

UAM | IFIMAC  EXCELENCIA
CONDENSED MATTER PHYSICS CENTER MARÍA
DE MAEZTU

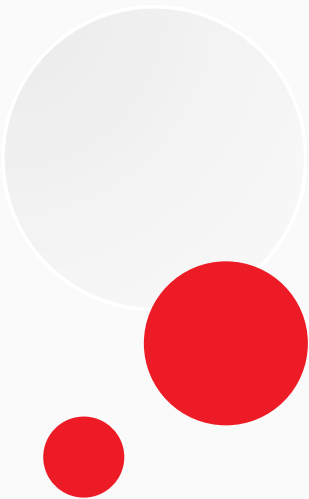
Activity Report.

2025

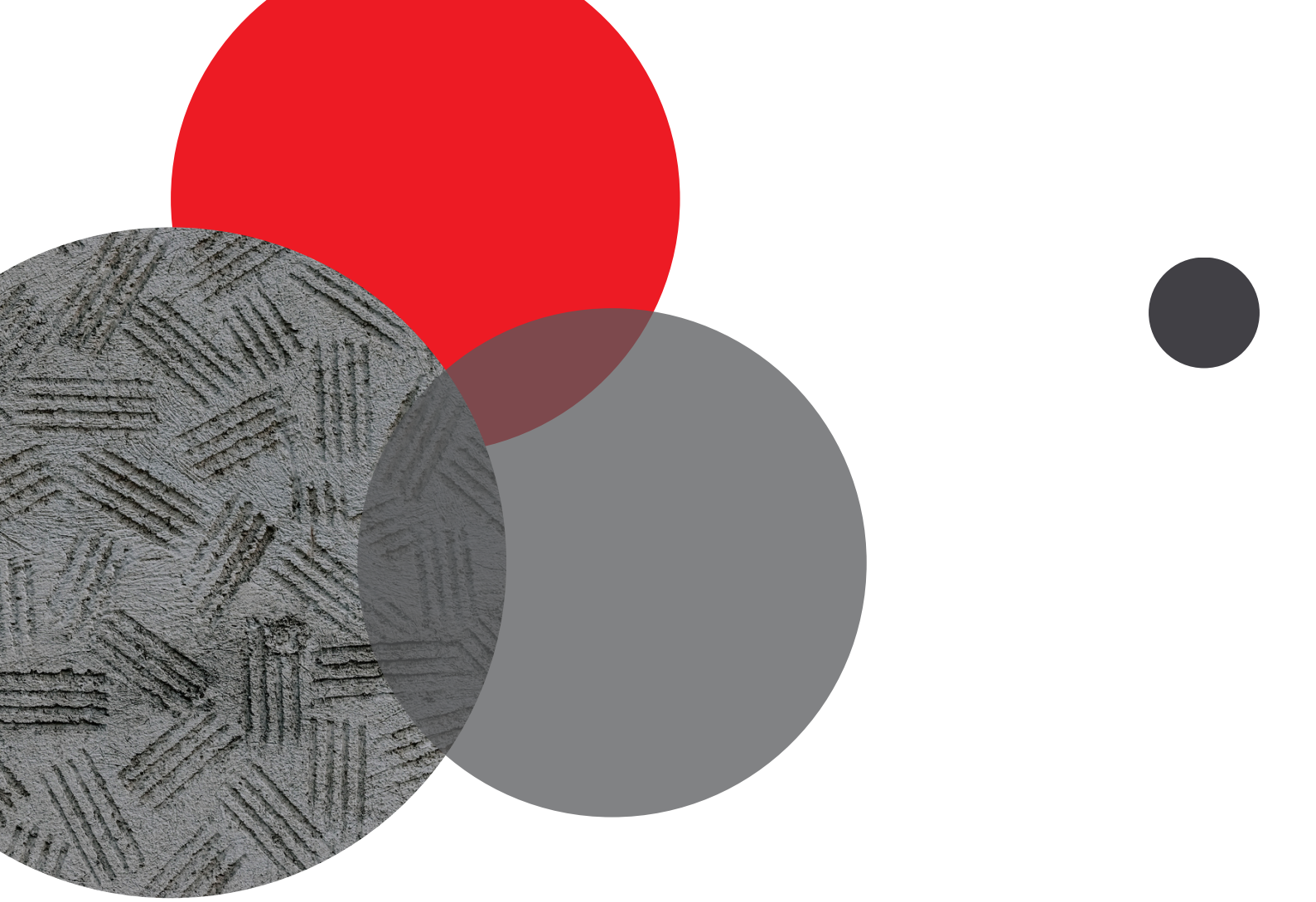




IFIMAC



1. OUR CENTER	07
1.1. Letter from the Director	08
1.2. Overview	10
1.3. Research Lines	10
2. ORGANIZATION	23
2.1. Steering Committee	24
2.2. Organization Chart	25
2.3. Communication Committee	26
2.4. Gender Equality Committee	27
2.5. Seminars Committee	30
2.6. Scientific Advisory Board	31
3. IFIMAC AT A GLANCE	32
3.1. Human Resources	33
3.2. Competitive Projects	34
3.3. Scientific Production	36
3.4. Transfer Activities	38
3.5. Training Activities	39
3.6. Other Research and Outreach Activities	39
4. RESEARCH	40
4.1. Research Highlights	41
4.2. Young Researchers	47
4.3. IFIMAC Colloquia Series and Seminars	48
4.4. IFIMAC Day 2025	57
4.5. Research Projects	59
– International R&D Projects	59
– National R&D Projects	60
– Community of Madrid Funding	70
– Private Funding	71
– UAM Funding	71
4.6. Publications	73
4.7. Invited Lectures	90
4.8. Organization of Congresses	95
4.9. Sponsorships	96
4.10. Transfer Activities	97
– Patent applications	97
– UAM Emprrende	97
– Knowledge-based Companies	98
– Article 60	98
4.11. Awards	98
5. TRAINING ACTIVITIES	101
5.1. Predoctoral Fellowships Program of the Spanish AEI	102
5.2. Master and Doctorate Programs	104
5.3. IFIMAC's Master Grants	104
5.4. Research Awards for Physics Students	105
6. OUTREACH ACTIVITIES	106
6.1. Science Outreach activities	107
6.2. IFIMAC on Media	108
6.3. IFIMAC YouTube Channel	108
6.4. IFIMAC Social Media	116
7. HUMAN RESOURCES	117
7.1. New Members Proposed by IFIMAC Researchers	118
7.2. IFIMAC Researchers	121
7.3. IFIMAC Staff	124



1



OUR CENTER

LETTER FROM OUR DIRECTOR



Rubén Pérez

IFIMAC Director

Welcome to the annual report of the Condensed Matter Physics Center (IFIMAC). Established in 2012, IFIMAC's mission is to pursue 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. During 2025, IFIMAC developed the scientific project linked with its third consecutive award as a "Maria de Maeztu (Mdm) research unit of excellence".

The ambitious goal of this project is to strengthen our scientific capacities and to foster our activity in areas of social impact like gender equality, outreach and knowledge transfer to prepare the center for an application to a recognition as a Severo Ochoa research center of excellence at the end of our current Mdm project.

On March 14th 2025, IFIMAC reached one of its strategic objectives: the Social Council of the Universidad Autónoma de Madrid (UAM), our hosting institution, approved the creation of the IFIMAC Foundation. Almost one year later, on April 13th 2026, with a significant delay due to the elections for Rector at UAM, we are finally ready to complete the legal steps and start our adventure as IFIMAC Foundation. This is a key step in the path to reach the status of a Severo Ochoa Center in the 2028 call.

IFIMAC membership is awarded to individual researchers, based on the scientific excellence achieved at the different levels of academic career. IFIMAC had 86 members in 2025, including 58 permanent research and teaching staff from UAM, 7 emeritus professors, 3 assistant professors and 18 young researchers associated with different programs of international talent attraction. These young researchers are supported by national (12 Ramón y Cajal contracts), regional (3 Atracción de Talento Comunidad de Madrid (AT-CM) modalidad 1), Fundación La Caixa (1) and IFIMAC (2). One of our young researchers has been granted an ERC Starting grant in the 2025 call. Work at IFIMAC is supported by a technical staff that included 2 IT and High-Performance Computing Infrastructure officers, 1 Laboratory Technician, 2 Project Managers and an Outreach technician. Apart from its members, IFIMAC hosted in 2025 the research activity and training of 31 post-doctoral researchers (70% of them, non-Spaniards), and 87 PhD students. They contribute significantly to the achievement of the IFIMAC's mission.

Our research outcome in 2025 increases the total number of articles (199) and the publication in top-cited journals with respect to the previous year (32.5% in D1 according to WoS). A selection of papers highlighting the research activity of IFIMAC in key areas --spanning from Quantum Materials and Technologies, Nano and Quantum optics, and Nanotechnology, to Soft and Active Matter and Biophysics-- can be found in section 4 of the report. Considering the end of the national calls for projects and infrastructure associated with the Next Generation Funds, IFIMAC researchers have continued to be very successful in the attraction of funding in 2025, with 139 active projects representing a total budget of 8.8 million €, and EU support through Horizon, ERA and ERC calls representing 20.66% of the total 2025 funding. Together with vibrant basic research (more than 16% of IFIMAC researchers are among the top 2% most cited authors), It is worth noting the increasing knowledge transfer activity of IFIMAC. Between 2022 and 2025, nine IFIMAC researchers have participated in the UAM Emprende programme across the General, Industry, and Health tracks. 2025 ends with three new patents, a Knowledge-Based Company (KBC) and three collaboration agreements with private companies. These activities demonstrate our sustained commitment to promote a culture of knowledge transfer, research valorization, market validation, and entrepreneurship-oriented innovation.

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 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, 29 technical seminars, to the monthly IFIMAC Colloquia. Among the outreach activities, I would like to highlight the third edition of the mentoring program for women physics students (with 43 women mentees and 41 mentors --with no gender restriction--) organized by the IFIMAC Gender Committee, and the consolidation of the IFIMAC Newsletter. This platform for sharing our activities within IFIMAC and with the broader Condensed Matter Physics Community is released twice a year and aims to strengthen the identity of our organization, and to provide regular updates on our achievements.

I invite you to explore this annual report and, through its pages, to discover IFIMAC's reality and promising future.

Rubén Pérez
IFIMAC Director

OVERVIEW

The Condensed Matter Physics 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. 62 researchers constitute its permanent staff with nineteen young researchers (RyC, talent grant, Junior leader IFIMAC positions) and up to one hundred fourteen postdoctoral researchers and PhD students.

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) in the 2014 call and it was renewed in 2018 (CEX2018-000805-M). The third María de Maeztu accreditation was evaluated during 2023 and awarded in April 2024 (CEX2023-001316-M).

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

Research 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:



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.

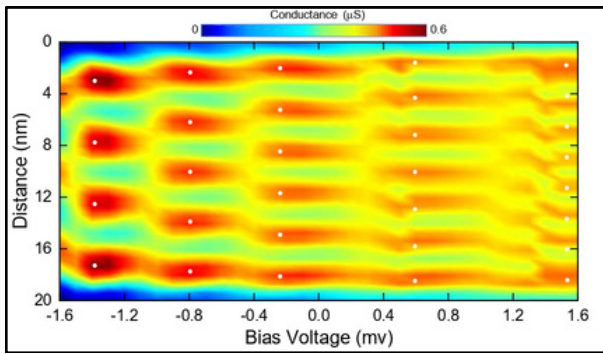


Figure 1: Conductance (color scale on the top) vs bias voltage (x-axis) and distance (y-axis) demonstrating lateral quantization of collective electronic states at the surface of the heavy fermion superconductor URu_2Si_2 . Image taken at 100 mK. From *Nature* 616, 465 (2023).

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 modeling of new materials (Figure 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 2).

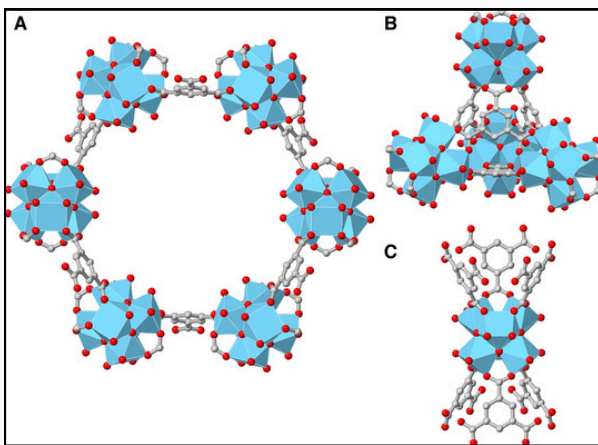


Figure 2: Hexagonal pore (A) and tetrahedral cavity (B) in the luminescent metal organic framework MOF-808, an emergent class of optical sensors. We show an unsaturated Zr_6O_8 cluster in C. Blue is Zr, grey is C and red is O, hydrogen is removed for clarity. From *Nature Communications* 14, 2506 (2023).

IFIMAC takes full advantages of the possibilities offered by UAM, leveraging the use of fabrication, nanofabrication (Figure 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 modeling, leverage experimental efforts in instrumentation to creating top level science. Practically any new idea in materials synthesis can be addressed at IFIMAC.

IFIMAC studies all sorts of topical quantum materials, obtaining advances in magnetism, superconductivity, topological properties of materials, interfaces, optical properties, electronics and spintronics, surface physics, molecular systems, graphene and other two-dimensional materials (Figure 4). Regarding the material properties under study at IFIMAC, several groups are very active in the research on magnetism, superconductivity, spintronics and vortex physics.

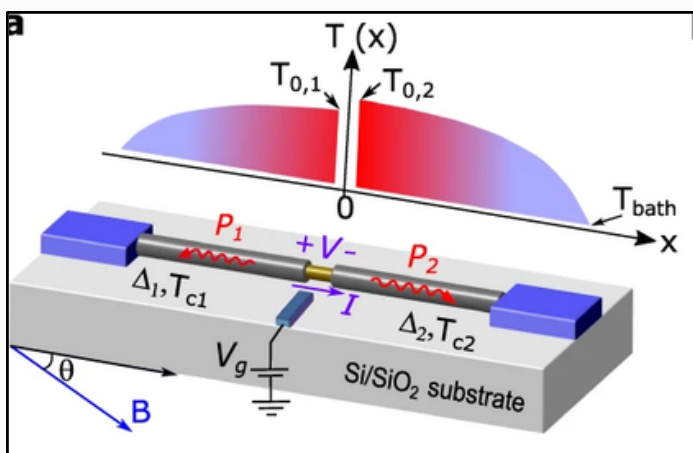


Figure 3: Device made of superconducting leads and a semiconducting nanowire. An etched part in the middle of the nanowire allows applying a gate. Heat flow (red lines) leads to a new characterization tool, Joule spectroscopy. From **Nature Communications** 14, 2873 (2023).

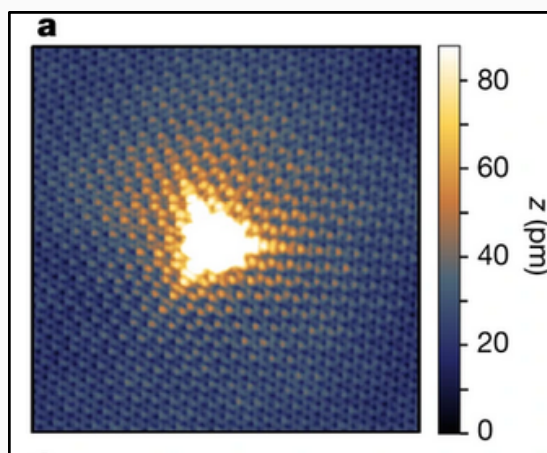


Figure 4: Friedel oscillations from H atoms in graphene. Additional wavefronts appearing due to dislocations are shown in red. From **Nature**, 574, 219 (2019).



First Principles Simulations and Modelling

Computer modeling has grown over the years into a scientific discipline on its own. Models are used to evaluate real-world phenomena that may be too complex to analyze directly in the laboratory or through experimentation, allowing hypotheses to be tested at a fraction of the cost. 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.

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 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 containing the propagation direction (Figure 5). 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.

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.

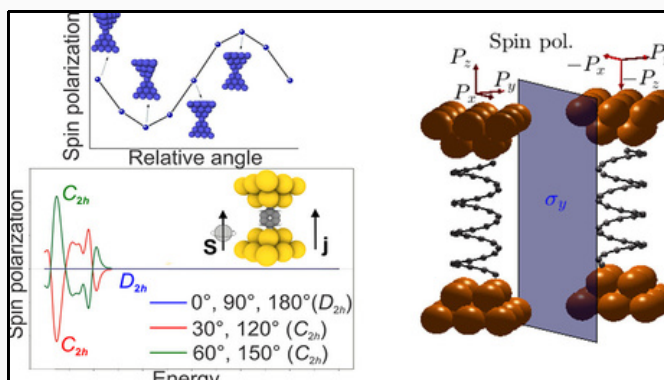


Figure 5: Different types of chiral systems such as those in the figure may exhibit the CISS effect. From *ACS Nano*, 17, 6452 (2023).

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.



Figure 6: 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).

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 authors show that a redox protein, cytochrome C, can behave as an electrically driven switch when incorporated in a solid-state junction with gold electrodes (Figure 6).

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.

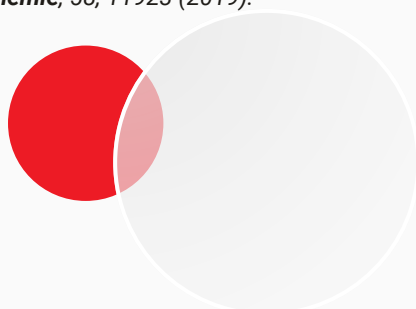




Figure 7: Front cover artistic view of the catalytic process for acetylene hydrogenation. From *J. Phys. Chem. C*, 118, 5352 (2014).

