	Estévez	Maria Carmen	CSIC Postdoctoral Researcher
	Fariña	David	CIBER Technician
	Gòmez	Silvia	CIBER Technician
	González	Ana Belén	CSIC Postdoctoral Researcher
	Koziel	Marta	CSIC Visiting Student
	Losoya	Adrian	CONACYCT PhD. Student
	Márquez	Salomon Elieser	CONACYCT PhD. Student
	Maldonado	Jesús Manuel	CONACYCT PhD. Student
	Martínez	Francesc	CSIC Visiting Student
	Otte	Marinus A.	CSIC Postdoctoral Researcher
	Piña	Ana Patricia	CSIC Visiting Doctoral Student
	Rodríguez Delgado	Melissa Marlene	CONACYCT PhD. Student
	Sánchez	César	Doctoral Student
	Sepúlveda	Borja	CSIC Tenured Scientist
	Serra	Anna	CSIC Visiting Student
	Solís	Verónica Iraís	CONACYCT PhD. Student
	Soler	María	FPI Doctoral Student
Nanostructured Functional Materials Group			
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	García	Beatriz	CSIC Doctoral Student
	Guardingo	Mireia	CSIC Doctoral Student
	Massaro	Giuseppina	CSIC Visiting Doctoral Student
	Nador	Fabiana	Visiting Postdoctoral Researcher

	Novio	Fernando	CSIC Juan de la Cierva Researcher
	Roscini	Claudio	CSIC Postdoctoral Researcher
	Sedò	Josep	CSIC Project Manager
	Simmchen	Juliane	CSIC Doctoral Student
	Torres	Hector	CSIC Visiting Doctoral Student
	Vázquez	Nuria Alexandra	CSIC Doctoral Student
	Vilasau	Jon	Postdoctoral Researcher
	Wnuk	Karolina	CSIC Doctoral Student
Novel Energy-Oriented Materials Group			
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	Ayyad	Omar	Postdoctoral Researcher
	Caban	Zahilia	Doctoral Student
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	García Cortadella	Ramon	CSIC Visiting Student
	Ruiz	Vanesa	CSIC Juan de la Cierva Researcher
	Suárez	Julieth	CSIC Doctoral Student
Oxide Nanoelectronics Group			
	Catalán	Gustavo	ICREA Research Professor and Group Leader
	Cordero	Rohíni Kuma	Doctoral Student
	Domingo	Neus	Ramon y Cajal Researcher
	Lòpez	Laura	Doctoral Student
	Narváez	Jackeline	CSIC Doctoral Student in transition to ICN
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	Sotomayor	Clivia	ICREA Research Professor and Group Leader
	Alzina	Francesc	Senior Researcher
	Arias	Noèlia	Group Project Manager
	Armstrong	Eileen	Visiting Doctoral Student
	Bernal	Monica Emperatriz	Visiting Doctoral Student
	Bhansali	Sweta	Doctoral Student
	Chávez	Emigdio	Doctoral Student
	Delgado Simao	Claudia	Postdoctoral Researcher
	Fernández	Ariadna	Doctoral Student
	Francone	Achille	Postdoctoral Researcher
	García	Yamila	Postdoctoral Researcher
	Gomis	Jordi	Postdoctoral Researcher

