UAM | IfiMAC Condensed Matter Physics Center | EXCELENCIA MARÍA DE MAEZTU

IFIMAC

CONDENSED MATTER PHYSICS CENTER

ACTIVITY REPORT 2022


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1. OUR CENTER

LETTER FROM THE DIRECTOR

Welcome to the annual report of the Condensed Matter Physics Center (IFIMAC). Established in 2012, IFIMAC's mission is pursuing cutting-edge research and scientific excellence in this broad field, at the crossroads of Physics, Chemistry, Materials Science and Biology, fostering a truly multidisciplinary approach. In 2022, we have celebrated our tenth anniversary with the IFIMAC day. These ten years have consolidated IFIMAC as a Spanish center of reference in the field, with an internationally recognized research program that spans from Quantum Materials and Technologies, Nano and Quantum optics, and Nanotechnology, to Soft and Active Matter and Biophysics.

During this year, we have made significant progress along several strategic lines, defined by the new Steering Committee in October 2021, in order to complete our current "Maria de Maeztu research unit of excellence" (MdM) project and to prepare for the next call, due in early 2023. Among them, we highlight: (i) the hiring of three technicians to support our experimental and computational activities and our outreach efforts, together with (ii) the improvement of our current research infrastructure with common experimental and computational facilities, and (ii) the refurbishment of some office spaces to accommodate the new hirings of PhD student and post-doctoral researchers. These initiatives, started in 2022, will be fully completed in 2023.

IFIMAC membership is awarded to individual researchers, based on the scientific excellence achieved at the different levels of the academic career. IFIMAC had 83 members in 2022, including 65 permanent research and teaching staff from our host institution, the Universidad Autónoma de Madrid (UAM), and 18 young researchers associated with different programs of international talent attraction. These young researchers are supported by national (10 Ramon y Cajal contracts), regional (3 Atracción de Talento Comunidad de Madrid (AT-CM) modalidad 1 fellows) and private (3 Junior Leader La Caixa grants) programs, as well as by an assistant professorship from UAM and our own MdM funds (1 young international research leader).

We are particularly proud of this last initiative, that offers brilliant international young researchers a four-year contract, lab space and funding to develop their own research groups. The three young researchers attracted with the previous 2014-2018 MdM grant secured Ramón y Cajal contracts and have become permanent staff at UAM. Two of them have been awarded ERC starting grants. The three recruitments with the current 2019-2022 MdM project have also got Ramón y Cajal contracts in the last two calls (one of them declined in favor of an AT-CM fellowship). Apart from its members, IFIMAC hosted in 2022 the research activity and training of 34 post-doctoral researchers (53\% of them, non-spaniards), and 118 PhD students. They contribute significantly to the achievement of the IFIMAC's mission.

Our research outcome in 2022 consolidates the total number of articles (198) --with a small reduction in the publication in top-cited journals with respect to the previous year, 80,3% (58.6%) in Q1-- 56,6% (24.7%) in D1 according to Scopus (WoS)--, and a significant increase in patent applications (7). IFIMAC researchers have been particularly successful in the attraction of funding in 2022 (a 29\% increase with respect to 2021), with 119 active projects representing a total budget of 8.9 million € (20.4 % EU). Together with this external funding, the seven collaborative projects, supported by past and current MdM funds, have played a key role in fostering synergies among IFIMAC researchers. The two currently active collaborative projects, "Disorder as a novel platform for topological superconductivity" and "Dynamically driving spinning colloidal particles in 2D lattices", expand the boundaries of two areas of intense activity, topological properties and active matter, in which IFIMAC has a unique position and great potential.

These research activities are complemented by the IFIMAC's involvement in training and outreach. We directly promote the Master in Physics of Condensed Matter and the Biological Systems (https://www.masternanobio.es) and the PhD Program in Physics of Condensed Matter, Nanoscience and Biophysics (http://doctorate-nanobio-uam.es), and are involved in another three master and three doctoral programs at UAM. Our outreach activities cover from lectures for primary and high schools to promote STEM studies and scientific careers in the areas covered by IFIMAC, to the development of a very successful series of videos, in collaboration with the Youtube channel QuantumFracture , approaching our latest research to society. Under the orientation of our gender committee, these activities have been strongly focused on reducing the underrepresentation of women in STEM fields, particularly acute in the case of Condensed Matter Physics. Two key activities started in 2022 are (i) the mentoring program for female physics students (with 34 female mentees and 34 mentors --with no gender restriction--), and (ii) the development of a series of videos that showcase the research activity of IFIMAC from the perspective of some of our young female researchers, supported by a grant from FECYT.

I invite you to explore this annual report. Through its pages, you will discover IFIMAC's reality. Looking into the future, IFIMAC has a great potential to go beyond its already remarkable achievements. We are already working on some important initiatives, like a change in our legal status and a brand-new building with top-class lab space, that will contribute to boost our research activity and knowledge transfer in the coming years.

Ruben Perez

IFIMAC Director

1. OUR CENTER

OVERVIEW

The IFIMAC – Condensed Matter Physics Center is a María de Maeztu Excellence Research Unit. The Center got the first Maria de Maeztu Excellence accreditation (MDM-20140377) on the 2014 call and it was renewed in 2018 (CEX2018-000805-M).

The Condensed Matter Physcis Center is a Research Center within UAM, located in the campus of the Universidad Autónoma de Madrid pursuing cutting-edge research and scientific excellence. It comprises researchers from several university departments aiming to advance the limits of knowledge in both theoretical and experimental Condensed Matter Physics. Sixty seven researchers constitute its permanent staff with seventeen young resarchers (RyC, talent grant, Junior leader, IFIMAC positions) and up to one hundred and fifty postdoctoral researchers and Ph.D students.

Research performed in the institute has gained world reputation in the following areas:

- Advanced Materials
- First Principles Simulations and Modeling
- Nanophysics
- Nano and Quantum Optics
- Soft Condensed Matter and Biophysics

RESEARCH LINES

Resarch developed in the IFIMAC since it was set up in 2012 is organized in the following areas. Here we describe relevant general aspects of each line in the past years:

1. Advanced materials

Today's devices and appliances require materials with ever increasing capabilities. Superconductors deliver considerable improvements in energy storage and transport and are fundamental in medicine for magnetic resonance imaging. Graphene and graphene-based materials promise to improve functionalities of many devices. New molecular systems are excellent sieves and are used in gas storage or photovoltaics.

IFIMAC works on the fundamental properties of materials with the aim to set the pace for future transformational changes in technology. For this, we carry an extensive research program in the synthesis, characterization, and modelling of new materials (Figure 1.1). We develop state of the art instrumentation and techniques which we offer to other research groups through spin-offs or scientific collaborations.

Among them are computational techniques as well as atomic manipulation and surface characterization techniques (Figure 1.2). IFIMAC takes full advantages of the possibilities offered by the UAM, leveraging the use of fabrication, nanofabrication (Figure 1.3) and characterization facilities of the Campus. The Helium liquefaction unit of the UAM is unique nation-wide and recovers and liquefies Helium for science, often also delivering industry. The fabrication facilities include state-of-the-art machines, with a new metal 3D printer and a development center for new instrumentation. IFIMAC allows researchers to measure and characterize materials from atomic scale to large sizes, from low to high frequencies, at temperatures down to 7 mK and magnetic fields up to 22 T. IFIMAC includes the only laboratory contributing to the access system of a large-scale European infrastructure (the European high magnetic field laboratory), and collaborates very actively in synchrotron, neutron scattering and free electron laser facilities. Advanced calculations, from ab-initio to modelling, leverage experimental efforts and efforts in instrumentation to creating top level science. Practically any new idea in materials synthesis can be addressed at IFIMAC.

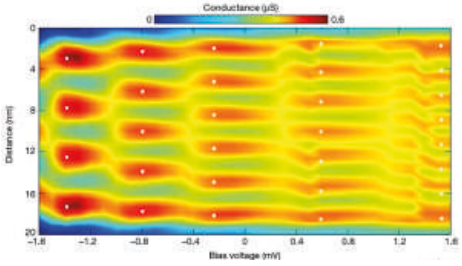

Figure 1.1: Conductance (color scale on the top) vs bias voltage (x-axis) and distance (y-axis) demonstrating lateral quantization of collective electronic states at the surface of the heavy fermion superconductor URu2Si2. Image taken at 100 mK. ***From Nature 616, 465 (2023).***

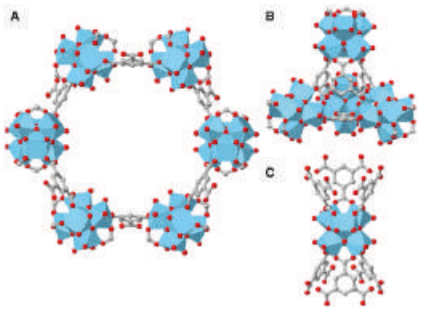

Figure 1.2: Hexagonal pore (A) and tetrahedral cavity (B) in the luminescent metal organic framework MOF-808, an emergent class of optical sensors. We show an unsaturated Zr6O8 cluster in C. Blue is Zr, grey is C and red is O, hydrogen is removed for clarity. ***From Nature Communications 14, 2506 (2023).***

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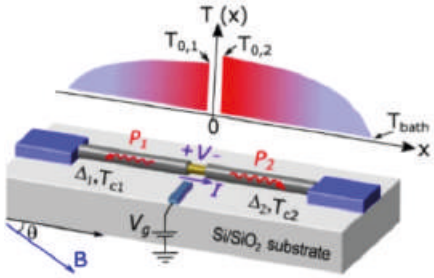

Figure 1.3: Device made of superconducting leads and a semiconducting nanowire. An etched part in the middle of the nanowire allows applying a gate. Heat flow (red lines) leads to a new characterization tool, Joule spectroscopy. ***From Nature Communications 14, 2873 (2023).***

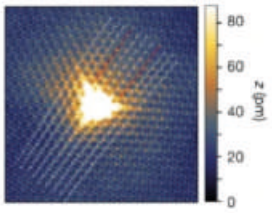

Figure 1.4: Friedel oscillations from H atoms in graphene. Additional wavefronts appearing due to dislocations are shown in red. ***From Nature, 574, 219 (2019).***

IFIMAC studies all sorts of topical quantum materials, obtaining advances in magnetism, superconductivity, topological properties of materials, interfaces, optical properties (Figure 1.4), electronics and spintronics, surface physics, molecular systems, graphene (Figure 1.5) and other two-dimensional materials. Regarding the material properties under study at IFIMAC, several groups are very active in the research on magnetism, superconductivity, spintronics and vortex physics.

2. First Principles Simulations and Modeling

Computer modeling has grown over the years into a scientific discipline on its own. Models are utilized to assess real-world phenomena maybe too complex to be analyzed in the laboratory or under hypotheses at a fraction of the cost of undertaking the actual activities. Models in industry, government, and educational institutions shorten design cycles, reduce costs, and enhance knowledge.

In Physics, the modeling of materials, through what is known as "first-principles", has become a major research field. By "first-principles" one understands the use of the fundamental quantum mechanical laws of nature without any assumptions. The properties of the materials should emerge from the numerical solution of these laws. The models here are in fact a faithful representation of reality, but in a controlled environment.

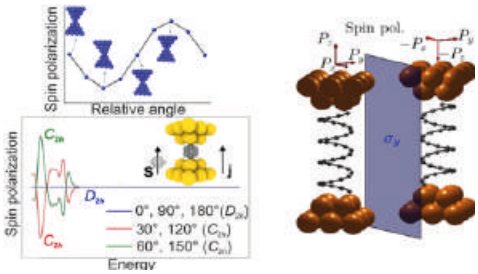

Figure 2.1: Different types of chiral systems such as those in the figure may exhibit the CISS effect. ***From ACS Nano, 17, 6452 (2023).***

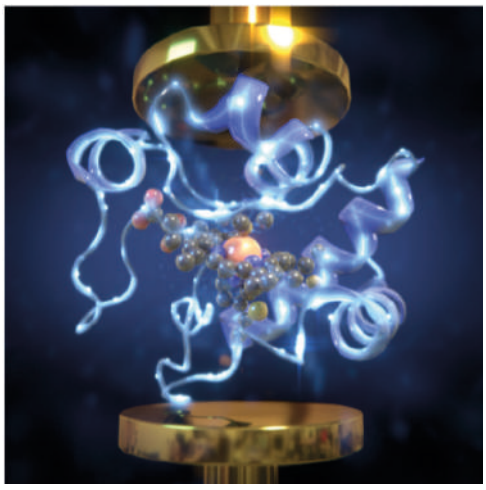

Figure 2.2: An electrically driven switch can be formed by a cytochrome C monolayer, sandwiched between a gold layer and a gold nanowire. ***From Angewandte Chemie, 58, 11923 (2019).***

Researchers at IFIMAC have a long-standing and well-deserved international reputation on computer modeling and, in particular, on the development of efficient first-principles codes for the simulation of the optoelectronic and structural properties of molecules, materials, and systems in general described down to the atomic level (SIESTA, ANT. Gaussian, FIREBALL, MOLCAS, EDUS, etc.). All the other research lines at IFIMAC benefit one way or another from this expertise. This knowledge not only benefits fundamental research, but can also be transferred directly into the society through spin-offs.

IFIMAC researchers exploit these simulation codes to explore a wide variety of problems, including electronic transport, catalysis on reducible oxides and out-of-equilibrium electron dynamics.

Spin-dependent electronic transport is an essential feature not only in engineered devices for spintronics, but also in chemical and biological processes involving the propagation of a current through molecules. In recent years, it has been experimentally verified that an initially unpolarized beam of electrons will emerge polarized (in some cases, significantly) upon traversing a chiral molecule such as a DNA-like helicene; a realization of the so-called chirality-induced spin selectivity (CISS) effect. In a recent article published in ACS Nano IFIMAC researchers show based on the use of representation theory within the scattering formalism for transport, that the appearance of such spin polarization is fundamentally allowed in a much wider family of systems, namely those that lack symmetry planes or axes

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containing the propagation direction. The role of the contacts is hence as qualitatively important as that of the molecules, to the point that the presence of the latter is not generally needed to observe spin polarization. These predictions are illustrated by DFT calculations where they also show that the polarization vector is accompanied by a net spin accumulation in the system for finite bias, which may be detected in magneto-conductance setups.

Proteins are key biological molecules that are responsible for numerous energy conversion processes such as photosynthesis or respiration. In recent years, proteins have been investigated in a new setting, namely in solid-state electronic junctions, with the goal of understanding the charge transfer mechanisms in these biomolecules, but also with the hope of developing a new generation of bio-inspired nanoscale electronic devices. Now, a new step towards this goal was reported in Angewandte Chemie) by a collaboration between Weizmann Institute of Science (Israel) and **IFIMAC researchers**. In this work, the athors show that a redox protein, cytochrome C, can behave as an electrically driven switch when incorporated in a solid-state junction with gold electrodes. By changing the external bias voltage in the junction, it was shown that the relevant molecular orbitals of the protein can be brought in and out of resonance with the chemical potential of the electrodes, which leads to the current-switch behavior. Showing transition from off- to on- resonance can be very challenging and this is the first time it has been achieved for proteins within the same working junction. Extensive ab initio DFT calculations revealed that the charge transport proceeds through the heme unit in these proteins and that the coupling between the protein's frontier orbitals and the electrodes is sufficiently weak to prevent Fermi level pinning. The on-off change in the electrical current was shown to persist up to room temperature, demonstrating reversible, bias-controlled switching of a protein ensemble, which provides a realistic path to protein-based bioelectronics.

The unique catalytic properties of ceria for the partial hydrogenation of alkynes have been examined for acetylene hydrogenation. Catalytic tests over polycrystalline CeO2 at different temperatures and H2/C2H2 ratios reveal ethylene selectivities in the range of 75–85% at high degrees of acetylene conversion and hint at the crucial role of hydrogen dissociation on the overall process. DFT is applied to CeO2(111) in order to investigate reaction intermediates and to calculate the enthalpy and energy barrier for each elementary step. At a high hydrogen coverage, □-C2H2 radicals adsorbed on-top of surface oxygen atoms are the initial reactive species forming C2H3 species effectively barrierless. The high alkene selectivity is owed to the lower activation barrier for subsequent hydrogenation leading to gas-phase C2H4 compared to that for the formation of □-C2H4 radical species. These findings rationalize for the first time the applicability of CeO2 as a catalyst for olefin production and potentially broaden its use for the hydrogenation of polyunsaturated and polyfunctionalized substrates containing triple bonds.

Figure 2.3: Front cover artistic view of the catalytic process for acetylene hydrogenation. ***From J. Phys. Chem. C, 118, 5352 (2014)***

In a recent manuscript published in Journal of Chemical Theory and Computation a collaboration of IFIMAC researchers have presented a theoretical framework and its numerical implementation to simulate the out-of-equilibrium electron dynamics induced by the interaction of ultrashort laser pulses in condensed-matter systems. Their approach is based on evolving in real time the density matrix of the system in reciprocal space. It considers excitonic and nonperturbative light–matter interactions. They show some relevant examples that illustrate the efficiency and flexibility of the approach to describe realistic ultrafast spectroscopy experiments. The approach is suitable for modeling the promising and emerging ultrafast studies at the attosecond time scale that aim at capturing the electron dynamics and the dynamical electron–electron correlations via X-ray absorption spectroscopy.

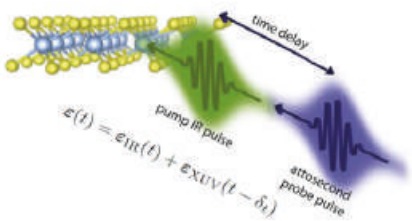

Figure 2.4: Schematics of a pump-probe experiment where a first laser pulse excites the material while a second one explores the time evolution of the excitation. ***From Journal of Chemical Theory and Computation,19, 333 (2023)***

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3. Nanophysics

When the characteristics dimensions of a system or a device are shrunk to the nanoscale, their properties change dramatically. The reason for that is that at this scale quantum mechanical effects set in, which leads to novel physical phenomena that, in turn, are often the basis of unforeseen technological applications. One of the main goals of researchers at IFIMAC is the study of the electronic, mechanical, thermal, and optical properties of structures and devices with nanometric dimensions, for which classical laws do not longer apply. For this purpose, we make use of a wide range of nanofabrication techniques, experimental probes, and theoretical tools

Some of our main activities in the field of Nanophysics are related to the theoretical and experimental study of novel low-dimensional systems such as graphene and graphene-based nanostructures. Antimonene, a single layer of antimony atoms, was firstly obtained at IFIMAC. This 2D material is attracting much attention due to its strong spin-orbit coupling and its potential in optoelectronics, thermoelectric applications, and biomedicine. This work was the result of an internal theoretical-experimental collaboration at IFIMAC, whose researchers are world leaders in this topic.

Making use of experimental techniques such as Angle Resolved Photoemission Spectroscopy (ARPES) or Low Energy Electron Diffraction (LEED), IFIMAC researchers also investigate topics like 2D structural phase transitions, surface charge density waves, or the electronic structure of laterally nanostructured systems. Furthermore, we study the growth and properties of nanometer-scale objects on solid surfaces with applications in spintronics, optoelectronics, magnetic recording, nanoscale catalysis, nanomechanical biosensing, medical nanoimaging, etc.

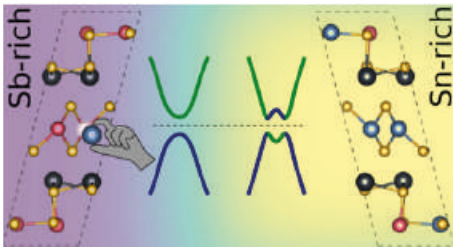

Figure 3.1: A quantum phase transition, predicted from DFT calculations and originating from stoichiometric changes in one of its composing layers (a large concentration of Sn in the quasihexagonal one) turns franckeite into a strong topological insulator. ***From Nano Lett. 21, 7781 (2021).***

IFIMAC researchers work actively in 2D materials and heterostructures, and its associated topological properties. Recently, they have predicted, on the basis of DFT, a quantum phase transition in franckeite, originating from stoichiometric changes in one of its composing layers (the quasihexagonal one). Franckeite is a natural superlattice composed of two alternating layers of different composition, easy to exfoliate into very thin heterostructures and which has shown potential for optoelectronic applications. Not surprisingly, its chemical composition and lattice structure are so complex that franckeite has escaped screening protocols and high-throughput searches of materials with nontrivial topological properties. Now, it has been predicted that, while for a large concentration of Sb, franckeite is a sequence of type-II semiconductor heterojunctions, for a large concentration of Sn, these turn into type-III, much alike InAs/GaSb artificial heterojunctions, and franckeite becomes a strong topological insulator. Transmission electron microscopy observations confirm that such a phase transition may actually occur in nature.

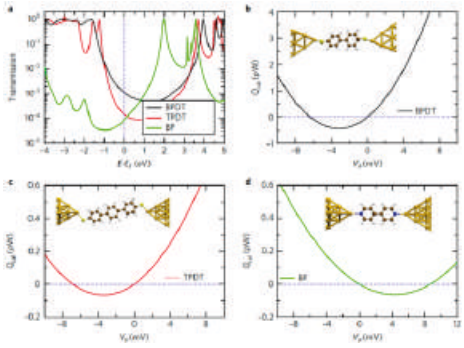

Figure 3.4: (b-d) Computed heating/cooling effect in the molecular junctions formed by gold electrodes and prototypical molecules(Au–biphenyl-4,4' -dithiol–Au, Au–terphenyl-4,4' ' -dithiol–Au and Au–4,4' -bipyridine–Au). The transmission (a) and its derivative at EF determine the electrical conductance and the Seebeck coefficient of the molecular junctions. ***From Nature Nanotech. 13, 122 (2018)***

Other important areas of expertise in our center are the fields of Nanoelectronics and Quantum Transport. In particular, in recent years researchers at IFIMAC have played a leading role in the understanding of the electronic transport in a great variety of nanoscale systems such as metallic atomic-size contacts, single-molecule junctions, superconducting hybrid structures, or strongly correlated low-dimensional systems. The study of thermoelectricity in molecular junctions is of fundamental interest for the development of various technologies including cooling (refrigeration) and heat-to-electricity conversion. IFIMAC researchers have developed theoretical methods, based on self-energy-corrected density functional theory calculations, to characterize the electrical and thermoelectric properties of molecular junctions.