These findings rationalize for the first time the applicability of CeO_2 as a catalyst for olefin production and potentially broaden its use for the hydrogenation of polyunsaturated and polyfunctionalized substrates containing triple bonds. In a recent manuscript published in the *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 (Figure 8). 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.

The unique catalytic properties of ceria for the partial hydrogenation of alkynes have been examined for acetylene hydrogenation (Figure 7). Catalytic tests over polycrystalline CeO_2 at different temperatures and $\text{H}_2/\text{C}_2\text{H}_2$ 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 $\text{CeO}_2(111)$ in order to investigate reaction intermediates and to calculate the enthalpy and energy barrier for each elementary step.

At a high hydrogen coverage, b- C_2H_2 radicals adsorbed on-top of surface oxygen atoms are the initial reactive species forming C_2H_3 species effectively barrierless. The high alkene selectivity is owed to the lower activation barrier for subsequent hydrogenation leading to gas-phase C_2H_4 compared to that for the formation of b- C_2H_4 radical species.

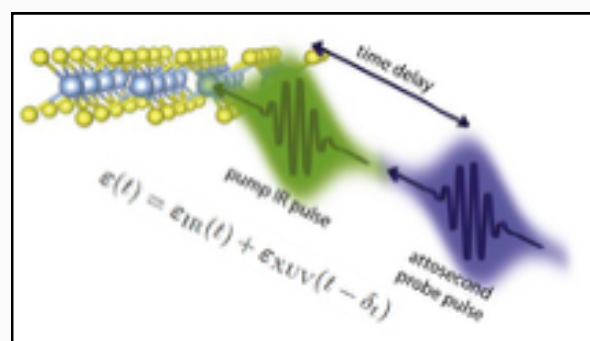


Figure 8: Schematics of a pump-probe experiment where a first laser pulse excites the material while a second one explores the time evolution of the excitation. From *Journal of Chemical Theory and Computation*, 19, 333 (2023).



When the characteristic 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.

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 (Figure 9), originating from stoichiometric changes in one of its composing layers (the quasi-hexagonal one). Franckeite is a natural superlattice composed of two alternating layers of different composition, easy to exfoliate into very thin heterostructures, which has shown potential for optoelectronic applications.

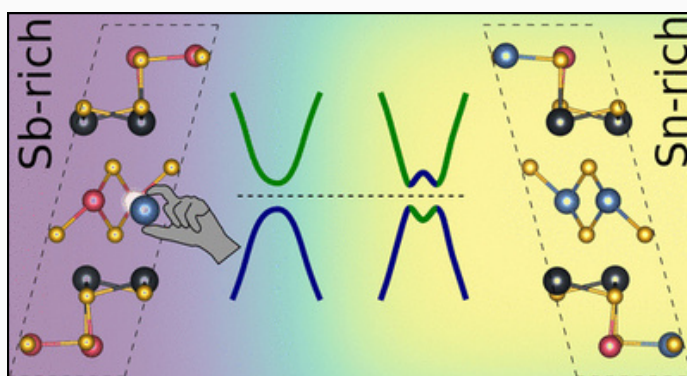


Figure 9: A quantum phase transition, predicted from DFT calculations and originating from stoichiometric changes in one of its composing layers (a large concentration of Sn in the quasi-hexagonal one) turns franckeite into a strong topological insulator. From *Nano Lett.* 21, 7781 (2021).

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.

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.

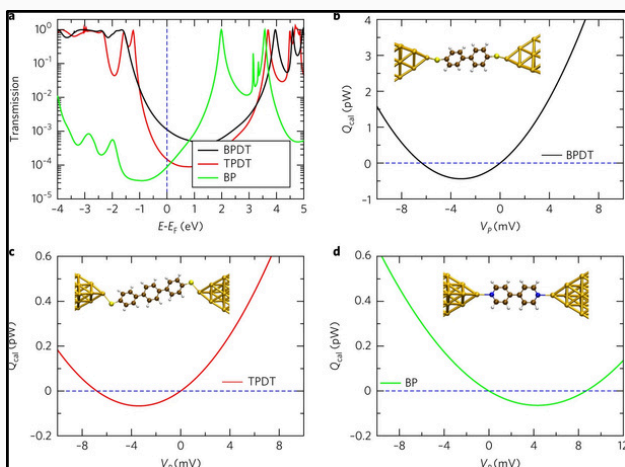


Figure 10: (b-d) Computed heating/cooling effect in the molecular junctions formed by gold electrodes and prototypical molecules (Au-biphenyl-4,4'-dithiol-Au, Au-terphenyl-4,4'-dithiol-Au and Au-4,4'-bipyridine-Au). The transmission (a) and its derivative at E_F determine the electrical conductance and the Seebeck coefficient of the molecular junctions. From *Nat. Nanotechnol.* 13, 122 (2018).

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 (Figure 10).

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 (Figure 11). Discrete localized states, known as “Andreev bound states,” form in the nanowire as a result of coupling to the superconductor. When the 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.

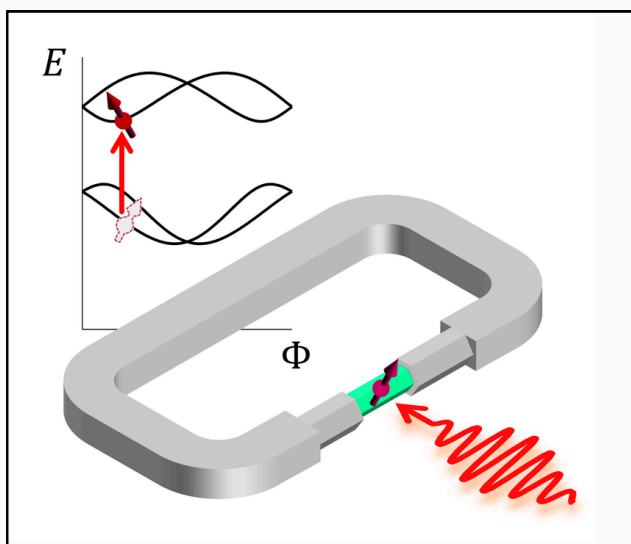
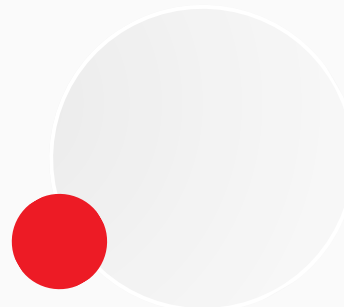


Figure 11: Spin-Orbit Splitting of Andreev States Revealed by Microwave Spectroscopy. The circuit includes an InAs nanowire enclosed by a superconducting aluminum loop. The spin state of a single electron in the nanowire has a measurable impact on the electrical properties of the circuit. From *Phys. 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 (Figure 12). 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.

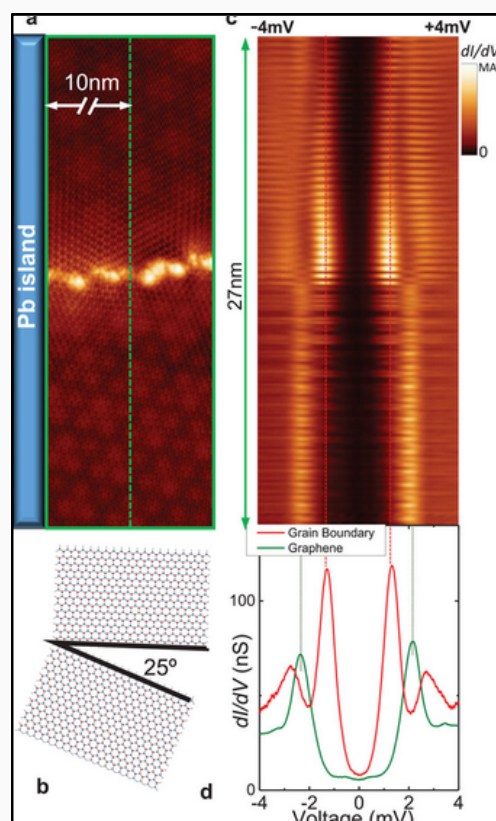


Figure 12: Grain Boundary (GB) magnetism induces Yu–Shiba–Rusinov states in superconducting graphene. From **Advanced Materials** 33, 2008113 (2021).



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 (Figure 13) enables scalability and integration in

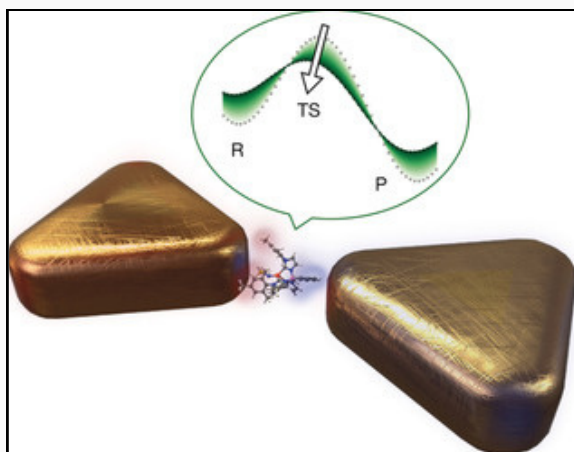


Figure 13: Light focused on the nanoscale can interact with quantum emitters, including complex molecules. From, **Angew. Chem. Int. Ed.** 58, 8698 (2019)

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

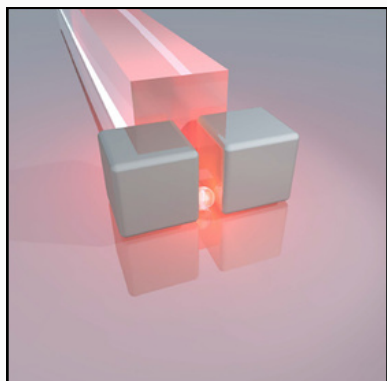


Figure 14: Nanophotonic structures allow confining light on the nanoscale. From *ACS Photonics*, 5(9), 3447-3451 (2018).

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 (Figure 14). 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.

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 (Figure 15).

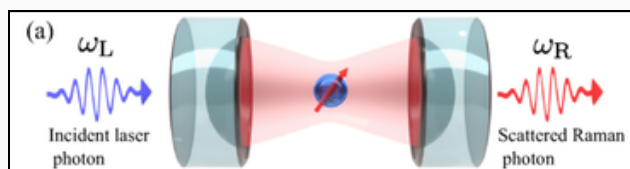


Figure 15: Ultrastrong coupling enables the spontaneous Raman scattering of incident radiation. From *Phys. Rev. Lett.* 129, 273602 (2022).

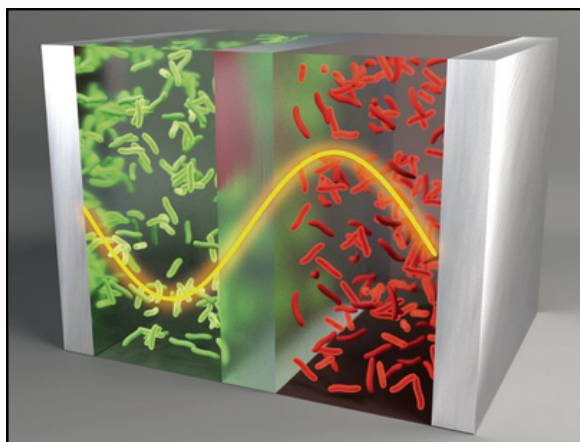


Figure 16: Energy transfer between molecules is modified by the presence of vacuum fields in a photonic cavity. From *Science* 373, eabd0336 (2021).

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 (Figures 16 and 17).

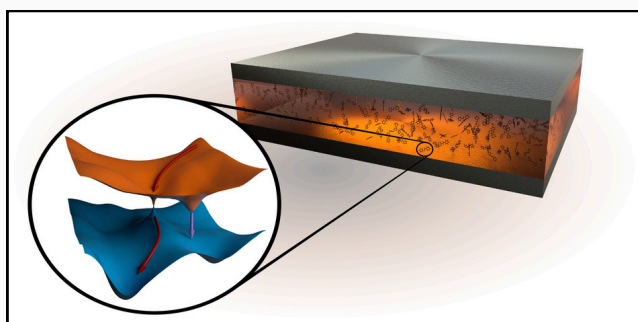


Figure 17: With polaritonic chemistry, chemical structure can be manipulated through strong coupling between light and matter. From *ACS Photonics* 9, 1096 (2022).

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 (Figure 18), time-resolved spectroscopy, quantum microcavities based on semiconductor nanostructures, exciton polaritons, and on the preparation of Bose-Einstein condensates in solid-state systems.

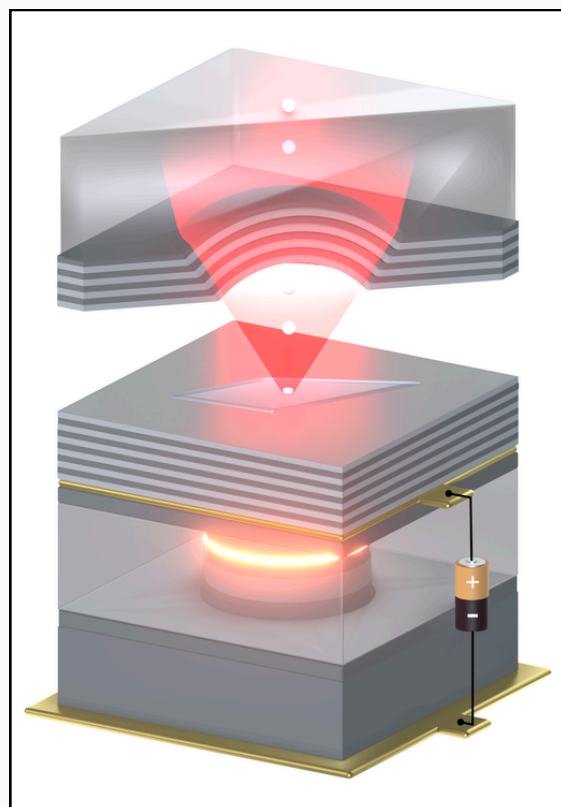


Figure 18: Sketch of a room temperature single photon source for quantum communication protocols. A quantum emitter (such as a defect in hBN) couples to the open cavity, enhancing the single photon emission.

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 19).

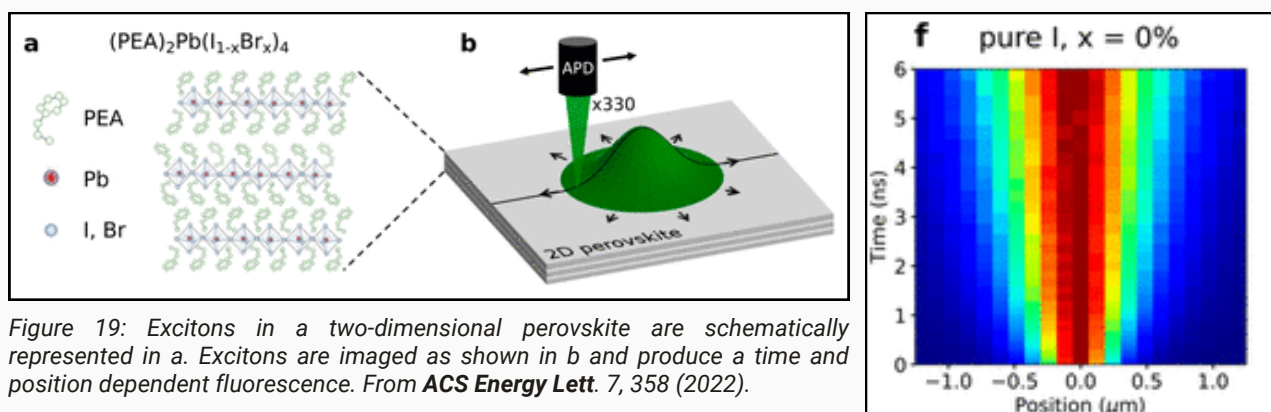


Figure 19: Excitons in a two-dimensional perovskite are schematically represented in a. Excitons are imaged as shown in b and produce a time and position dependent fluorescence. From *ACS Energy Lett.* 7, 358 (2022).



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

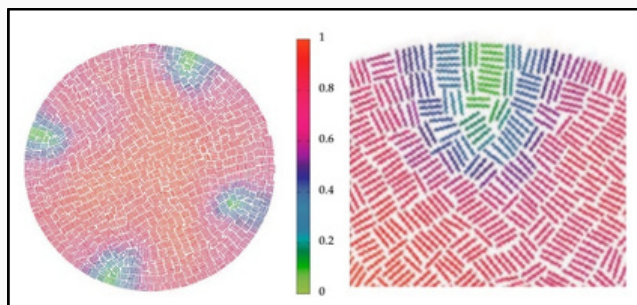


Figure 20: Exotic liquid crystalline phases in monolayers of vertically vibrated granular particles. From **Liquid Crystals** 50, 1261–1278 (2023)

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 (Figure 20). This system represents a novel approach to study order in 2D fluids of hard particles.

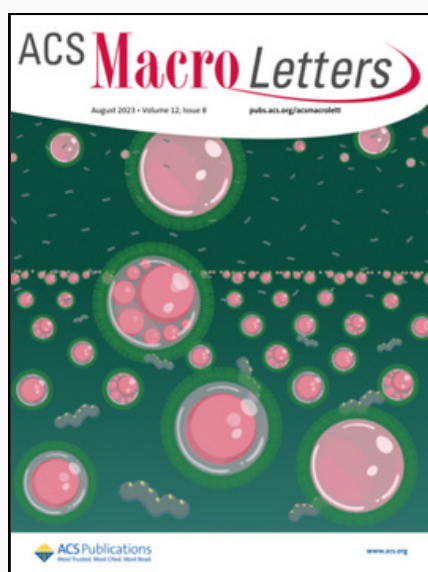


Figure 21: Aqueous two-phase systems within selectively permeable membranes. From **ACS Macro Lett.**, 12, 132 (2023).