	Graczykowski	Bartlomiej	Postdoctoral Researcher
	Guillotel	Erwan	Group Project Manager
	Khunsin	Worawut	Postdoctoral Researcher
	Kirchhoff	Alexandra	Visiting Student
	Kreuzer	Martin	Postdoctoral Researcher
	May	Patrick	Postdoctoral Researcher
	Navarro	Daniel	Postdoctoral Researcher
	Reparaz	Juan Sebastián	Postdoctoral Researcher
	Ruiz	Yasser Bruno	Visiting Doctoral Student
	Sledzinska	Marianna	Laboratory Engineer
	Wagner	Markus	Postdoctoral Researcher
Physics and Engineering of Nanodevices Group			
	Valenzuela	Sergio	ICREA Research Professor and Group Leader
	Bonell	Frédéric	Marie Curie Postdoctoral Researcher
	Costache	Marius Vasile	Ramon y Cajal Researcher
	Lòpez	Christian	Visiting Student
	Neumann	Ingmar	Doctoral Student
	Raes	Bart	Postdoctoral Researcher
	Sierra	Juan Francisco	Postdoctoral Researcher
Supramolecular Nanochemistry and Materials Group			
	Maspoch	Daniel	ICREA Research Professor and Group Leader
	Ariñez	Javier	Doctoral Student
	Ayala	Abraham	Doctoral Student
	Burneo	Ivan Patricio	Doctoral Student
	Cano	Antonia Maria	Postdoctoral Researcher
	Carbonell	Carlos	Laboratory Engineer
	Carné	Arnau	Doctoral Student
	Ciardi	Agnese	Visiting Student
	del Pozo	Marc	Visiting Student
	Espín	Jordi	Doctoral Student
	Evangelio	Maria Emilia	Postdoctoral Researcher
	Fabregat	Clara	Visiting Student
	García	Sonia	Postdoctoral Researcher
	González	Marta	Group Project Manager
	Imaz	Inhar	Ramon y Cajal Researcher

	Kahsay	Adane	Visiting Student
	Mejías	Nereida	Technician
	Navarro	Joana	Visiting Student
	Rubio	Marta	Doctoral Student
	Ruyra	Àngels	Doctoral Student
	Sáez	Adrian	Visiting Student
	Stylianou	Kyriakos	Postdoctoral Researcher
	Vila	Marc	Visiting Student
Theoretical and Computational Nanoscience Group			
	Roche	Stephan	ICREA Research Professor and Group Leader
	Barrios	Jose Eduardo	Visiting Postdoctoral Researcher
	Brandbyge	Mads	Visiting Scientist
	Cresti	Alessandro	Visiting Scientist
	Cummings	Aron	Postdoctoral Researcher
	Dinh	Van Tuan	Doctoral Student
	Ferrer	Nicolás	Undergraduate
	Leconte	Nicolas	Postdoctoral Researcher
	Ortmann	Frank	Senior Researcher
	Pérez	Pablo Matias	Visiting Doctoral Student
	Pedersen	Jesper Goor	Visiting Postdoctoral Researcher
	Rasmussen	Jesper	Visiting Doctoral Student
	Soriano	David	Postdoctoral Researcher
Theory and Simulation Group			
	Ordejón	Pablo	CSIC Full Professor
	Abufager	Paula	Visiting Postdoctoral Researcher
	Alonso	José Miguel	CSIC Tenured Scientist
	Andersen	Nick Papior	CSIC Visiting Postdoctoral Researcher
	Boskovic	Desanka	CSIC Doctoral Student
	González	Silvia	CSIC Visiting Senior Researcher
	Huhs	Georg	Visiting Doctoral Student
	Kepenekian	Mikaël	Postdoctoral Researcher
	Lorente	Nicolás	CSIC Research Scientist
	Martínez Gordillo	Rafael	CSIC Doctoral Student
	Migani	Annapaola	CSIC Ramon y Cajal Researcher
	Pérez	Miguel Angel	CSIC Doctoral Student
	Robles	Roberto	CSIC Postdoctoral Researcher