Within the area of nanoelectronics, our groups are currently developing a strong theoretical/experimental activity on hybrid superconducting devices. This work ranges from the understanding of their basic transport properties to their potential application for quantum information processing using microwave techniques of the so-called Andreev qubits. The qubit is based on a circuit that consists of a submicron indium arsenide (InAs) nanowire enclosed by a superconducting aluminum loop. Discrete localized states, known as “Andreev bound states,” form in the nanowire as a result of coupling to the superconductor. When absorption of a photon induces a transition between two of these states, the loop inductance changes. The absorption spectrum of the circuit can be measured by monitoring the resulting frequency shift of a microwave resonator inductively coupled to the loop. The spectrum shows a fine structure of spin-split Andreev states, well accounted for by a simple model with spin-orbit coupling as the key ingredient.

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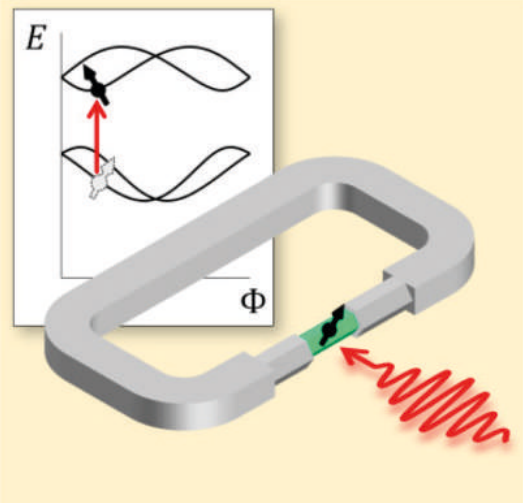

Figure 3.2: Spin-Orbit Splitting of Andreev States Revealed by Microwave Spectroscopy. The circuit includes an InAs nanowire enclosed by a superconducting aluminum loop. The spin state of a single electron in the nanowire has a measurable impact on the electrical properties of the circuit. ***From Phys. Rev. X 9, 011010 (2019).***

A very important topic in our center is also the use and modeling of Scanning Probe Microscopes (SPMs). Atomic Force Microscopy (AFM) is being currently used for the study of the mechanical, electrical and frictional properties of low-dimensional materials. Another key subject is the use of cryogenic Scanning Tunneling Microscopy (STM) and Spectroscopy (STS) for the surface characterization of semiconductor and superconductor nanostructures. One recent example involves the first observation of Yu–Shiba–Rusinov (YSR) states in graphene. Superconductivity in graphene is induced by proximity effect brought by adsorbing nanometer-scale superconducting Pb islands. Using STM and STS the superconducting proximity gap is measured and YSR states are visualized, extending more than 20 nm away from the graphene grain boundaries. These observations provide the long-sought experimental confirmation that graphene grain boundaries host local magnetic moments and constitute the first observation of YSR states in a chemically pure system. From a theoretical point of view, IFIMAC researchers are among the worldwide leaders in the area of ab initio modeling of nanowires and SPMs.

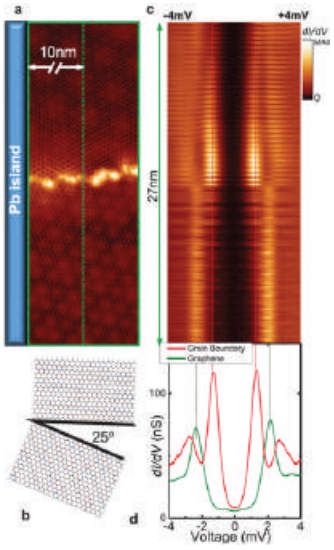

Figure 3.3: Grain Boundary (GB) magnetism induces Yu–Shiba–Rusinov states in superconducting graphene. ***From Advanced Materials 33, 2008113 (2021).***

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4. Nano and Quantum Optics.

The related areas of Nano and Quantum Optics are dedicated to the study of light-matter interactions at the nanoscale and at a quantum level and are two promising lines for the development of efficient, energy-saving, and compact platforms for future information technology. Nanophotonic systems offer a key advantage over other platforms: Their unique ability to concentrate light in the nanoscale enables scalability and integration in the solid-state, and at the same time gives access to the quantum properties of photons. IFIMAC hosts a group of internationally recognised researchers working in this field and counts with extensive laser lab facilities for spatial, spectral, and angular characterization of nano and quantum optical effects.

Nano Optics is devoted to the study of electromagnetic field propagation, confinement, and interaction with matter at a sub-wavelength scale. Advances in fabrication and characterization techniques nowadays permit the study of optical phenomena at the nanoscale. Researchers at IFIMAC have made seminal contributions to the field through the study of nano-plasmonic systems, including the phenomenon of extraordinary optical transmission through subwavelength apertures or the proposal of *spoof* surface plasmon polaritons that mimic the light confinement properties of metals but at lower frequencies. Other important contributions were in the field of plasmon-assisted transport in atomic-scale junctions and the propagation of electromagnetic waves in magneto-plasmonic nanostructures. Light-matter interaction in two-dimensional systems, such as graphene and graphene-based heterostructures, graphene relatives, transition metal dichalcogenides and their combination in vertical stacks are also investigated at IFIMAC.

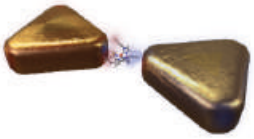

Figure 4.1: Light focused on the nanoscale can interact with quantum emitters, including complex molecules ***From , Angew. Chem. Int. Ed. 58, 8698 (2019)***

Figure 4.2: Nanophotonic structures allow to confine light on the nanoscale ***From ACS Photonics, 5(9), 3447-3451 (2018)***

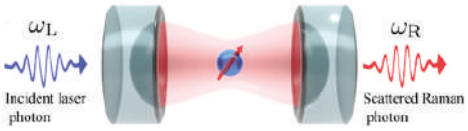

Figure 4.3: Ultrastrong coupling enables the spontaneous Raman scattering of incident radiation. ***From Phys. Rev. Lett. 129, 273602 (2022)***

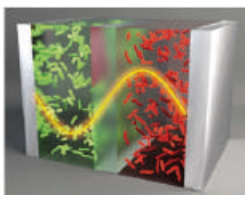

Figure 4.4: Energy transfer between molecules is modified by the presence of vacuum fields in a photonic cavity. ***From, Science 373, eabd0336 (2021)***

Quantum optics is a related field of research, merging the areas of quantum field theory and optics, and dealing with phenomena involving light and its interaction with matter at the quantum level. The field has evolved considerably from its early studies of coherence properties of radiation and parametric processes of light to recent topics of investigation such as quantum information, manipulation of single atoms, Bose-Einstein condensation, etc. Theorists at IFIMAC have produced seminal contributions to the understanding of light emission and absorption spectra in low-dimensional semiconductor structures. We have worked on the quantum optics produced by interacting bosonic complexes describing cavity polaritons and contributed with pioneering works on the superfluidity and coherence properties of polariton gases both under resonant and non-resonant pumping.

IFIMAC gathers leading theorists worldwide on **quantum nanophotonics**, the area of overlap between nano and quantum optics. The group has extensive experience on designing nanophotonic systems to achieve and control interactions between quantum emitters and photon modes and to generate quantum states of light, with a particular focus on hybrid plasmonic-photonic structures that combine the advantages of strong field confinement and long lifetimes. The group has also been at the forefront of a new interdisciplinary area of research aimed at taking advantage of QED phenomena such as strong light-matter coupling to manipulate atomic, molecular, and condensed-matter systems, and has participated actively in the birth and development of this new area of research through several seminal contributions.

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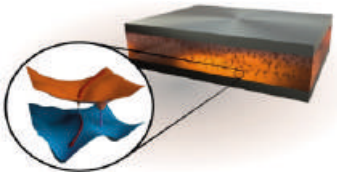

Figure 4.5: With polaritonic chemistry, chemical structure can be manipulated through strong coupling between light and matter. ***From ACS Photonics 9, 1096 (2022)***

Experimental groups at IFIMAC have a long experience on optical spectroscopy of semiconductor low-dimensional systems, such as quantum optics based on semiconductor quantum dots. IFIMAC researchers have expertise in photon correlation techniques, properties of single photon emitters, time-resolved spectroscopy, quantum microcavities based on semiconductor nanostructures, exciton polaritons, and on the preparation of Bose-Einstein condensates in solid-state systems. Furthermore, we have also developed compact laser sources based on plasmonic nanoparticles. Another very active area of experimental research at IFIMAC is the study of exciton diffusion in complex semiconductors or perovskites to optimise their ability to harvest solar energy, in combination with artificial intelligence approaches.

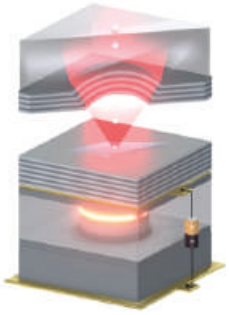

Figure 4.6: Sketch of a room temperature single photon source for quantum communication proto- cols. A quantum emitter (such as a defect in hBN) couples to the open cavity, enhancing the single photon emission.

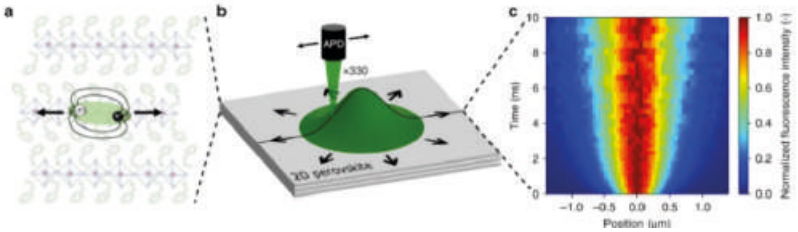

Figure 4.7: Excitons in a two-dimensional perovskite are schematically represented in a. Excitons are imaged as shown in b and produce a time and position dependent fluorescence. ***From ACS Energy Lett. 7, 358 (2022)***

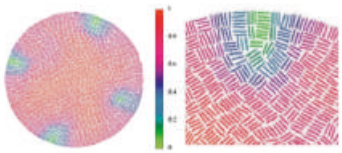

Figure 5.1: Exotic liquid crystalline phases in monolayers of vertically vibrated granular particles. ***From Liquid Crystals, 2023. https://doi.org/10.1080/02678292.2023.2200262***

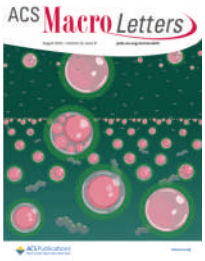

Figure 5.2: Aqueous two-phase systems within selectively permeable membranes. ***From ACS MacroLetters, 12, 132 (2023).***

5. Soft Matter and Biophysics

Soft condensed matter comprises a variety of mesoscopic physical systems that are easily deformed by small thermal or mechanical stresses, including liquids, colloids, polymers, liquid crystals, gels, membranes, foams, etc. The relevant length and time scales of these systems are thus naturally larger than those of atoms or molecules, which facilitates experimentally accessing the microscopic states of these systems to understand and predict their emergent macroscopic properties, using the framework of statistical mechanics. Using vibrated granular particles, a variety of fluid patterns with orientational order that resemble equilibrium liquid-crystal phases were found, exhibiting topological defects due to confinement, much as molecular liquid crystals. This system represents a novel approach to study order in 2D fluids of hard particles.

Biological systems are also soft and built on the rich diversity of mesoscale structures mentioned. A tissue is a soft hydrogel, a hierarchical dynamic structure composed by many cells, which in turn are made up of many molecular assemblies orchestrating processes at different length and time scales. These systems set the most outstanding challenge in our goal to understand the spontaneous self-assembly of matter. Bottom-up approaches to recreate biological systems may enable to isolate fundamental physical principles from the complex set of signaling and metabolic pathways of natural systems. With this in mind, we have recently transferred microfluidic technologies from Harvard to IFIMAC, to fabricate vesicles as cell mimetics with exquisite

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control, enabling to study physical phenomena such as adhesion, fusion, and motility in model systems. These vesicles can also mimic the complex organization of the cell cytoplasm. IFIMAC researchers have used this technology to fabricate vesicles enclosing aqueous compartments to study the effect of permeable membranes in phase separations. Importantly, these vesicles may also find applications in biomedicine, pharmacy, and cosmetics.

Figure 5.3: Trapping flocking particles with asymmetric obstacles. ***From Soft Matter, 16, 4739, 2020.***

Moreover, biological systems are active, they constantly produce and consume energy, which results in the emergence of sometimes unintuitive collective properties. The emergent subdiscipline of Active Matter focuses on understanding such collective properties, which frequently requires out-of-equilibrium physics descriptions. Using bacteria, modeled as run-and-tumble particles, IFIMAC researchers are studying the emergence of collective motion in confined environments.

Molecular Dynamics (MD) simulations are a powerful tool to understand biological processes at the atomic scale. IFIMAC researchers are applying them to the study of proteins, nucleic acids and viruses in their native liquid environment. The elasticity of double-stranded DNA (dsDNA) is a key molecular determinant in the many cellular contexts in which this molecule is found, as it affects the binding affinity of dsDNA with proteins as well as the dsDNA response to the mechanical action exerted by proteins. Using all-atom MD simulations, IFIMAC researchers have proposed that parts of the DNA sequence act as a physical code that controls the structure and mechanical properties of dsDNA at short scales, paving the way for protein-DNA interaction and organization of the genomic material. This work has been extended to dsRNA, where they identified a sequence motif consisting of alternating adenines and uracils, or AU-tracts, that strongly bend the RNA double-helix. This result may be exploited in the emerging field of RNA nanotechnology and might also constitute a natural mechanism for proteins to achieve recognition of specific dsRNA sequences.

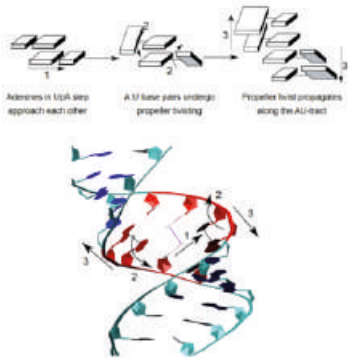

*Figure 5.4: Proposed mechanism for AU-tract induced bending. AU-tract bending is illustrated using rigid blocks representation (top) and a snapshot of the molecular dynamics trajectory (bottom, AU-tract is marked in red). F****rom Nucleic Acid Research 22,*** *12917 (2020).*

IFIMAC has a strong tradition in the construction and use of scanning probe microscopes, in particular in Atomic Force Microscopy (AFM). One of the most exciting applications of AFM is the characterization of biological material at the single-particle level. **Physical Virology**, the study of viruses usually involve bulk experiments, which gather average data from large ensembles of structures, thus considering all the particles as indistinguishable. However, biochemical processes are highly asynchronous and intermediate states are poorly populated. Therefore, average measurements might conceal details of the processes taking place in viruses. AFM allows the imaging and manipulation of individual virus particles adsorbed on a surface in liquid milieu by using a sharp tip (□10 nm) located at the end of a microcantilever. In this way, IFIMAC researchers study the electrostatic charge of virus structures, monitor differences between wild type and mutant viruses during disassembly, and resemble the disruption process of viruses taking place during infection. Some of these studies are supported by MD simulations using coarse-grained models and simulation codes developed at IFIMAC.

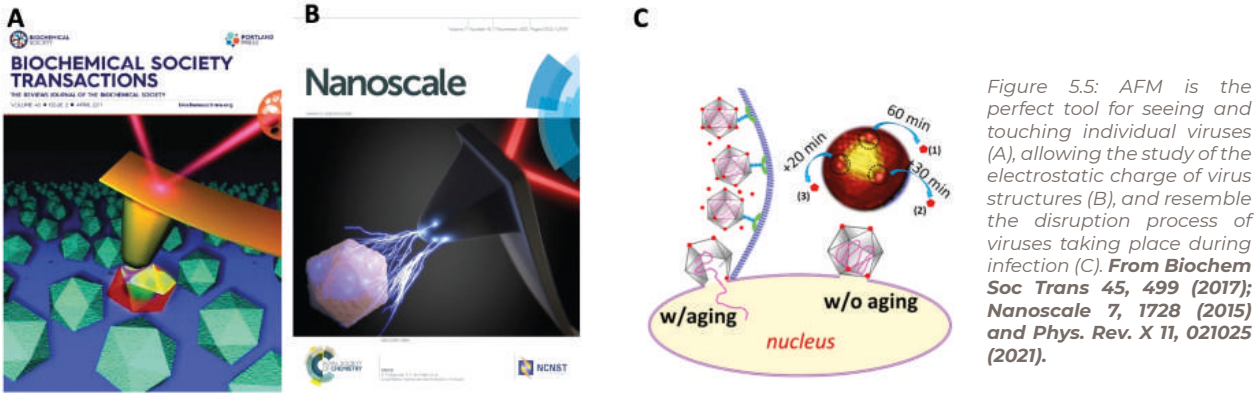

Figure 5.5: AFM is the perfect tool for seeing and touching individual viruses (A), allowing the study of the electrostatic charge of virus structures (B), and resemble the disruption process of viruses taking place during infection (C). ***From Biochem Soc Trans 45, 499 (2017); Nanoscale 7, 1728 (2015) and Phys. Rev. X 11, 021025 (2021).***

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ORGANIZATION/MANAGEMENT

Steering Committee

Rubén Pérez Pérez

IFIMAC Director

Full Permanent Professor at Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.

Luisa E. Bausá López

IFIMAC Deputy Director

Full Permanent Professor at Materials Physics Department, Universidad Autónoma de Madrid.

Antonio I. Fernández-Domínguez

Member

Associate Professor at Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.

Cristina Gómez-Navarro González

Member

Professor at Department of Condensed Matter Physics, Universidad Autónoma de Madrid.

Felix Zamora Abanades

Member

Full Permanent Professor at Department of Inorganic Chemistry, Universidad Autónoma de Madrid.

Hermann Suderow

Infrastructure development

Full Permanent Professor at Department of Condensed Matter Physics, Universidad Autónoma de Madrid.

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Scientific Advisory Board

Prof. Juan Ignacio Cirac
Scientific Director at the Max-Planck Institut für Quantenoptik (Germany).

Prof. Nicola Marzari
Director at MARVEL, National Centre of Competence in Research on Computational Design and Discovery of Novel Materials, École Polytechnique Fédérale de Lausanne. (Switzerland)

Prof. Päivi Törmä
Professor at the Department of Applied Physics, Head of the Quantum Dynamics (QD) research group. Aalto University (Finland)

Prof. Roser Valenti
Professor at Institut für Theoretische Physik, Goethe Universitat Frankfurt am Main, Frankfurt (Germany)

Prof. Monica Olvera de la Cruz
Lawyer Taylor Professor at Department of Materials Science, Northwestern University (USA)

Dr. Enrique Espi Guzman
(Technical Advisor, Repsol DeepTech), Madrid (Spain)

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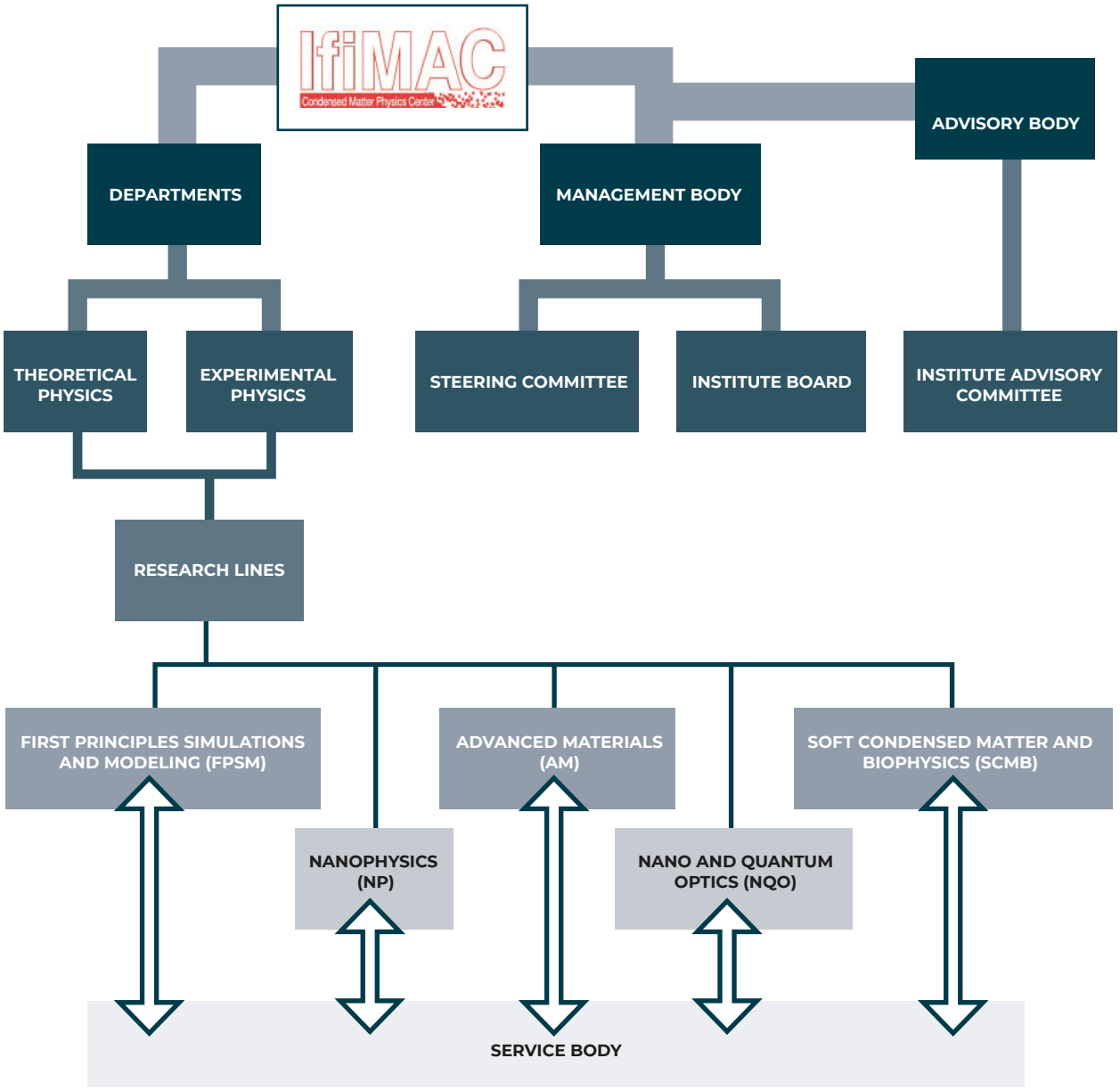
Organization Chart



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GENDER EQUALITY COMMITTEE

On April 2021 was created the Gender Equality Committee at IFIMAC. The main task of this Committee is to generate good practices and promote specific activities targeted at strengthening the role of women in Science, also particularly inside IFIMAC, as well as raising awareness of the IFIMAC members on gender equality issues in science. Currently the gender committee is composed by six researchers: I. Guillamón, J. Feist, M. Jaafar, C. Polop, F. Marchetti and C. Gomez-Navarro

The activities designed to reach these broad goals are organised in different areas: diagnosis and monitoring, participation, visibility and awareness, and support for students. Each of these areas and their specific actions are promoted and carried on by different female and male members of IFIMAC. During 2022 the activity of this committee has been focus on:

Performing an initial diagnostic report regarding gender equality at IFIMAC. This report will analyze the IFIMAC indicators and statistics improving the gender disaggregated data collection. We are evaluating indicators such as the number of hired personnel and Principal Investigators on competitive projects fellowship or grant awardees.