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 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 (Figure 21). Importantly, these vesicles may also find applications in biomedicine, pharmacy, and cosmetics.



Figure 22: 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 (Figure 22).

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 (Figure 23). 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.

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.

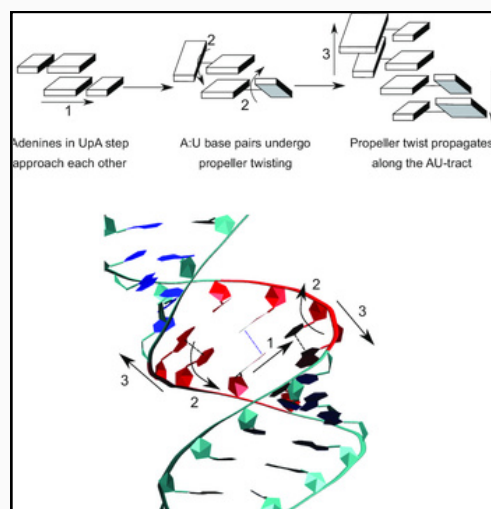


Figure 23: Proposed mechanism for AU-tract induced bending. AU-tract bending is illustrated using rigid blocks representation (top) and a snapshot of the molecular dynamics trajectory (bottom, AU-tract is marked in red). From *Nucleic Acid Res.* 22, 12917 (2020).



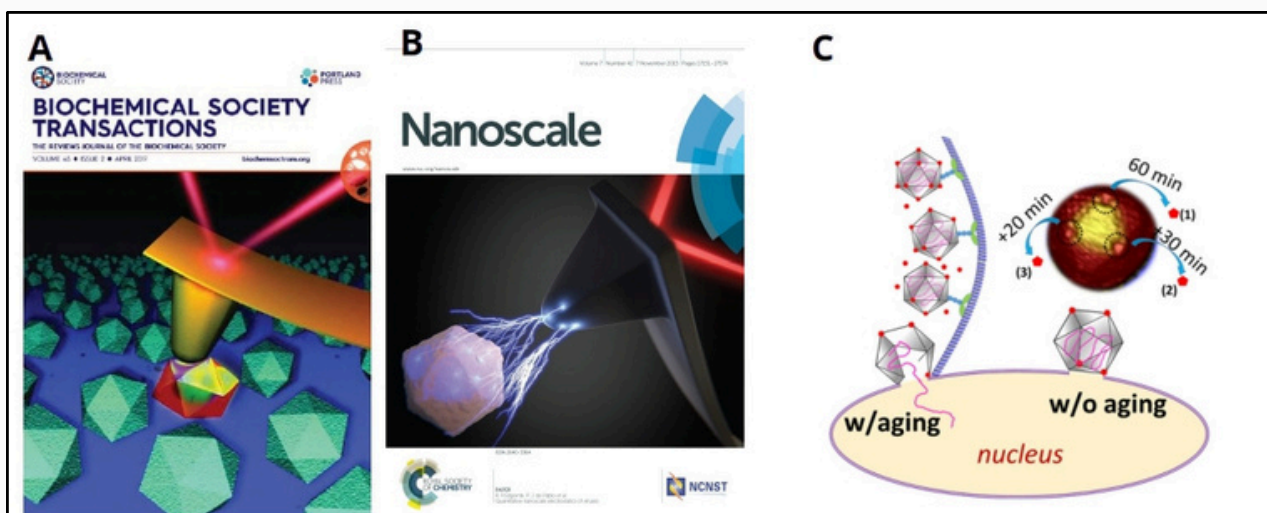
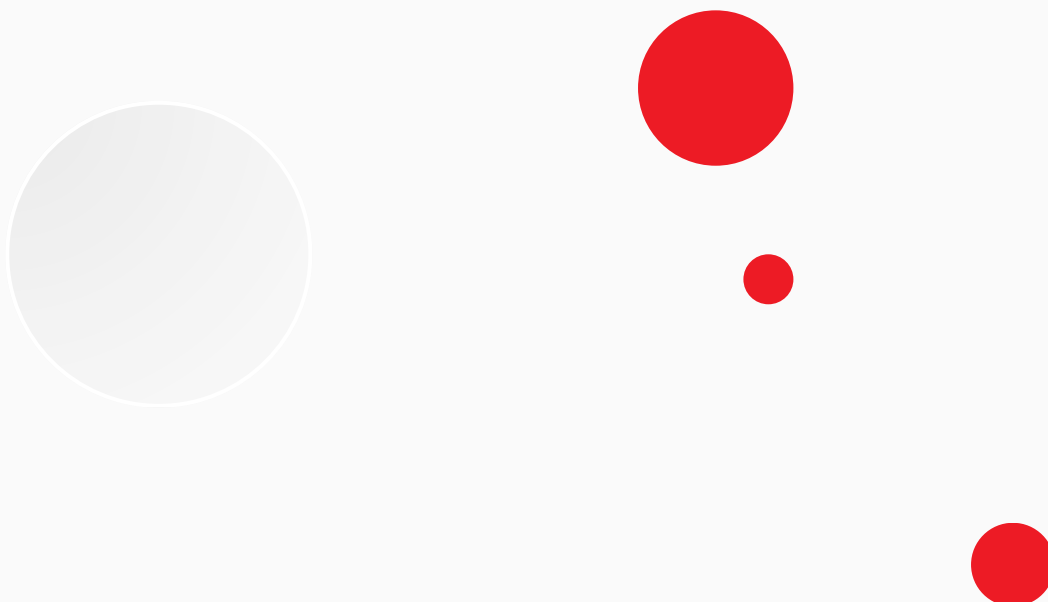
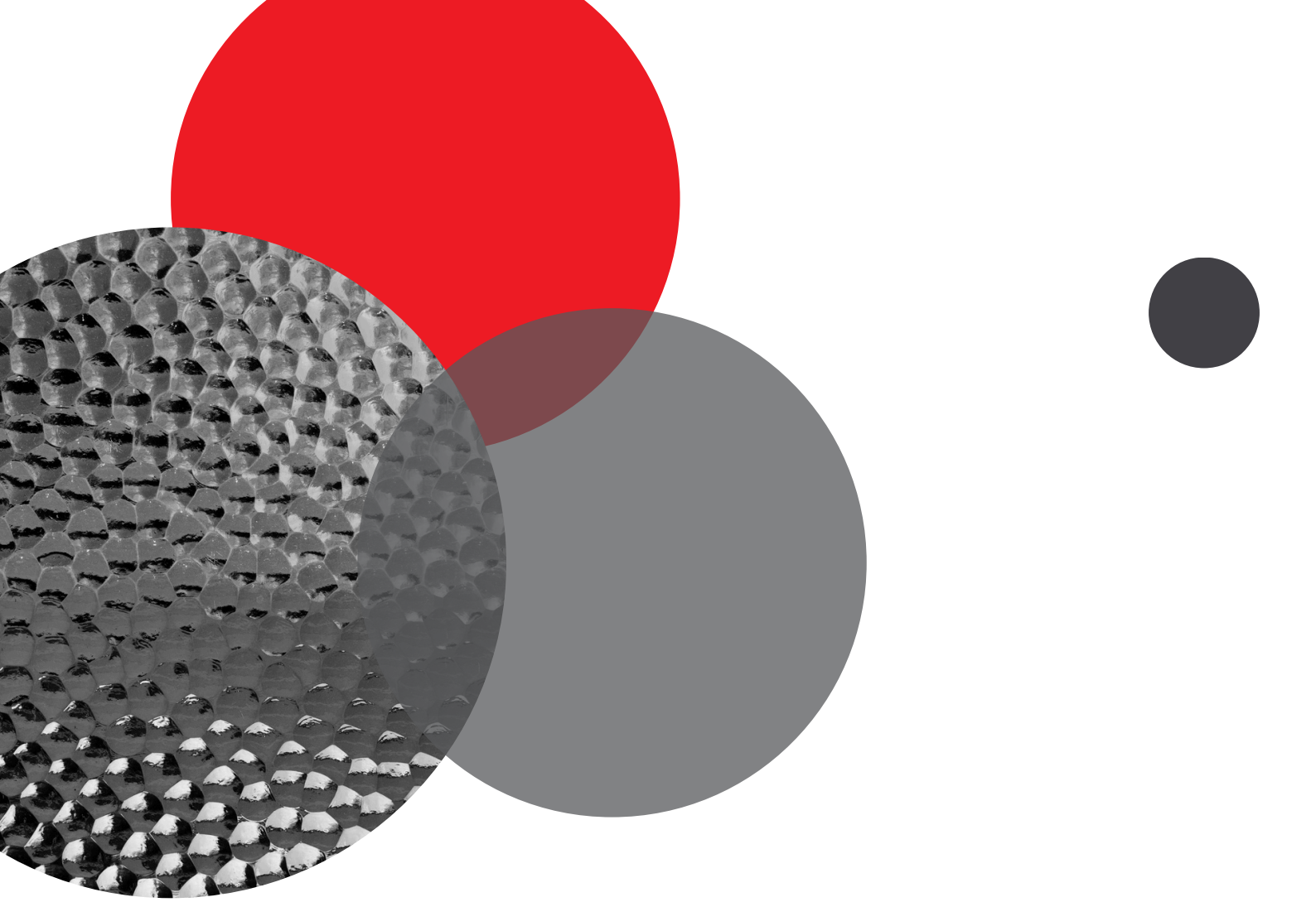


Figure 24: AFM is the perfect tool for seeing and touching individual viruses (A), allowing the study of the electrostatic charge of virus structures (B), and resemble the disruption process of viruses taking place during infection (C). From: *Biochem. Soc. Trans.* 45, 499 (2017); *Nanoscale* 7, 1728 (2015), and *Phys. Rev. X* 11, 021025 (2021).

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 (Figure 24). Some of these studies are supported by MD simulations using coarse-grained models and simulation codes developed at IFIMAC.





2



ORGANIZATION

STEERING COMMITTEE



Rubén Pérez Pérez
IFIMAC Director

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



Luisa E. Bausá López
IFIMAC Deputy Director

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



Antonio I. Fernández-Domínguez
Member

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



Cristina Gómez-Navarro González
Member

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



Félix Zamora Abanades
Member

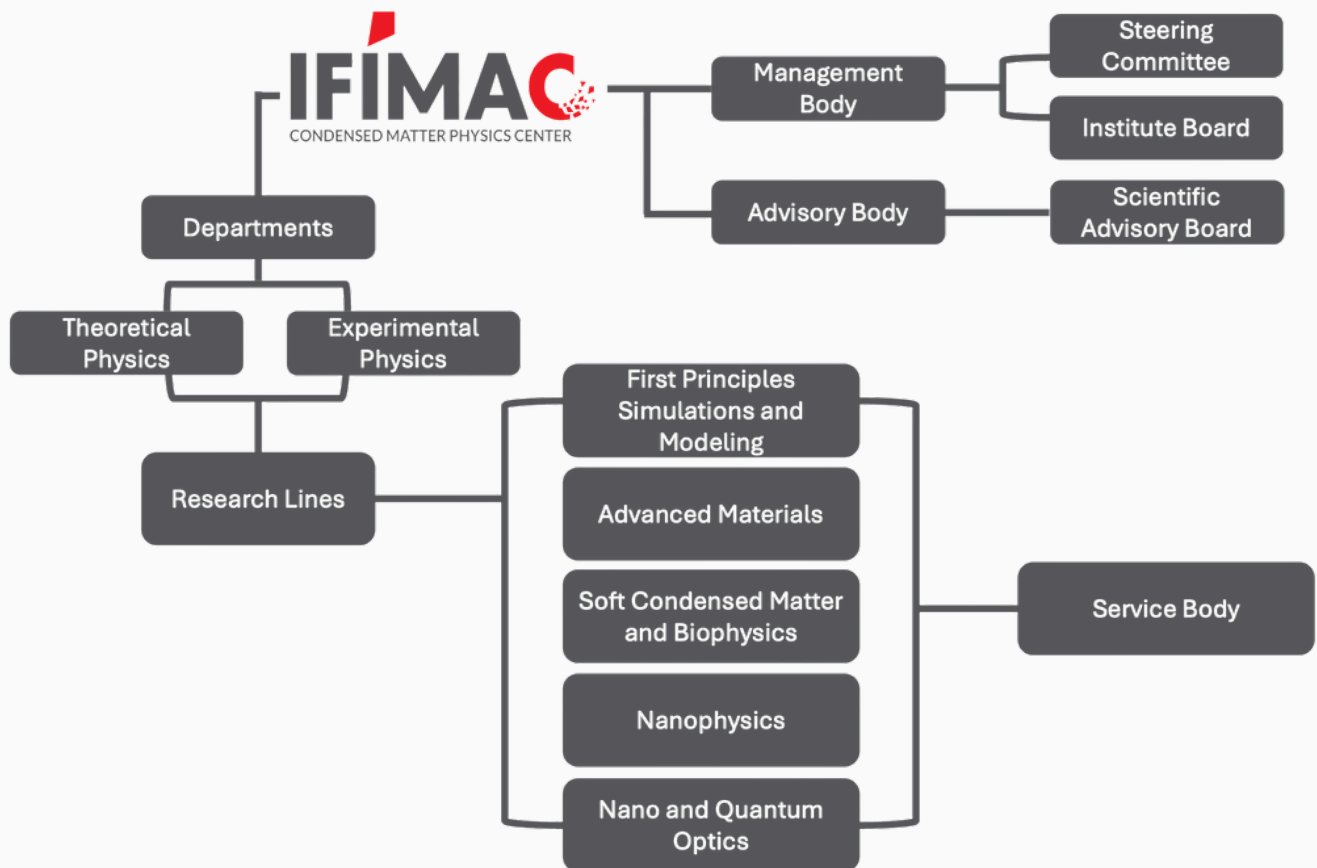
Full Permanent Professor at the Department of Inorganic Chemistry, Universidad Autónoma de Madrid.



Hermann Suderow
Member

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

ORGANIZATION CHART



COMMUNICATION COMMITTEE

As members of the Communication Committee, their mission is to enhance the visibility of the activities, achievements, and news from the Center. Their research communication aims to promote a greater understanding of science, its relevance to everyday life, and its role in addressing global challenges.



Pablo Ares García
Head of the Committee

Ramón y Cajal Fellow at the Department of Condensed Matter Physics, Universidad Autónoma de Madrid.



Carlos Antón Solanas
Member

CM-Talento Fellow at the Department of Physics of Materials, Universidad Autónoma de Madrid.



Paloma Arroyo Huidobro
Member

Ramón y Cajal Fellow at the Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.

NEW



Salvatore Assenza
Member

Ramón y Cajal Fellow at the Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.



Antonio I. Fernández-Domínguez
Member

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

NEW



Héctor González Herrero
Member

Ramón y Cajal Fellow at the Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.



Diego Martín Cano
Member

Ramón y Cajal Fellow at the Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.

GENDER EQUALITY COMMITTEE

In April 2021, the Gender Equality Committee was created at IFIMAC. Its main goal is to promote good practices and organize activities that support women's role in science, especially within IFIMAC, while also raising awareness about gender equality among its members.



Cristina Gómez-Navarro
Mentoring Program Coordinator

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



Isabel Guillamón
Member

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



Francesca Maria Marchetti
Member

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



Elena del Valle Reboul
Member

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



Johannes Feist
Member

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



Carlos Antón Solanas
Member

CM-Talento Fellow at the Department of Physics of Materials, Universidad Autónoma de Madrid.



Diego Martín Cano
Member

Ramón y Cajal Fellow at the Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.



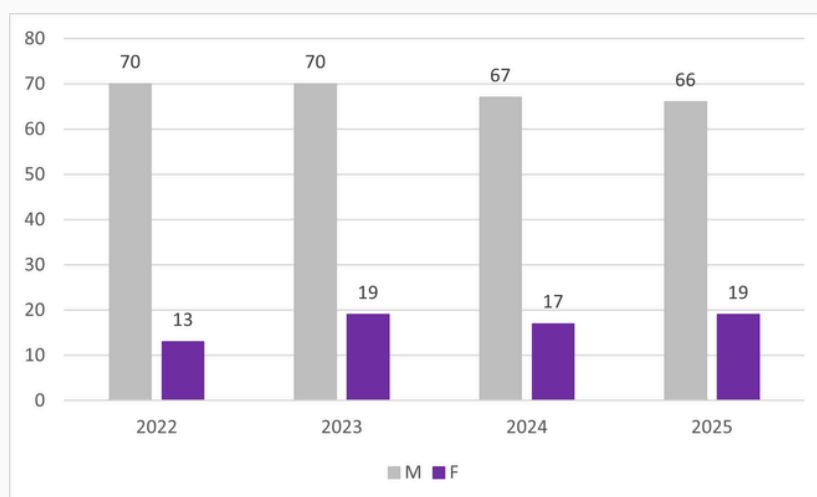
Celia Polop
Member

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

The committee's activities focus on different areas: monitoring and evaluation, participation, visibility and awareness, and student support.

1. **Monitoring gender balance at IFIMAC:** The graph below illustrates the evolution of the of women at IFIMAC over recent years. Our monitoring shows a steady increase in the representation of women within the institute, a positive trend that the committee is committed to sustaining in the coming years. (See IFIMAC at a glance for further details.)

Evolution by Gender (2022–2025)



2. **Mentoring Program:** The establishment of the fourth edition of the mentoring program for women physics students has been one of the committee's main priorities this year. This initiative, launched as one of the committee's earliest actions, aims to foster a close and supportive connection between undergraduate students and research activities.

