Higher Education

DIPC School

International Summer School on Semiconductor Interfaces – Methods and Model Systems

July 27-31, 2014
Palacio de Miramar, Donostia-San Sebatián, Spain

ORGANIZERS
Dr. Daniel Sánchez Portal (Centro de Física de Materiales CSIC-UPV/EHU and DIPC, Donostia-San Sebatián, Spain)
Prof. Krestin Volz (Philipps-Universität Marburg, Germany)

Interfaces between solids play a decisive role in modern material sciences and their technological applications. Among the most prominent examples are semiconductor devices, which have been miniaturized to such an extent that their optical and electronic properties are determined decisively by internal interfaces. Other relevant examples are interfaces in solar cells, the separation between carriers of opposite signs taking place there, and the organic/inorganic interfaces of functionalized particles and surfaces in biosensors.

This summer school is motivated by to this growing interest in the study of buried interfaces and aims to present the latest experimental and theoretical developments in the field. The school is aimed at a postgraduate level. We will have three speakers/subtopics every day covering different aspects of the subject. The speakers are internationally leading experts in their respective field. Every speaker gives two lectures. A tutorial-like introduction to the state-of-the art in her/his field (60+20 min) followed by a talk covering her/his own latest work (30+10 min).

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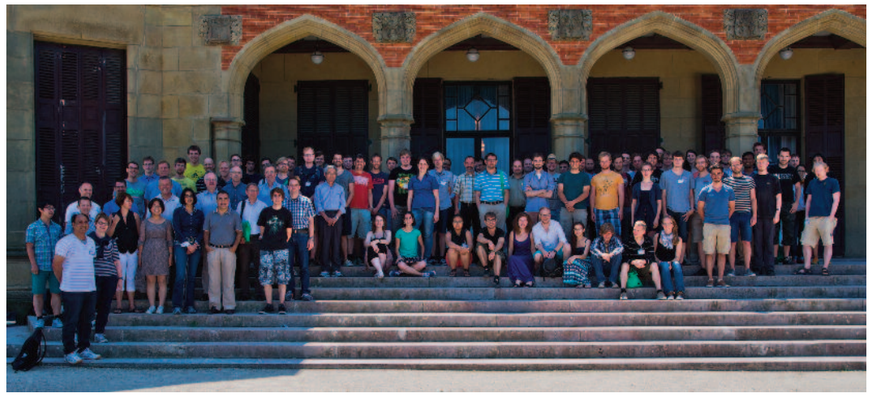
Some of the subjects covered in the course:
Scanning transmission electron microscopy, laser and time-resolved optical and photoemission spectroscopies, characterization of interfaces using synchrotron and FEL-based X-Ray spectroscopy, semiconductor heteroepitaxy, epitaxial growth of growth organic model interface, surface functionalization with organic molecules, ab initio calculations of organic/inorganic interfaces.

Institutional support and funding:
The course is organized within the Summer Courses of the University of the Basque Country and is held at the Palacio de Miramar in Donostia-San Sebastián. The institutions that support the event are:

- University of the Basque Country UPV/EHU
- Collaborative Research Center on Structure and Dynamics of Internal Interfaces (SFB 1083) and Research Training Group "Functionalization of Semiconductors", Philipps-Universität Marburg, Germany
- Centro de Física de Materiales de San Sebastián, CFM UPV/EHU-CSIC, Donostia-San Sebastián, Spain
- Donostia International Physics Center (DIPC), Donostia-San Sebastián, Spain



DIPC School

Frontiers of Condensed Matter

August 25 – September 4, 2014
Donostia-San Sebastián, Spain

This DIPC School aims at offering Master and PhD students a training program in the area of Condensed Matter Physics. It is organized jointly by the Materials Physics Center CFM-CSIC (Spain), Ecole Doctorale de Physique de Grenoble (France), the Casimir Research School Delft-Leiden (Netherlands), and the Ecole Doctorale de Physique et d`Astrophysique (PHAST), Lyon (France).