Stablishing the first edition of a mentoring program for female students. one of the first initiatives of this committee has been setting-up a mentoring program for undergraduate female physics students. This program seeks at-offering a close and friendly contact with research activities. In addition, it aims at:

- promoting the scientific career of women students of the graduate and master's degree
- providing female role models.
- empowering mentors.
- building a strong network between women in the academic field of physics

The first edition of this program started, after an intense communication campaign, with great success in September 2022 with a duration of one academic course. This year we account with the participation of 34 female mentees and 34 mentors (with no gender restriction) These numbers imply that 30% of the female physics students at UAM are enrolled in this mentoring program and more than 40% of senior researchers of IFIMAC participate as mentors.

Both mentees and mentors received an introductory course to mentoring before the launching of the program: mentors received a 6 hours course while mentees received a 2 hours session, both imparted by the external expert Louise Schubert, from Schubert consulting. The mentoring program was launched with an initial meeting starting by a gender equality talk and finished by a gathering coffee. The mentoring program is Currently running and it includes monthly or twice-monthly meetings between mentor and mentee of 1 hour and the possibility of visiting the mentor's research group.

This mentoring program was selected as a representative of success between young students to be presented in the latest SOMMa gender group meeting dedicated to mentoring activities.

Promoting outreach activities on the International Day of Women and Girls in Science (11 February) The activities are aimed at primary and secondary school students. with the aim of making visible the scientific activity of the women who work at IFIMAC and notice pioneering women in the history of science.

In 2022, **the Condensed Matter Physics Center joined the celebration of the International Day of Women and Girls in Science** through a series of talks in different schools and secondary schools, given by IFIMAC members.

Celia Gonzalez participated in the initiative #100tífiques – https://100tifiques.cat/, organized by a consortium of research institutes. She gave an invited talk at Collegi Sagrada Família Sant Andreu de Barcelona on February 11th. **Celia Gonzalez** also gave two online talks ***"Acercando la ciencia al instituto"*** at IES Cruz Santa de Tenerife, on February 9th, and ***"La ciencia también es cosa nuestra"*** at IES Eulogio Florentino Sanz, Arevalo (Avila) on February 16th.

Marta Fernández-Lomana gave an invited talk ***"Física de bajas temperaturas (Superconductores)"*** at Colegio Mirasol (Fuencarral) for the student of 2nd grade of bachillerato category in sciences on February 23rd.

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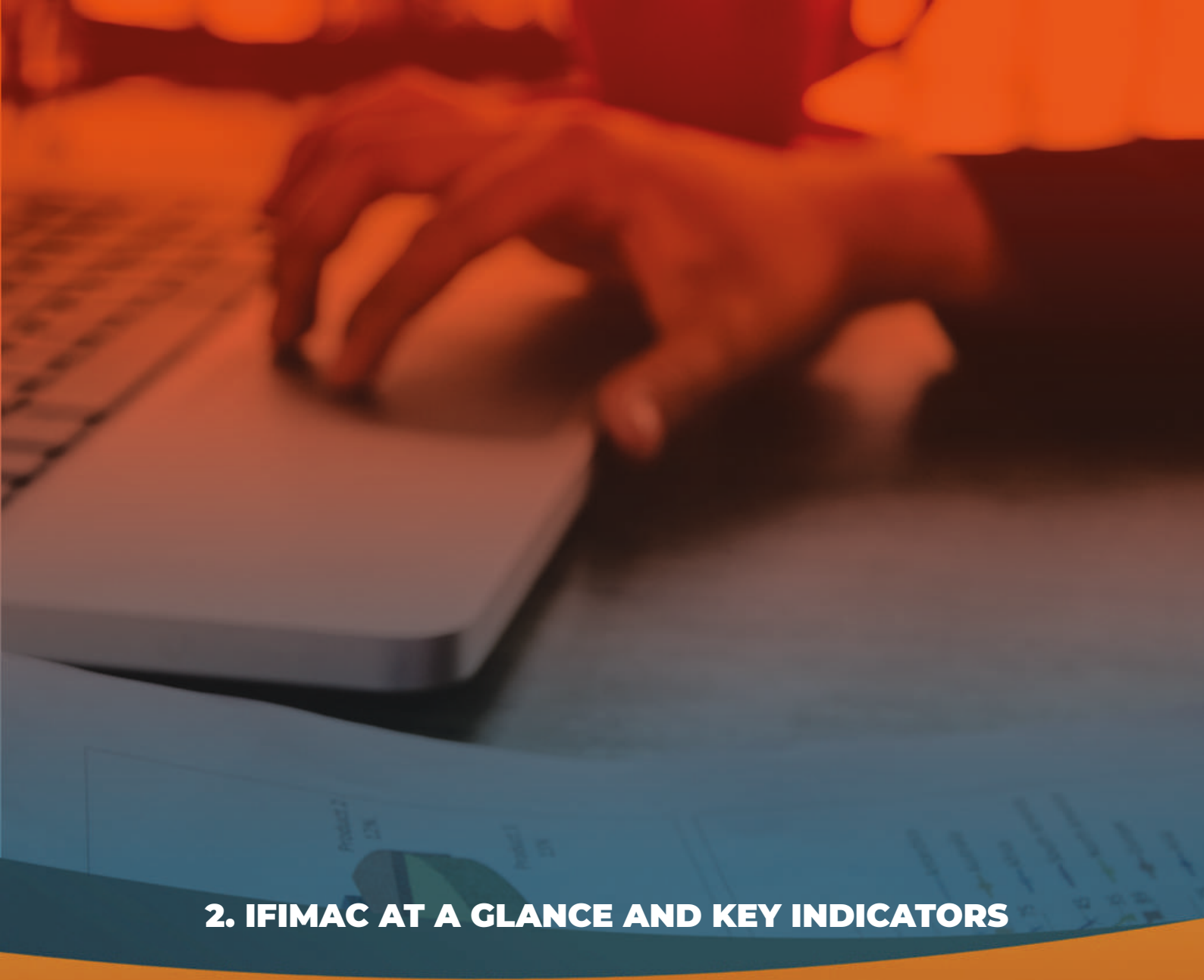
Cristina Gómez-Navarro gave a talk "***Mama quiero ser científica... ¿y ahora qué?"*** at the BBVA "Move for equality" working group on February 10th.

Miriam Jaafar Ruiz-Catellanos gave two talks ***"Conociendo a una científica del nanomundo"*** for the students from 1st and 2nd grade of Bachillerato category at Colegio Esclavas del Sagrado Corazón de Jesús (Madrid), on March, 3rd.

Linda Zotti gave a talk ***"Electrónica molecular: ¿qué es eso? Y qué hace una mujer trabajando en eso?"*** at Colegio Altair Internacional (Madrid) on March 14th.

Promoting participation: The Gender Equality Committee aim to achieve within two years a minimum of 40% of female members in the following committees: Steering Committee, Scientific Advisory Board, Project evaluation committee, Grant commission, Recruitment commission, Thesis Defense Committees, Invited seminar



2. IFIMAC AT A GLANCE AND KEY INDICATORS

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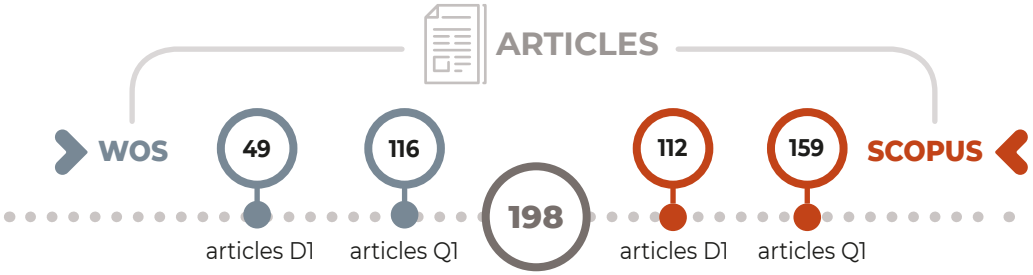
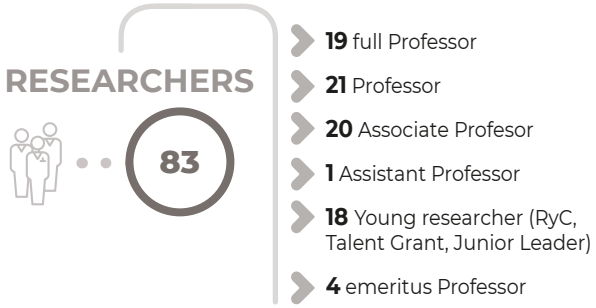
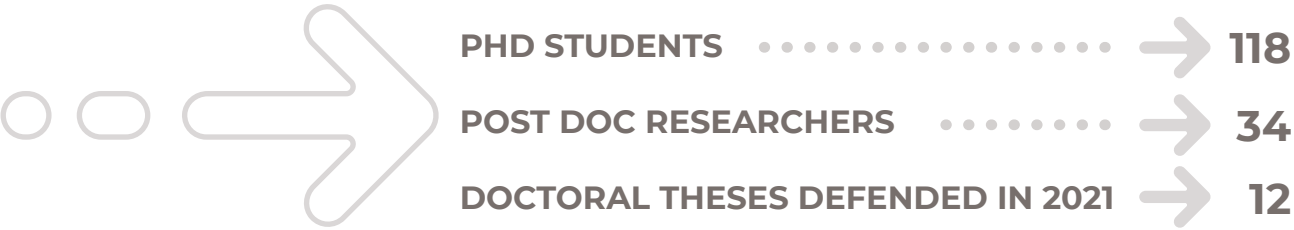
2. IFIMAC AT A GLANCE (2022)





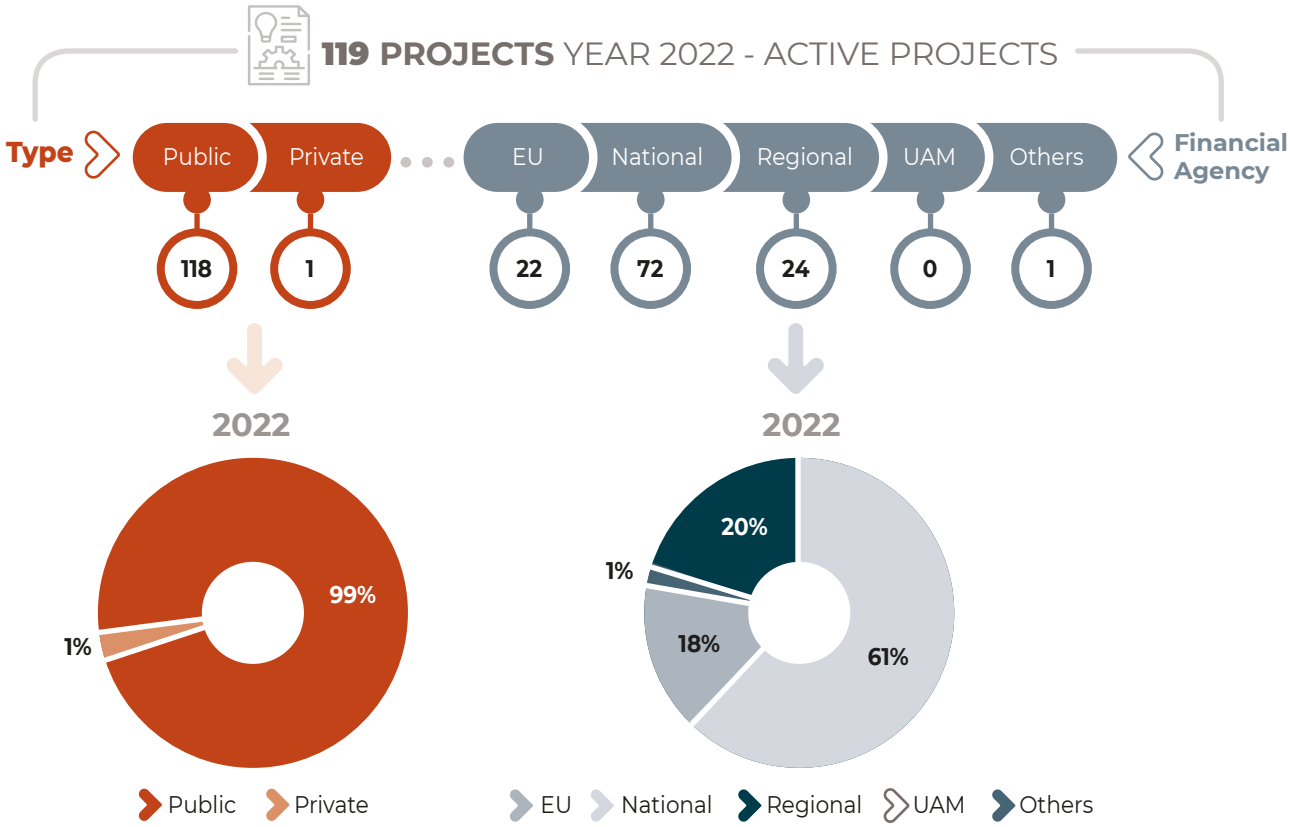


INDICATORS Publications

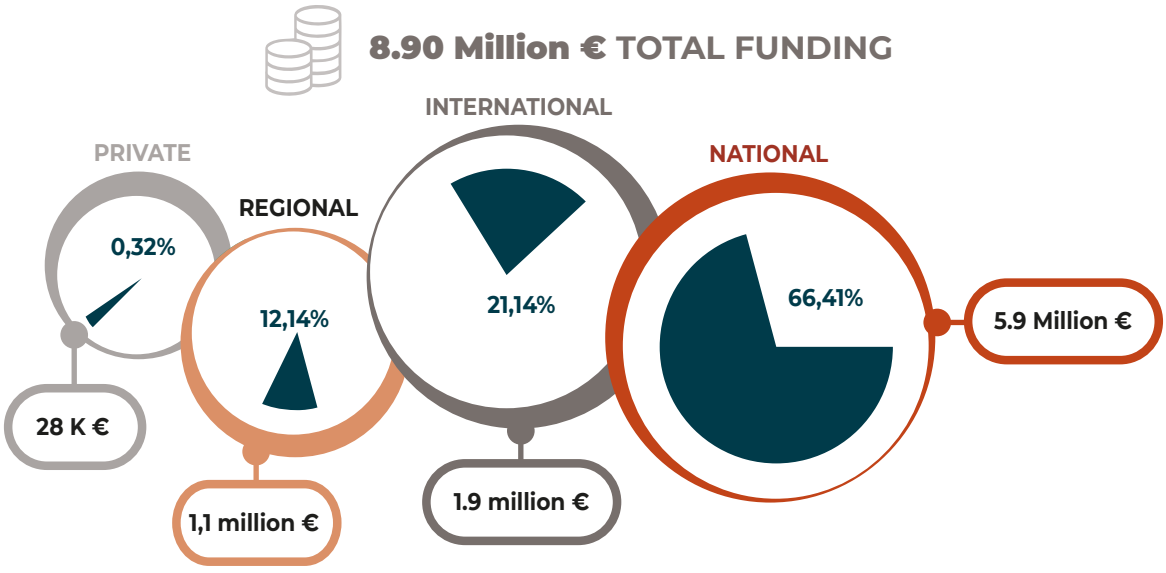
AVERAGE IF: 9,05

2. IFIMAC AT A GLANCE (2022)

INDICATORS Projects

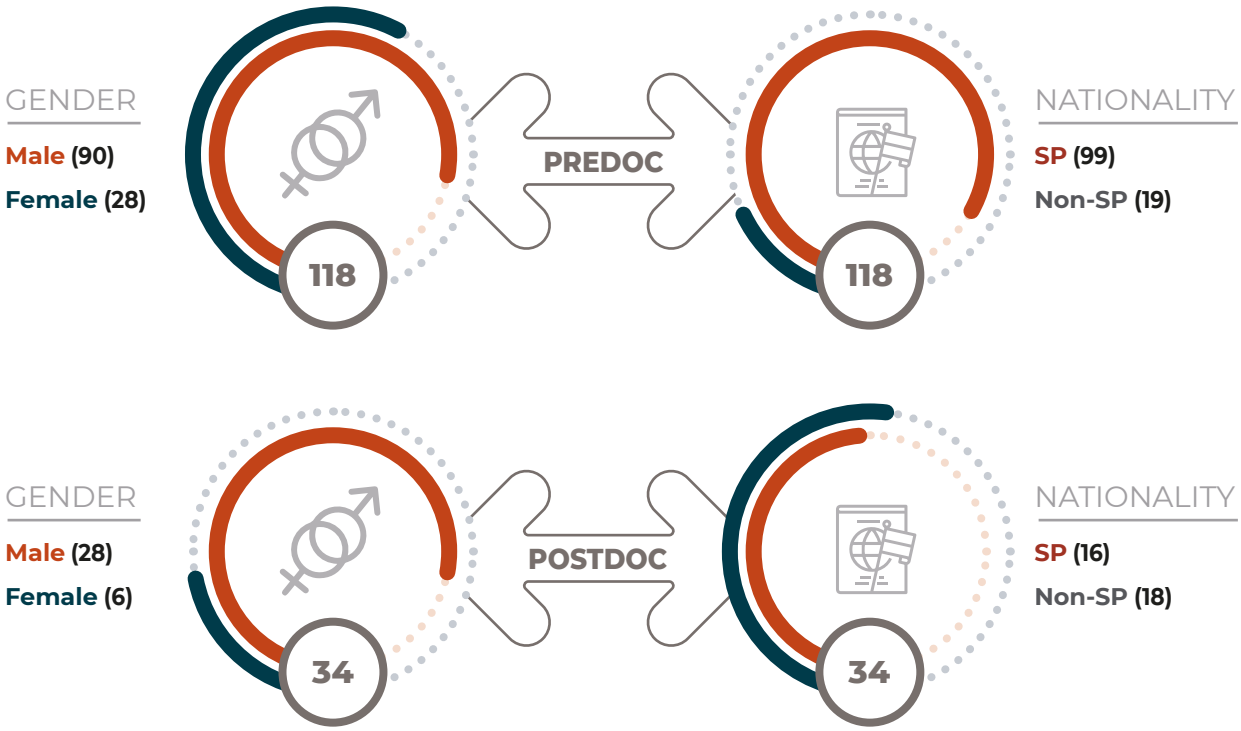


INDICATORS Funding



2. IFIMAC AT A GLANCE (2022)

INDICATORS Human resources



INDICATORS Doctoral thesis defended

INDICATORS Invited lectures

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3. RESEARCH

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3. RESEARCH

MAIN RESEARCH ACTIVITIES

IFIMAC COLABORATIVE PROJECTS

As a part of our strategic program (2019-2023) within the Maria de Maeztu Excellence Accreditation, IFIMAC launched the third call for collaborative projects within different groups (between 3 and 5) working at IFIMAC. The projects funded with a budget of 160.000 euros each that are being carried out at IFIMAC are the following. A short summary of the progress of these projects during 2022 is given below:

Disorder as a novel platform for topological superconductivity

Isabel Guillamón / Hermann Suderow, Miguel Ángel Ramos, Roberto Otero, Juan José Palacios

One of the aims of the project is to seek to prepare samples of bismuth (Bi) and alloys in which Bi transforms to a topological insulator (bismuth-antimony, Bi-Sb). The idea is to produce sufficient disorder so that these systems become superconducting (Bi becomes superconducting below 6 K in the amorphous state). The challenge is to overcome the strong tendency of Bi to crystallize even in single crystals of very small size, producing polycrystalline instead of amorphous behavior. We need to create inside the samples sufficiently large amorphous areas. To this end, we have irradiated Bi and Bi-Sb samples using protons, obtaining small-gap semiconductors. Amorphous Bi was prepared using a spinning technique. By evaporation, films of BixSb100-x alloys (x=0, 5, 10, 15) have been prepared using different experimental conditions, and subsequently irradiated either with protons or Bi ions (up to 35 MeV). The resulting materials have been morphologically and structurally characterized by means of SEM and XRD. The electrical behavior in the temperature range of 2-300 K has until now semiconducting character. On the theory side, approaches to calculate the electronic properties of amorphous Bi are under development. Theory results have been published (Physical Review B 105, 155128, 2022), reporting the use of convolutional neural networks to predict the topological character of simple models of disordered systems. The technique seems promising, and the theory side is extending it to more realistic models using a Slater-Koster parametrization of amorphous Sb and Bi in two-dimensional form (for the time being, an extension to three dimensions might come later). This part of the project has been carried out by M. A. Ramos, H. Suderow, I. Guillamón and J.J. Palacios.

On the other hand, we have studied the natural defects in Bi(111) surfaces using tunneling microscopy/spectroscopy and tunneling electroluminescence. In particular, the spatial dependence of the electronic structure has been characterized around the different types of atomic defects found on the surface as well as the atomic steps, finding that the quasiparticle interference maps are very different depending on the nature of the defect. Likewise, plasmonic luminescence spectra have been obtained, which is surprising given the low density of electronic states at the Fermi level. Single crystals of the superconductor Bi2212 were also measured and characterized. This part of the project has been carried out in collaboration between R. Otero, H. Suderow and J.J. Palacios.

