

Higher Education

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DIPC School

Surfaces and Interfaces

June 20-23, 2017

Miramar Palace, Donostia / San Sebastián

<http://www.nanogune.eu/event/sschool2017>

Chairman

Jose M. Pitarke (CIC nanoGUNE and UPV/EHU)

Scientific Committee

Shashank Harivyasi (Graz University of Technology, Graz)

Mato Knez (CIC nanoGUNE, San Sebastian)

Morten Madsen (University of Southern Denmark, Sonderborg)

Moritz Muller (Materials Physics Center, San Sebastian)

Daniel Sánchez-Portal (Materials Physics Center, San Sebastian)

Weike Wang (CIC nanoGUNE, San Sebastian) Organizing Committee

Organizing Committee

Julene Lure (CIC nanoGUNE, San Sebastian)

Itziar Otegui (CIC nanoGUNE, San Sebastian)

Katharina Rubahn Rubhan (University of Southern Denmark, Sønderborg)

The summer school "Surfaces and Interfaces" took place on 20-23 June 2017 in the framework of a European collaborative network of doctorate programs in Physics and Chemistry of Advanced Materials (PCAM), a European initial training network THINFACE, and the Summer Courses of the University of the Basque Country (UPV/EHU). The summer school was held in a seaside palace in the scenic city of San Sebastian, Basque Country (Spain) and welcomed Master and PhD students, post-docs, and all researchers interested in the field. The program, based on tutorials and invited talks, also included oral contributions and posters.



Tutorials

- **Advances in 2D Materials**
Oliver Monti (University of Arizona, USA)
- **Thin-Film Solar Cells**
Frank Nüesch (EMPA, Switzerland)
- **Photonics/Plasmonics in 2D Materials**
Luis Martín-Moreno (Universidad Zaragoza, Spain)
- **Core-level Spectroscopies**
Franz Himpsel (University of Wisconsin-Madison, USA)

Invited speakers

Stefano Agnoli (Università degli Studi di Padova)
Rainer Hillenbrand (CIC nanoGUNE, Spain)
James O'Shea (University of Nottingham, UK)
Talat Rahman (University of Central Florida, USA)
Koen Vandewal (TU Dresden, Germany)
Karin Zojer (Graz University of Technology, Austria)
Jost Adam (Syddansk University, Denmark)
David Egger (Regensburg University, Germany)
Luca Floreano (Istituto Officina dei Materiali, Italy)

DIPC School

PhotoElectroCatalysis at the Atomic Scale

June 27-30, 2017

Miramar Palace, Donostia / San Sebastián

<http://pecas.dipc.org/>

Scientific Committee

José Ángel Martín Gago (Instituto de Ciencia de Materiales de Madrid, CSIC)

Doris Grumelli (INIFTA – CONICET)

Miquel Salmerón (Lawrence Berkeley National Lab)

Alexander Weber-Bargioni (Molecular Foundry-Lawrence Berkeley National Lab)

Klaus Kern (Max Planck Institute for Solid State Research)

Organizing Committee

Sara Barja (Ikerbasque, CFM-CSIC-UPV/EHU, DIPC)

Celia Rogero (CFM-CSIC-UPV/EHU, DIPC)

Mato Knez (Ikerbasque, CIC nanogune)

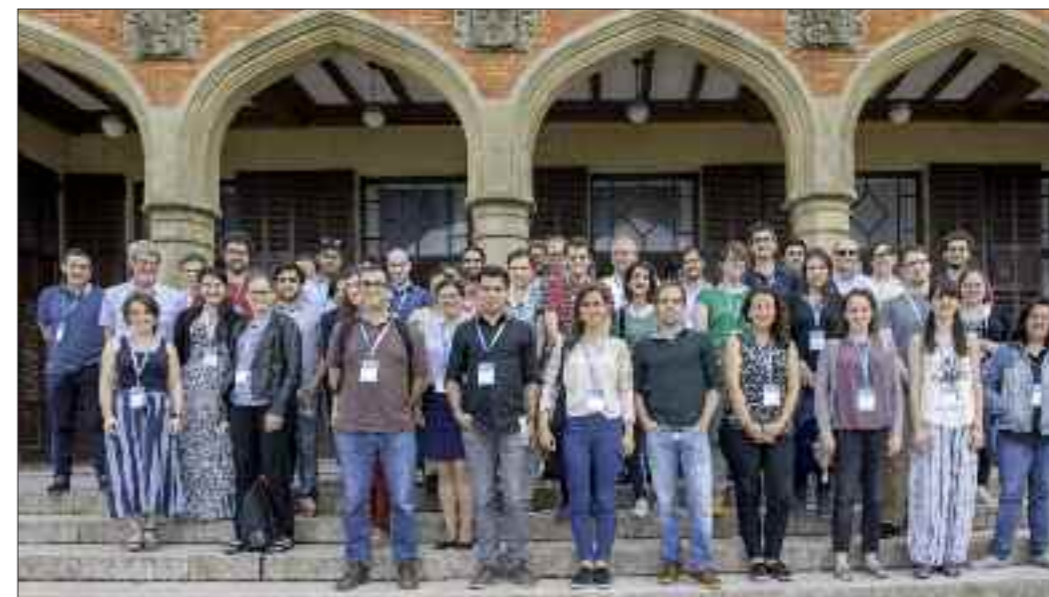
Karmela Alonso (DIPC)