The courses are complemented by more specialized research seminars on timely topics.

During the school, there is plenty of time for informal discussions between participants and lecturers. A poster session is organized. The school can host 60 participants, (including lecturers - limited by the size of the lecture hall), and is intended for experimentalists and theoreticians.

LECTURERS AND TOPICS
L. Di Carlo (TU Delft) Quantum Information
A. Levy Yeyati (Universidad Autónoma de Madrid) Superconducting point-contacts
J. Meyer (U. Grenoble) Topological Phases
Y. Nazarov (TU Delft) Quantum Transport
F. Pistolesi (U. Bordeaux) Nanomechanics
J. Zaanen (U. Leiden) Strongly-correlated Systems

SEMINARS SPEAKERS
J. Aizpurua (CFM, San Sebastian)
S. Bergeret (CFM, San Sebastian)
P. Brouwer (Freie Universität Berlin)
F. Hekking (U. Grenoble)
T. Klapwijk (TU Delft)
L. Kouwenhoven (TU Delft)
T. Meunier (U. Grenoble)
I. Pascual (Nanogune)
J. Van Ruitenbeek (U. Leiden)
V. Vitelli (U. Leiden)

ORGANIZING COMMITTEE
Jan van Ruitenbeek (U. Leiden)
Frank Hekking (U. Grenoble)
Julia Meyer (U. Grenoble)
Sebastian Bergeret (CFM-DIPC)
Francisco López Gejo (CFM)

cont.

CONTRIBUTIONS

J. Zaanen (U. Leiden)
Quantum criticality: from high Tc superconductivity to black holes. (I)

T. Klapwijk (TU Delft)
Direct observation of ballistic Andreev-reflection: an overview

S. Bergeret (CSIC-DIPC)
Introduction to Superconductor-Ferromagnet Nanohybrids

J. Zaanen (U. Leiden)
Quantum criticality: from high Tc superconductivity to black holes. (II)

F. Pistolesi (CNRS)
Introduction to Nano-ElectroMechanical Systems (I)

T. Meunier (U. Grenoble)
Quantum spin manipulation and spin transfer of a single electron

F. Pistolesi (CNRS)
Introduction to Nano-ElectroMechanical Systems (II)

J. Zaanen (U. Leiden)
Quantum criticality: from high Tc superconductivity to black holes. (III)

L. Di Carlo (TU Delft)
Quantum Information (I)

J. Aizpurua (CSIC-DIPC)
Nanophotonics with plasmons

P. Brouwer (Freie U. Berlin)
Majorana Wires

L. Di Carlo (TU Delft)
Quantum Information (III)

J. Van Ruitenbeek (U. Leiden)
Single molecules as electronic devices

Y. Nazarov (TU Delft)
- Scattering approach to quantum transport (I)

J. Meyer (U. Grenoble)
Topological Phases (I)

V. Vitelli (U. Leiden)
Topological Mechanics

N. Hussey (HFML)
Contrasting criticalities in the cuprates and pnictides

J. Meyer (U. Grenoble)
Topological Phases (II)

Y. Nazarov (TU Delft)
Scattering approach to quantum transport (II)

A. Levy Yeyati (UAM)
The Hamiltonian approach to quantum transport in nanostructures (I)

I. Pascual (CIC nanoGune)
Tunnel spectroscopy of atoms and molecules: exciting electrons, spins and vibrations

Y. Nazarov (TU Delft)
Scattering approach to quantum transport (III)

J. Meyer (U. Grenoble)
Topological Phases (III)

A. Levy Yeyati (UAM)
The Hamiltonian approach to quantum transport in nanostructures (II)

Y. Nazarov (TU Delft)
Scattering approach to quantum transport (II)

L. Kouwenhoven (TU Delft)
Experimental detection of Majoranas

A. Levy Yeyati (UAM)
The Hamiltonian approach to quantum transport in nanostructures (III)

DIPC School

Scanning Probe Microscopy: A Tribute to Heinrich Rohrer

September 5-12, 2014
Donostia-San Sebastián, Spain

This DIPC School is a tribute to Heinrich Rohrer (1933-2013) who shared the 1986 Nobel Prize in Physics with Gerd Binnig for the design of the scanning tunneling microscope (STM). This invention gave scientists the ability to image, measure and manipulate atoms for the first time.