Finally, through a collaboration between I. Guillamón, H. Suderow and J.J. Palacios, it was shown that conduction through atomic size junctions presents a sizeable magnetic field dependence on fields as high as 20 T. Calculations on the conditions to observe magnetic field dependent conduction were carried out. Furthermore, the sixfold fermion system PdSb2 was analyzed from tunneling spectroscopy and theory, highlighting the role of surface states in the tunneling conductance.

Dynamically driving spinning colloidal particles in 2D lattices

Juan. L. Aragonés, Laura. R. Arriaga, Salvatore Assenza , José. V. Alvarez

The main goal of the project is to fully characterize, in terms of transport and topological invariants, a novel topological active material comprising two key constituents: a suspension of colloidal particles that rotate under the external actuation of a homogenous magnetic field (so-called spinners) and an array of obstacles, which exhibits analogies with quantum topological materials (i.e. quantum Hall fluids) despite of its classical nature. We have started by characterizing the transport properties of this system as a function noise. This will enable us to test the robustness of this transport to perturbations, and ultimately tune and optimize the transport properties of this system.

Transport properties of spinners in disordered lattices of obstacles

We are considering the effect that the disorder and defects on the positions of the obstacles has on the transport properties of the spinners. The robustness of the transport properties of the system to the noise is one of the signatures of the topological-protected transport. We are considering different types of noises. First, we have analyzed the effect of decorrelated noise on the lattice positions of the obstacles, and now, we are studying the effect of correlated noise on the lattice positions. The correlated noise configurations are being obtained from the equilibrium configurations of a liquid in which the particles interact through a certain interaction potential with short- and long-range interactions. We characterize these disordered configurations of obstacles by identifying the relevant correlation length between the positions, which can be obtained from the radial distribution function. We have develop a novel method to obtain this characteristic length scale in model systems such as Lennard-Jones and Yukawa liquids, and we are testing its potential to identify the correlation length in real systems such water. We are also analyzing the effect of defects

3. RESEARCH

(i.e. absence of obstacles in lattice positions) on the obstacle's network by studying the transport as function of the density of defects, considering its relationship with the percolation threshold of the lattice.

In the absence of noise on the obstacle's lattice positions, the active rotating particle, or spinner, is trapped in two types of trajectories independently of the attraction between spinner and the obstacle, but depending on the rotational angular frequency of the particle (ω) and independently of the attraction: i) obstacle-centered trajectories at small ω (blue trajectory in Fig.1), and ii) hollow-centered trajectories at higher ω (orange trajectory in Fig.1), as shown in Fig.1. Interestingly, the presence of noise on the lattice positions of the obstacles breaks the lattice symmetry, and the spinner scape these confined trajectories travelling through the lattice. Thus, contrary to intuition, active spinning matter exhibits disorder-enhanced transport, which is the opposite to passive systems [1]. We have computed the time-averaged mean square displacements (MSD) with and without attraction between the active particle and the obstacles, as shown in Fig. 2.

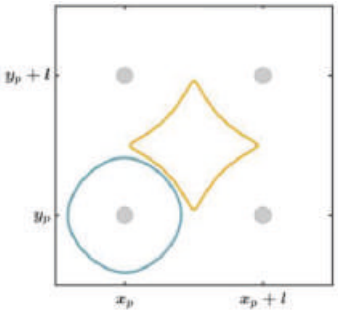


Figure 1. Steady state solutions of the system at two spinner's angular velocities, at lowerω (blue trajectory) and higher ω(orange trajectory).

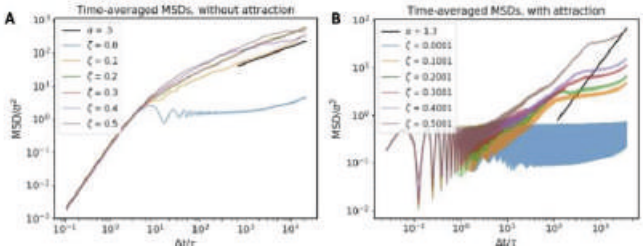


Figure 2. Time-averaged mean square displacements in log-log scale of the spinner in lattices of area fraction ϕ = 0.16 at different noise levels on the obstacle's positions (ζ) without spinner-obstacle attraction (A) and with attraction (B). The black solid line has slope α = 0.5 in A (subdiffusive transport) and α = 1.5 in B (superdiffusive transport), where MSD = $4Dt^{\alpha}$.

Interestingly, we observe that in the pure repulsive case, the longtime transport is not diffusive, but subdiffusive, as shown by the solid black line in Fig. 2A. This means that even small amounts of noise are enough to break the symmetry of the lattice and the spinner can escape the trapped trajectories. However, in the case of pure hydrodynamics the spinner exhibits a transient subdiffusive that arise from transient trapping within a heterogeneous environment [2]. In addition, we observe that the transport coefficient of the spinner is independent of the noise level. Again, contrarily to intuition, in the presence of an attractive interaction between the spinner and the obstacles, the longtime transport of the spinner in this disordered media becomes superdiffusive. In this case, the spinner instead of hop between the voids of the lattice, jumps from obstacle to obstacle. Therefore, as the noise level on the obstacle's lattice positions increases, the open trajectories that the spinner can find increases.

In parallel to the numerical simulations, we are carrying out experiments. In this case, we create the arrays of obstacles by attaching polystyrene particle to a glass slide. Therefore, we are studying disordered lattices, but for now, we do not have control over the amount or type of disorder. However, we can choose regions where the obstacles are more symmetric or ordered. As expected, spinners in local ordered regions are trapped and localized, as it can be seen in Fig. 3. Moreover, for spinners in more disordered regions, we observe a similar behavior to the numerical case with attractive interactions between the spinner and the obstacles. Spinners in regions with a higher local disorder exhibit long trajectories across the lattice, jumping from obstacle to obstacle. Thus, the time-averaged MSD shows a superdiffusive transport (α = 1.5).

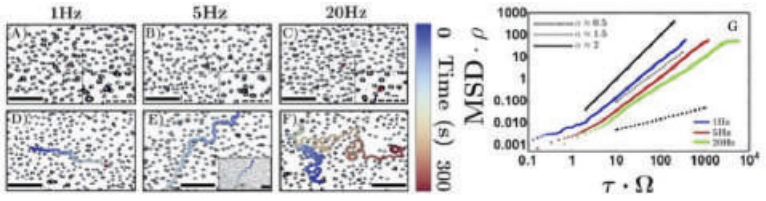


Figure 3. Experimental trajectories of spinners in ordered (A-C) and disordered environments (D-E) at three different rotational frequencies 1Hz (A-D), 5Hz (B-E), and 20Hz (C-F). Spinners in local ordered regions are trapped and localized. The solid scale bars are 50μm and the dashed scale bars are 16μm. Whereas spinner in local disordered regions become delocalized and translates across the lattice. G) Time-averaged mean square displacements in log-log scale of the spinner, where τ is the lag time, ρ the obstacle's density and Ω the spinner's rotational frequency.

3. RESEARCH

We are moving forward on how to control the configurations of the obstacles. We have generated random configurations of obstacles in the computer, and we have ordered the mask to BlackHole Lab, which will be the mold to produce the lattices of obstacles in a controlled manner in PDMS.

Previously, our Center funded other five proposals in two different calls for this kind of projects involving several research groups to strengthen the internal collaborations to boost scientific excellence

First Call:

Virus as molecular containers: transport, delivery and nanoreactors (Pedro J de Pablo Gómez, José Ortega Mateo, Rafael Delgado Buscalioni)

Visualizing, understanding and controlling Andreev bound states down to atomic scale (Hermann Suderow Rodríguez, Alfredo Levy Yeyati , Álvaro Martin Rodero, Miguel Angel Ramos Ruiz , Jose Gabriel Rodrigo Rodriguez, Isabel Guillamón Gómez)

Second call:

Single-photon generation in 2D crystalsfor quantum information (Juan José Palacios Burgos , Elsa Prada , Gabino Rubio Bollinger , José Manuel Calleja Pardo, Snezana Lazic , Carlos Tejedor de Paz , Luis Viña Liste)

Ultrahigh pressure chemistry at the nanoscale (Julio Gómez Herrero, Enrique García Michel , José María Gómez Rodríguez , Daniel Farías Tejerina, Félix Zamora Abanades, Fernando Martín García)

Charge and heat transport in atomic, molecular and protein-based junctions (Nicolás Agrait de la Puente , Juan Carlos Cuevas y , Rubén Pérez Pérez)

YOUNG RESEARCHERS

One of the most important and decisive action within the Maria de Maeztu Grant has been the hiring of three brilliant international young researchers. Thanks to the financial support of this grant, IFIMAC was able to offer three new four-years contracts plus an additional money to develop their research group to these three researchers:

SAÜL VÉLEZ pursed his master's (2008) and PhD studies (2012) at the University of Barcelona under the supervision of Prof. Tejada, receiving in both the Extraordinary award for his results on quantum magnetism. In April 2013, Saül joined the nanodevices group at CIC nanoGUNE to work with Prof. Hueso with the purpose to transition towards spintronics and nanodevices, areas in which he is now a reference. From September 2017 to May 2021, Saül also hold a senior postdoctoral position in the groups of Prof. Gambardella and Prof. Fiebig at ETH Zürich.

With interest in spintronics, magnetotransport, and optoelectronics phenomena, his recent research focused on exploring magnetoresistive effects and magnetic dynamic phenomena in metal/oxide heterostructure devices. Among his discoveries, he has demonstrated that interfacial interactions and spin currents can be used for probing and manipulating the magnetic moments of electrically insulating materials, opening a new research field with profound fundamental and technological impacts. His contributions to polaritonics and optoelectronics in low dimensional materials and heterostructures are also multiple.

Saül joined IFIMAC in June 2021 as Junior Group Leader and found the Spintronics and Nanodevices group. In his lab, he aims at exploring non-conventional materials and new device concepts for spintronic applications.

Dr. Saul Velez was awarded with a RyC grant (that he rejected to incorporate to his talent grant) and a Talent Attraction grant from the Community of Madrid in year 2021. On January 2022 he started his talent grant contract at IFIMAC.

AKASHDEEP KAMRA obtained his master degree in Electrical Engineering from the Indian Institute of Technology Kanpur and a PhD in Physics from the Delft University of Technology, Netherlands. Then he worked as an Alexander von Humboldt postdoc fellow at the University of Konstanz, Germany before joining Norwegian University of Science and Technology as an independent researcher. His primary interest lies in the theory of spin-dependent phenomena in magnetic insulators, (super)conductors and their hybrids. Akash especially enjoys working on research problems that exploit knowledge from different sub-fields of Physics. While being a "theorist", he has performed several experiments first hand in the past and continues to collaborate closely with experimentalists. When not enjoying Physics, Akash likes to go hiking and exploring new places.

Dr. Akashdeep Kamra was awarded with a Ramón y Cajal grant (2021 call), starting his contaract as RyC researcher at the beginning of 2023.

PABLO ARES research interests have a marked multidisciplinary character within the framework of nanoscience and nanotechnology. They are focused on the use and development of scanning probe microscopies, mainly atomic force microscopy (AFM), for the study of low-dimensional systems, with particular attention to 2D materials.

He received his B.S. and Master degree in Physics at the Universidad Complutense de Madrid (Spain) in 2003. He then joined the company Nanotec Electrónica S.L. (devoted to the design, development and commercialization of scanning

3. RESEARCH

probe microscopes) as an Application Scientist. In 2014, he moved to the Universidad Autónoma de Madrid (Spain), where in 2017 he obtained his Ph.D. in Condensed Matter Physics and Nanotechnology under the supervision of Prof. Julio Gómez-Herrero and Dr. Adriana Gil. His thesis presented a double scientific-technical aspect, with advances on the AFM technique itself, as well as with more fundamental science studies, such as the isolation and study of antimonene, pioneering the worldwide experimental research on this novel 2D material.

After this, he joined the Graphene Group at the Condensed Matter Physics department of the University Of Manchester (UK) as a Research Associate working with Prof. Konstantin S. Novoselov and Dr. Laura Fumagalli. Once there he gained a Marie Sklodowska-Curie Individual Fellowship in 2018. His research during this time focused on basic properties of 2D materials and their combination in van der Waals heterostructures, and their use for the study of electrical properties of molecules under extreme confinement.

Dr. Pablo Ares was awarded with a Ramón y Cajal grant (2020 call), and he started his contract as RyC researcher in 2022.

In a previos call in the frame of the first accreditation as a Maria de Maeztu unit of excellence, IFIMAC atracted other three top young resarchers:

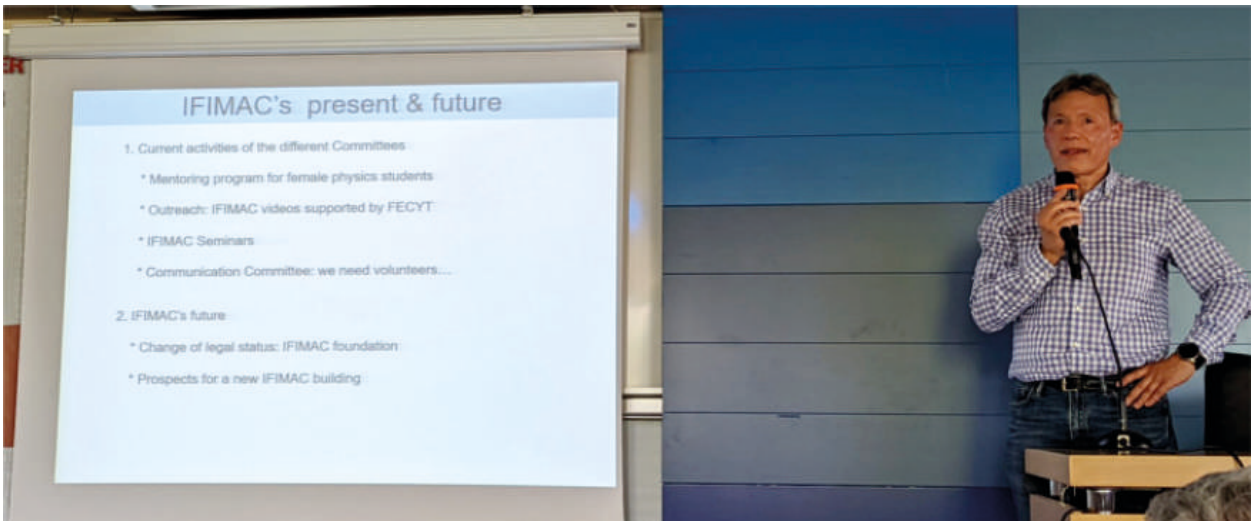
1) EDUARDO LEE: His research program is focused on the investigation of hybrid superconductor-semiconductor quantum dot devices. It is divided in two main directions: (i) the exploration of arrays of proximity- coupled QDs as a potential system for building a 1D topological superconductor with edge MZMs, and (ii) the development of hybrid devices towards applications in nanoelectronics. It is important to notice that Dr. Eduardo Lee was awarded with an ERC Starting Grant in year 2016.

2) FERRY PRINS: The aim of his research project is to establish an experimental research group focused on understanding and controlling light-matter interactions at the nanoscale. To achieve this, his group will study carefully chosen combinations of photonic, plasmonic, and excitonic effects that are characteristic of nanostructured materials and interfaces. Specifically, they will use innovative processing strategies to eliminate losses in exciton transport in quantum dot solids through photonic control, open up routes towards excitonic circuitry using the unique properties of 2D semiconductors, and develop plasmonic nanopores for nanoscale spectroscopy. Dr. Ferry Prins was awarded with a Talent Attraction grant from the Community of Madrid in year 2016, and with a Ramón y Cajal grant in 2019

3) JOHANNES FEIST: The theoretical research that he conduct within IFIMAC is related to the field of strong coupling of organic molecules with confined light modes. This field relies on the recent progress in nanophotonics and nanoplasmonics that has allowed unprecedented control over electromagnetic fields on the nanoscale, creating confined modes of light that can couple to excitations in a material. One of the major goals of this research is how confined light modes can be used to significantly alter material and chemical properties of organic materials. It is important to notice that Dr. Johannes Feist was awarded with an ERC Starting Grant in year 2016, and was awarded with a Ramón y Cajal Grant in 2018

IFIMAC Day 2022 “10 years of IFIMAC”

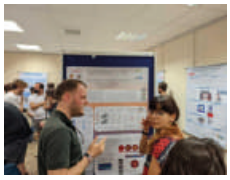
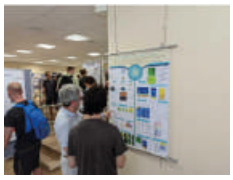
On June 2022 we celebrated our fist IFIMAC DAY. The goal of the meeting was to gather all the people that are part of IFIMAC (members, together with postdoctoral researchers and PhD students working in their research groups), to celebrate the activities developed in our centre since its creation in 2012.

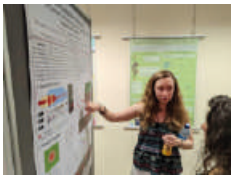


3. RESEARCH

The meeting included a short introduction by the IFIMAC Director, and a series of talks on all of the collaborative projects funded by IFIMAC so far--one of the landmarks in our research activity funded by the two Maria de Maeztu excellence accreditation--. These talks were given by a member of the project and included a summary of the main scientific results, along with a brief assessment of the lasting influence of the collaboration in the research activity of each group.

In between the talks, we had a poster session where PhD students and postdocs were able to share their work at IFIMAC




To facilitate interaction between all the attendants, we organized a buffet lunch at the Plaza Mayor, UAM Campus.

The talks given were the following:

“Disorder as a novel platform for topological superconductivity” *(Juan José Palacios)*

“Charge and heat transport in atomic and molecular junctions” *(Nicolás Agrait)*

“Dynamically driven spinning colloidal particles in 2D lattices: a topological active metamaterial” *(Juan Luis Aragonés)*

“Ultrahigh pressure chemistry at the nanoscale” *(Pablo Ares)*

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“Single-photon generation in 2D crystals for quantum information” (*Herko Van der Meulen)*

“Virus as molecular containers: transport, delivery and nano-reactors. Challenges and results” *(Pedro J. de Pablo)*

“Visualizing, understanding and controlling Andreev bound states down to atomic scale” *(Hermann Suderow)*

SEMINARS

During the year 2022 we have continued with the joint IFIMAC ICMMM Seminars that started in 2020, as a consequence of the covid 19 pandemic, in order to adapt the IFIMAc Seminars to the needs of that time. The online format has meant a double opportunity for us. On the one hand, it has allowed us to count with renowned international (and also national) speakers on a weekly basis. On the other hand, it has enabled us to reach an international audience that is well beyond the area of the UAM campus and Madrid.

In addition, during 2022, with the return to normality after covid 19, we have considered to relaunch the IFIMAC onsite seminars without giving up the advantages that the online/joint format have brought.

In 2022, were held 25 joint IFIMAC ICMM Seminars along with 2 IFIMAC Seminars, that were the beginning of a new Series of IFIMAC Colloquium for 2023.

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→ *IFIMAC+ICMM 2022 Seminars*

Caitlin Howell

University of Maine (USA)

"Engineering Bio-Inspired Surfaces to Control Biological Systems"

January 1st 2022; 12.00h

IFIMAC+ICMM Hybrid format. Sala de Seminarios, 5ª planta, Módulo 5, Facultad de Ciencias, UAM (Spain)

Héctor Ochoa

Donostia International Physics Center (Spain) and Columbia University in New York (USA)

"Phase" fluctuations of moiré superlattices

January 20th 2022; On line 12:00h

IFIMAC+ICMM Hybrid format. Salón de Actos at ICMM, C/ Sor Juana Inés de la Cruz 3, 28049 Madrid

Elena Hassinger

Max Planck Institute for Chemical Physics of Solids, Dresden (Germany)

"Field-induced transition from even to odd parity superconductivity in CeRh2As2"

https://youtu.be/Ynm3BSEprho

January 27th 2022; On line 12:00h

IFIMAC+ICMM

Wiebke Drenckhan

Max Planck Institute for Chemical Physics of Solids, Dresden (Germany)

"Institut Charles Sadron, CNRS UPR22

University of Strasbourg, France"

https://youtu.be/TKjGJfHr25c

February, 3rd 2022; On line 12:00h

IFIMAC+ICMM

Bruno de la Torre

Regional Centre of Advanced Technologies and Materials, Palacký University, Olomouc, CZ

"Imaging the anisotropic charge distribution within a single atom with Scanning Probe Microscopy"

https://youtu.be/cUxS49-1Ovg

February 10th 2022; On line 12:00h

IFIMAC+ICMM

Gloria Platero

Instituto de Ciencia de Materiales de Madrid, ICMM-CSIC

"Simulation of topological phases in quantum dot arrays"

February, 17th 2022; On line 12:00h

IFIMAC+ICMM Hybrid format. Salón de Actos at ICMM, C/ Sor Juana Inés de la Cruz 3, 28049 Madrid

Adolfo del Campo

University of Luxembourg

"Topological Defects in a Quantum Annealer"

February, 24th 2022; On line 12:00h

IFIMAC+ICMM

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Natalia Ares

Department of Materials, Oxford University (UK)

"Quantum devices as a meeting point between thermodynamics and artificial intelligence"

March, 3rd 2022; On line 12:00h

IFIMAC+ICMM

Christian Schneider

Institute for Physics, Carl von Ossietzky University Oldenburg

"Exciton-Polaritons and their condensates in microcavities loaded with atomically thin crystals"

https://youtu.be/DTIiAzUvehU

March, 10th, 2022; On line 12:00h

IFIMAC+ICMM

Larz Fritz

Institute of Theoretical Physics University of Utrecht

"Hydrodynamic electrons in Dirac type systems: the role of particle-hole pairs"

https://youtu.be/s_yuLq1OWpk

March 24th 2022; On line 12:00h

IFIMAC+ICMM

Nacho Pascual

CIC nanoGUNE, San Sebastian - Donostia, 20018, Spain.

"Emergence of π-Paramagnetism in Engineered Graphene Nanostructures"

March, 31st 2022; On line 12:00h

IFIMAC+ICMM

Esther Amstad

Material Science Department (IMX) Ecole Polytechnique Fédérale de Lausanne (EPFL) (Switzerland).