	Silva	José Angel	CSIC Doctoral Student
	Troiano	Gustavo Feliciano	Visiting Postdoctoral Researcher
Electron Microscopy Division			
	Ballesteros	Belén	Division Leader
	Belarre	Francisco Javier	Technician
	Kafa	Houmam	Visiting PhD student
	Pach	Elzbieta	Doctoral Student
	Rosado	Marcos	Technician
	Spinato	Cinzia	Visiting PhD student
Nanofabrication Division			
	Kehagias	Nikolaos	Division Leader
	Francone	Achille Leo	Postdoctoral Researcher
	Medina	Juan Ignacio	Laboratory Engineer
Nanomaterials Growth Division			
	Santiso	José	CSIC Tenured Scientist
	Bagués Salg	Núria	CSIC Doctoral Student
	Moreno	Roberto	CSIC Doctoral Student
	Roqueta	Jaume	CSIC Technician
	Zapata	James Arturo	CSIC Visiting Doctoral Student
Nanoscience Instrument Development Division			
	Ceballos	Gustavo	Division Leader
	Maymò	Marc	Laboratory Engineer
Common Equipment			
	Borrisé	Xavier	Technician
	García	Pablo	Technician
	Saiz	Javier	Technician
	Sauthier	Guillaume	Technician
Management and Services - Finance			
	Bellafont	Lluís	ICN2 Manager
	Vela	Judit	Finance Director
	Caño	Inmaculada	Travel and Expenses Services
	Camarero	Laura	Assistant
	Corominas	Marc	Assistant
	Domene	Sandra	Purchasing Services
	Franco	Ruth	Accountant
	Nieto	Emma	Finance and TT Project Management

	Zárate	Ángela	CSIC Administration
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	Ros	Xavier	General Services Manager
	Domínguez	Carlos Germán	Maintenance Technician
	Francesch	Astrid	Assistant
	Lamine	Ly	Receptionist
	Valenzuela	Francisco Javier	Maintenance Technician
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	Pérez	Rocio	Human Resources Manager
	Collados	Mireia	Human Resources Officer
	Garrés	Montserrat	Internal Communication Officer
	Oneca	Raquel	Assistant
	Rodríguez	Anabel	Human Resources Officer
Management and Services - IT			
	Lizcano	David	IT Manager
	Hernando	Jordi	IT Assistant
	Hoflich	Manfred	IT Client Services
	Ilzarbe	Francesc Xavier	Junior IT Officer
	Macià	Antonio	IT Network and Security Engineer
	Rivas	David	IT Network and Security Engineer
Management and Services - Marketing and Communication			
	Argemi	Alex	Scientific Communication Manager
	Carreras	Miriam	Visiting Student
	de la Osa	Ana	Events Officer
	Gros	Pau	Visiting Student
	Picazo	Gemma	Visiting Student
	Qushair	Gregory	Scientific Communication Officer
	Torres	Dámaso	Webmaster and Graphic Designer
Management and Services - Projects			
	Martí	Mireia	Projects Department Manager
	Tienda	Dulce	Project Manager
Management and Services - Strategy			
	Kogon	Boaz	Strategy Manager
Management and Services - Technology Transfer			
	Reverter	Jordi	Technology Transfer Manager

Del Rey	Alfonso	Technological Transfer Officer
Jamier	Vincent	Project Manager
Lòpez	Cristina	Technological Transfer Officer

ICN Publications from 2013

Groups

- Atomic Manipulation and Spectroscopy Group
- Force Probe Microscopy and Surface Nanoengineering Group
- Inorganic Nanoparticles Group
- Magnetic Nanostructures Group
- Nanobioelectronics and Biosensors Group
- NanoBiosensors and Bioanalytical Applications Group
- Nanostructured Functional Materials Group
- Nanostructured Materials for Photovoltaic Energy Group
- Novel Energy-Oriented Materials Group
- Oxide Nanoelectronics Group
- Phononic and Photonics Nanostructures Group
- Physics and Engineering of Nanodevices Group
- Supramolecular Nanochemistry and Materials Group (NANO^{UP})
- Theoretical and Computational Nanoscience Group
- Theory and Simulation Group

Technical Development and Support

- Electron Microscopy Division
- Nanofabrication Division
- Nanomaterials Growth Division