The program provides:

- Support for women students pursuing undergraduate, master's, and doctoral degrees in physics.
- Female role models to inspire and guide students.
- Training and empowerment opportunities for mentors.
- A strong academic network for women in physics.

This year, 43 mentees are enrolled in the program, representing approximately 40% of all women physics students at UAM. In addition, more than 55% of senior researchers at IFIMAC are actively involved as mentors. Since the program's launch in 2022, when it began with 32 students, participation has evolved very positively, showing steady growth over successive editions. Furthermore, feedback collected through evaluations from both mentees and mentors has been consistently excellent, highlighting the program's strong impact and high level of satisfaction among participants.

A central component of the program is mandatory training in mentoring and gender in science for both mentors and mentees, delivered by an external expert from Skills4Science. A mid-year evaluation and additional training session are also held to ensure continuous improvement.

The impact of the mentoring program has extended beyond IFIMAC itself. It has generated significant discussion within the gender equality meetings of SOMMA, where the initiative has been presented as a best-practice example. As a result of this broader interest, a scientific article has recently been published outlining the objectives and cornerstones of the program, its unexpected outcomes, and a set of practical recommendations for institutions planning to implement similar mentoring systems.

Mentoring to cultivate female talent in science, C Gómez-Navarro, J Hansen, FEBS letters 599 (19), 2689-2692.

INAUGURACION PROGRAMA MENTORIA - IFIMAC
CURSO 25/26

IfiMAC

12 septiembre 2025
Sala conferencias
Modulo 0
Facultad de Ciencias
UAM

programa MENTORÍA
Alumnas de física

UAM **IfiMAC** EXCELENCIA MARGA DE MAZZU

12 septiembre 2025
Modulo 0
Facultad de Ciencias

11:45 Bienvenida e Indicaciones prácticas
Cristina Gómez-Navarro: investigadora IFIMAC

12:00 De los últimos Informes a la Acción:
Género y Educación
Sofia Facal, Skills4Science

12:20 "La importancia de acompañarnos:
mi experiencia en las mentorías"
Miriam Moreno, mente

12:40-13:15 Aperitivo

Mas información en : ifimac.uam.es/mentoría
Para consultas: mentoría.ifimac@uam.es

IfiMAC
Condensed Matter Physics Center

3. **Promoting Outreach Activities on Women in Science:** To celebrate the International Day of Women and Girls in Science on February 11th, we organized a science fair featuring a series of interactive workshops. (See outreach section for details)

4. We also **participated in educational centers** by giving talks and organizing workshops. Some of these initiatives include:

- 2025 Cristina Gómez-Navarro: "**Mamá, quiero ser científica, ¿y ahora qué?**" at IES Luis Gongora.

The committee remains devoted to expanding these initiatives and continuing to foster an inclusive and supportive environment for women in science.

SEMINARS COMMITTEE

As members of the IFIMAC seminar committee, their main objective is to organize the center's seminars and colloquia. This includes planning the schedule, selecting speakers, coordinating logistics, and promoting the events.



Iván Brihuega
Member

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



Antonio I. Fernández-Domínguez
Member

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



Isabel Guillamón
Member

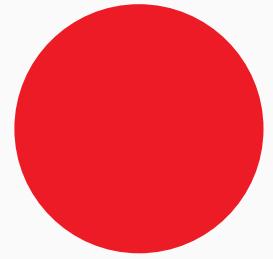
Associate Professor at the Department of Condensed Matter Physics, Universidad Autónoma de Madrid.



Laura Rodríguez Arriaga
Member

Ramón y Cajal Fellow at the Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.

SCIENTIFIC ADVISORY BOARD



PhD. Enrique Espi Guzman

Technical Advisor, Repsol
DeepTech (Spain).



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Cecil and Ida Green Professor
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Prof. Nicola Marzari

Cavendish Professor of Physics,
University of Cambridge (UK).



Prof. Monica Olvera de la Cruz

Lawyer Taylor Professor at the
Department of Materials Science,
Northwestern University (USA).



Prof. Päivi Törmä

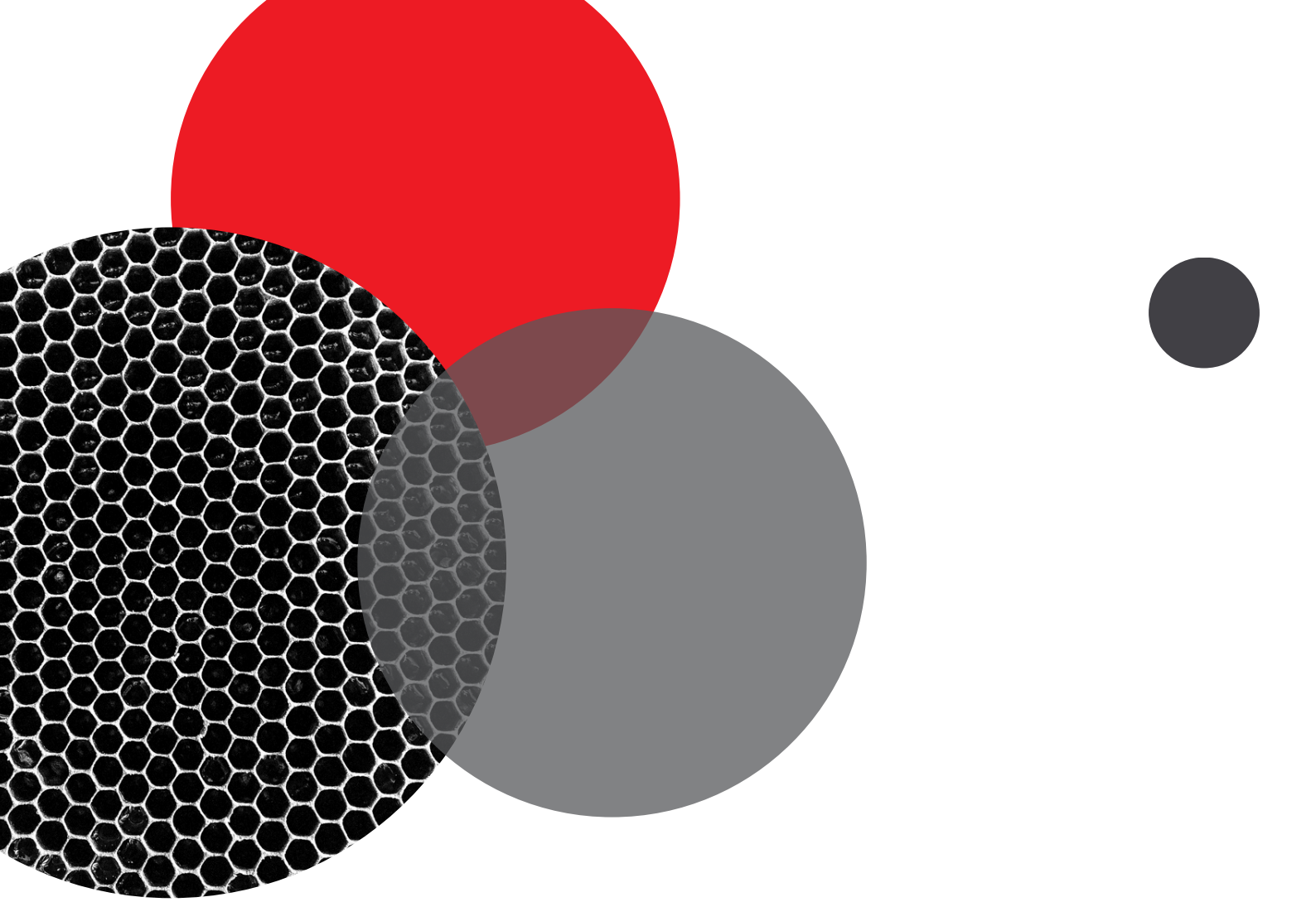
Professor at the Department of
Applied Physics, Head of the
Quantum Dynamics (QD) research
group. Aalto University (Finland).



Prof. Roser Valentí

Professor at the Institut für
Theoretische Physik, Goethe
Universität Frankfurt am Main,
Frankfurt (Germany).





3

**IFIMAC AT
A GLANCE**

HUMAN RESOURCES

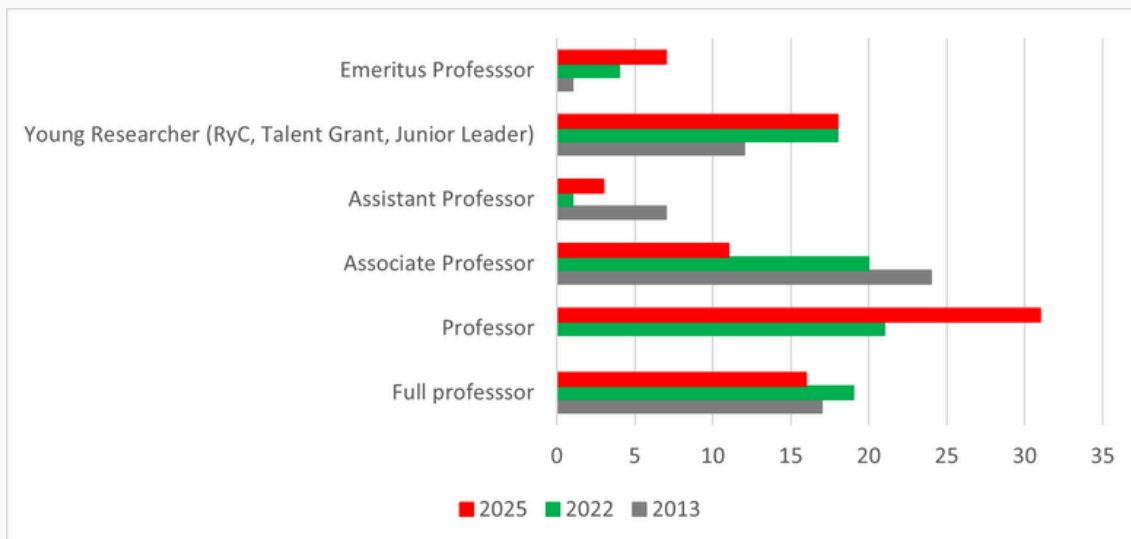
IFIMAC Researchers: 86

NEW 5 new researchers affiliated during 2025.

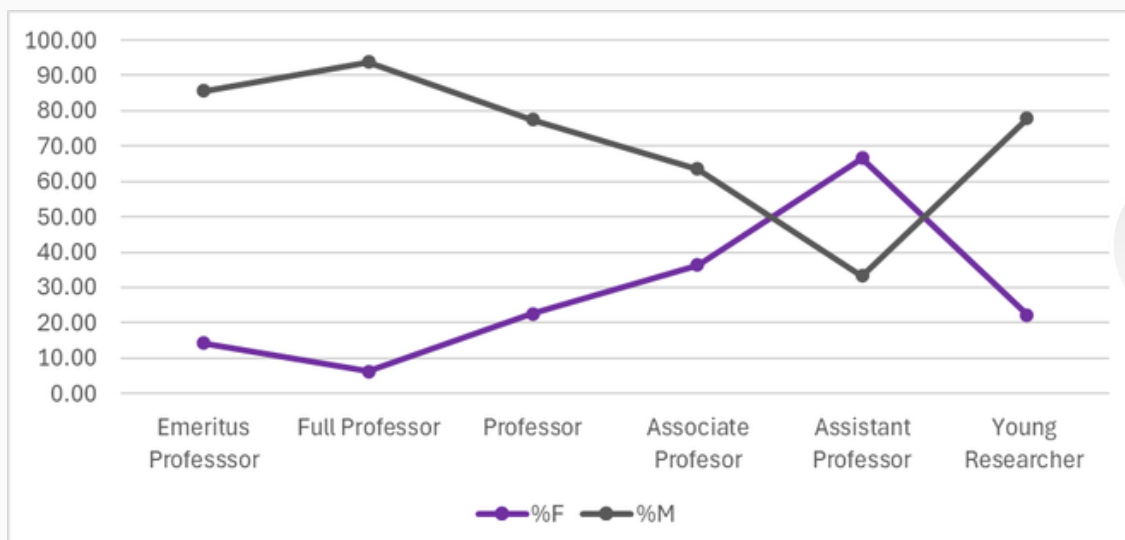
16 Full Professor
 31 Professor
 11 Associate Professor
 3 Assistant Professor
 7 Emeritus Professor

18 Young researcher (RyC, Talent Grant, IFIMAC Young Leader, LaCaixa Junior Leader)

Evolution by Professional Category (2013-2025)



By gender 2025:



IFIMAC Staff: 6

- 2 IT and High-Performance Computing Infrastructure
- 2 Project Manager
- 1 Laboratory Technician
- 1 Outreach

By gender: Male: 50% Female: 50%

IFIMAC Predoctoral

N° PREDOCTORAL RESEARCHERS	MALE	FEMALE	SPANISH	NON SPANISH
87	63	24	72	15

By gender: 72.41% Male 27.59% Female

IFIMAC Postdoctoral

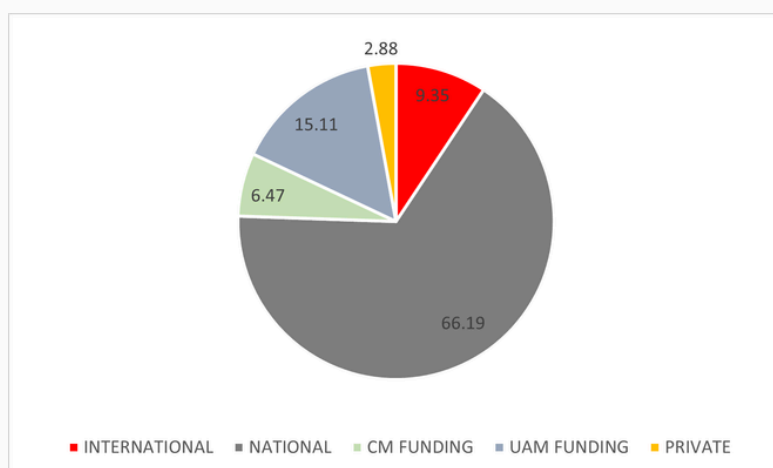
N° POSTDOCTORAL RESEARCHERS	MALE	FEMALE	SPANISH	NON SPANISH
31	25	6	9	22

By gender: 81% Male 19% Female

COMPETITIVE PROJECTS

N° ACTIVE PROJECTS	INTERNATIONAL	NATIONAL	CM FUNDING	UAM FUNDING	PRIVATE
139	13	92	9	21	4
NEW 25 new projects	1	13	4	5	2

97.12% are **public** projects and 2.88% are **private** projects.





European Research Council
Established by the European Commission

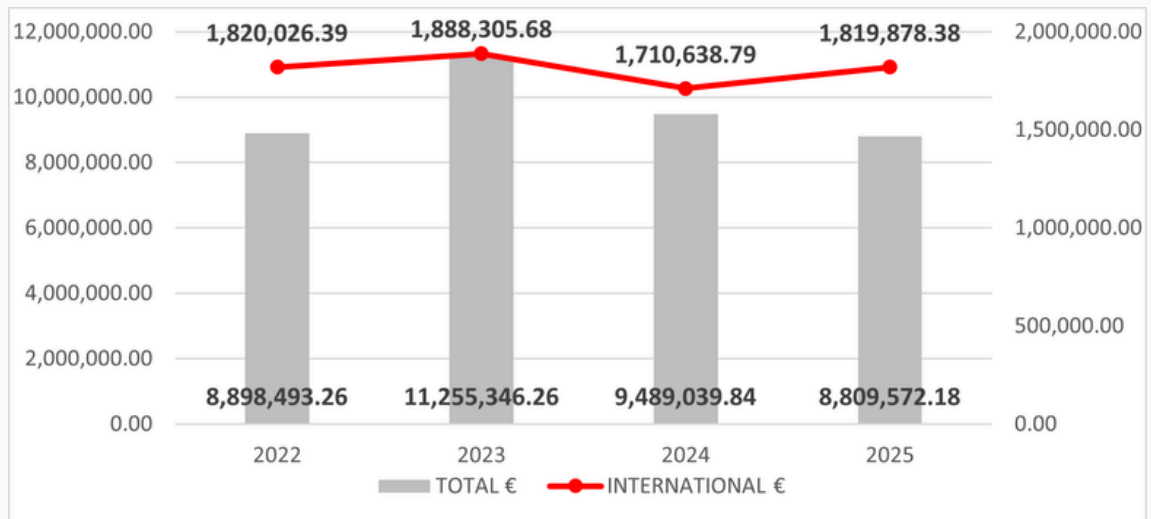
TOTAL ERC	3
FUNDING	999,680.38 EUR
ERC MALE (2)	699,513.62 EUR
ERC FEMALE (1)	300,166.76 EUR
NEW ERC (Male)	1

Funding

102,436.88 € by IFIMAC researcher

N° ACTIVE PROJECTS	INTER-NATIONAL	NATIONAL	CM FUNDING	UAM FUNDING	PRIVATE	TOTAL ANNUAL FUNDING
139	1,819,878.38 EUR	5,266,154.50 EUR	1,322,798.49 EUR	209,002.65 EUR	191,738.16 EUR	8,809,572.18 EUR

Evolution by Professional Category (2013-2025)

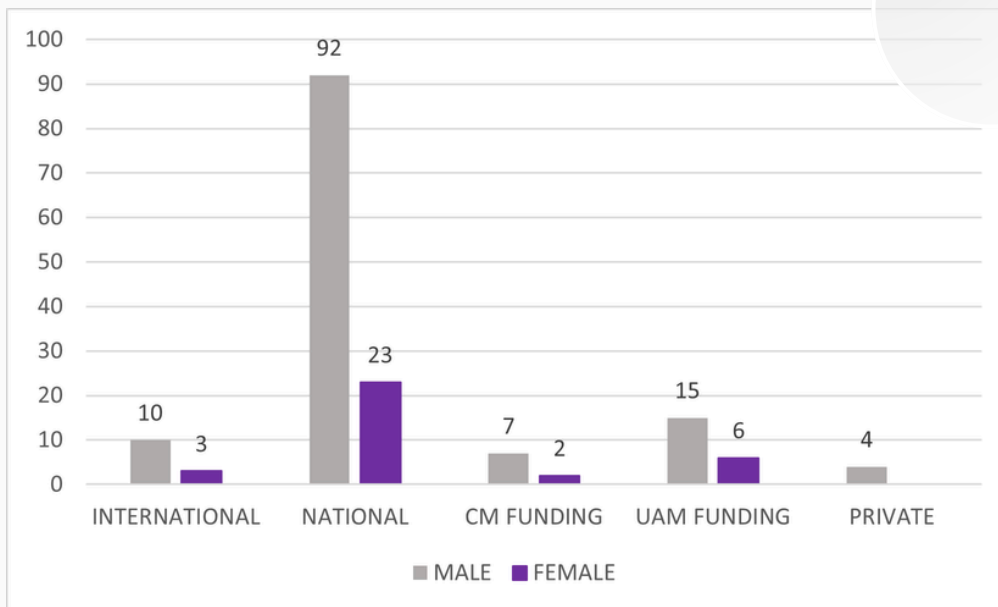


Competitive projects by gender and funding

78% competitive projects lead by male.