"Drops: a tool to produce recyclable load-bearing hydrogels"

https://youtu.be/y30u9O0h5tE

April, 7th 2022; On line 12:00h

IFIMAC+ICMM

Silvia Picozzi

Consiglio Nazionale delle Ricerche, Istituto CNR-SPIN Chieti, c/o Univ. "G. D'Annunzio" Chieti-Pescara, 66100 Chieti (Italy)

"Spin-orbit coupling: an endless source of complex magnetism"

April, 21st 2022; On line 12:00h

IFIMAC+ICMM

Luca Chirolli

Istituto Nanoscienze

Consiglio Nazionale delle Ricerche, Istituto CNR•NANO

"Enhanced coherence and Majorana qubits in superconducting circuits featuring nperiodic

Josephson junctions"

https://youtu.be/9u4nx5uWzOQ

April, 28th 2022; On line 12:00h

IFIMAC+ICMM

3. RESEARCH

Alexandra Palacio-Morales

Laboratoire de Physique des Solides Université Paris-Saclay (France)

"Misfit Layer Compounds: A Platform for Heavily Doped 20 Transition Metal Dichalcogenides"

May, 5th 2022; On line 12:00h

IFIMAC+ICMM

Tobias Stauber

Instituto de Ciencia de Materiales de Madrid, CSIC)

"Correlated phases in multilayer graphene"

https://youtu.be/BJnjl-pK9B0

May 12th 2022; On line 12:00h

IFIMAC+ICMM

Giorgio Benedek

Donostia International Physics Center (DIPC) Dept. of Materials Science, Università di Milano-Bicocca

"The surface electron-phonon interaction at conducting surfaces measured with He atom scattering"

May 19th 2022; 12:00h

Sala de Conferencias, 6ª planta, Módulo 3, Facultad de Ciencias (UAM); IFIMAC+ICMM

Anton Akhmerov

Quantum Tinkerer group Delft University of Technology The Netherlands

"Josephson versus Andreev: what can we do with only tunnel junction circuits?"

https://youtu.be/BLQUF3O7AqQ

May 26th 2022; On line 12:00h

IFIMAC+ICMM

Christophe Galland

Institute of Physics, EPFL Switzerland

"Molecular Optomechanics: a fresh look on Raman scattering"

https://youtu.be/ln8Zgjx35H4

June, 2nd 2022; 12:00h

Sala de Conferencias, 6ª planta, Módulo 3, Facultad de Ciencias (UAM) *IFIMAC+ICMM*

Sebastián Bergeret

Centro de Física de Materiales CFM, CSIC-UPV, San Sebastián

"Magnetoelectric effects and non-reciprocal transport in superconducting systems"

June, 16th 2022; On line 12:00h

IFIMAc+ICMM

Luis Gonzalez MacDowell

Physical Chemistry Department, Universidad Complutense de Madrid, Spain

"Fluctuating Interfaces"

October, 6th 2022; On line 12:00h

IFIMAC+ICMM

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Hans Huebl

Walther-Meissner-Institut, Bayerische Akademie der Wissenschaften, Garching, Germany

"Sensing Solid-State Excitations with Hybrid Quantum Systems"

https://youtu.be/VBTipdMKCj0

October, 20th 2022; 12:00h

Hybrid On-line On-site; Sala de Seminarios, 5ª planta, Módulo 5, Facultad de Ciencias (UAM); IFIMAC+ICMM

Iván López-Montero

Department of Physical Chemistry, Universidad Complutense de Madrid, Spain

"in vitro reconstitution of cellular functions to study the self-assembly and dynamics of biomembranes"

November, 11st, 2022; 12:00h

Hybrid On-line On-site Sala de Seminarios, 5a. planta, Módulo 5, Facultad de Ciencias (UAM) IFIMAC+ICMM

Eduardo Lee

Vondensed Matter Physics Center, IFIMAC UAM

"Joule spectroscopy of hybrid superconductor semiconductor nanodevices"

https://www.youtube.com/watch?v=OTzKLvUm9Js

November 17th 2022; On line 12:00h

IFIMAC+ICMM

Richard Schlitz

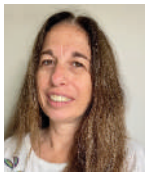
Department of Materials, ETH Zurich (Switzerland)

"Investigating individual spins on surfaces by electron paramagnetic resonance in a scanning tunneling microscope"

December, 1st 2022

On-site venue: Sala de Seminarios, 5th floor, Módulo 3, Facultad de Ciencias (UAM) IFIMAC 2022 SEMINARS

→ IFIMAC 2022 SEMINARS



Nurit Ashkenasy

Department of Materials Engineering and the Ilse Katz Institute for Nanoscale Science and Technology, Ben-Gurion University of the Negev, Beer-Sheva, Israel

"BIOINSPIRED ELECTRONIC MATERIALS"

September, 12th 2022

IFIMAC, Modulo 5, Seminar Room. Online Zoom

Nicola Marzari

École Polytechnique Fédérale de Lausanne (EPFL) and Paul Scherrer Institut Switzerland

"To see world in a grain of sand"

October, 26th 2022

Modulo 8, Sala de Grados. Facultad de Ciencias 16:00 h

3. RESEARCH

PhD POSITION AT THE IFIMAC WITHIN THE PREDOCTORAL FELLOSHIPS PROGRAM OF THE SPANISH AEI AND THE FUNDACIÓN LA CAIXA INPHINIT PROGRAMME

We welcame 2 new PhD students, one in each Strategic research line:

- GALOR GEVA (Experimental condensed Matter Physics).

He is pursuing his PhD working in the project Dynamically driven spinning colloidal particles in 2D lattices: a topological active metamaterial, under th supervision of Laura R. Arriaga

- MAKSIM LEDNEV (Theoretical condensed matter physics).

He es working and pursuing his PhD in the field of nano and quantum optics under the supervision of Johannes Feist and Francisco José García Vidal.

We also Welcame a new PhD student, in the frame of Fundación La Caixa INPhINIT predoctoral programme:

- ANNA LUISA ROMLING.

She is pursuing her PhD at IFIMAC on the young and emerging field of Quantum Magnonics under the supervision of Akashdeep Kamra.

RESEARCH PROJECTS

International R&D projects:

1 **ANDREEV QUBITS FOR SCALABLE QUANTUM COMPUTATION- ANDQC**
Reference: GA 828948
Funding institution: COMISION EUROPEA
Period: 01/04/2019-31/03/2024
PI: LEVY-YEYATI MIZRAHI, ALFREDO

2 **ATTOSECOND CHEMISTRY- ATTOCHEM**
Reference: CA18222
Funding institution: COMISION EUROPEA
Period: 25/10/2019-24/10/2023
PI: MARTIN GARCIA, FERNANDO

3 **IMPROVING THE SUSTAINABILITY OF THE EUROPEAN MAGNETIC FIELD LABORATORY**
Reference: GA 871106
Funding institution: COMISION EUROPEA
Period: 01/11/2020-31/10/2024
PI: SUDEROW RODRIGUEZ, HERMANN JESUS

4 **MAGNETOELECTRIC 3D PRINTING TECHNOLOGY - THE REVOLUTION OF ACTUATABLE COMPOSITES**
Reference: GA 101047081
Funding institution: COMISION EUROPEA
Period: 01/10/2022-30/09/2026
PI: ZAMORA ABANADES, FELIX JUAN

5 **MID-INFRARED QUANTUM TECHNOLOGY FOR SENSING**
Reference: GA 101070700
Funding institution: COMISION EUROPEA Period: 01/10/2022-30/09/2025
PI: FERNANDEZ DOMINGUEZ, ANTONIO ISAAC

6 **MODIFICATION OF MOLECULAR STRUCTURE UNDER STRONG COUPLING TO CONFINED LIGHT MODES - MMUSCLES**
Reference: GA 714870
Funding institution: COMISION EUROPEA
Period: 01/04/2017-31/03/2023
PI: FEIST, JOHANNES MAXIMILIAN

7 **MOLECULAR DYNAMICS IN THE GAS PASE**
Reference: CA18212
Funding institution: COMISION EUROPEA
Period: 12/11/2019-11/11/2023
PI: DIAZ-TENDERO VICTORIA, SERGIO

8 **NANOSCALE COHERENT HYBRID DEVICES FOR SUPERCONDUCTING QUANTUM TECHNOLOGIES**
Reference: CA 16218
Funding institution: COST ASSOCIATION
Period: 18/10/2017-31/10/2022
PI: SUDEROW RODRIGUEZ, HERMANN JESUS

9 **NOTsoQUANTUM: Realistic simulations of polaritonic chemistry**
Reference: GA101029384
Funding institution: COMISION EUROPEA
Period: 01/09/2022-31/08/2025
PI: FEIST, JOHANNES MAXIMILIAN

10 **QUANTUM INTERFERENCE ENHANCED THERMOELECTRICITY -QUIET**
Reference: GA 767187
Funding institution: COMISION EUROPEA
Period: 01/02/2018-31/10/2022
PI: AGRAIT DE LA PUENTE, MARIO NICOLAS

3. RESEARCH

11 SCANNING PROBE MICROSCOPY IN HIGH VECTORIAL MAGNETIC FIELDS: NEW DEVICE FOR IMAGING QUANTUM MATERIALS - VECTORFIELDIMAGING
Reference: 101069239
Funding institution: COMISION EUROPEA
Period: 01/06/2022-30/11/2023
PI: GUILLAMON GOMEZ, ISABEL

12 SUPERCONDUCTING NANODEVICES AND QUANTUM MATERIALS FOR COHERENT MANIPULATION - SUPERQUMAP
Reference: CA 21114
Funding institution: COMISION EUROPEA
Period: 06/10/2022-05/10/2026
PI: SUDEROW RODRIGUEZ, HERMANN JESUS

13 THE ULTIMATE TIME SCALE IN ORGANIC MOLECULAR OPTO-ELECTRONICS, THE ATTOSECOND REFERENCE: GA 951224
Funding institution: COMISION EUROPEA
Period: 01/04/2021-31/03/2027
PI: MARTIN GARCIA, FERNANDO

14 THEORETICAL INVESTIGATION OF SURFACE PHONON POLARITON-BASED QUANTUM PHOTONIC CIRCUITS REFERENCE: GA 101067180
Funding institution: COMISION EUROPEA
Period: 01/10/2022-30/09/2024
PI: FERNANDEZ DOMINGUEZ, ANTONIO ISAAC

15 USING EXTREME MAGNETIC FIELD MICROSCOPY TO VISUALIZE CORRELATED ELECTRON MATRIALS - PNICTEYES
Reference: GA 679080
Funding institution: COMISION EUROPEA
Period: 01/03/2016-28/02/2022
PI: GUILLAMON GOMEZ, ISABEL

16 MISTI GLOBAL SEED FUND PROGRAM
Reference: 2021/00076/001
Funding institution: Massachusetts Institute of Technology
Period: 01/09/2021-31/12/2022
PI: PRINS, FERRY

17 MULTI-FUNCTIONAL ICEPHOBIC, ROBUST, LIGHTWEIGHT AND TRANSPARENT COATINGS FOR WINDOWS AND LENSES (IGC AS)
Reference: 300023
Funding institution: Ice Guard Coating AS
Period: 01/09/2019-28/02/2022
PI: FARIAS TEJERINA, DANIEL

18 MULTI-FUNCTIONAL ICEPHOBIC, ROBUST, LIGHTWEIGHT AND TRANSPARENT COATINGS FOR WINDOWS AND LENSES (NORCE)
Reference: 300023
Funding institution: NORCE Norwegian Research Centre AS
Period: 01/09/2019-28/02/2022
PI: FARIAS TEJERINA, DANIEL

19 PROTEIN NANOCAGES AS SINGLE MOLECULAR REACTORS TO UNDERSTAND BIOCATALYSIS IN CROWDED ENVIROMENTS
Reference: RGP0012/2018
Funding institution: THE INTERNATIONAL HUMAN FRONTIER SCIENCE PROGRAM ORGANIZATION
Period: 01/06/2018-31/08/2023
PI: DE PABLO GOMEZ, PEDRO JOSE

20 MULTI-FUNCTIONAL ICEPHOBIC, ROBUST, LIGHTWEIGHT AND TRANSPARENT COATINGS FOR WINDOWS AND LENSES
Reference: PCI2019-103586
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2019- 28/02/2022
PI: FARIAS TEJERINA, DANIEL

21 TECNOLOGÍAS CUÁNTICAS A TEMPERATURA AMBIENTE
Reference: PCI2018-093145
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/03/2018- 30/06/2022
PI: GARCIA VIDAL, FCO. JOSE

22 TENSIONES MECÁNICAS EN COMPONENTES LAMINARES DE IONES LITIO: LA MURALLA A FRANQUEAR PARA EL USO DE BATERÍAS DE LI EN APLICACIONES INTENSIVAS
Reference: PCI2019-103594
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/03/2019- 28/02/2023
PI: POLOP JORDA, CELIA

National R&D Projects:

23 ACELERANDO LA TRANSICIÓN DIGITAL CON NANOFOTÓNICA CUÁNTICA: PLATAFORMAS
Reference: TED2021-130552B-C21
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/12/2022- 30/11/2024
PI: MARTIN CANO, DIEGO

24 ACTIVATION OF GREENHOUSE GASES FOR CLEAN ENERGY FUELS: A COMBINED MOLECULAR BEAMS AND XPS STUDY
Reference: TED2021-130446B-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/12/2022- 30/11/2024
PI: FARIAS TEJERINA, DANIEL

25 CARACTERIZACIÓN DE EXCITACIONES ÓPTICAS EN MATERIALES 2D CON RESOLUCIÓN ATÓMICA
Reference: PID2021-128011NB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2022- 31/08/2025 PI: OTERO MARTIN, ROBERTO

3. RESEARCH

26 CENTRO DE INVESTIGACION DE FISICA DE LA MATERIA CONDENSADA (IFIMAC)
Reference: CEX2018-000805-M
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 16/12/2019- 15/12/2023
PI: GARCIA VIDAL, FCO. JOSE

27 CONFIGURACIÓN DE LA ESTRUCTURA ELECTRÓNICA DE MATERIALES 2D: FOTORRESPUESTA Y PROPIEDADES DE ESPÍN
Reference: PID2021-123295NB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2022- 31/08/2025
PI: GARCIA MICHEL, ENRIQUE

28 CONTROL A LA NANOESCALA DE NUEVAS PROPIEDADES INCORPORADAS AL GRAFENO: SUPERCONDUCTIVIDAD, MAGNETISMO Y GAP ELECTRÓNICO
Reference: PID2020-115171GB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2021-45535
PI: BRIHUEGA ALVAREZ, IVAN

29 CONTROL QUÍMICO DE REDES METAL-ORGÁNICAS DE ZIRCONIO PARA LA CAPTURA Y DETECCIÓN ÓPTICA DE CONTAMINANTES AMBIENTALES
Reference: PID2021-123839OB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2022- 31/08/2025
PI: PLATERO PRATS, ANA EVA

30 ESTRUCTURAS SOSTENIBLES AVANZADAS PARA ENERGÍA Y FOTÓNICA-UAM
Reference: TED2021-129666B-C21
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/12/2022- 30/11/2024
PI: LAZIC, SNEZANA

31 CORRELACIONES CUÁNTICAS E INTERFERENCIA DE FOTONES INTERACTÚANTES EN ESTRUCTURAS MATERIA-LUZ BIDIMENSIONALES
Reference: PID2020-113415RB-C22
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2021- 31/08/2024
PI: MARCHETTI, FRANCESCA MARIA

32 CUANDO LAS INTERACCIONES ADHESIVAS CONTROLAN EL MOVIMIENTO CELULAR
Reference: RTI2018-101953-A-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/01/2019- 30/09/2022
PI: RODRIGUEZ ARRIAGA, LAURA

33 DEFECTOS Y HETEROUNIONES BIDIMENSIONALES DE DICALCOGENUROS CON METALES DE TRANSICIÓN
Reference: PGC2018-093291-B-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/01/2019- 30/09/2022
PI: LOPEZ VAZQUEZ DE PARGA, AMADEO

34 DESCIFRANDO LAS PROPIEDADES MAGNÉTICAS DE SISTEMAS BASADOS EN NANOHILOS Y NANOPARTÍCULAS PARA IMANES PERMANENTES
Reference: TED2021-130957B-C55
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/12/2022- 30/11/2024
PI: JAAFAR RUIZ-CASTELLANOS, MIRIAM

35 DIFRACTOMETRO DE RAYOS X DE MONOCRISTAL CON FUENTE DUAL
Reference: EQC2021-007518-P
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/06/2021- 31/12/2023
PI: ZAMORA ABANADES, FELIX JUAN

36 DINÁMICA Y RUIDO EN NUEVOS MATERIALES Y DISPOSITIVOS PARA PROCESAMIENTO ULTRA RÁPIDO Y NO DISIPATIVO DE SEÑALES
Reference: RTI2018-095303-B-C55
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/01/2019- 30/09/2022
PI: ALIEV KAZANSKI, FARKHAD

37 DINÁMICA, TRANSPORTE DE ESPÍN Y RUIDO EN ANTIFERROMAGNÉTICOS EPITAXIALES Y OTROS SISTEMAS NOVEDOSOS PARA PROCESAMIENTO ULTRARRÁPIDO Y POCO DISIPATIVO DE SEÑALES
Reference: PID2021-124585NB-C32
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2022- 31/08/2025
PI: ALIEV KAZANSKI, FARKHAD

38 DISEÑO DE MATERIALES 2D PARA APLICACIONES DE ENERGÍA: MEMBRANAS Y BATERÍAS
Reference: PID2019-106268GB-C32
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/01/2020- 30/09/2023
PI: ZAMORA ABANADES, FELIX JUAN

39 DISEÑO DE MATERIALES 2D PARA APLICACIONES EN ENERGÍA: NANOELCTROMECANICA
Reference: PID2019-106268GB-C31
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/01/2020- 30/09/2023
PI: GOMEZ-NAVARRO GONZALEZ, CRISTINA

3. RESEARCH

40 EFECTOS DE MUCHOS CUERPOS Y TRANSPORTE EN SEMIMETALES TOPOLÓGICOS
Reference: PID2021-127240NB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2022- 31/08/2025
PI: CORTIJO FERNANDEZ, ALBERTO

41 ELECTRÓNICA COHERENTE EN DISPOSITIVOS SUPERCONDUCTORES
Reference: PID2020-117992GA-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2021- 31/08/2025
PI: BURSET ATIENZA, PABLO

42 ENHANCING THE MECHANICAL STABILITY OF INTERFACES IN SOLID-STATE LI-ION BATTERIES FOR ENERGY-INTENSIVE APPLICATIONS
Reference: PCI2022-132998
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/05/2022- 30/04/2025
PI: POLOP JORDA, CELIA

43 ESCALADO INDUSTRIAL DE TINTAS BASADAS EN MATERIALES BIDIMENSIONALES: CARACTERIZACIÓN Y RECUBRIMIENTOS
Reference: PDC2021-120782-C22
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/12/2021- 30/11/2023
PI: GOMEZ HERRERO, JULIO

44 ESCALADO INDUSTRIAL DE TINTAS BASADAS EN MATERIALES BIDIMENSIONALES: PREPARACIÓN Y RECUBRIMIENTOS
Reference: PDC2021-120782-C21
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/12/2021- 30/11/2023
PI: ZAMORA ABANADES, FELIX JUAN

45 ESTRUCTURAL LOCAL DE MATERIALES NANO-POROSOS EN ACCIÓN
Reference: EUR2020-112294
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/12/2020-45260
PI: PLATERO PRATS, ANA EVA

46 ESTUDIO DE LA INTERACCION BIOFISICA ENTRE NANOCONTENEDORES PROTEICOS Y SU CONTENIDO MOLECULAR: MECANICA ESTRUCTURAL, LIBERACION DE LA CARGA Y CATALISIS CONFINADA
Reference: FIS2017-89549-R
Funding institution: MINISTERIO DE ECONOMIA Y COMPETITIVIDAD
Period: 01/01/2018- 30/09/2022
PI: DE PABLO GOMEZ, PEDRO JOSE

47 ESTUDIOS COMPUTACIONALES DE MATERIALES BIOMOLECULARES Y BIOINSPIRADOS
Reference: PID2021-125604NB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2022- 31/08/2025
PI: ORTEGA MATEO, JOSE

48 EXPLORANDO LA INTERACCIÓN ENTRE PARTÍCULAS VÍRICAS Y MATERIALES: FUNDAMENTOS Y APLICACIONES PROFILÁCTICAS (INFRAESTRUCTURA)
Reference: VIRMAT
Funding institution: CONSEJERIA CIENCIA, UNIVERSIDADES E INNOVACION
Period: 01/02/2020- 31/12/2022
PI: DE PABLO GOMEZ, PEDRO JOSE

49. EXPLORANDO LA INTERACCIÓN ENTRE PARTÍCULAS VÍRICAS Y MATERIALES: FUNDAMENTOS Y APLICACIONES PROFILÁCTICAS (PROYECTO)
Reference: VIRMAT
Funding institution: CONSEJERIA CIENCIA, UNIVERSIDADES E INNOVACION
Period: 01/02/2020- 31/12/2022
PI: DE PABLO GOMEZ, PEDRO JOSE

50 EXPLORANDO LOS DETERMINANTES FÍSICOS Y ESTRUCTURALES DE LA DESACTIVACIÓN DE VIRUS INDIVIDUALES SOBRE SUPERFICIES: ATRAPAMIENTO, BIOMECÁNICA Y DESEMPAQUETAMIENTO GENÓMICO
Reference: PID2021-126608OB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2022- 31/08/2025
PI: DE PABLO GOMEZ, PEDRO JOSE

51 EXTENDIENDO LOS LÍMITES DE LA FÍSICA DE ATTOSEGUNDOS: VISUALIZACIÓN Y CONTROL DE PROCESOS DE TRANSFERENCIA ELECTRÓNICA EN SISTEMAS DE INTERÉS QUÍMICO Y BIOLÓGICO
Reference: PID2019-105458RB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/06/2020- 31/05/2023
PI: MARTIN GARCIA, FERNANDO