The DIPC School PECAS was aimed at promoting interdisciplinary discussion of scientists in the material science and photoelectrochemistry fields in addition to presentation of new results, ideas and methods to understand the catalyst-electrolyte interface at an atomic level.

The school was taught at the postgraduate level in the fields of surface science and electrochemistry, but introductory seminars were specially addressed to introduce master and graduate students from chemistry and/or physics in each topic covered in the school.

Subjects covered in the school:

- In situ and in operando electrochemistry-surface science techniques and methods
- Energy conversion from photon and chemical energy to electrical energy
- Electrocatalysts for water splitting and CO₂ reduction
- Local active sites on solid surfaces: reactivity of defects
- Chemical engineering and synthesis of photoelectrochemical systems
- Novel materials for electrochemical energy storage
- Electrochemical biosensors
- Theoretical modeling of electrochemical interfaces



Invited Speakers

Olaf Magnussen, Christian-Albrechts-Universität zu Kiel

Jan Rossmeisl, University of Copenhagen

Alexander Weber-Bargioni, Molecular Foundry-Lawrence Berkeley National Lab

Craig Banks, Manchester Metropolitan University

José Ángel Martín Gago, Instituto de Ciencia de Materiales de Madrid, CSIC

Doris Grumelli, Instituto de Investigaciones Físicoquímicas Teóricas y Aplicadas, INIFTA – CONICET

Ulrike Diebold, Technische Universität Wien

Ib Chorkendorff, Technical University of Denmark

Rolf Jürgen Behm, Institute of Surface Chemistry and Catalysis, Ulm University

Ricardo Díez Muiño, Donostia International Physics Center

Alvaro Colina, Universidad de Burgos.

Pau Gorostiza, Institute for Bioengineering of Catalonia

DIPC School

Nanotechnology Meets Quantum Information (NanoQI '17)

July 24-28, 2017

Miramar Palace, Donostia / San Sebastián

<http://nanoqi.dipc.org/>

Scientific Committee

J.I. Cirac (MPQ Garching)

A. Imamoglu (ETH Zurich)

M.D. Lukin (Harvard University)

G. Giedke (Ikerbasque, DIPC)

Alejandro Gonzalez-Tudela (MPQ Garching)

Advances in nanofabrication and the understanding and control of the quantum properties of matter are laying the groundwork for revolutionary new technologies and information processing capabilities. Following the successful school in 2016, the summer school NanoQI'17 provided an introduction to the basics and recent advances in major areas of quantum information theory and solid-state-based quantum technologies. Both the physics of different implementations of quantum information technologies and the applicable theoretical methods were covered.

The school was aimed at PhD students and young postdocs interested in quantum information processing and quantum technologies. The lectures were given by leading researchers in the field (both from experiment and theory) that offered an overview of the main concepts and methods and explained promising current research directions. In addition there was a forum for all participants to present and discuss their own research with their colleagues and senior researchers.

Eight leading experts reviewed the experimental and theoretical state-of-the-art for some of the most promising implementations such as semiconductor quantum dots, superconducting circuits, defect centers in diamond, photonic crystal structures, and topological insulators and explore the prospects of quantum computing, quantum technologies, and the physics of quantum many-body systems.

Subjects covered in the school:

- Quantum Information and Quantum Simulations
- Quantum Optics
- Semiconductor Quantum Dots and Spin Qubits
- Circuit-QED and Superconducting Qubits
- Defects in Diamonds for Quantum Information Processing and Metrology
- Quantum Optomechanics
- Solid-state Quantum Optics
- Topological Matter



Invited Speakers

J. Ignacio Cirac (MPQ Garching, Germany)

Rudolf Gross (TU München, Germany)

Fedor Jelezko (U Ulm, Germany)

Atac Imamoglu (ETH Zurich, CH)

Mikhail D. Lukin (Harvard University, USA)

Florian Marquardt (U Erlangen, Germany)

Eugene Polzik (U Copenhagen, Denmark)

Gil Refael (Caltech, Pasadena, USA)

Lieven Vandersypen (TU Delft, Netherlands)

Susanne Yelin (U Connecticut, USA)

DIPC School

Topological Matter School 2017

August 21-25, 2017

Miramar Palace, Donostia / San Sebastián

<http://tms17.dipc.org/>

Organizing Committee

Reyes Calvo (CIC nanoGUNE)

Dario Bercioux (DIPC)

Maia G. Vergniory (DIPC)

Jérôme Cayssol (LOMA)

This one-week school provided pedagogical lectures by leading experts on the field. The school comprises introductory sessions on group theory and topology supported with practical exercises, including a session on numerical quantum transport calculation of topological systems. There was a number of focus sessions on topological phases of matter such as topological insulators, Weyl semimetals or topological superconductors, including a review session on the major experimental achievements in the field. In addition, a special session was dedicated to the connection between high energy physics and topological matter.