22% competitive project lead by female.

23 competitive projects with two PI (male and female) and 3 lead by two female.



These are people who participate in the projects and therefore contribute to more than 139 active projects.

GENDER	INTER-NATIONAL	NATIONAL	CM FUNDING	UAM FUNDING	PRIVATE	TOTAL ANNUAL FUNDING
MALE	1,167,188.79 EUR	4,553,762.11 EUR	1,266,341.15 EUR	158,505.30 EUR	191,738.16 EUR	7,337,535.52 EUR
FEMALE	652,689.59 EUR	712,392.39 EUR	56,457.33 EUR	50,497.35 EUR	0.00 EUR	1,472,036.65 EUR

77,475.61€ by IFIMAC woman researcher.
109,515.46€ by IFIMAC man researcher.

SCIENTIFIC PRODUCTION

199 Docs (WoS & Scopus)
96.48% citable items
76.38% OA

2.31 papers by IFIMAC researcher.

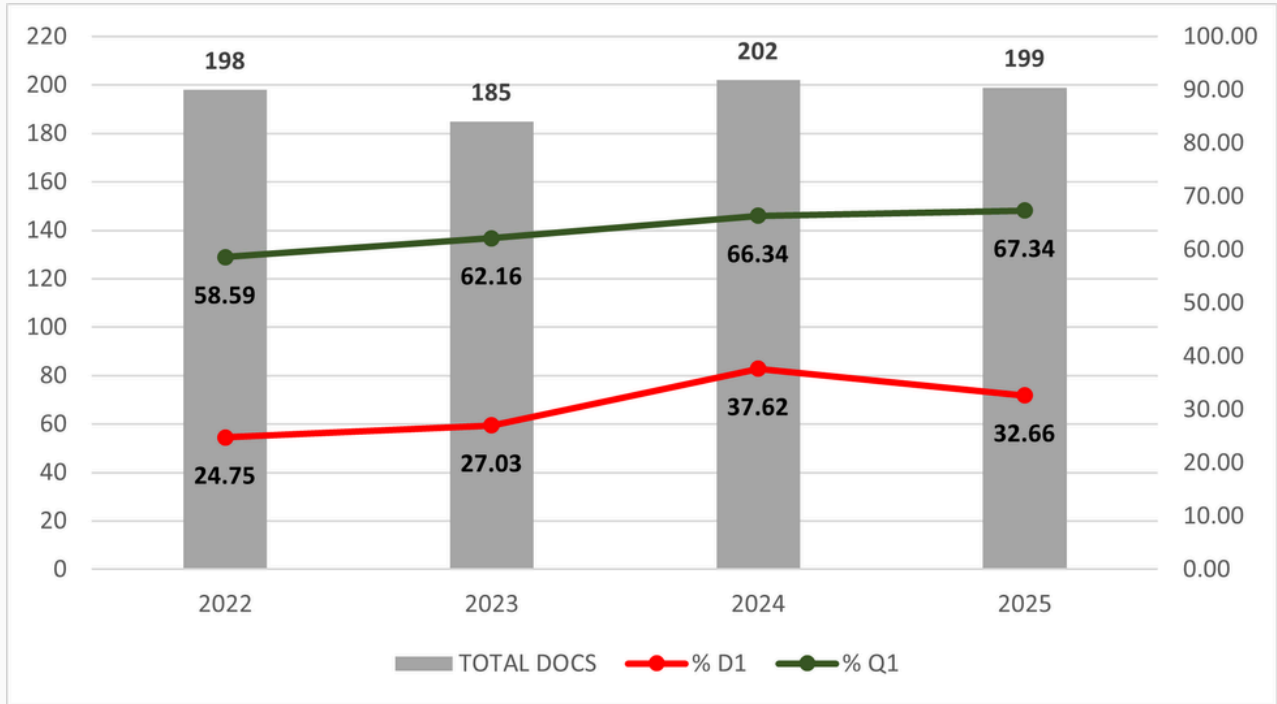


Q1 (JCR)	D1 (JCR)
133	64

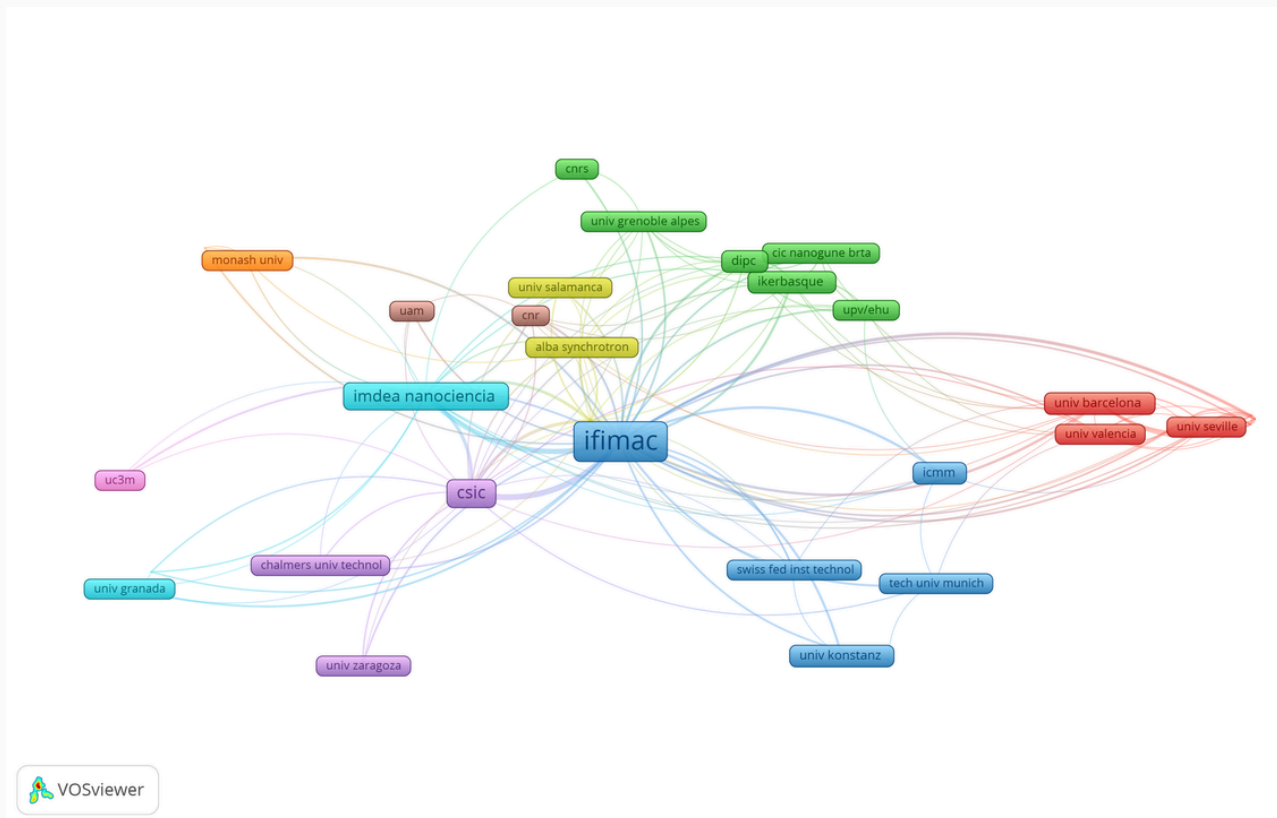


Q1 (SJR)	D1 (SJR)
176	112

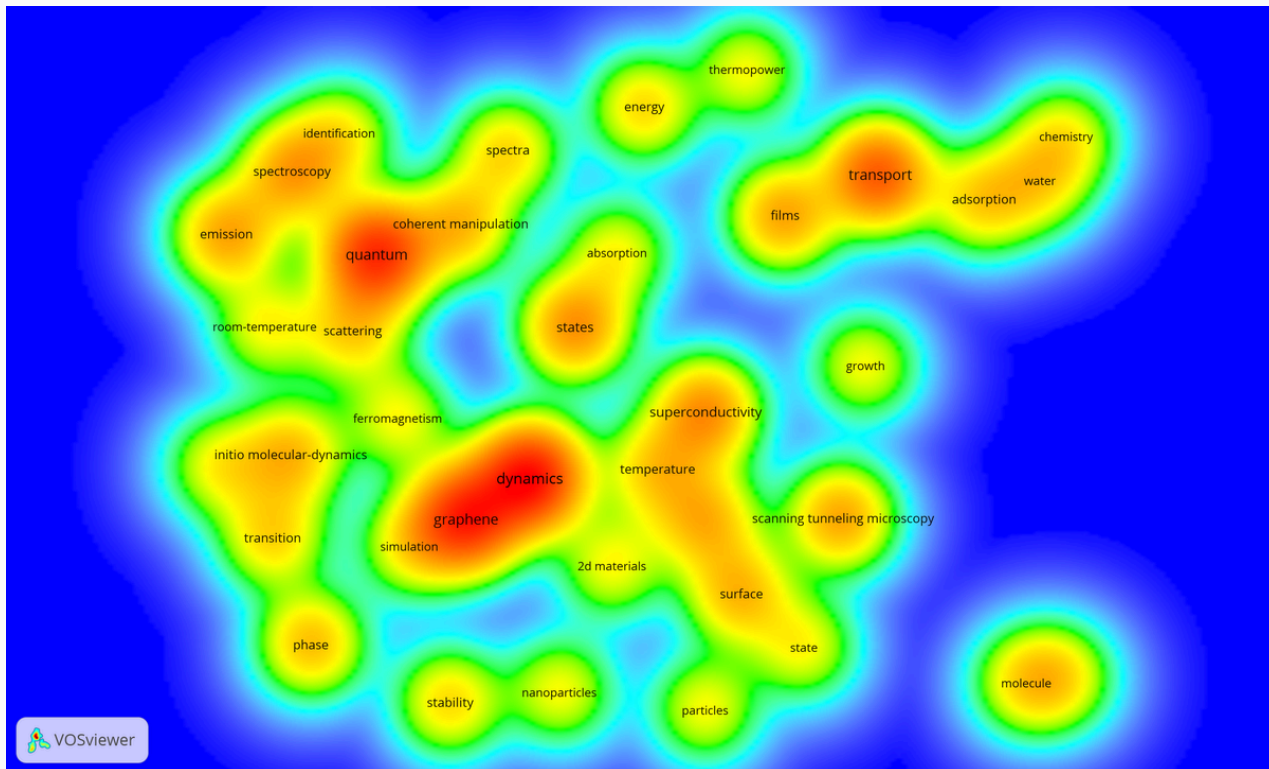
Evolution IFIMAC's Scientific production 2022-2025 (Source: WoS)



IFIMAC's scientific collaboration. (Source: WoS)



IFIMAC's scientific production by keywords. (Source: WoS)

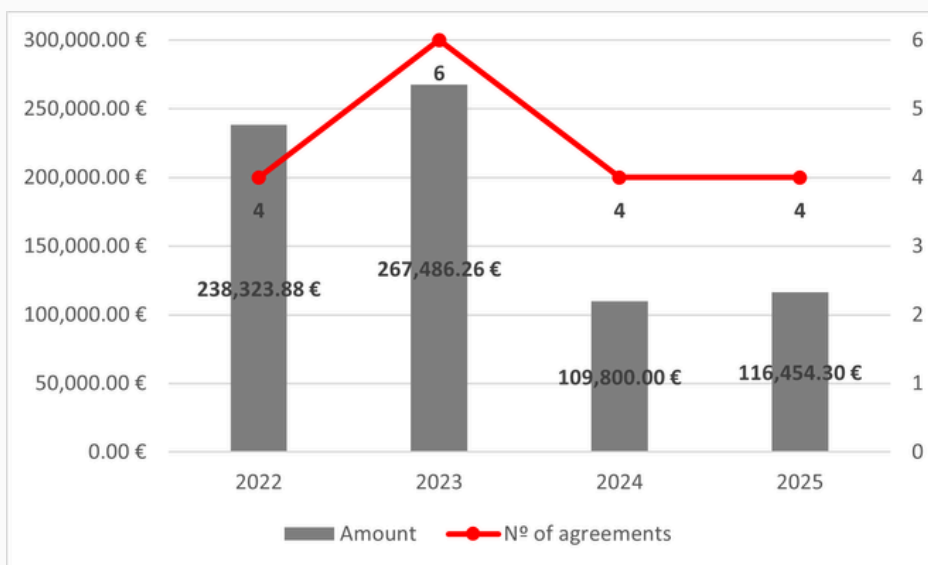


TRANSFER ACTIVITIES

Patent applications: 3

UAM Emprende activities 2022-2025: 9

Art 60 2022-2025: Total of agreements: 18 Total amount: 732,064.44€



Knowledge-Based Companies: 1

TRAINING ACTIVITIES

Doctoral thesis defended: 38

By gender: 94.74% Male 5.26% Female

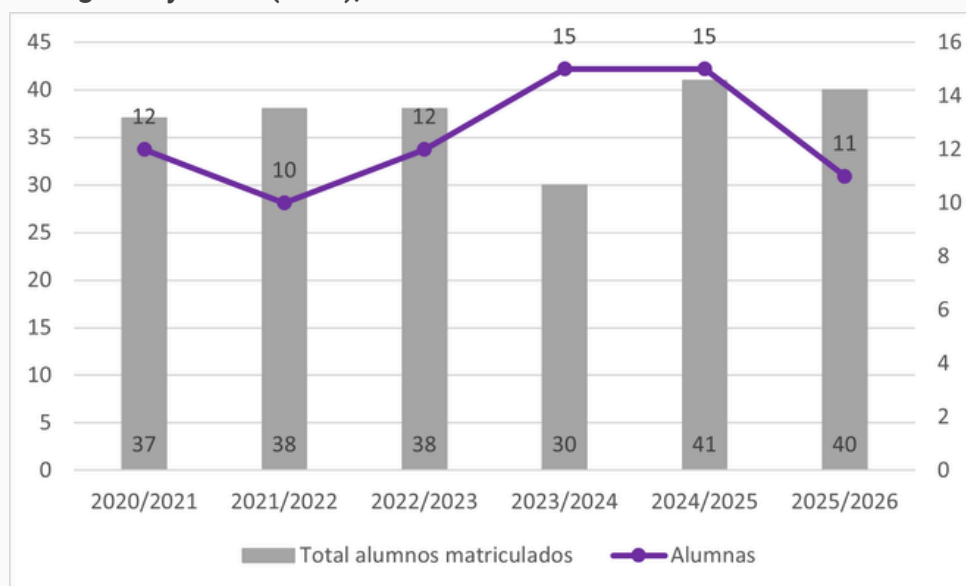
Predocctoral Fellowships Program of the Spanish AEI: 4 [1]

IFIMAC's Master Fellowships: 10

Research Awards for Physics Students: 2

IFIMAC Mentoring Program: 43 mentees and 41mentors

Students in the master's degree in Condensed Matter Physics and Biological Systems (UAM), 2020/21–2025/26