52 FABRICACIÓN ADITIVA EN METAL PARA LA INSTRUMENTACIÓN CIENTÍFICA AVANZADA
Reference: EQC2021-007318-P
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/06/2021- 31/12/2023
PI: GOMEZ HERRERO, JULIO

53 FLUJO DE CARGA Y ENERGÍA EN PROCESOS QUÍMICOS COMPLEJOS
Reference: PID2019-110091GB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/06/2020- 31/05/2023
PI: DIAZ-TENDERO VICTORIA, SERGIO

3. RESEARCH

54 FUNDAMENTOS MICROSCÓPICOS DEL MICROSCOPIO DE FUERZAS ATÓMICAS Y MICROBALANZAS DE CUARZO PARA SENSAR BIOMOLÉCULAS
Reference: PID2020-117080RB-C51
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2021- 31/08/2024
PI: DELGADO BUSCALIONI, RAFAEL

55 GRAFENO Y MATERIALES BIDIMENSIONALES PARA APLICACIONES EN ENERGÍA LIMPIA
Reference: PID2019-109525RB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/06/2020- 31/05/2023
PI: FARIAS TEJERINA, DANIEL

56 HACÍA UN NUEVO QUBIT DE SHIBA BASADO EN PUNTOS CUÁNTICOS HÍBRIDOS SUPERCONDUCTOR-SEMICONDUCTOR
Reference: TED2021-130292B-C41
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/12/2022- 30/11/2024
PI: LEVY-YEYATI MIZRAHI, ALFREDO

57 IDENTIFICACIÓN QUÍMICA Y CONTROL DE LAS PROPIEDADES ELECTRÓNICAS Y MECÁNICAS DE SISTEMAS MOLECULARES MEDIANTE MICROSCOPIAS DE PROXIMIDAD Y APRENDIZAJE AUTOMÁTICO
Reference: PID2020-115864RB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2021- 31/08/2024
PI: POU BELL, PABLO

58 INFLUENCIA DE LA NANOESTRUCTURACIÓN EN LAS PROPIEDADES MECANOQUÍMICAS DE CÁTODOS COMPOSITE ZERO-STRAIN PARA BATERÍAS DE ION LI DE ESTADO SÓLIDO
Reference: PID2021-124667OB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2022- 31/08/2025
PI: POLOP JORDA, CELIA

59 INGENIERÍA CUÁNTICA DE LUZ Y MATERIA EN LA NANOESCALA
Reference: PID2021-126964OB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2022- 31/08/2025
PI: FERNANDEZ DOMINGUEZ, ANTONIO ISAAC

60 LA FÍSICA DE LA MATERIA CONDENSADA SALE AL ENCUENTRO
Reference: FCT-21-17475
Funding institution: FECYT FUNDACIÓN ESPAÑOLA PARA LA CIENCIA Y LA TECNOLOGÍA
Period: 01/07/2022- 30/06/2023
PI: GOMEZ-NAVARRO GONZALEZ, CRISTINA

61 MANIPULAR LA MATERIA MEDIANTE LAS FLUCTUACIONES DEL VACÍO
Reference: PID2021-125894NB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2022- 31/08/2025
PI: GARCIA VIDAL, FCO. JOSE

62 MATERIALES CON ORDENAMIENTO FERROELÉCTRICO Y ANTIFERROMAGNÉTICO PARA APLICACIONES ESPINTRÓNICAS ULTRARRÁPIDAS Y CONTROLABLES ELÉCTRICAMENTE
Reference: PID2021-122980OA-C53
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2022- 31/08/2025
PI: VELEZ CENTORAL, SAUL

63 MATERIALES PARA LA INFORMACIÓN CUÁNTICA BASADOS EN EXCITONES EN SEMICONDUCTORES
Reference: PID2020-113445GB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2021- 31/08/2024
PI: VAN DER MEULEN, HERKO PIET

64 MATERIALES POROSOS AVANZADOS EN SEPARACIONES ENERGÉTICAS DE BAJA ENERGÍA DE GASES DE INTERÉS MEDIOAMBIENTAL
Reference: TED2021-129886B-C42
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/12/2022- 30/11/2024
PI: ZAMORA ABANADES, FELIX JUAN

65 MATERIALES TOPOLÓGICOS PARA FOTOVOLTAICA
Reference: TED2021-131323B-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/12/2022- 30/11/2024
PI: PALACIOS BURGOS, JUAN JOSE

66 MATERIALES Y SENSORES CUÁNTICOS MEDIANTE IMPLANTACIÓN DE IONES A MEV
Reference: PID2021-127498NB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2022- 31/08/2025
PI: RAMOS RUIZ, MIGUEL ANGEL

67 MECÁNICA DEL CALOR: UNIENDO TRANSPORTE DE CALOR Y FRICCIÓN EN LA NANOESCALA
Reference: TED2021-132219A-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/12/2022- 30/11/2024
PI: ARES GARCIA, PABLO

68 MICROSCOPÍAS DE BARRIDO A BAJAS TEMPERATURAS EN CAMPOS MAGNÉTICOS VECTORIALES
Reference: PDC2021-121086-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/12/2021- 30/11/2023
PI: SUDEROW RODRIGUEZ, HERMANN JESUS

3. RESEARCH

69 MICROSCOPIO ELECTRÓNICO DE BARRIDO DE EMISIÓN DE CAMPO DE ULTRA ALTA RESOLUCIÓN PARA APLICACIONES EN NANOLITOGRAFÍA, IMAGEN, ANÁLISIS QUÍMICO Y NANO-INGENIERÍA
Reference: EQC2021-007091-P
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/06/2021- 31/12/2023
PI: AGRAIT DE LA PUENTE, MARIO NICOLAS

70 MODELIZACION DE MATERIALES COMPLEJOS: BIOMOLECULAS Y SISTEMAS BIDIMENSIONALES
Reference: MAT2017-88258-R
Funding institution: MINISTERIO DE ECONOMIA Y COMPETITIVIDAD
Period: 01/01/2018 - 30/06/2022
PI: ORTEGA MATEO, JOSE

71 NANODISPOSITIVOS FOTÓNICOS DE ESTADO SOLIDO OBTENIDOS POR COMBINACIÓN DE EMISORES DE TIERRAS RARAS, NANOESTRUCTURAS PLASMÓNICAS Y MATERIALES 2D
Reference: PID2019-108257GB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/06/2020- 31/05/2023
PI: BAUSA LOPEZ, LUISA EUGENIA

72 NANOINGENIERÍA DE DISPOSITIVOS DE ESTADO SÓLIDO PARA COMPUTACIÓN NEUROMÓRFICA
Reference: PID2020-116181RB-C31
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 44440- 31/08/2024
PI: CAMARERO DE DIEGO, JULIO

73 NUEVOS FENÓMENOS Y APLICACIONES DE MATERIALES TOPOLÓGICOS FUERTEMENTE CORRELACIONADOS EN EQUILIBRIO Y FUERA DE EQUILIBRIO
Reference: RTI2018-098452-B-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/01/2019- 31/12/2022
PI: MERINO TRONCOSO, JAIME

74 NUEVOS SUPERCONDUCTORES PARA TECNOLOGÍAS CUÁNTICAS: VISUALIZANDO Y MANIPULANDO CORRELACIONES TRIPLETE
Reference: PID2020-114071RB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2021- 31/08/2024
PI: SUDEROW RODRIGUEZ, HERMANN JESUS

75 ÓPTICA DE LUZ MAGNETO-ELÉCTRICA EN MEDIOS NANOESTRUCTURADOS DIELÉCTRICOS
Reference: PGC2018-095777-B-C22
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/01/2019- 31/12/2022
PI: MARQUES PONCE, MANUEL IGNACIO

76 PHOTONIC TAILORING OF NANOMATERIALS: EXTRAORDINARY LIGHT HARVESTING IN EXCITONIC SYSTEMS
Reference: PGC2018-097236-A-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/01/2019- 31/12/2022
PI: PRINS, FERRY

77 PLANTA DE LICUEFACCIÓN DE HELIO PARA LA CIENCIA Y TECNOLOGÍA CERCA DEL CERO ABSOLUTO
Reference: EQC2021-007277-P
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/06/2021- 31/12/2023
PI: SUDEROW RODRIGUEZ, HERMANN JESUS

78 PRODUCCIÓN DE HIDRÓGENO POR DISOCIACIÓN ELECTROQUÍMICA DE AGUA ASISTIDA POR FOTOCATALIZADORES CON CONTROL DE ESPÍN
Reference: TED2021-131042B-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/12/2022- 30/11/2024
PI: MIGUEL LLORENTE, JUAN JOSE DE

79 PRODUCCIÓN Y MANIPULACIÓN CONTROLABLE DE ESTADOS CUÁNTICOS DE LUZ EN SEMICONDUCTORES BIDIMENSIONALES
Reference: PID2020-113415RB-C21
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2021- 31/08/2024 PI: LAZIC, SNEZANA

80 PROPIEDADES CUÁNTICAS DE LA LUZ EMITIDA POR UNA UNIÓN TÚNEL
Reference: PGC2018-096047-B-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/01/2019- 30/06/2022
PI: OTERO MARTIN, ROBERTO

81 QUIRALIDAD Y HELICIDAD EN LA NANOESCALA DESDE PRIMEROS PRINCIPIOS
Reference: PID2019-109539GB-C43
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/06/2020- 31/05/2023
PI: PALACIOS BURGOS, JUAN JOSE

82 REDES METAL-ORGÁNICAS DE DISEÑO ATÓMICO: ARQUITECTURAS POROSAS PARA LA ELIMINACIÓN DE CONTAMINANTES EMERGENTES
Reference: RTI2018-096138-A-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/01/2019- 30/09/2022
PI: PLATERO PRATS, ANA EVA

3. RESEARCH

83 RETOS Y OPORTUNIDADES DE LAS TECNOLOGÍAS SUPERCONDUCTORAS EN LA AVIACIÓN COMERCIAL SIN EMISIONES DE GASES INVERNADERO
Reference: TED2021-130546B-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/12/2022 - 30/11/2024
PI: SUDEROW RODRIGUEZ, HERMANN JESUS

84 SIESTA Y SU INTEROPERABILIDAD PARA LOS NUEVOS RETOS EN SIMULACIONES ATOMÍSTICAS (SIESTA-UAM)
Reference: PGC2018-096955-B-C42
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/01/2019- 31/12/2022
PI: SOLER TORROJA, JOSE MARIA

85 SIMULACIÓN DE OPTOELECTRÓNICA MOLECULAR RESUELTA EN EL TIEMPO CON EL CÓDIGO XCHEM
Reference: PDC2021-121073-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/12/2021- 30/11/2023
PI: MARTIN GARCIA, FERNANDO

86 SIMULACIÓN MULTIESCALA DE MATERIALES POROSOS AVANZADOS
Reference: TED2021-129886B-C44
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/12/2022- 30/11/2024
PI: TARAZONA LAFARGA, PEDRO JOSE

87 SUPERCOMPUTACIÓN, ALMACENAMIENTO Y BIG DATA
Reference: EQC2021-007589-P
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/06/2021- 31/12/2023
PI: GARCIA VIDAL, FCO. JOSE

88 SUPERCONDUCTIVIDAD EN LA NANOESCALA: DISPOSITIVOS CUÁNTICOS DE 0 A 2D
Reference: PID2020-117671GB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2021- 31/08/2024
PI: LEVY-YEYATI MIZRAHI, ALFREDO

89 TECNOLOGÍAS POLARITONICAS CUÁNTICAS
Reference: RTI2018-099737-B-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/01/2019- 30/09/2022
PI: FEIST, JOHANNES MAXIMILIAN

90 TRANSFERENCIA DE ENERGIA Y ELECTRONES EN MATERIALES SOLIDOS LUMINISCENTES ACTIVADOS POR LANTANIDOS MULTIVALENTES
Reference: MAT2017-83553-P
Funding institution: MINISTERIO DE ECONOMIA Y COMPETITIVIDAD
Period: 01/01/2018- 30/06/2022
PI: SEIJO LOCHE, LUIS IGNACIO

91 TRANSPORTE DE CALOR Y TERMOELECTRICIDAD EN CONTACTOS MOLECULARES
Reference: PID2020-114880GB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/09/2021- 31/08/2024
PI: CUEVAS RODRIGUEZ, JUAN CARLOS

92 TRANSPORTE Y MANIPULACIÓN DEL CALOR EN EL RÉGIMEN CUÁNTICO
Reference: PID2019-110125GB-I00
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/06/2020- 31/05/2023
PI: SANCHEZ RODRIGO, RAFAEL

93 VIRTUAL-QCM: SOFTWARE CIENTÍFICO PARA REPRODUCIR EXPERIMENTOS EN MICROBALANZAS DE CUARZO A PARTIR DE PRIMEROS PRINCIPIOS
Reference: PDC2021-121441-C21
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/12/2021- 30/11/2023
PI: DELGADO BUSCALIONI, RAFAEL

94 UNIONES JOSEPHSON BASADOS EN ACOPLAMIENTO ESPIN-ORBITA PARA MEMORIAS CRIOGÉNICAS NO DISIPATIVAS
Reference: TED2021-130196B-C22
Funding institution: AGENCIA ESTATAL DE INVESTIGACION
Period: 01/12/2022- 30/11/2024
PI: ALIEV KAZANSKI, FARKHAD

Regional R&D Projects

1 ACELERACIÓN Y ESCALADO
Reference: 2021/00334/001
Funding institution: AYUNTAMIENTO DE MADRID
Period: 01/11/2021-30/11/2022
PI: ZAMORA ABANADES, FELIX JUAN

2 AYUDA PARA LA REALIZACION DE DOCTORADO INDUSTRIAL EN LA COMUNIDAD DE MADRID.
Doctorando Cristina Arqueros Albay. Convocatoria 2020
Reference: IND2020/IND-17321
Funding institution: COMUNIDAD DE MADRID
Period: 05/02/2021-04/02/2024
PI: ZAMORA ABANADES, FELIX JUAN

3 AYUDA PARA LA REALIZACION DE DOCTORADO INDUSTRIAL EN LA COMUNIDAD DE MADRID.
Doctorando Miguel Ángel Chamorro Villanueva. Convocatoria 2019
Reference: IND2019/AMB-17242
Funding institution: COMUNIDAD DE MADRID
Period: 03/02/2020-02/02/2023
PI: ZAMORA ABANADES, FELIX JUAN

4 Centro de Innovación digital en Biociencias, Biotecnología y Salud (DIH-bio)
Reference: OI2020-UAM-7.0
Funding institution: COMUNIDAD DE MADRID
Period: 29/11/2021-30/06/2023
PI: ZAMORA ABANADES, FELIX JUAN

3. RESEARCH

5 ECOSISTEMA DE INNOVACIÓN MADRIDNORTE: KNODE
Reference: OI2019-UAM-115659
Funding institution: COMUNIDAD DE MADRID
Period: 01/01/2020-31/12/2022
PI: ZAMORA ABANADES, FELIX JUAN

6 Electron transport through protein-based hybrid junctions and role of mutations
Reference: SI3/PJI/2021-00191
Funding institution: COMUNIDAD DE MADRID
Period: 01/01/2022-31/12/2023
PI: ZOTTI, LINDA ANGELA

7 Excelencia profesorado universitario Catedrático de Universidad - Física de la Materia Condensada
Reference: 2020/00338/001
Funding institution: COMUNIDAD DE MADRID
Period: 01/01/2020-31/12/2024
PI: AGRAIT DE LA PUENTE, MARIO NICOLAS

8 EXCELENCIA PROFESORADO UNIVERSITARIO CATEDRÁTICO/A DE UNIVERSIDAD - FÍSICA DE LA MATERIA CONDENSADA
Reference: 2021/00037/001
Funding institution: COMUNIDAD DE MADRID
Period: 01/01/2021-31/12/2024
PI: ALIEV KAZANSKI, FARKHAD

9 EXCELENCIA PROFESORADO UNIVERSITARIO CATEDRÁTICO/A DE UNIVERSIDAD - QUÍMICA INORGÁNICA
Reference: 2021/00041/001
Funding institution: COMUNIDAD DE MADRID
Period: 01/01/2021-31/12/2024
PI: ZAMORA ABANADES, FELIX JUAN

10 EXCELENCIA PROFESORADO UNIVERSITARIO PROFESOR CONTRATADO DOCTOR - FÍSICA DE LA MATERIA CONDENSADA
Reference: 2020/00331/001
Funding institution: COMUNIDAD DE MADRID
Period: 01/01/2020-31/12/2024
PI: AGRAIT DE LA PUENTE, MARIO NICOLAS

11 EXCELENCIA PROFESORADO UNIVERSITARIO PROFESOR CONTRATADO DOCTOR - FÍSICA TEÓRICA DE LA MATERIA CONDENSADA
Reference: 2020/00327/001
Funding institution: COMUNIDAD DE MADRID
Period: 01/01/2020-31/12/2024
PI: LEVY-YEYATI MIZRAHI, ALFREDO

12 EXCELENCIA PROFESORADO UNIVERSITARIO PROFESOR TITULAR DE UNIVERSIDAD - FÍSICA DE LA MATERIA CONDENSADA
Reference: 2020/00336/001
Funding institution: COMUNIDAD DE MADRID
Period: 01/01/2020-31/12/2024
PI: AGRAIT DE LA PUENTE, MARIO NICOLAS

13 EXCELENCIA PROFESORADO UNIVERSITARIO PROFESOR/A CONTRATADO/A DOCTOR/A - FÍSICA DE LA MATERIA CONDENSADA
Reference: 2021/00051/001
Funding institution: COMUNIDAD DE MADRID
Period: 01/01/2021-31/12/2023
PI: JAAFAR RUIZ-CASTELLANOS, MIRIAM

14 EXCELENCIA PROFESORADO UNIVERSITARIO PROFESOR/A CONTRATADO/A DOCTOR/A - FÍSICA DE LA MATERIA CONDENSADA
Reference: 2021/00048/001
Funding institution: COMUNIDAD DE MADRID
Period: 01/01/2021-31/12/2024
PI: VALLE REBOUL, ELENA DEL

15 EXCELENCIA PROFESORADO UNIVERSITARIO PROFESOR/A TITULAR DE UNIVERSIDAD - FÍSICA DE LA MATERIA CONDENSADA
Reference: 2021/00034/001
Funding institution: COMUNIDAD DE MADRID
Period: 01/01/2021-31/12/2024
PI: OTERO MARTIN, ROBERTO

16 MICROSCOPÍA MAGNÉTICA MULTIPARAMÉTRICA CON ALTA SENSIBILIDAD
Reference: SI1/PJI/2019-00055
Funding institution: COMUNIDAD DE MADRID
Period: 01/01/2020-30/09/2022
PI: JAAFAR RUIZ-CASTELLANOS, MIRIAM

17 MICROSCOPIO DE FUERZAS ATÓMICAS TECNOLÓGICO EN UHV PARA NANOCIRCUITOS ULTRA LIMPIOS.
Reference: SI3/PJI/2021-00479
Funding institution: COMUNIDAD DE MADRID
Period: 01/01/2022-31/12/2023
PI: ARES GARCIA, PABLO

18 NANOFOTÓNICA PARA COMPUTACIÓN CUÁNTICA (NANOQUCO-CM) GRUPO: QNANOLIGHT REFERENCE: Y2020/TCS-6545
Funding institution: COMUNIDAD DE MADRID
Period: 01/07/2021-30/06/2024
PI: GARCIA VIDAL, FCO. JOSE

19 NUEVOS MATERIALES BIDIMENSIONALES: CARACTERIZACIÓN, PROPIEDADES Y APLICACIONES - G2-UAM
Reference: S2018/NMT-4511
Funding institution: COMUNIDAD DE MADRID
Period: 01/01/2019-30/04/2023
PI: BRIHUEGA ALVAREZ, IVAN

20 SOLUCIONES DEL NANOMAGNETISMO A LOS RETOS SOCIALES - 287
Reference: S2018/NMT-4321
Funding institution: COMUNIDAD DE MADRID
Period: 01/01/2019-30/04/2023
PI: RAMOS RUIZ, MIGUEL ANGEL

3. RESEARCH

21 SOLUCIONES DEL NANOMAGNETISMO A LOS RETOS SOCIALES - LASUAM
Reference: S2018/NMT-4321
Funding institution: COMUNIDAD DE MADRID
Period: 01/01/2019-30/04/2023
PI: MIRANDA SORIANO, RODOLFO

22 SOLUCIONES DEL NANOMAGNETISMO A LOS RETOS SOCIALES - LBT-UAM
Reference: S2018/NMT-4321
Funding institution: COMUNIDAD DE MADRID
Period: 01/01/2019-30/04/2023
PI: SUDEROW RODRIGUEZ, HERMANN JESUS

23 INCENTIVOS A LA PRESENTACIÓN DE PROPUESTAS A HORIZONTE EUROPA - FERRY PRINS
Reference: 1001030276
Funding institution: SERVICIO DE INVESTIGACION UAM
Period: 01/07/2022-30/06/2023 PI: PRINS, FERRY

24 INCENTIVOS A LA PRESENTACIÓN DE PROPUESTAS A HORIZONTE EUROPA - SALVATORE ASSENZA
Reference: 1001050141
Funding institution: SERVICIO DE INVESTIGACION UAM
Period: 01/07/2022-30/06/2023
PI: ASSENZA, SALVATORE

Private Funding:

CONVENIO BANCO SANTANDER-UAM-IFIMAC
Reference: SANTANDER UNIVERSIDADES
Funding institution: BANCO DE SANTANDER CENTRAL HISPANO SA
Period: 18/06/2016-31/12/2024
PI: GARCIA VIDAL, FCO. JOSE

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SCIENTIFIC RESULTS

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National and International congresses: invited lectures

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2 *"Quantum Magnonics: Realizing ideas from quantum optics with magnets, and going beyond!"*, A. Kamra. **Spin Cavitronics IV Workshop,** Max Planck Institute for the Science of Light (MPL), Er-langen, Germany.

3 "*Detection and manipulation of Andreev states in hybrid nanowire Josephson junctions using cQED techniques"*, A. Levy, **Hybrid Solid State Quantum Circuits, Sensors, and Metrology,** 13-16 December 2021, Bad Honnef Germany

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9 *"Electron-phonon coupling and thermal expansion in superconducting 2D materials."* D. Farías, **Fifth International Workshop on Scattering of Atoms and Molecules from Surfaces**.12/09/2022. Cambridge (UK),

10 *'Nanophotonics in Toruń'*, D. Martín Cano**, Aleksander Jabłoński Foundation and the Nicolaus Copernicus University in Toruń**, September 18-21, 2022, Toruń, Poland.