The lectures cover basic concepts and fundamentals of different SPM techniques including STM, Near Field Optical Microscopy (SNOM) and Atomic (AFM), Electrostatic (EFM) or Magnetic Force microscopes (MFM). It also discusses advanced topics such as time resolved SPM, density functional theoretical approaches, single molecule SPM or biology and nano-medicine applications.

The main topics are complemented with a workshop and seminars on state-of-the-art SPM research, with the participation of some of the most relevant scientists who will give a first-person view of latest discoveries in this field.

ORGANIZERS
Andrés Arnau (CFM-CSIC-EHU)
Ricardo Díez-Muiño (DIPC, CFM-CSIC-EHU)
Rainer Hillenbrand (NanoGune)
Enrique Ortega (CFM-CSIC-EHU)
Jose Ignacio Pascual (CIC nanoGune)
Juan José Sáenz (DIPC, Ikerbasque; IFIMAC-UAM)

Course

Field Theoretical Methods in Solid State Physics

March 10, 14, 17, 21 and 24, 2014
DIPC, Donostia-San Sebastián, Spain

PROFESSOR
Marijan Sunjic (University of Zagreb, Croatia)

Prof. Sunjic is a well-known specialist in condensed matter theory and has worked extensively in the fields of photoemission and electronic excitations. We invited him to prepare a course that could be delivered to young researchers and he kindly agreed to design a program on field theoretical methods in solid state physics. It should be of particular interest to master students, PhD students and post-docs but it is open to anyone interested in the topic.

March 10, 2014
Quantum mechanical description of many-body systems
Many body systems, nonseparability of Schroedinger equation: exact and approximate methods; many-body wave functions – bosons and fermions. Second quantization: Creation, annihilation and field operators, physical states and observables.

March 14, 2014
Green's functions - propagators. Single-particle function - definitions, properties.
Spectral function. Free particle Green's function; boson Green's function. Perturbation expansion of the Green's function, Wick's theorem, lowest order terms; Feynman diagrams and their evaluation.

March 17, 2014
Some applications of Green's function method
Vacuum fluctuations, connected and disconnected diagrams. Linked Cluster Theorem. Reducible and irreducible diagrams. Particle self-energy, Dyson equation. Quasiparticle - definition and properties.

March 21, 2014
Ground state energy
Coulomb (Hartree) and exchange (Fock) energies, correlation energy. Boson Green's functions, Fermion-boson (electron-phonon) interaction. Polaron, renormalization of particle mass and energy.

March 24, 2014
Linear response theory
Correlation functions and the differential cross section. Dynamical and static structure factors. Neutron and x-ray scattering in crystals: differential cross section, elastic scattering, Debye-Waller factor, phonon emission and absorption.

Theses

Structure and electronics of donor-acceptor blends.
Elisabeth Goiri Little
February 2014
Supervisors: Dimas G. de Oteyza and Enrique Ortega

Elastic and inelastic electron transport through alkane-based molecular junctions.
Giuseppe Foti
September 2014
Supervisors: Thomas Frederiksen and Andres Arnau

Master's Degree Program

UPV/EHU Research Master's in Nanoscience

DIPC 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 Center of Materials Physics (CSIC-UPV/EHU) "Master's in Nanoscience".

The Research Master's in Nanoscience has been offered since 2007 with more than seventy students who have obtained their Master's degree. Almost 50% of our graduates are international students coming from four different 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.

Credits

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