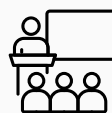
OTHER RESEARCH AND OUTREACH ACTIVITIES



Awards
3



Organization of congresses
20



Invited lectures
67



Sponsorships
7



IFIMAC Colloquium
7

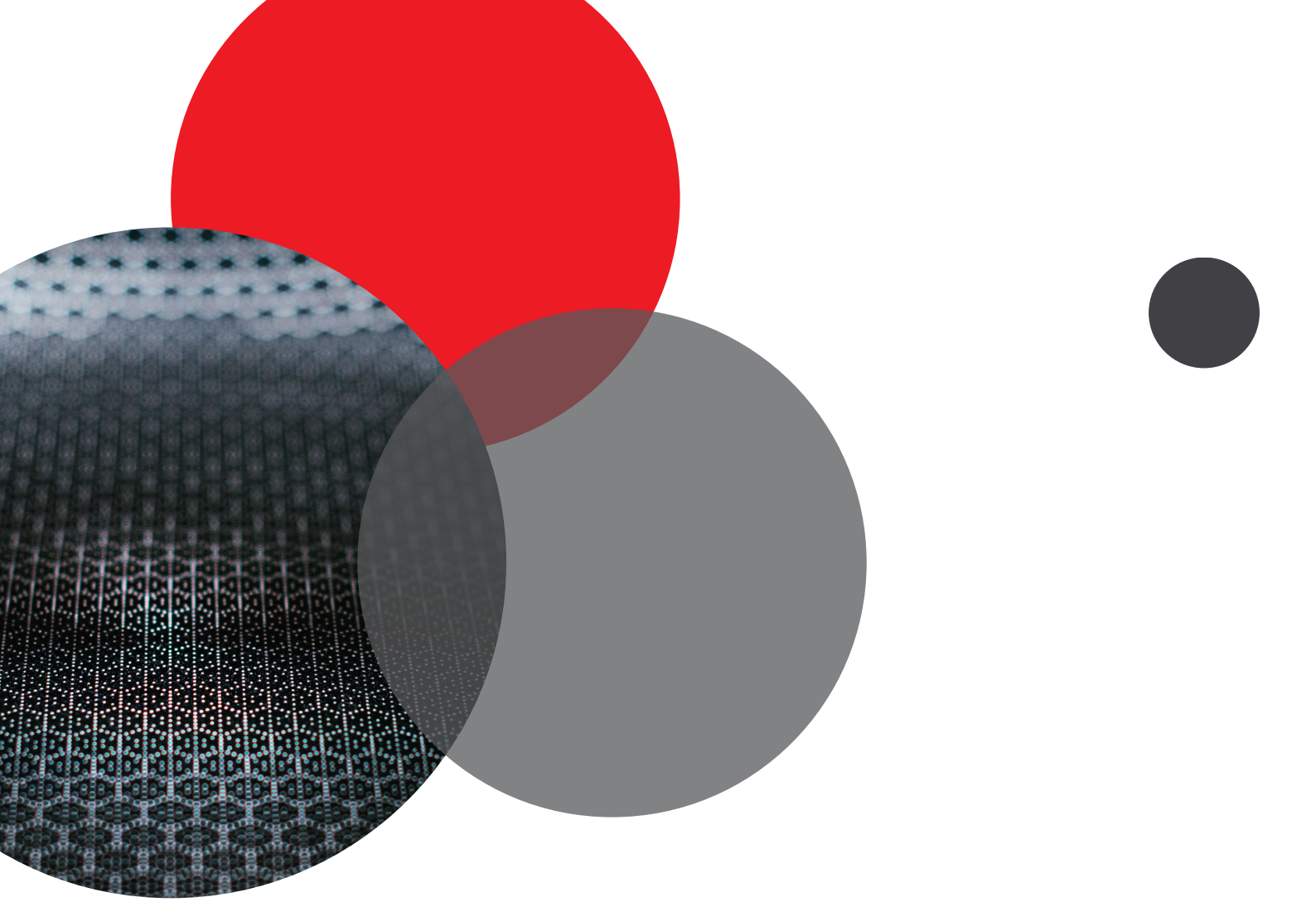


IFIMAC Seminars
29



Outreach activities
12

[1] All IFIMAC predoctoral students benefit from financial support for their doctoral thesis. In this item, we only highlight the FPI grants linked to the María de Maeztu Unit of Excellence.



4

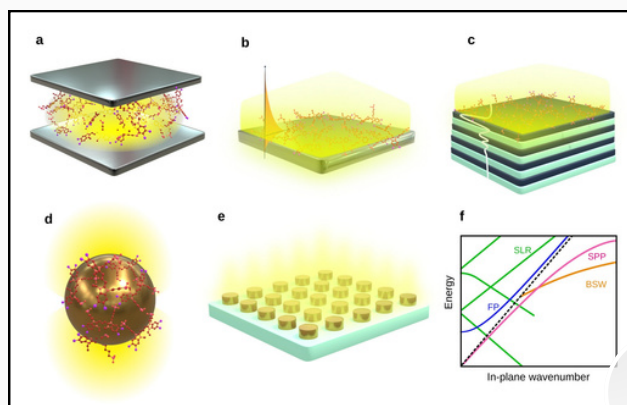
RESEARCH

RESEARCH HIGHLIGHTS

Cavity-enhanced energy transport in molecular systems. *Nature Materials* 24, 344 (2025). DOI: 10.1038/s41563-024-01962-5

Gal Sandik, **Johannes Feist**, **Francisco J. García-Vidal** & Tal Schwartz

Molecules are the building blocks of all of nature's functional components, serving as the machinery that captures, stores and releases energy or converts it into useful work. However, molecules interact with each other over extremely short distances, which hinders the spread of energy across molecular systems. Conversely, photons are inert, but they are fast and can traverse large distances very efficiently. Molecules are the building



blocks of all of nature's functional components, serving as the machinery that captures, stores and releases energy or converts it into useful work. However, molecules interact with each other over extremely short distances, which hinders the spread of energy across molecular systems. Conversely, photons are inert, but they are fast and can traverse large distances very efficiently. Using optical resonators, these distinct entities can be mixed with each other, opening a path to new architectures that benefit from both the active nature of molecules and the long-range transport obtained by the coupling with light. In this Review, we present the physics underlying the enhancement of energy transfer and energy transport in molecular systems, and highlight the experimental and theoretical advances in this field over the past decade. Finally, we identify several key questions and theoretical challenges that remain to be resolved via future research.

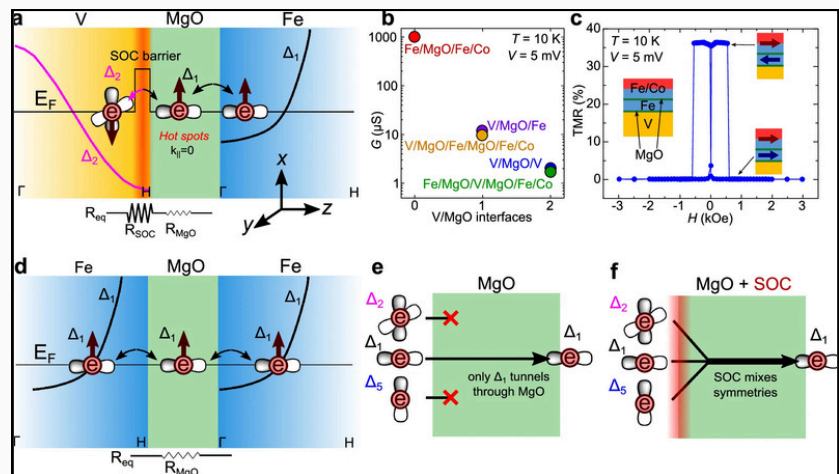
Giant shot noise in superconductor/ferromagnet junctions with orbital-symmetry-controlled spin-orbit coupling. *Nat Commun* 16, 9524 (2025). DOI: 10.1038/s41467-025-64493-w

César González-Ruano, Chenghao Shen, **Pablo Tuero**, Coriolan Tiusan, Yuan Lu, Jong E. Han, Igor Žutić & **Farkhad G. Aliev**

Researchers from the MAGNETRANS-UAM group, working with collaborators at the University at Buffalo (SUNY, USA) and in University of Loraine, France, have discovered an unusually large shot noise in epitaxial superconducting V/MgO/Fe junctions. The origin of this giant noise is a peculiar realization of a superconducting proximity effect, where a simple superconductor influences its neighbors.

The measurements reveal largely unexplored implications of orbital-symmetry-controlled proximity effects. The importance of orbital symmetries and the accompanying spin-orbit coupling is manifested by an unexpected emergence of another superconducting region strikingly different from the parent superconductor.

Unlike vanadium's common spin-singlet superconductivity, the broken inversion symmetry in V/MgO/Fe junctions and the resulting interfacial spin-orbit coupling leads to the formation of spin-triplet superconductivity across the ferromagnetic iron. The authors show that the enhanced shot noise, known from Josephson junctions with two superconductors, could be measured even in a single superconductor.



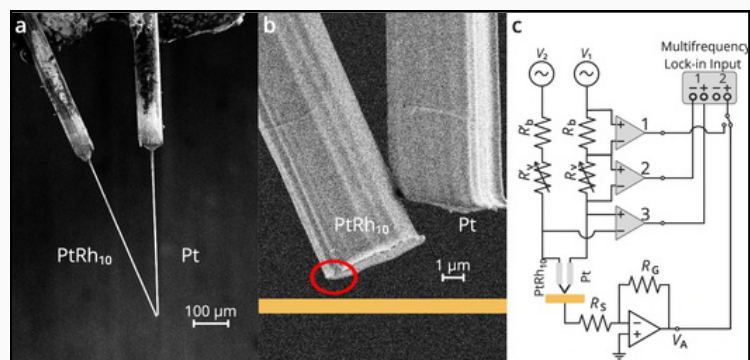
This discovery, recently published in Nature Communications, motivates revisiting how the spin-orbit coupling and superconducting proximity effects can transform many materials.

Heat transfer in metallic nanometre-sized gaps. Nat Commun 16, 7342 (2025). DOI: 10.1038/s41467-025-62672-3

Rubén López-Nebreda, Oscar Mateos-Lopez, Pablo Martinez Martinez, Juan José García-Esteban, Ángel Ibabe, Nuria Roca-Giménez, Pilar Segovia, Enrique Garcia Michel, Eduardo J. H. Lee, Jose Guilherme Vilhena, Juan Carlos Cuevas & Nicolás Agrait

Heat transfer in nanoscale gaps is of key relevance for a variety of technologies. Recent experiments have reported contradictory results shedding doubts about the fundamental mechanisms for heat exchange when bodies are separated by nanometre-sized gaps. Here, we aim at resolving this controversy by measuring the thermal conductance of gold atomic-sized contacts with a custom-designed scanning tunnelling microscope that incorporates a novel thermal probe.

This technique enables the measurement of thermal and electrical conductance in different transport regimes. When the electrodes are separated by a nanometre-sized gap, we observe thermal signals whose magnitude and gap size dependence cannot be explained with standard heat transfer mechanisms.



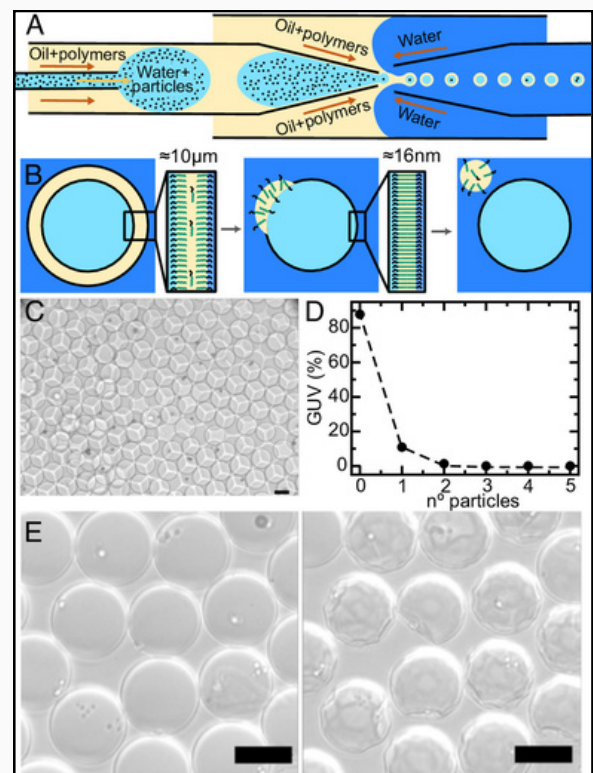
With the help of non-equilibrium molecular dynamic simulations, we elucidate that these anomalous signals are due to the thermal conduction through water menisci that form between tip and sample under customary operation conditions. Our work resolves this fundamental puzzle and suggests avenues for the investigation of heat conduction in atomic and molecular junctions.

From confined rotational flows to surface-enabled motion, Proc. Natl. Acad. Sci. U.S.A. 122 (13) e2424236122 (2025) DOI: 10.1073/pnas.2424236122

Paula Magrinya, Pablo Palacios-Alonso, Pablo Llombart, Rafael Delgado-Buscalioni, Alfredo Alexander-Katz, Laura R. Arriaga and Juan L. Aragonés.

Friction forces are essential for cell movement, yet they also trigger numerous active cellular responses, complicating their measurement *in vivo*. Here, we introduce a synthetic model designed to measure friction forces between biomimetic membranes and substrates.

The model consists of a vesicle with precisely controlled properties, fabricated via microfluidics, encapsulating a single ferromagnetic particle that is magnetically driven to rotate. The rotation of the particle generates a confined rotational flow, setting the vesicle membrane into motion. By adjusting the magnetic field frequency and vesicle size, the rotation frequency of the vesicle can be finely controlled, resulting in a rolling vesicle that functions as an effective tribological tool across a wide frequency range. At low frequencies, molecular contact between the membrane and substrate dominates frictional interactions, which enables determination of the contact friction coefficient. At higher frequencies, lubrication becomes predominant, causing the vesicles to slip rather than roll. Adjusting membrane fluidity and incorporating specific ligand–receptor interactions within this model will enable detailed studies of frictional forces in more complex biomimetic systems, providing key insights into the mechanisms of cell movement and mechanotransduction.

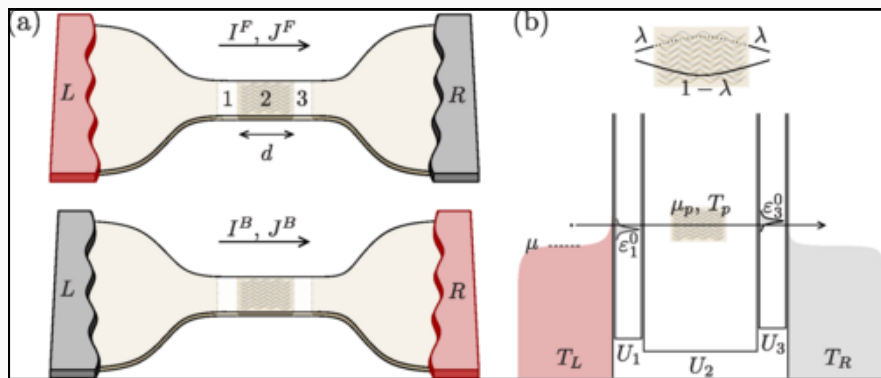


Scattering Theory of Thermal and Bipolar Thermoelectric Diodes Phys. Rev. Lett. 134, 186301 (2025). DOI: 10.1103/PhysRevLett.134.186301

José Balduque and Rafael Sánchez

Linear conductors are reciprocal: reversing the nonequilibrium forces they are coupled to (e.g., temperature differences) also reverses the response currents. Devices working as thermal diodes need to break this constriction by using nonlinearities, so the reversed

currents are asymmetric (nonreciprocal) when the reservoir temperatures are exchanged. In this work, we describe the onset of interaction-induced nonlinearities in a quantum conductor, identifying thermalization and charging effects as



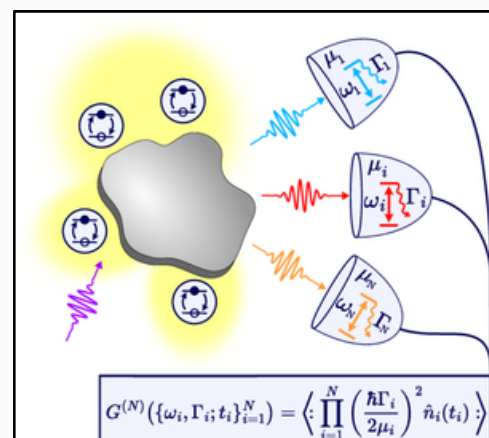
responsible for measurable thermal and thermoelectric diodes. Furthermore, we show that realistic quantum-coherent conductors manifest what we name antireciprocal responses, with charge currents being unaffected by the reversal of temperatures.

Spatially Resolved Photon Statistics of General Nanophotonic Systems. PRX Quantum 6, 020361. DOI:10.1103/z3cr-l7pw

Maksim Lednev, Diego Fernández de la Pradilla, Frieder Lindel, Esteban Moreno, Francisco J. García-Vidal and Johannes Feist.

Many quantum technologies require light sources with intrinsically quantum properties, in which the photons that are emitted are correlated and entangled with each other. Such quantum light sources often are inefficient and/or too large for integration in compact devices. A promising route to solve these issues are nanophotonic setups which offer subwavelength confinement of light, which dramatically enhances light-matter interactions and reduces system sizes, opening the door to the efficient production of highly nonclassical photon states. However, the complex structure of the electromagnetic field in such systems makes it challenging to theoretically access and predict the quantum state of the photons, which is a prerequisite for the efficient design of nanophotonic quantum light sources. In research published in PRX Quantum, we introduce a new theoretical framework that overcomes this challenge. To probe the photons at the positions of interest, we include auxiliary two-level systems that act as field detectors, sensing the electric field at their respective locations. To make the problem computationally tractable, we map the complex electromagnetic field to an equivalent network of a few lossy, interacting modes. This approach enables the use of standard quantum optical tools to fully characterize the quantum correlations of the emitted photons in space, frequency, time and polarization.

We apply our framework to a hybrid system consisting of quantum emitters and metallic nanoparticles and show that even in these simplified scenarios, the emitted light displays quantum features that depend nontrivially on the position at which it is detected. The presented techniques and obtained results pave the way to a deeper understanding of light-matter interactions at the nanoscale and open up possibilities for designing novel sources of nonclassical light.

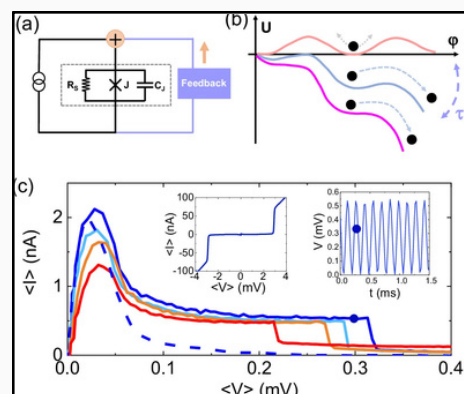


The feedback driven atomic scale Josephson microscope. Nat Commun 16, 5843 (2025). DOI :10.1038/s41467-025-60569-9

Samuel D. Escribano, Víctor Barrena, David Perconte, Jose Antonio Moreno, Marta Fernández Lomana, Miguel Águeda, Edwin Herrera, Beilun Wu, Jose Gabriel Rodrigo, Elsa Prada, Isabel Guillamón, Alfredo Levy Yeyati & Hermann Suderow.