Ramón y Cajal

- Annapaola
- Inhar Imaz
- Marius Cos
- Neus Domi

ATOMIC MANIPULATION AND SPECTROSCOPY GROUP

Dr. Aitor Mugarza

- **Site- and orbital-dependent charge donation and spin manipulation in electron-doped metal phthalocyanines**, C. Krull, R. Robles, A. Mugarza, P. Gambardella, *Nature Materials* **12**, 337-343 (2013)
- **Symmetry and magnitude of spin-orbit torques in ferromagnetic heterostructures**, K. Garello, I.M. Miron, C.O. Avci, F. Freimuth, Y. Mokrousov, S. Blugel, S. Auffret, O. Boulle, G. Gaudin, P. Gambardella, *Nature Nanothec.* **8**, 587-593 (2013)
- **Scattering of surface electrons by isolated steps versus periodic step arrays**, J. E. Ortega, J. Lobo-Checa, G. Peschel, S. Schirone, Z. M. Abd El-Fattah, M. Matena, F. Schiller, P. Borghetti, P. Gambardella, and A. Mugarza, *Phys. Rev. B.* **87**, 115425 (2013)
- **Observation of out-of-plane unidirectional anisotropy in MgO-capped planar nanowire arrays of Fe**, Arora, S.K., O'Dowd, B.J. , Polishchuk, D.M. , Tovstolytkin, A.I. , Thakur, P. , Brookes, N.B. , Ballesteros, B. , Gambardella, P. , Shvets, I.V. , *J. Appl. Phys.*, **114 (13)**,133903 (2013)
- **Magnetization Reversal Behaviour of Planar Nanowire Arrays of Fe**, Arora, S.K., O'Dowd, B. J., Thakur, P., Brookes, N.B., Ballesteros, B., Gambardella, P., Shvets I.V., *Curr. Nanosci.*, **9**, 609-614 (2013)

FORCE PROBE MICROSCOPY AND SURFACE NANOENGINEERING GROUP

Dr. rer. nat. Jordi Fraxedas

- **Ultrasensitive force detection with a nanotube mechanical resonator**, Moser, J.; Güttinger, J.; Eichler, A.; Esplandiu, M.J.; Liu, D.E.; Dykman, M.I.; Bachtold, A., *Nature Nanotechnology*, **8**, 493-496 (2013)
- **Imaging the Proton Concentration and Mapping the Spatial Distribution of the Electric Field of Catalytic Micropumps**, Afshar Farniya, A.; Esplandiu, M. J. ; Reguera, D.; Bachtold, A., *Phys. Rev. Lett.* **111**,168301 (2013)
- **Minimal Invasiveness and Spectroscopy-Like Footprints for the Characterization of Heterogeneous Nanoscale Wetting in Ambient Conditions**, Amadei, C.A.; Santos, S.; Pehkonen, S.O.; Verdaguer, A.; Chiesa, M., *Journal of Physical Chemistry C*, **117**, 20815 - 20819 (2013)
- **Size dependent transitions in nanoscale dissipation**, Santos, S.; Amadei, C.A.; Verdaguer, A.; Chiesa, M., *Journal of Physical Chemistry C*, **117**, 10615 - 10622 (2013)
- **Colloidal Solutions of Organic Conductive Nanoparticles**, de Caro, D.; Souque, M.; Faulmann, C.; Coppel, Y.; Valade, L.; Fraxedas, J.; Vendier, O.; Courtade, F., *Langmuir*, **29**, 8983 (2013)
- **Communication: Growing room temperature ice with graphene**, Verdaguer, A.; Segura, J.J.; Lopez-Mir, L., Sauthier, G.; Fraxedas, J., *Journal of Chemical Physics*, **138**, 12 (2013)
- **Nanoparticles of Molecule-based Conductors**, de Caro, D.; Valade, L.; Faulmann, C.; Jacob, K.; Van Dorsselaer, D.; Chtioui, I.; Salmon, L.; Sabbar, A.; El Hajjaji, S.; Pérez, E.; Franceschi S.;Fraxedas, J., *New J. Chem.*, **37**, 3331 (2013)
- **Aqueous Alteration vs. Shock in Villalbeto de la Pena Polymict Chondritic Breccia**, Trigo-Rodriguez, J. M.; Moyano-Cambero, C. E. ; Martinez-Jimenez, M.; Fraxedas, J.; Alonso-Azcarate, J., *Meteoritics & Planetary Science*, **48**, A349 (2013)
- **Surface screening of written ferroelectric domains in ambient conditions**, Segura, J.J.; Domingo, N.; Fraxedas, J.; Verdaguer, A., *Journal of Applied Physics*, **113**,187213 (2013)