Invited Speakers

Alexander Altland (Cologne)

Jens Bardarson (Dresden/Stockholm)

Haim Beidenkopf (Rehovot)

Andrei Bernevig (Princeton)

Erwann Bocquillon (Paris)

Claudia Felser (Dresden)

Adolfo Grushin (Berkeley/Grenoble)

Titus Neupert (Zurich)

Leslie Schoop (Stuttgart)

Ivo Souza (Donostia / San Sebastián)

Michael Wimmer (Delft)

DIPC Course

Rational Design of 2D Materials

January 2017

DIPC, Donostia / San Sebastián

Prof. Talat S. Rahman

Department of Physics, University of Central Florida, USA and DIPC, Spain

The aim of this course was to lay the foundation for experimental and theoretical work that forms the basis for designing 2D materials with desired functionalities. The approach falls under the umbrella of the Materials Genome Initiative (MGI) in which theory and experiments work in a feedback loop with information from one used to better the other, to accelerate the discovery of novel materials. It was addressed to physics and chemistry students at all stages and senior scientists who are interested in understanding and predicting the characteristics of functional 2D materials. The specific direction and scope of the course was open to discussion and was adjusted to the interest of the audience.

DIPC Course

Introduction to Quantum Many-body Systems and Quantum Information

March 2017

DIPC, Donostia / San Sebastián

J.-Prof. Dr. Roman Orus

Institut für Physik, Johannes Gutenberg-Universität Mainz, Germany

The aim of this course is to provide the basics on the necessary tools to understand quantum many-body systems from a quantum information perspective. We reviewed the theory of quantum entanglement and its quantification, its application in the study of quantum phase transitions, and its implications for quantum matter through the tensor network representation of quantum states. As a practical application, we explained the basics of the Density Matrix Renormalization Group algorithm, the most successful numerical tool in the study of the low-energy properties of 1d quantum lattice systems.

DIPC Course

A Brief Introduction to the Theory of Networks

April 2017

DIPC, Donostia / San Sebastián

Prof. Gabriel Cwilich

Yeshiva University, New York, USA

In this series we covered some basic concepts of networks' theory: their different metrics and measures at the local level and their large structure, and the most common mathematical techniques to study them.

We discussed theoretical models of networks (Poissonian, power-law distributions, configuration models, small-world model) and of network formation (including the Barabasi-Albert model of preferential attachment); and finally some processes in networks (percolation and network resilience and (time permitting) models of spreads of diseases.

DIPC Course

Group Theory in Condensed Matter: A Practical Introduction

September 2017

DIPC, Donostia / San Sebastián

Prof. Juan Luis Mañes Palacios

Facultad de Ciencia y Tecnología, UPV/EHU, Bilbao, Spain

This course gave a practical introduction to the uses of group theory in actual condensed matter problems. The stress was on applications rather than formalism, and the main ideas and techniques in group theory was introduced through practical examples. No previous knowledge of group theory was assumed.

Theses

Nonadiabatic effects in adsorbate-surface interactions from first principles.

Dino Novko

March 2017

Supervisor: Maria Blanco

Ab-initio theoretical study of electronic excitations and optical properties in nanostructures.

Federico Marchesin

July 2017

Supervisor: Daniel Sanchez Portal

Structural and electronic properties of two-dimensional alloys of GdAg₂/Ag(111) and GdAu₂/Au(111).

Alexander Correa

September 2017

Supervisor: Lucia Vitali

Master's Degree Program

UPV/EHU Research Master's in Nanoscience

DIPC, along with CIC nanoGUNE, collaborates in the official postgraduate program in nanoscience organized by the Materials Physics Department of the University of the Basque Country (UPV/EHU) and the Materials Physics Center (CFM-CSIC-UPV/EHU).

The Research Master's in Nanoscience has been offered since 2007 with now close to 120 students having obtained their Master's degree. Almost 50% of our graduates are international students from four continents (Europe, America, Africa and Asia).

Researchers at DIPC participate in this program in various ways and from different perspectives by developing curriculums, giving lectures, acting as counselors to some of the students, and providing seminars on issues of special interest to the students.

In addition, DIPC plays a valuable role, providing essential infrastructure and funding, within its means, to help ensure the proper development of the program.