The ultimate spatial limit to establish a Josephson coupling between two superconducting electrodes is an atomic-scale junction. The Josephson effect in such ultras-small junctions has been used to unveil new switching dynamics, study coupling close to superconducting bound states or reveal non-reciprocal effects. However, the Josephson coupling is weak and the sensitivity to temperature reduces the Cooper pair current magnitude. Here we show that a feedback element induces a time-dependent bistable regime which consists of spontaneous periodic oscillations between two different Cooper pair tunneling states (corresponding to the DC and AC Josephson regimes respectively). The amplitude of the time-averaged current within the bistable regime is almost independent of temperature.

By tracing the periodic oscillations in the new bistable regime as a function of the position in a Scanning Tunneling Microscope, we obtain atomic scale maps of the critical current in 2H-NbSe₂ and find spatial modulations due to a pair density wave. Our results fundamentally improve our understanding of atomic size Josephson junctions including a feedback element in the circuit and provide a promising new route to study superconducting materials through atomic scale maps of the Josephson coupling.

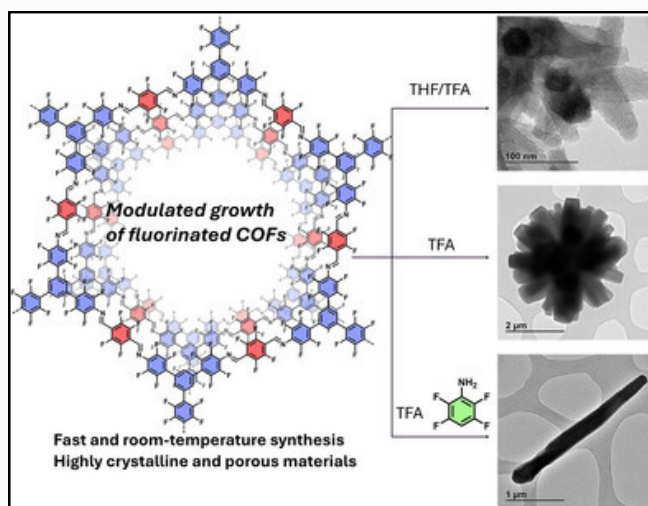


Unconventional Fast Room Temperature Synthesis of Covalent Organic Framework Single Crystals Unveiling Precise Structural Insights. Angew. Chem.-Int. Edit., 64, 37 (2025) DOI: 10.1002/anie.202510312.

Miguel Jiménez-Duro, Dr. Marcos Martínez-Fernández, Dr. Jorge J. Cabrera-Trujillo, Eva Osuna, Miguel Fernández-Ramos Humanes, Cristina Gómez-Navarro, Julio Gómez-Herrero, Félix Zamora & José L. Segura.

Two-dimensional covalent organic frameworks (COFs) are a special kind of crystalline polymers produced by the polycondensation reaction of organic linkers. However, the polymerization is often uncontrolled and conventionally yields polycrystalline powders. For that reason, the development of new methods to obtain single-crystalline COFs is an urgent need. Herein, we report a modulated, room-temperature, and fast synthesis of a highly fluorinated COF where the reaction conditions were systematically analyzed to yield single-crystalline rods of around three microns. The increase in crystal size enabled the analysis of precise structural features such as the mechanical properties or the different aggregation states of the bidimensional framework.

In addition, the reaction mechanism was computationally elucidated, and the roles of the modulator agent and the catalyst were analyzed, confirming the critical importance of trifluoroacetic acid and 2,3,5,6-tetrafluoroaniline in modulating Schiff base bond formation and, consequently, the crystallinity of the resulting COF. This study reveals new insights into the crystallization of high-quality 2D COFs.



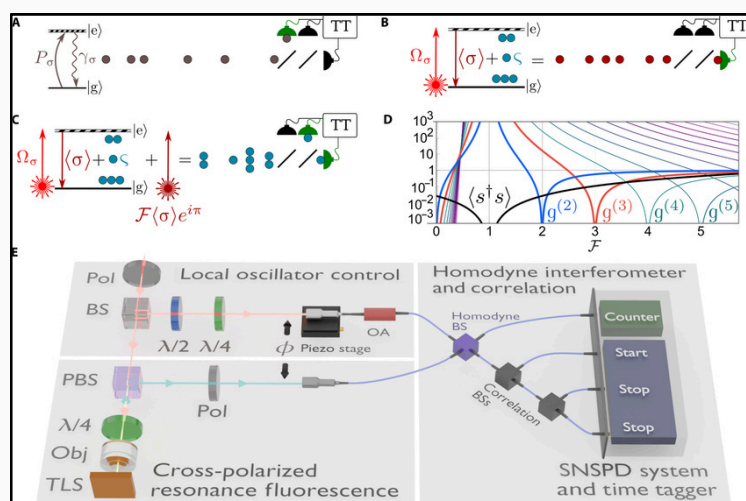
Unlocking multiphoton emission from a single-photon source through mean-field engineering.

Science Advances 11, 3395 (2025). DOI: 10.1126/sciadv.adw3395

Sang Kyu Kim, Eduardo Zubizarreta Casalengua, Katarina Boos, Friedrich Sbresny, Carolin Calcagno, Hubert Riedl, Jonathan J. Finley, **Carlos Antón-Solanas**, Fabrice P. Laussy, Kai Müller, Lukas Hanschke & **Elena del Valle**

A collaboration between researchers at the Technical University of Munich, Universidad Autónoma de Madrid, and ICMM-CSIC has demonstrated a groundbreaking way to turn a single-photon emitter into a controlled multiphoton source. The work, published in Science Advances (Kim et al., 2025), reveals how subtle control over a quantum emitter’s mean electromagnetic field can unlock new regimes of light emission once thought inaccessible.

Traditionally, single-photon sources are engineered to avoid simultaneous emission of multiple photons — a cornerstone for quantum communication and computing. However, the study shows that in coherently driven systems, multiphoton processes are not accidental but intrinsic to the underlying quantum dynamics. By using a finely tuned homodyne setup, the team introduced an external coherent field to interfere with the emitter’s own mean field.



This “mean-field engineering” allowed them to switch between single-, two-, and even three-photon emission with remarkable precision. “Our results show that even in the simplest quantum system — a two-level emitter — multiphoton correlations can be revealed and controlled,” explains the leading author Elena del Valle (UAM). “It’s a striking reminder that quantum fluctuations play a key role, even when they seem negligible.” This discovery opens new avenues for photonic quantum technologies, including deterministic generation of multiphoton states, photon sorting, and precision control in quantum networks

YOUNG RESEARCHERS

One of the objectives of the recently approved María de Maeztu Unit of Excellence is to recruit up to three outstanding young international researchers for a period of three years, together with additional funding to support the development of their research groups. In June 2024, the selection process was launched with the aim of hiring these researchers in the first quarter of 2025. The call was resolved in November 2024 with the selection of two candidates; one declined the offer, and the other, Miguel Bello, joined IFIMAC in 2025. In 2025, a new call was launched and was resolved with the selection of two candidates; one declined the offer, and the other, Edouardos Loukopoulos, joined IFIMAC in November 2025.

The vacancies were published on the IFIMAC website, Nature Careers, and EurAxess.



The screenshot shows the IFIMAC website for the 2024 call. It features the UAM and IFIMAC logos at the top. The main heading is "RESEARCH POSITIONS FOR YOUNG SCIENTISTS". The text describes the Condensed Matter Physics Center (IFIMAC) and its research areas. It includes a link to the IFIMAC website for more information and a deadline for applications: September 15th 2024. Contact information for Rubén Pérez, IFIMAC Director, is provided at the bottom.



More information 2024 call:
<https://www.ifimac.uam.es/job-s-opportunities/ifimac-research-positions-for-experimental-young-scientists/>



More information 2025 call:
<https://www.ifimac.uam.es/job-s-opportunities/ifimac-research-positions-for-experimental-young-scientists/>

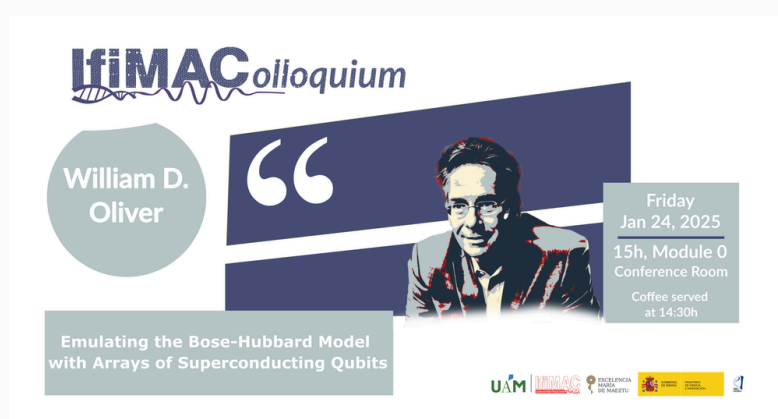


The screenshot shows the IFIMAC website for the 2025 call. It features the UAM and IFIMAC logos at the top. The main heading is "RESEARCH POSITION FOR EXPERIMENTAL YOUNG SCIENTISTS". The text describes the Condensed Matter Physics Center (IFIMAC) and its research areas. It includes a link to the IFIMAC website for more information and a deadline for applications: March 15th 2025. Contact information for Rubén Pérez, IFIMAC Director, is provided at the bottom.

IFIMAC COLLOQUIA SERIES AND SEMINARS

IFIMAC continued in 2025 with the IFIMAC Colloquia Series, complementing our existing programs, including the ongoing IFIMAC Seminars. In 2025, 7 IFIMAC Colloquia Series and 29 IFIMAC Seminars were held.

IFIMAC Colloquia Series



IfiMAC Colloquium

William D. Oliver

“

Friday
Jan 24, 2025
15h, Module 0
Conference Room
Coffee served
at 14:30h

Emulating the Bose-Hubbard Model with Arrays of Superconducting Qubits

UAM IFIMAC EXCELENCIA MÉRITO DE INVESTIGADOR



William D. Oliver, Massachusetts Institute of Technology, USA.

Emulating the Bose-Hubbard Model with Arrays of Superconducting Qubits

https://www.youtube.com/watch?v=XQtaE_KuSy4



IfiMAC Colloquium

Jordi Gracia-Ojalvo

“

Friday
Feb 7, 2025
12h, Building C
at EPS "Sala de grados"
Coffee served
at 11:30h

Bacterial biofilms as minimal models of living matter

UAM IFIMAC EXCELENCIA MÉRITO DE INVESTIGADOR



Jordi Garcia-Ojalvo, Universitat Pompeu Fabra, Barcelona, Spain.

Bacterial Biofilms as Minimal Models of Living Matter

<https://youtu.be/qWsLkesU7NU>



IfiMAC Colloquium

Raffaele Mezzenga

“

Friday
March 14, 2025
12h, Building C
at EPS, Sala de grados
Coffee served
at 11:30h

LLPS vs LLCPS: lesson learned from amyloid and nanocellulose fibrils

UAM IFIMAC EXCELENCIA MÉRITO DE INVESTIGADOR



Raffaele Mezzenga, ETH Zurich, Switzerland.

LLPS vs LLCPS: lesson learned from amyloid and nanocellulose fibrils

<https://www.youtube.com/watch?v=x0zPfMG7kts>

IfiMAC Colloquium

Jérôme Faist

“



Friday
April 4, 2025
12h, Building C
at EPS, Sala de grados
Coffee served
at 11:30h

Controlling solid state phases through vacuum field

UAM IfiMAC EXCELENCIA PARA DE MARQUETU



Jérôme Faist, ETH Zurich, Switzerland. Max Planck Institute for the Science of Light (Germany)
Controlling Solid State Phases Through Vacuum Field
<https://youtu.be/HhykpYJpytQ>

IfiMAC Colloquium

Päivi Törmä

“



Monday
May 5, 2025
12h, Module 0
Conference room
Coffee served
at 11:30h

Quantum Geometry in flat-band superconductivity, Bose Einstein condensation, and nanophotonics

UAM IfiMAC EXCELENCIA PARA DE MARQUETU




Päivi Törmä, Aalto University, Finland
Quantum Geometry in flat-band superconductivity, Bose-Einstein condensation, and nanophotonics
<https://youtu.be/PWhbvp4xc-l>

IfiMAC Colloquium

Jaroslav Fabian

“



Friday
May 9, 2025
12h, Module 0
Conference room
Coffee served
at 11:30h

Spintronics with 2D materials

UAM IfiMAC EXCELENCIA PARA DE MARQUETU




Jaroslav Fabian, Department of Physics, University of Regensburg, Germany
Spirotronics with 2D Materials
<https://youtu.be/umom6czBYN0>

IfiMAC Colloquium

Vidya Madhava

“



Friday
June 6, 2025
12h, Building C
At EPS, Sala de Grados
Coffee served
at 11:30h

Ultrafast measurements of massive phase oscillations of a condensate with a laser coupled STM

UAM IfiMAC EXCELENCIA PARA DE MARQUETU



Vidya Madhava, University of Illinois, Urbana Champaign (USA)
Ultrafast measurements of massive phase oscillations of a condensate with a laser coupled STM
<https://www.youtube.com/watch?v=r7aZxHgWwxM>

IFIMAC Seminars

IfiMAC Seminar





3D topological photonics: 3D Chern photonic insulators and electromagnetic axions

Aitzol García-Etxarri

Donostia International Physics Center and IKERBASQUE, Basque Foundation for Science, Spain



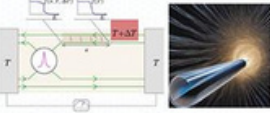
Monday, January 13, (2025), 12:00h

Department of Theoretical Condensed Matter Physics, Faculty of Sciences, Module 5, Seminar Room (5th floor).



Aitzol García-Etxarri: 3D topological photonics: 3D Chern photonic insulators and electromagnetic axions
<https://www.ifimac.uam.es/ifimac-seminars/3d-topological-photonics-3d-chern-photonic-insulators-and-electromagnetic-axions/>

IfiMAC Seminar

Nonlocal and local thermoelectricity in topological nanosystems

Alessandro Braggio

Scuola Normale Superiore (Pisa, IT)

Thursday, Jan 16, (2025), 12:00h

Department of Theoretical Condensed Matter Physics, Faculty of Sciences, Module 5, Seminar Room (5th floor).



Alessandro Braggio: Nonlocal and Local Thermoelectricity in Topological Nanosystems
<https://www.ifimac.uam.es/ifimac-seminars/nonlocal-and-local-thermoelectricity-in-topological-nanosystems/>

IfiMAC Seminar





Modelling excitons: from vibrational coupling to topology

Bartomeu Monserrat

University of Cambridge

Thursday, 23 January (2025) 12:00h

Department of Condensed Matter Physics, Faculty of Sciences, Module 3, Seminar Room (5th Floor).



Bartomeu Monserrat: Modelling excitons: from vibrational coupling to topology
<https://www.ifimac.uam.es/ifimac-seminars/modelling-excitons-from-vibrational-coupling-to-topology/>

IfiMAC Seminar





Exploration of Three-Atom-Thick Structures and Advances in Molecular Electronics Techniques at Room Temperature

Carlos Sabater

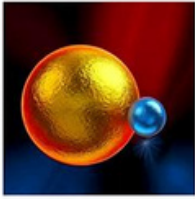
Universidad de Alicante

Thursday, Feb 6, (2025), 12:00h

Department of Theoretical Condensed Matter Physics, Faculty of Sciences, Module 5, Seminar Room (5th floor).



Carlos Sabater: Exploration of Three-Atom-Thick Structures and Advances in Molecular Electronics Techniques at Room Temperature
<https://www.ifimac.uam.es/ifimac-seminars/exploration-of-three-atom-thick-structures-and-advances-in-molecular-electronics-techniques-at-room-temperature/>



Controlling light-matter interactions with plasmonic and dielectric architectures

Christos Tserkezis

POLIMA—Center for Polariton-driven Light-Matter Interactions, University of Southern Denmark

Thursday, Feb 13, (2025), 12:00h

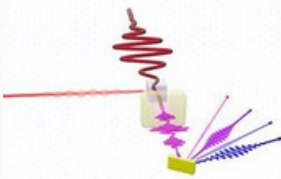
Department of Physics and Materials Science, Faculty of Sciences, Module 4, Seminar Room.



Christos Tserkezis: Controlling light-matter interactions with plasmonic and dielectric architectures

POLIMA University of Southern Denmark (Denmark)

<https://www.ifimac.uam.es/ifimac-seminars/controlling-light-matter-interactions-with-plasmonic-and-dielectric-architectures/>



Strong-fields and photons in solids, from classical to quantum light

David N. Porschke

Joint Attosecond Science Laboratory, University of Ottawa and National Research Council of Canada

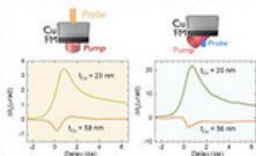
Wednesday, Feb 19, (2025), 15:00h

Department of Theoretical Condensed Matter Physics, Faculty of Sciences, Module 5, Seminar Room (5th floor).



David N. Porschke: Strong-fields and photons in solids, from classical to quantum light

<https://www.ifimac.uam.es/ifimac-seminars/strong-fields-and-photons-in-solids-from-classical-to-quantum-light/>



Disentangling the ultra-fast demagnetization and spin accumulation in magneto-optical detection

Alberto Anadón

Université de Lorraine, CNRS, Nancy, France

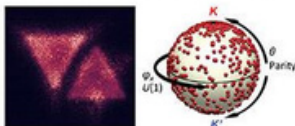
Friday, March 21, (2025), 13:00h

Department of Theoretical Condensed Matter Physics, Faculty of Sciences, Module 5, Seminar Room (5th floor).