11 "*Foremost photonics 2022'*,D. Martín Cano. Costanza Toninelli, October 10-14, 2022, in Sicily, Italy.

12 *"Heating effects in hybrid superconductor-semiconductor devices"*. E. Lee, **CMD29 (29th Conference of the Condensed Matter Division of the European Physical Society)**, 21/08/2022-26/08/2022, Manchester, England.

13 *"Towards quantum devices based on hybrid superconductor-semiconductor nanostructures"* E. Lee **22nd IEEE International Conference on Nanotechnology**, 04-08/07/2022, Palma de Mallorca, Spain.

14 "Superconducting spintronics with spin-orbit interaction and symmetry *filtering"* F. G. Aliev, C. González-Ruano, D. Caso, P. Tuero, L. G. Johnsen, C. Tiusan, M. Hehn, J.Fabian, N. Banerjee,J. Linder. **14th International Conference on Physics of Advanced Materials,** 2022, Dubrovnik, Croacia"

15 *"Visualizing Energy Transport in Nanocrystal Thin-Films"*. F. Prins. **NanoGe Spring meeting**, March 2022,

16 *"Computational methods and tools for complex suspensions"*. Juan L. Aragones **CECAM**, May 23 – 27, 2022. Bilbao (Spain)

17 *"Dispersions: Drops, Particles and Bugs",* Laura R. Arriaga. **Science, Startups and Success**, May 31 – June 4, 2022. Benasque (Spain).

18 *"Enantioselective adsorption on chiral and magnetic substrates"* J. J. de Miguel **Workshop on "Electronic and Magnetic Properties of Chiral Structures and their Assemblies",** 26 - 30 junio 2022. Telluride (EE.UU.),

19 *"From amino acids to proteins: electron transport and mechanical deformation"*, L. Zotti **Bioderived Electronics** 15-19/05/2022 (Israel) "*Polariton condensates co-directional waveguide couplers (PI)"*. L. Viña. **Workshop on "Semiconductors, nanostructures, 2D systems and Dirac matter",** junio 2022, Grenoble (Francia).

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21 *"Novel routing devices for polariton condensates (PI)"* E. Rozas, I. Robles-Lopez, J. Lizarraga, M.D. Martín, and L. Viña International **Workshop on 2D materials**, octubre 2022, Varsovia (Polonia).

22 *"Manipulating the emission of rare earth quantum emitters by plasmonic chains"* L.E. Bausá **9th International Conference on Optical, Optoelectronic and Photonic Materials and Applications ICOOPMA-22**, 3-8/7/2022, Gante, Bélgica.

23 *"Electrostatic doping modulation in monolayer MoS2 through ferroelectric domain patterns"* P. Molina, J. Fernandez-Tejedor, D. Gallego-Fuente, P. Ares, J. Gomez-Herrero, L. E. Bausá and M.O Ramírez **7th International Workshop on Advanced Spectroscopy and Optical Materials IWASOM'22**. 10-15/7/2022, Gdansk, Polonia

24 *"Plasmonic arrangements on crystalline gain media for solid state nanolasers"* L.E. Bausá **7th European Conference on Crystal Growth ECCG7** . 25-27/7/2022, París, Francia

25 *"Ferroelectrically driven lateral MoS2 p-n homojunctions probed by optical spectroscopy"* J. Fernandez-Tejedor, D. Gallego-Fuente, P. Molina, P. Ares, J. Gomez-Herrero, L. E. Bausá and M.O Ramírez **22 International Conference on Dynamical Processes of States States of Solids DPC22** 4-9/9/2022 Wroclaw, Polonia.

26 *"Novel features of plasmon-assisted solid-state lasers at the nanoscale"* L.E. Bausá, **Nanolight,** 6-10/3/ 2022 Benasque, España

27 "*Optical forces and complex suspensions*" M. Marqués, **Computational methods and tools for complex suspensions,** 23-27 May, 2022 Bilbao, Spain

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32 *"Active motion induced by random electromagnetic fields"* M. Marqués, **Active Days 2022**, 5-7 December 2022, Paris, France

33 *"Quantum spin liquids and superconductivity in honeycomb molecular materials"* J. Merino, **SPICE-Workshop (Mainz): New spin on molecular quantum materials**, 24-26 May 2022. Mainz, Germany

34 *"Study of few-layer antimonene electrical properties by Scanning-Probe-Assisted Nanowire Circuitry"*. P.Ares. **NanoSeries conference on Global Nanotechnology**, 06/2022, Virtual. NanoSeries Innovation Award for "outstanding work in driving the nanotechnologies forward".

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38 *"Current-induced control of chiral magnetic textures in magnetic insulators"* Saül Vélez, **Joint European Magnetic Symposia 2022 (JEMS)**, 24-29 July 2022 Warsaw, Poland.

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40 "Ultrafast dynamics of photoionized alcohols and nitriles in the gas phase" S. Diaz Tendero **MPS2022 – International Conference on Many Particle Spectroscopy of Atoms, Molecules, Clusters and Surfaces** 15- 17 June 2022. Turku, Finland.

41 *"Ultrafast processes in amino-acids, amino-acids derivatives and clusters of amino-acids induced by ionizing radiation"* S. Diaz Tendero **ECAMP14 – 14th European Conference on Atoms Molecules and Photons.** 27 June- 1 July 2022. Vilnius, Lithuania.

42 *"Ultrafast dynamics of ionized molecules and molecular clusters in the gas phase"* S. Diaz **Tendero SPIG2022 – 31st Summer School and International Symposium on the Physics of Ionized Gases,** 5-9 September 2022. Belgrade, Serbia Date.

43 "*Electrical and Thermal Transport in Molecular Junctions*", Nicolás Agrait, **15th European School on Molecular Nanoscience (ESMolNa2022) & the 9th Workshop on 2D Materials (W2DM2022)**, 22- 26 May 2022Tordesillas (Valladolid, Spain).

44 *"Measuring the thermal and electrical conductance of atomic contacts using a novel hotwire-thermocouple scanning probe microscope"*, Nicolás Agrait, **Photon, Phonon, and Electron Transitions in Coupled Nanoscale Systems, 745. WE-Heraeus-Seminar**, 19 - 23 September 2022, Bad Honnef (Germany).

3. RESEARCH

45 *"Atomic force microscopy images carry chemical information: Halogen bonds, Tautomerization, and molecular identification with deep learning"*. R. Perez. **12th International Conference on Porphyrins and Phthalocyanines (ICPP-12)** Society of Porphyrins & Phthalocyanines 10-15/07/2022 Madrid

46 "*Effect of Molecule-Substrate Interaction on the Adsorption of Meso-Dibenzoporphycene Tautomers Studied by Scanning Probe Microscopy and First-Principles Calculations"*. R. Perez, **NanoSpain, Phantoms Foundation**. 17-20/05/2022 Madrid

47 *"Atomic force microscopy images carry key chemical information: Halogen bonds, tautomerization, and molecular identification with deep learning*". R. Pérez **RIVA 2022 – XII Iberian Vacuum and Applications Conference**, Spanish Vacuum Society (ASEVA) and the Portuguese Vacuum Society (SOPORVAC), 15- 17/05/2022 Braga (Portugal)

48 *"Atomic force microscopy images carry key chemical information: Halogen bonds, tautomerization, and molecular identification with deep learning*". R. Pérez **ACS Spring 2022 (ACS Award in Surface Chemistry 2022: Symposium in honor of Miquel Salmeron),** ACS,20-24/3/2022 San Diego (CA, USA), online participation, 3/21/2022

49 *"Hydrodynamics of quartz crystal microbalance experiments using discrete molecules"*. R. Delgado-Buscalioni "**1st Spanish Fluid Mechanics Conference"**, Cádiz, June 19-22, 2022

50 *"Chiral spintronics with magnetic insulators"*,Saül Vélez, **XXXVIII Reunión Bienal de la Real Sociedad Española de Física, Magnetism Symposia**, Murcia, Spain, 11-15 July 2022.

Organization of congresses

1 **Mini-colloquium "Bound states in hybrid superconductor nanostructures**" Condensed Matter Division of the European Physical Society 29th Meeting, (Manchester, 21-26 August 2022). Co-organized by Alfredo Levy

2 **Online FermiPolar Workshop - Fermi Polarons: from ultracold gases to 2D semiconductors**, (online, 07-18 February 2022). https://www.ifimac.uam.es/fermi-polarons-from-ultracold-gases-to-2d-semiconductors-fermipolar-workshop-07-18-feb-2022/ Co-organized by Francesca Marchetti

3 **XXVIII International Summer School Nicolas Cabrera on "The Physics of Bio-inspired and Biological Systems: From Emergent Behaviors to Functional Materials"**, (Miraflores de la Sierra, Madrid (Spain), 2-7 September, 2022). Organized by Juan L. Aragones, Laura R. Arriaga and Raul Guantes.

4 **7th International Workshop on Advanced Spectroscopy and Optical Materials** (Gdansk, Polonia, July 2022) Luisa Bausá member of the International Scientific Committee.

5 **International Conference on Dynamical Processes on Excited States of Solids DPC22** (Wroclaw, Polonia, 4-9 setiembre 2022). Luisa Bausá member of the International Advisory Committee

6 **SPIE Photonics Europe. Symposium: Fiber lasers and Glass Photonics**. (Strasbourg, France, April 2022). M. O. Ramírez member of the Program Committee

7 **International Conference on Materials Science, Engineering & Technology (**Singapore, September 2022). María. O. Ramírez member of the Program Committee

8 **Nanospain conference 2022,** (Madrid, Spain 17-20 May 2022). Co-organized by Manuel Marqués

9 **SummerLIB: fundamentals, materials and applications of lithium-ion batteries** https://civis.eu/en/civis-courses/summerlib-fundamentals-materials-and-applications-of-lithium-ion-batteries (11-12 July 2022). Co-organized by Celia Polop

10 **Computational methods and tools for complex suspensions** (Bilbao, Basque Country, Spain, 23-27 May, 2022). Co-organized by Rafael Delgado-Buscalioni

11 **DEEP-GAS 2022: "Dynamics of Energetic & Electronic Processes in molecules and clusters in the GAS phase"** MD-GAS COST Action (CA18212) meeting, (Madrid (Spain) October 4th to 7th 2022). Co-organized by Sergio Díaz-Tendero

12 **ZCAM-ASEVA Workshop on Metal-Oxide Ultrathin Films and Nanostructures** ZCAM, ASEVA (Asociación Española del Vacio y sus Aplicaciones) Zaragoza Center for Advanced Modelling (ZCAM), (Zaragoza, 4-8 July 2022). Co-organized by Rubén Pérez

13 **Cold Atom Workshop (CAW)** (Madrid 24-25 November 2022), https://sites.google.com/view/caw-madrid-2022/home Co-organized by Francesca Marchetti.

14 **Symposium "Advances in nanomaterials characterization by Atomic Force Microscopy"** in the XXXVIII Biennial of Physics of the Spanish Royal Physics Society (RSEF), (Murcia, Spain 11-15 July 2022). Co-organized by Pablo Ares, Miriam Jaafar Ruiz-Castellanos and Guilherme Vilhena

15 '**Novel Frontiers and Challenges in Magnetism' Symposium** within XXXVIII Reunión Bienal de la Real Sociedad Española de Física (Murcia, Spain, 11-15 July 2022). Co- organized by Miriam Jaafar.

3. RESEARCH

Sponsorships

1 **Nanospain Conference 2022** *(Madrid, May 17-20, 2022)*, organized by Antonio Correia (Fundación Phantom), Pedro Echenique(Donostia International Physics Center), Manuel Marqués (IFIMAC/Universidad Autonoma de Madrid), Lars Montelius (INL (Portugal)), Jose Manuel Perlado Martin (IFN-GV & ETSII/UPM), Juan José Saenz (DIPC - In memoriam), Josep Samitier (IBEC/Universidad de Barcelona), Daniel Sanchez Portal (CSIC - UPV/EHU - DIPC), Pedro A. Serena (ICMM-CSIC)
https://www.nanospainconf.org/2022/committees.php

2 **"Advances in nanomaterials characterization by Atomic Force Microscopy" Symposium** within **XXXVIII Bienal de la Real Sociedad Española de Física (RSEF)** (*Murcia, July 11-15)* organized by Elisa Palacios Lidón (Universidad de Murcia), Pablo Ares García, (IFIMAC/ Universidad Autónoma de Madrid), Carmen Munuera López (Instituto de Ciencia de Materiales de Madrid, ICMM-CSIC), Miriam Jaafar Ruiz-Castellanos (IFIMAC/Universidad Autónoma de Madrid), Guilherme Vilhena (IFIMAC/ Universidad Autónoma de Madrid)
https://gefes-rsef.org/advances-in-nanomaterials-characterization-by-atomic-force-microscopy-bienal-rsef-2022/

3 '**Novel Frontiers and Challenges in Magnetism' Symposium** within **XXXVIII Reunión Bienal de la Real Sociedad Española de Física** (*Murcia, July 11-15)* organized by Jose Angel Fernández-Roldán (Universidad de Oviedo), Miriam Jaafar (IFIMAC, Universidad Autónoma de Madrid), Irene Lucas, (Universidad de Zaragoza), Ester M. Palmero (IMDEA Nanociencia, Madrid), Luis Moreno (Universidad de Sevilla)
https://gefes-rsef.org/novel-frontiers-and-challenges-in-magnetism-bienal-rsef-july-11-15-2022/

4 Support to the 10th edition of the GEFES awards for the best doctoral thesis in condensed Matter Physics.
https://gefes-rsef.org/x-edicion-premios-de-tesis-gefes-2022/

PATENT applications

1 **A COMPUTER IMPLEMENTED METHOD FOR IDENTIFYING A MOLECULE FROM ATOMIC FORCE MICROSCOPY IMAGES AND GENERATING THE NAME OF SAID MOLECULE ACCORDING TO THE IUPAC NOMENCLATURE**
Jaime Carracedo Cosme, Rubén Pérez Pérez
Application number: P202230398
Date of application: 29/04/2022
UAM, Quasar Science Resources SL
Countries: Spain, Oficina Española de Patentes y Marcas

2 **A COMPUTER IMPLEMENTED METHOD FOR IDENTIFYING A MOLECULE FROM ATOMIC FORCE MICROSCOPY IMAGES BY GENERATING A 2D COLORED RGB STRUCTURAL REPRESENTATION OF SAID MOLECULE IN THE FORM OF A BALL-AND-STICK DEPICTION**
Jaime Carracedo Cosme, Rubén Pérez Pérez
Application number: P202230396
Date of application: 29/04/2022
UAM, Quasar Science Resources SL
Countries: Spain Oficina Española de Patentes y Marcas

3 **NANOREACTORS FOR THE SYNTHESIS OF POROUS CRYSTALLINE MATERIALS**
Félix Zamora, David Rodríguez
Date of application: 18 de febrero de 2021
Priority number: EP18179325.8 (Entrada en fase nacional de la solicitud PCT No.:PCT/EP2019/066526)
Country: China nº 201980054690X
UNIVERSIDAD AUTÓNOMA DEMADRID

4 **NANOREACTORS FOR THE SYNTHESIS OF POROUS CRYSTALLINE MATERIALS**
Félix Zamora, David Rodríguez
Date of application: 22 de diciembre de 2020
Priority number: EP18179325.8 (Entrada en fase nacional de la solicitud PCT No.:PCT/EP2019/066526)
Country: Estados Unidos nº 17/255,121
UNIVERSIDAD AUTÓNOMA DEMADRID

5 **NANOREACTORS FOR THE SYNTHESISOF POROUS CRYSTALLINE MATERIALS**
Félix Zamora, David Rodríguez
Date of application: 18 de enero de 2021
Priority number: EP18179325.8 (Entrada en fase nacional de la solicitud PCT No.:PCT/EP2019/066526)
Country: European patent application nº EP19736609.9
UNIVERSIDAD AUTÓNOMA DE MADRID

6 **NANOREACTORS FOR THE SYNTHESIS OF POROUS CRYSTALLINE MATERIALS**
Félix Zamora, David Rodríguez
Date of application: 17 de enero de 2022
Priority number: EP18179325.8 (Entrada en fase nacional de la solicitud PCT No.:PCT/EP2019/066526)
Country: Hong Kong nº 62022046474.2
UNIVERSIDAD AUTÓNOMA DE MADRID

7 **NANOREACTORS FOR THE SYNTHESISOF POROUS CRYSTALLINE MATERIALS**
Félix Zamora, David Rodríguez
Date of application: 21 de diciembre de 2020
Priority number: EP18179325.8 Entrada en fase nacional de la solicitud PCT No.:PCT/EP2019/066526"
Country: Japón nº 2020-571441
UNIVERSIDAD AUTÓNOMA DE MADRID

3. RESEARCH

Awards

Miriam Jaafar, IFIMAC member, recognized with a Special Mention in the in the 1st edition of the Award for the best Invention protected by Industrial Property granted in 2020

Miriam Jaafar was recognized with a Special Mention in the Woman Inventor category, for her patent ES2711860, "Sistema para un microscopio de fuerzas atómicas", in the first edition of the Award for the best Invention protected by Industrial Property granted in 2020. Julio Gómez and Pablo Ares, IFIMAC members, also participated as co-inventors of this patent.

The objective of these awards is to distinguish the protection of research results through Patents and Utility Models granted in 2020 by the Spanish Patent and Trademark Office, recognizing the value of protected and competitively positioned in the market, Spanish R&D and supporting and promoting research, and scientific and technological activity.

Francisco José García-Vidal Included In Clarivate 2022 Compilation Of Most Influential Authors

Each year, Clarivate™ identifies the world's most influential researchers the select few who have been most frequently cited by their peers over the last decade. In 2022, fewer than 7,000, or about 0.1%, of the world's researchers, in 21 research fields and across multiple fields, have earned this exclusive distinction.

Francisco José García-Vidal is, for the seventh time, among this elite group recognized for its exceptional research influence, demonstrated by the production of multiple highly-cited papers that rank in the top 1% by citations for field and year in the Web of Science™.

In the 2022 edition there are only two researchers, in the physics category, from Spain, among the world's most influential researchers: Francisco José García-Vidal (IFIMAC-UAM) and Francisco Guinea (IMDEA Nanociencia)

Pablo Ares recognized with an "Innovation Award"

Dr. Pablo Ares was recognized with an "Innovation Award" during the first edition of the NanoSeries Conference, celebrated online on June 21-24.

The award committee highlighted «his thought-provoking presentation on "Study of Few-Layer Antimonene Electrical Properties by Scanning-Probe-Assisted Nanowire Circuitry"».

These awards were given to the individual presenters with outstanding work in driving the nanotechnologies forward.

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4. TRAINING AND OUTREACH ACTIVITIES

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4. TRAINING AND OUTREACH ACTIVITIES

MASTER AND DOCTORATE PROGRAMMES

IFIMAC members are actively involved in the Master Programmes:
- Máster Universitario en Física de la Materia Condensada y de los Sistemas Biológicos
- Máster Universitario en Química Teórica y Modelización Computacional
- Máster Universitario en Materiales Avanzados, Nanotecnología y Fotónica
- Máster Universitario en Química Aplicada

And in the Doctorate programmes:
- Física de la Materia Condensada, Nanociencia y Biofísica
- Programa de Doctorado en Materiales Avanzados yNanotecnología
- Química Teórica y Modelización Computacional
- Química Aplicada

IFIMAC'S MASTER FELLOWSHIPS

IFIMAC has offered 12 grants for the best students starting the Masters of Condensed Matter Physics within UAM.

2021/2022 course: five Master grants awarded:

1.- **Martínez Martínez, Pablo** (Máster en Física de la Materia Condensada y de los Sistemas Biológicos BIOFÍSICA)
TFM Supervisor: David Miguez"

2.- **Ocio Moliner, Mikel** (Máster en Física de la Materia Condensada y de los Sistemas Biológicos BIOFÍSICA)
TFM Supervisor: David Miguez"

3.- **Gonzalez Lastre, Manuel Eduardo** (Master en Física de la Materia Condensada y los Sistemas Biológicos (BIOFISICA)) TFM Supervisor: Raul Guantes

4.- **Sagasta Beltran de Guevara, Ande**r (Master en Química Teórcia y Modelización Computacional)
TFM Supervisor: Fernando Martín

5.- **Osuna Bris, Eva** (Master en Física de la Materia Condensada y los Sistemas Biológicos (NANOFISICA)
TFM Supervisor: Cristina Gómez-Navarro González.