INORGANIC NANOPARTICLES GROUP

ICREA Research Professor Víctor Puntes

- **Absence of CeSites in Chemically Active Colloidal Ceria Nanoparticles**, Cafun, J. - D., Kvashnina, K. O., Casals, E., Puntes, V. F., & Glatzel, P, *ACS NANO* (2013)
- **Altered characteristics of silica nanoparticles in bovine and human serum: the importance of nanomaterial characterization prior to its toxicological evaluation**, Izak-Nau, E., Voetz, M., Eiden, S., Duschl, A., & Puntes, V. F., *Particle and Fibre Toxicology*,**1**, 56. (2013)
- **Spontaneous formation of hollow cobalt oxide nanoparticles by the Kirkendall effect at room temperature at the water-air interface**, Varón, M., Ojea-Jimenez, I., Arbiol, J., Balcells, L., Martínez, B., & Puntes, V. F., *Nanoscale*,**6**, 2429-2436. (2013)
- **Engineered Inorganic Nanoparticles for Drug Delivery Applications**, Ojea-Jiménez I.; Comenge J.; García-Fernández L.; Megson Z.A.; Casals E.; Puntes V.F., *Current Drug Metabolism*, **14**, 518-530 (2013)
- **Interaction of differently functionalized fluorescent silica nanoparticles with neural stem- and tissue-type cells**, Izak-Nau, E., Kenesei, K., Murali, K., Voetz, M., Eiden, S., Puntes, V. F., et al, *Nanotoxicology*, , 1-11. (2013)
- **Dipolar Magnetism in Ordered and Disordered Low-Dimensional Nanoparticle Assemblies**, Varón, M., Beleggia, M., Kasama, T., Harrison, R. J., Dunin-Borkowski, R. E., Puntes, V. F., *Sci. Rep.* (2013)
- **Radiochemical synthesis of 105gAg-labelled silver nanoparticles.**, Ichedef, C., Simonelli, F., Holzwarth, U., Bagaria, J. P., Puntes, V. F., Cotogno, G., et al, *Journal of nanoparticle research*, **15**, 2073 (2013)
- **Characterizing Nanoparticles Reactivity: Structure-Photocatalytic Activity Relationship**, Piella, J., Bastús, N. G., Casals, E., & Puntes, V., *J. Phys.: Conf. Ser.*,, 012040. (2013)
- **Exploring release and recovery of nanomaterials from commercial polymeric nanocomposites**, Busquets-Fité, M., Fernandez, E., Janer, G., Vilar, G., Vázquez-Campos, S., Zanasca, R., et al. (2013), *J. Phys.: Conf. Ser.*,, 012048 (2013)
- **Monitoring migration and transformation of nanomaterials in polymeric composites during accelerated aging**, Vilar, G., Fernández-Rosas, E., Puntes, V., Jamier, V., Aubouy, L., & Vázquez-Campos, S., *J. Phys.: Conf. Ser.*,, 012044. (2013)

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- **The social context of nanotechnology and regulating its uncertainty: A nanotechnologist approach**, Jamier, V., Gispert, I., & Puntes, V., *J. Phys.: Conf. Ser.*,, 012059. (2013)

MAGNETIC NANOSTRUCTURES GROUP

ICREA Research Professor Josep Nogués

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