2022/2023 course: five Master grants awarded:

1.- **De la Peña Ruiz, Sebastián** (Máster en Física de la Materia Condensada y de los Sistemas Biológicos)
TFM Supervisor: Juan Carlos Cuevas

2.- **Viña Bausá, Beatriz Marí**a (Máster en Máster en Física de la Materia Condensada y de los Sistemas Biológicos, NANOFÍSICA) TFM Supervisor: Iván Brihuega

3.- **Fernandez Écija, Laura** (Máster en Nuevos Alimentos)
TFM Supervisor: Félix Zmora Abanades

4.- **Molina Hernandez, Javier** (Máster en Física de la Materia Condensada y de los Sistemas Biológicos, BIOFÍSICA)
TFM Supervisor: David Miguez Gómez

5.- **Diez Silva, Pablo** (Máster en Física de la Materia Condensada y de los Sistemas Biológicos, NANOFÍSICA)
TFM Supervisor: Linda Angela Zotti

6.- **Tuero Álvarez, Pablo** (Máster en Física de la Materia Condensada y de los Sistemas Biológicos NANOFÍSICA)
TFM Supervisor: Farkhad Aliev

RESEARCH AWARDS FOR PHYSICS STUDENTS

The Condensed Matter Physics Center provides two of the six awards called by The Nicolas Cabrera Institute

The candidates awarded by IFIMAC in the 2022 edition are:

- Youhuang Yang

- Senlin Yue

https://www.inc.uam.es/wp-content/uploads/Cartel_Awards-Physics-Students-2022.pdf

4. TRAINING AND OUTREACH ACTIVITIES

OUTREACH

1 Quantum Matter Seminars, "Andreev states in hybrid nanowire Josephson junctions", Northeastern University; February, 23th 2022. **Alfredo Levy**

2 Quantum matter and energy Seminars"Detection and manipulation of Andreev states in hybrid nanowire Josephson junctions", Universidad de Pamplona, Colombia; December, 17th 2022 **Alfredo Levy**

3 FUTURO Cuántico, online event. Participation on an online encounter with industry professionals for discussions around quantum technologies; with the talk: "Quantum Metrology" **Carlos Sánchez**

4 Artworks for outreach. **Carlos Sánchez** won the competition Quantum Visions, a quantum-themed art context organized by UK National Quantum Technologies Programme (UKNQTP), aiming to promote quantum sciences through artworks. "A Brumal Coherence"
https://www.quantumcity.org.uk/news/artwork-dreams-wins-first-prize-quantum-visions-competition

5 Dissemination project "La Física de la Materia Condensada sale al encuentro" from FECYT running through a collaboration with the Youtube channel Quantum Fracture that accounts more than 3M subscribers. PI: **Cristina Gómez-Navarro;** Members: **Luisa E. Bausá, Rubén Pérez, Antonio Fernandez- Dominguez, Félix Zamora**

6 Book: D. Farías, J. C. Cuevas. Las ideas que cambiaron el mundo. Biblioteca Buridán, 368 pages ISBN-13: 978-8417700072. Popular science book about relativity theory and quantum mechanics

7 Dissemination talk, "Ecuaciones de Maxwell: Nanofotónica y óptica cuántica" Jornadas de divulgación de investigación del FTMC, **Diego Martín Cano**

8 Outreach to Society of Soft Matter and Biophysics by BBVA:
https://www.fbbva.es/noticias/escuela-nicolas-cabrera-reune-lideres-mundiales-en-biofisica/
Interviews to the Summer School speakers in "El Mundo" and "ABC" newspapers: https://www.elmundo.es/papel/historias/2022/09/06/631783ab21efa068298b45a6.html
https://www.abc.es/ciencia/monica-olvera-robot-anda-agua-quiero-meterlo-20220911151316-nt.html **Juan L. Aragonés and Laura R. Arriaga**

9 News in Print Media:
https://www.lavanguardia.com/vida/20220708/8394443/autonoma-investiga-interfaces-metales-aplicacion-tecnologia.html
Linda A. Zotti

10 Member of the National Committee of the DÍA INTERNACIONAL DE LA LUZ (diadelaluz.es). **María de la O Ramírez**

11 Media interviews: Interview about atomic force microscopy on Onda Bierzo. January, 22th 2022.
https://www-ivoox-com.cdn.ampproject.org/v/s/www.ivoox.com/magazine-onda-bierzo-sabado-laura-sanchez-22-audios-mp3_rf_81189282_amp_1.html?amp_js_v=a6&amp_gsa=1&usqp=mq331AQKKAFQArABIIACAw%3D%3D#aoh=16429512595530&amp_ct=1642951261966&referrer=https%3A%2F%2Fwww.google.com&amp_tf=De%20%251%24s&ampshare=https%3A%2F%2Fwww.ivoox.com%2Fmagazine-onda-bierzo-sabado-laura-sanchez-22-audios-mp3_rf_81189282_1.html
Pablo Ares

12 Media interviews: Interview about atomic force microscopy on Radio Bierzo SER. January, 20th 2022. Cadena SER.
https://cadenaser.com/audio/ser_aso_bierzo_hoyporhoybierzo_20220120_122000_140000/
Pablo Ares

13 Conference "Microscopios de fuerzas atómicas: herramientas de la nanotecnología y puerta al mundo"
Ciclo de divulgación científica La Central Divulga.. Organising entity: La Fábrica de Luz, Museo de la Energía de Ponferrada. Ponferrada, Spain; January 20th 2022. **Pablo Ares**

14 Media interviews: Interview in the TV show 8 Magazine Bierzo. La 8 Bierzo. January 19th 2022.
https://youtu.be/6U9_pNVMyXA?t=1840
Pablo Ares

4. TRAINING AND OUTREACH ACTIVITIES

15 **International Day of Women and Girls in Science:**
The Condensed Matter Physics Center joined the celebration of the International Day of Women and Girls in Science through a series of talks in different schools and secondary schools, given by IFIMAC members.
Celia Gonzalez participated in the initiative #100tífiques – https://100tifiques.cat/, organized by a consortium of research institutes. She gave talk at Collegi Sagrada Família Sant Andreu de Barcelona on February 11th.
Celia Gonzalez "Acercando la ciencia al instituto", IES Cruz Santa de Tenerife, February 9th, and "La ciencia también es cosa nuestra", IES Eulogio Florentino Sanz, Arevalo (Avila), February 16th.
Marta Fernández-Lomana "Física de bajas temperaturas (Superconductores)" Colegio Mirasol (Fuencarral) for the student of 2nd grade of bachillerato category in sciences, February 23rd.
Cristina Gómez-Navarro "Mama quiero ser científica... ¿y ahora qué?", BBVA "Move for equality" working group, February 10th.
Miriam Jaafar Ruiz-Catellanos "Conociendo a una científica del nanomundo" for the students from 1st and 2nd grade of Bachillerato category, Colegio Esclavas del Sagrado Corazón de Jesús (Madrid), March, 3rd.
Linda Zotti "Electrónica molecular: ¿qué es eso? Y qué hace una mujer trabajando en eso?", Colegio Altair Internacional (Madrid), March 14th.

16 **Outreach videos in collaboration with QuantumFracture**:
Since 2017, we have kept a fruitful collaboration with the youtube channel QuantumFracture and QuantumFractureEN (https://www.youtube.com/user/QuantumFracture), devoted to scientific outreach in Spanish and English. Since then, we have generated 7 videos that have received more than 7 million views. The first video, "La física de lo complejo", provided a general perspective on the field of Condensed Matter Physics, as well as the research performed at IFIMAC. A team of 7 IFIMAC researchers were involved in its realization. The following videos dealt with different topics of intense research activity worldwide, in which IFIMAC researchers play an important role. They were coordinated by 1-2 IFIMAC researchers each, who offered their particular vision on the topic in question. The titles of the videos were: "El cristal que se alimenta de entropía", "Cómo el microscopio más potente del mundo acabó en España", "El quinto estado de la materia: superfluidos y superconductores", "El material cuántico que se enfría al sol", y "Ya, en serio, ¿qué es la luz?". These videos can be also found (both in Spanish and in English) in our webpage and youtube channel: https://www.ifimac.uam.es/outreach/, https://www.youtube.com/c/ifimac.
Finally, in 2022, we have been awarded a FECYT grant entitled "La física de la materia condensada sale al encuentro", within the "Convocatoria de Ayudas para el foment de la cultura científica, tecnológica y de la innovación". This funding is being employed to support the generation of new outreach audiovisual materials. The first ("Cómo se Fabrica un Bit Cuántico. Átomos Artificiales") of the three videos planned for this project was published in November 2022.

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5. HUMAN RESOURCES

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5. HUMAN RESOURCES

NEW RESEARCHERS AFFILIATED DURING 2022

New members proposed by IFIMAC Researchers:

Carlos Antón Solanas (Talent grant)

Carlos Anton Solana's area of expertise is experimental nanophotonics and solid-state quantum optics. Carlos obtained his PhD at the Univ. Autonoma of Madrid in 2015. Then he became a postdoctoral researcher at C2N-CNRS, France. Until 2019, he worked on solid state quantum optics, using quantum dots coupled to micropillar cavities. Afterwards, he obtained an Individual Marie Sklodowska-Curie Fellowship to work on "Scalable Quantum Photonics with Ultra Bright Photon Sources". During his 2nd postdoc at University of Würzburg, 2019-2020 and University of Oldenburg, 2020-2022, Germany, he worked on excitons and exciton polaritons and single photon emitters in atomically thin crystals of transition metal dichalcogenides. In 2022 he incorporated to IFIMAC with a "Talent grant CM"

Jose Guilherme Vilhena Alburquerque (Talent grant)

Jose Guilherme multi-disciplinary research is tied together by the quest for understanding and controlling novel properties emerging at the nanoscale – and endeavour the development and use of state-of-the-art computational techniques often in a synergistic colaboration with experiments. He recenty joined IFIMAC thanks to a 'Atracción de Talento Senior – Comunidad de Madrid' with the aim of tamming the exotic form of ballistic heat transport emerging at the nanoscale. This phenomena leads to the breakdown of classical laws and calls for a novel formalism capable of accurately accounting for both quantum statistics and anharmonic effects. The technological interest of such developments ultimately fueled yet another project within the "Transicion Ecological y Digital" call.

Herko Piet van der Meulen (Professor)

Herko van der Meulen obtained his degree in Physics at the University of Utrecht (the Netherlands) and did his PhD in Physics at the University of Amsterdam on the subject of specific heat measurements in high magnetic fields of heavy fermion systems and high temperature superconductors. He designed the setup and measured the specific heat of heavy fermion systems for the first time up to fields of 24.5 T in the High Field Magnet Laboratory at the University of Nijmegen. Afterwards he stayed as a postdoc in that laboratory, extending the measurements to thermal expansion experiments.

From 1994 onwards, he joined the Universidad Autónoma de Madrid (Spain). Here he started working on spectroscopy of semiconductor nanostructures. First in semiconductor quantum wells, where he measured the quantum Hall effect at 0.3 K, simultaneously by optical and electrical means. Afterwards the investigations were dedicated to quantum dots, quantum optics and photon correlation measurements, contributing to the group's first publication in Spain on single photon emission by semiconductor quantum dots.

María Dolores Martín Fernández (Professor):

María Dolores Martín is an associate professor at the Materials Physics department of Universidad Autónoma of Madrid. Her main research lines are all within solid state physics, focusing on the optical, electronic and spin properties of semiconductors and their nanostructures. She is a member of the SEMICUAM group and a board member of the INC. She has participated in 30 competitive research projects, leading several of them, published 71 articles on international peer reviewed journals and presented the main findings of her research in numerous international conferences and workshops, by invitation on many occasions.

5. HUMAN RESOURCES

Paloma Arroyo Huidobro (Ramón y Cajal researcher)

Paloma Arroyo Huidobro joined IFIMAC in December 2022 following the award of a Ramon y Cajal Fellowship. Prior to that, she received her PhD from Universidad Autónoma de Madrid in 2013 and then did a postdoctoral stay at Imperial College London (UK) between 2014 and 2019 where she held a Marie Sklodowska-Curie Fellowship (2016-2018). Between 2019 and 2022 she was an FCTResearch Fellow at the Instituto de Telecomunicações, based in Instituto Superior Técnico – University of Lisbon. In December 2022she joined IFIMAC following the award of a Ramon y Cajal Fellowship. Her work is dedicated to developing theory of nano-scalelight-matter interactions in nanophotonics and metamaterials. Recently, she has contributed to the fields of topological photonics andtime-modulated metamaterials.

Alicia Palacios (professor):

Alicia Palacios received her PhD Degree in 2006 at Universidad Autónoma de Madrid, Spain. She completed her education with several stays in the Université` Bordeaux I, and a long-term Postdoctoral fellowship (2006–2009) at the Lawrence Berkeley National Lab, Berkeley, CA. She is currently an Associate Professor at the Universidad Autónoma de Madrid. She received the Marie Curie Integration Grant (ATTOTREND) as a Fellow Researcher (2014). She has been Principal Investigator in several National projects since 2016 to date, and Computational projects, as well as participant inInternational Networks (COST Actions). She has published more than 85 peer reviewed articles ininternational journals and given more than 40 Invited talks in international conferences in the field ofAtomic and Molecular Physics. Her expertise can be summarized as "developing new ab initio time-dependent treatments for the description of atoms and molecules subject to ultrashort intense laserpulses". Mildred Dresselhaus Junior Award (2018) by the University of Hamburg. She is currently the coordinator of the Master on Theoretical Chemistry and Computational Modeling in Spain; and Chair of the Atomic, Molecular and Optical Physics Division at the European Physical Society.

Mercedes Hernando (Ramón y Cajal researcher)

Mercedes Hernando obtained her master's degree (Master of Biophysics) in 2006 at University Autónoma de Madrid. In 2014 she received her PhD in Condensed Matter Physics and Nanotechnology, (Department of Condensed Matter Physics, UAM). Her thesis under the supervision of Dr. P.J. de Pablo (pioneer in the use of Atomic Force Microscopy -AFM- on viruses description), centred in the interdisciplinary field of Physical Virology. Her thesis research focused on the study of mechanical properties and stability of viral capsids to understand the relationships between physical properties, structure, and biological functions.

In 2014 she moved to the laboratory of Prof. B. Dragnea (Indiana University, USA) where she led two projects which aimed to understand changes in the mechanical and physicochemical properties of two different biological systems: viral icosahedral cages and bioadhesives, resulting in three novel contributions.

In January 2017 she joined the group of Dr. C. San Martín (CNB-CSIC) under Juan de la Cierva contracts. She carried out a project focused on the characterization of the structure of the core and stability of human adenovirus type 5 (HAdV-C5) mutants by single particle cryo-EM, Cryo-ET and biophysical techniques contributing to keep the group at the forefront of adenovirus structure studies. In January 2021 she moved at the University Autónoma of Madrid as Profesor Ayudante Doctor and in 2023 she started a RyC research contract. She has established a new research line focusing on the characterization of nanoparticles combining atomic force microscopy (AFM), total internal reflection fluorescence (TIRF) and Raman spectroscopy. She is interested in a simultaneous characterization of optical and physicochemical properties in liquid media of individual synthetic and biological nanoparticles for nanotechnology, biotechnology, and biomedical applications.

5. HUMAN RESOURCES

IFIMAC MEMBERS

Surname and name	Professional category	Department	Research line/s
AGRAÏT DE LA PUENTE, Nicolás	Catedrático de Universidad	FMC	NP
ALIEV KAZANSKI, Farkhad	Catedrático de Universidad	FMC	AM
ÁLVAREZ ALONSO, Jesús	Titular de Universidad	FMC	NP AM
ÁLVAREZ CARRERA, José Vicente	Contratado Doctor	FMC	FPSM,NP
ANTÓN SOLANAS, Carlos	Atracción de Talento	FM	AM, NQO
ARAGONÉS GÓMEZ, Juan Luis	Investigador RyC	FTMC	SCMB
Ares García, Pablo	Investigador RyC	FMC	AM, NP
Arroyo Huidobro, Paloma	Investigador RyC	FTMC	NQO
ASSENZA, Salvatore	La Caixa Junior Leader	FTMC	SCMB
BAUSÁ LÓPEZ, Luisa E.	Catedrática de Universidad	FM	AM, NQO
BRAVO ABAD, Jorge	Contratado Doctor	FTMC	NQO
BRIHUEGA ALVAREZ, Iván	Contratado Doctor	FMC	AM,NP
Burset Atienza, Pablo	Research Fellow CM-Talento	FTMC	NP, AM
BURZURÍ LINARES, Enrique	Investigador RyC	FMC	NP, AM
CINACCHI, Giorgio	Contratado Doctor	FTMC	SCMB,AM
CORTIJO ALBERTO	Investigador RyC	FMC	FPSM
CUEVAS RODRÍGUEZ, Juan Carlos	Titular de Universidad	FTMC	NP,NQO
DELGADO BUSCALIONI, Rafael	Contratado Doctor	FTMC	SCMB
DIAZ-TENDERO VICTORIA, Sergio	Contratado Doctor	Q	FPSM
FARIAS TEJERINA, Daniel	Titular de Universidad	FMC	NP
FEIST Johannes	Investigador RyC	FTMC	NQO
FERNÁNDEZ DOMÍNGUEZ, Antonio I.	Contratado Doctor	FTMC	NQO
FLORES SINTAS, Fernando	Profesor Emérito	FTMC	NP,FPSM
GARCÍA GONZÁLEZ, Pablo	Titular de Universidad	FTMC	FPSM,NQO
GARCÍA MICHEL, Enrique	Catedrático de Universidad	FMC	AM,NP
GARCÍA MOCHALES, Pedro	Contratado Doctor	FMC	FPSM
GARCÍA VIDAL, Francisco José	Catedrático de Universidad	FTMC	NQO
GÓMEZ HERRERO, Julio	Catedrático de Universidad	FMC	NP,AM
GÓMEZ-NAVARRO GONZÁLEZ, Cristina	Titular de Universidad	FMC	AM,NP
GÓMEZ MÍGUEZ, David	Contratado Doctor	FMC	SCMB
GÓMEZ SANTOS, Guillermo	Titular de Universidad	FMC	FPSM
GUANTES NAVACERRADA, Raúl	Contratado Doctor	FMC	SCMB
GUILLAMÓN GÓMEZ, Isabel	Contratado Doctor	FMC	AM
HERNANDO, MERCEDES	Investigador RyC	FM	SCMB
Jaafar Ruiz-Castellanos, Miriam	Contratado doctor	FMC	AM NP
Kamra, Akashdeep	Joven Investigador IFIMAC	FTMC	AM, NP

5. HUMAN RESOURCES

Surname and name	Professional category	Department	Research line/s
LAZIC, Snezana	Contratado Doctor	FM	NP
LEE, Eduardo Jian Hua	Investigador RyC	IFIMAC	NP, AM
LEVY YEYATI, Alfredo	Catedrático de Universidad	FTMC	NP,AM
LÓPEZ VÁZQUEZ DE PARGA, Amadeo	Catedrático de Universidad	FMC	NP
MARCHETTI, Francesca María	Contratado Doctor	FTMC	NQO
MARQUÉS PONCE, Manuel	Titular de Universidad	FM	NQO
MARTÍN CANO, Diego	La Caixa Junior Leader	FTMC	NQO
MARTÍN FERNÁNDEZ, María Dolores	Titular de Universidad	FM	NQO
MERINO TRONCOSO, Jaime	Titular de Universidad	FTMC	AM
MIGUEL LLORENTE, Juan José de	Titular de Universidad	FMC	AM,NP
MONREAL VÉLEZ, Rosa	Catedrática de Universidad	FTMC	NP,NQO
MORENO SORIANO, Esteban	Titular de Universidad	FTMC	NQO
MORI SÁNCHEZ, Paula	Contratado doctor	Q	FPSM
ORTEGA MATEO, José	Catedrático de Universidad	FTMC	FPSM
OTERO MARTÍN, Roberto	Titular de Universidad	FTMC	AM, NP
PABLO GÓMEZ, Pedro José de	Titular de Universidad	FMC	SCMB,NP
PALACIOS BURGOS, Juan José	Catedrático de Universidad	FMC	NP,FPSM
PALACIOS CAÑAS, ALICIA	Titular de Universidad	Q	FPSM
PÉREZ PÉREZ, Rubén	Catedrático de Universidad	FTMC	NP,FPSM
Platero Prats, Ana Eva	Investigadora RyC	QI	AM
POLOP JORDÁ, Celia	Titular de Universidad	FTMC	M, NP
PORTO ORTEGA, Juan Antonio	Contratado Doctor	FTMC	NQO
POU BELL, Pablo	Contratado Doctor	FTMC	FPSM,NP
PRINS, Ferry	Investigador RyC	FMC	NQO
RAMÍREZ HERRERO, Mariola	Contratado Doctor	FM	AM, NQO
RAMOS RUIZ, Miguel Ángel	Titular de Universidad	FMC	AM,SCMB
RODRIGO RODRIGUEZ, José Gabriel	Titular de Universidad	FMC	AM
RODRÍGUEZ ARRIAGA, Laura	Investigadora RyC	FTMC	SCMB
RUBIO BOLLINGER, Gabino	Catedrático de Universidad	FMC	NP AM
Sánchez Rodrigo, Rafael	Investigador RyC	FTMC	NP
SEGOVIA CABRERO, Pilar	Titular de Universidad	FMC	AM,NP
SANCHEZ MUÑOZ, Carlos	La Caixa Junior Leader	FTMC	NQO
SEIJO LOCHÉ, Luis	Catedrático de Universidad	Q	FPSM
SOLER TORROJA, Jose María	Catedrático de Universidad	FMC	FPSM
SUDEROW RODRÍGUEZ, Hermann	Titular de Universidad	FMC	AM,NP
TARAZONA LAFARGA, Pedro	Catedrático de Universidad	FTMC	SCMB
TEJEDOR DE PAZ, Carlos	Profesor Emérito	FTMC	NQO
VALLE REBOUL, Elena del	Contratado Doctor	FTMC	NQO, NP
VAN DER MEULEN, Herko	Titular de Universidad	FM	AM, NQO

5. HUMAN RESOURCES

Surname and name	Professional category	Department	Research line/s
VIEIRA DÍAZ, Sebastián	Profesor Emérito	FMC	AM
VILHENA, GUILHERME	Atracción de Talento	FTMC	NP FPSM
VIÑA LISTE, Luis	Catedrático de Universidad	FM	NQO
VELASCO CARAVACA, Enrique	Titular de Universidad	FTMC	SCMB
Velez Centoral Saul	Joven Investigador IFIMAC	FMC	AM, NP
YNDURAIN MUÑOZ, Félix	Profesor Emérito	FMC	FPSM
ZAMORA ABANADES, Félix	Catedrático de Universidad	QI	AM
ZOTTI, Linda Ángela	Ayudante doctor	FTMC	NP, FPSM

Acronyms

Departments

FMC: Física de la Materia Condensada
FTMC: Física Teórica de la Materia Condensada
FM: Física de Materiales
QI: Química Inorgánica
Q: Química

Research Lines

NP: Nanophysics
AM: Advanced Materials
SCMB: Soft Condensed Matter and Biophysics
FPSM: First-principles Simulations and Modeling
NQO: Nano and Quantum Optics

IfiMAC
Condensed Matter Physics Center

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6. BUDGET

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GASTOS			INGRESOS	
Previsión de gastos de personal, gastos corrientes de funcionamiento y equipamiento e inversiones	a) Gastos de personal	**332.430,75**	**Estimación de ingresos por actividad propia**	**863.132,80**
	b) gastos corrientes de funcionamiento	**108.654,40**		
	c) equipamiento e inversiones	**18.112,39**		
TOTAL GASTOS (€)		**459.197,54**	**863.132,80**	