Alberto Anadón: Disentangling the ultra-fast demagnetization and spin accumulation in magneto-optical detection

<https://www.ifimac.uam.es/ifimac-seminars/disentangling-the-ultra-fast-demagnetization-and-spin-accumulation-in-magneto-optical-detection/>



Spontaneous symmetry breaking and plasmon lattices with gain

Femius Koenderink

AMOLF, Amsterdam

Wednesday, April 9, (2025), 11:00h

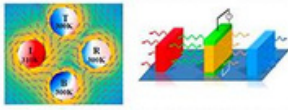
Department of Theoretical Condensed Matter Physics, Faculty of Sciences, Module 5, Seminar Room (5th floor).



Femius Koenderink: Spontaneous symmetry breaking and plasmon lattices with gain

<https://www.ifimac.uam.es/ifimac-seminars/spontaneous-symmetry-breaking-and-plasmon-lattices-with-gain/>

Near-field heat transfer close to the physical contact and in many-body systems



Philippe Ben-Abdallah

Laboratoire Charles Fabry, Institut d'Optique (CNRS), Paris

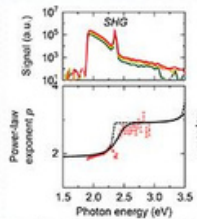
Thursday, April 24, (2025), 12:00h

Department of Theoretical Condensed Matter Physics, Faculty of Sciences, Module 5, Seminar Room (5th floor).



Philippe Ben-Abdallah: Near-field heat transfer close to the physical contact and in many-body systems
<https://www.ifimac.uam.es/ifimac-seminars/near-field-heat-transfer-close-to-the-physical-contact-and-in-many-body-systems/>

Photoluminescence from metals: Theory and experiments



Yonatan Sivan

Ben Gurion, University of the Negev

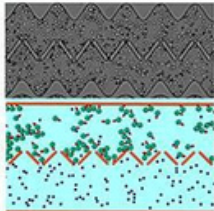
Monday, May 19, (2025), 12:00h

Department of Theoretical Condensed Matter Physics, Faculty of Sciences, Module 5, Seminar Room (5th floor).



Yonatan Sivan: Photoluminescence from metals – theory and experiments
<https://www.ifimac.uam.es/ifimac-seminars/photoluminescence-from-metals-theory-and-experiments/>

Exploring active-passive mixtures at the microscale: simulations and experiments



Horacio Serna

Marie Skłodowska-Curie Postdoctoral Fellow, Universidad Complutense de Madrid, Departamento de Estructura de la Materia, Física Térmica y Electrónica.

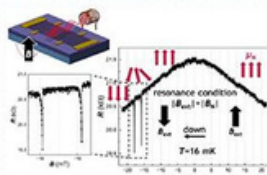
Tuesday, May 20, (2025), 12:00h

Department of Theoretical Condensed Matter Physics, Faculty of Sciences, Module 5, Seminar Room (5th floor).



Horacio Serna: Exploring active-passive mixtures at the microscale: simulations and experiments
<https://www.ifimac.uam.es/ifimac-seminars/exploring-active-passive-mixtures-at-the-microscale-simulations-and-experiments/>

Illuminating C13-based graphene: spin-orbit splitting, g-factor, and hyperfine coupling



Marta Prada

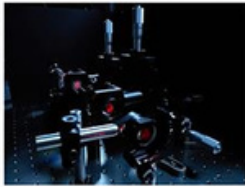
University of Hamburg

Thursday, May 22, (2025), 15:00h

Department of Theoretical Condensed Matter Physics, Faculty of Sciences, Module 5, Seminar Room (5th floor).



Marta Prada: Illuminating C13-based graphene: spin-orbit splitting, g-factor, and hyperfine coupling
<https://www.ifimac.uam.es/ifimac-seminars/illuminating-c13-based-graphene-spin-orbit-splitting-g-factor-and-hyperfine-coupling/>



Monday, May 26, (2025), 14:30h

Department of Theoretical
Condensed Matter Physics,
Faculty of Sciences, Module 5,
Seminar Room (5th floor).

Coherent perfect absorption, transmission and emission of light

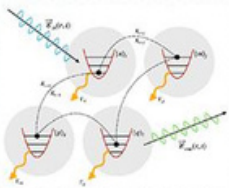
Stefan Rotter

Vienna University of Technology



**Stefan Rotter: Coherent perfect
absorption, transmission and
emission of light**

<https://www.ifimac.uam.es/ifimac-seminars/coherent-perfect-absorption-transmission-and-emission-of-light/>



Monday, June 2, (2025), 12:00h

Department of Theoretical Condensed
Matter Physics, Faculty of Sciences,
Module 5, Seminar Room (5th floor).

Quantum Dynamics of Polarizable Media: A Pseudo-Bosonic Approach to Dissipative Optics

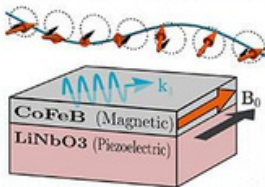
Frank E. Quintela Rodriguez

Scuola Normale Superiore, Pisa



**Frank E. Quintela Rodriguez:
Quantum Dynamics of Polarizable
Media: A Pseudo-Bosonic
Approach to Dissipative Optics**

<https://www.ifimac.uam.es/ifimac-seminars/quantum-dynamics-of-polarizable-media-a-pseudo-bosonic-approach-to-dissipative-optics/>



Tuesday, June 3, (2025), 12:00h

Department of Theoretical
Condensed Matter Physics,
Faculty of Sciences, Module 5,
Seminar Room (5th floor).

Shaking magnons: active and passive role of acoustic phonons in quantum magnonics

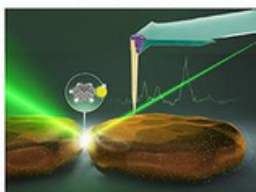
Carlos González Ballesteros

Institute for Theoretical Physics, Vienna
University of Technology (TU Wien)



**Carlos González Ballesteros:
Shaking magnons: active and
passive role of acoustic phonons in
quantum magnonics**

<https://www.ifimac.uam.es/ifimac-seminars/shaking-magnons-active-and-passive-role-of-acoustic-phonons-in-quantum-magnonics/>



Thursday, June 5, (2025), 12:00h

Department of Theoretical Condensed
Matter Physics, Faculty of Sciences,
Module 5, Seminar Room (5th floor).

Vibrational spectroscopy and optomechanical interactions with tip-enhanced nanocavities

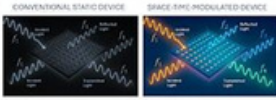
Philippe Roelli

CIC nanoGUNE, San Sebastián, Spain



**Philippe Roelli: Vibrational
spectroscopy and optomechanical
interactions with tip-enhanced
nanocavities**

<https://www.ifimac.uam.es/ifimac-seminars/vibrational-spectroscopy-and-optomechanical-interactions-with-tip-enhanced-nanocavities/>



Time Modulations to Enhance the Properties of Conventional RF and Photonic Devices

Antonio Alex Amor

RFCAS Group, Dpt. of Electronics and Communications Technology, Universidad Autónoma de Madrid.

Wednesday, June 25, (2025), 12:00h

Department of Theoretical Condensed Matter Physics, Faculty of Sciences, Module 5, Seminar Room (5th floor).



Antonio Alex Amor: Time Modulations to Enhance the Properties of Conventional RF and Photonic Devices

<https://www.ifimac.uam.es/ifimac-seminars/time-modulations-to-enhance-the-properties-of-conventional-rf-and-photonic-devices/>



Tuesday, July 1, (2025), 12h

Department of Theoretical Condensed Matter Physics, Faculty of Sciences, Module 5, Seminar Room (5th floor).

Spontaneous breaking of time-reversal symmetry and time-crystal states in chiral atomic systems

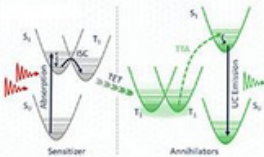
Mauro Antezza

Université de Montpellier



Mauro Antezza: Spontaneous breaking of time-reversal symmetry and time-crystal states in chiral atomic systems

<https://www.ifimac.uam.es/ifimac-seminars/spontaneous-breaking-of-time-reversal-symmetry-and-time-crystal-states-in-chiral-atomic-systems/>



Design Rules for Triplet-Triplet Annihilation Upconversion Annihilators

Andrew Pun

University of California San Diego

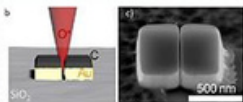
Wednesday, July 2, (2025) 12:00h

Department of Theoretical Condensed Matter Physics, Faculty of Sciences, Module 5, Seminar Room (5th floor).



Andrew Pun: Design Rules for Triplet-Triplet Annihilation Upconversion Annihilators

<https://www.ifimac.uam.es/ifimac-seminars/design-rules-for-triplet-triplet-annihilation-upconversion-annihilators/>



Plasmonic waveguides - a step closer to integrated nonlinear nanophotonics architectures

Stefano Palomba

University of Sydney, Australia

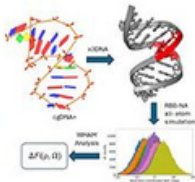
Monday, July 21, (2025), 12:00h

Department of Theoretical Condensed Matter Physics, Faculty of Sciences, Module 5, Seminar Room (5th floor).



Stefano Palomba: Plasmonic waveguides - a step closer to integrated nonlinear nanophotonics architectures

<https://www.ifimac.uam.es/ifimac-seminars/plasmonic-waveguides-a-step-closer-to-integrated-nonlinear-nanophotonics-architectures/>



DNA mechanics beyond the twistable wormlike chain

Enrico Carlon
KU Leuven

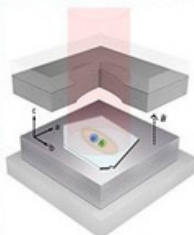
Thursday Sept 11 (2025), 12:00h

Department of Theoretical Condensed Matter Physics, Faculty of Sciences, Module 5, Seminar Room (5th floor).



Enrico Carlon: DNA mechanics beyond the twistable wormlike chain

<https://www.ifimac.uam.es/ifimac-seminars/dna-mechanics-beyond-the-twistable-wormlike-chain/>



Magneto-optical properties of Van-der-Waals Exciton-Polaritons

Christian Schneider

Monday, September 22 (2025), 12:00h

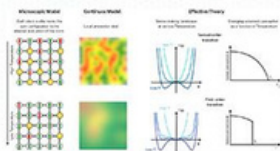
Department of Theoretical Condensed Matter Physics, Faculty of Sciences, Module 5, Seminar Room (5th floor).

Institut für Physik, Carl von Ossietzky University of Oldenburg, Germany



Christian Schneider: Magneto-optical properties of Van-der-Waals Exciton-Polaritons

<https://www.ifimac.uam.es/ifimac-seminars/magneto-optical-properties-of-van-der-waals-exciton-polaritons/>



Perception of a sensation as an emergent state of a cognitive network

Belen Valenzuela

Thursday, October 23 (2025), 12:00h

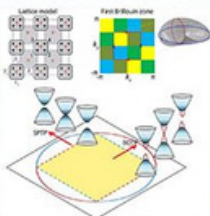
Department of Theoretical Condensed Matter Physics, Faculty of Sciences, Module 5, Seminar Room (5th floor).

ICMM-CSIC



Belen Valenzuela: Perception of a sensation as an emergent state of a cognitive network

<https://www.ifimac.uam.es/ifimac-seminars/perception-of-a-sensation-as-an-emergent-state-of-a-cognitive-network/>



Synthetic non-Abelian gauge fields for photons

Yi Yang

Monday October 27 (2025), 15:00h

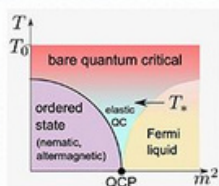
Department of Theoretical Condensed Matter Physics, Faculty of Sciences, Module 5, Seminar Room (5th floor).

Department of Physics, University of Hong Kong



Yi Yang: Synthetic non-Abelian gauge fields for photons

<https://www.ifimac.uam.es/ifimac-seminars/synthetic-non-abelian-gauge-fields-for-photons/>



Elastocaloric effect in nematic and alter magnetic quantum criticality

Iksu Jang

Karlsruhe Institute of Technology
Germany

Thursday November 13 (2025), 12h

Department of Theoretical
Condensed Matter Physics, Faculty of
Sciences, Module 5, Seminar Room
(5th floor).



Iksu Jang: Elastocaloric effect in nematic and alter magnetic quantum criticality

<https://www.ifimac.uam.es/ifimac-seminars/elastocaloric-effect-in-nematic-and-alter-magnetic-quantum-criticality/>

SEMINAR by IEEE Distinguished lecturer

Tailoring Magnetic Spin Textures in La0.7Sr0.3MnO3-Based Micromagnets

YAYOI TAKAMURA

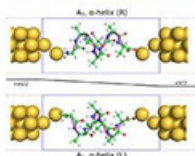
Universidad de California Davis

November 18
12:00 h.
Conference Room, Module 0
Faculty of Sciences
Autonomous University of Madrid



Yayoi Takamura: Tailoring Magnetic Spin Textures in La0.7Sr0.3MnO3-Based Micromagnets

<https://www.ifimac.uam.es/ifimac-seminars/tailoring-magnetic-spin-textures-in-la0-7sr0-3mno3-based-micromagnets/>



Biomolecules as spin dependent information pathways

Dr. Mario Galante

Assistant research scientist School of
Molecular Sciences, Tempe Campus,
Arizona State University

Monday November 24 (2025), 12h

Department of Theoretical
Condensed Matter Physics, Faculty of
Sciences, Module 5, Seminar
Room (5th floor).



Mario Galante: Biomolecules as spin dependent information pathways

<https://www.ifimac.uam.es/ifimac-seminars/biomolecules-as-spin-dependent-information-pathways/>



Boojums, Hedgehogs, Rings and Walls – Defects in Confined Nematics

Alberto Fernandez-Nieves

Department of Condensed Matter Physics, U Barcelona,
Barcelona, Spain ICREA – Catalan Institution for
Research and Advanced Studies (ICREA), Barcelona,
Spain Institute for Complex Systems, U Barcelona, Spain

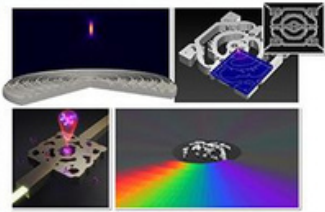
Tuesday, December 2 (2025),
12:00h

Department of Theoretical
Condensed Matter Physics,
Faculty of Sciences, Module 5,
Seminar Room (5th floor).



Alberto Fernandez-Nieves: Boojums, Hedgehogs, Rings and Walls – Defects in Confined Nematics

<https://www.ifimac.uam.es/ifimac-seminars/boojums-hedgehogs-rings-and-walls-defects-in-confined-nematics/>



Thursday, December 11 (2025), 12:00h

Department of Theoretical Condensed Matter Physics, Faculty of Sciences, Module 5, Seminar Room (5th floor).

Topology Optimization & Wave Physics - Photonics, Plasmonics, Optomechanics and Acoustics

Rasmus E. Christiansen, PhD

Technical University of Denmark



Rasmus E. Christiansen: Topology Optimization & Wave Physics - Photonics, Plasmonics, Optomechanics and Acoustics

<https://www.ifimac.uam.es/ifimac-seminars/topology-optimization-wave-physics-photonics-plasmonics-optomechanics-and-acoustics/>

IFIMAC DAY

On October 17, 2025, IFIMAC hosted its annual celebration, bringing together researchers, faculty, and students for a day of scientific exchange. Vice-Rector María Ángeles Martín Cabrejas and Vice-Dean José Luis Pau Vizcaíno opened the event with remarks that set the tone for a day centered on "Shaping the Future of IFIMAC." Director Rubén Pérez then delivered the State of IFIMAC address, highlighting the institute's accomplishments over the past year and unveiling its strategic vision for advancing condensed matter physics research.



IFIMAC DAY, 17 Oct 2025

Shaping the future of IFIMAC



Conference Room (Module C-0, Faculty of Science)

9:15 – 9:30 Opening

9:30- 10:00 State of IFIMAC (Rubén Pérez, IFIMAC Director)

10:00-11:00 Young researchers that recently joined IFIMAC

Chair: Cristina Gómez-Navarro (Head of the Experimental Section)

Miguel Bello (IFIMAC Young Leader)

Quantum optics in the many-body regime: challenges and opportunities

Iolanda di Bernardo (Ramon y Cajal Fellow)

Unconventional Electronic Responses in Layered Quantum Materials

11:00-11:30 Coffee break

11:30 – 13:00 IFIMAC researchers honored in the 2025 RSEF-Fundacion BBVA Physics Awards

Chair: Luis Viña (IFIMAC member & President of the RSEF)

Francisco José García Vidal (2025 Gold Medal)

The first thirty years of Nanophotonics: a personal journey

Julio Gómez Herrero (2025 Price in Physics, Research and Innovation)

A Journey into the Nanoworld with Scanning Probe Microscopy

13:30 -15:30 Lunch (Plaza Mayor)

15:30-18:30 Poster Session (Sala Polivalente & Hall de la Facultad Ciencias)



SESSION 1 – 09:30-11:00H

The morning session, chaired by Cristina Gómez-Navarro, Head of the Experimental Section, highlighted the Institute's commitment to fostering emerging talent. Two recently appointed researchers, Miguel Bello and Iolanda di Bernardo, presented their research.



Video:

<https://www.youtube.com/watch?v=RdyZSfU6clk&t=2s>

SESSION 2 – 11:30-13:00H

The afternoon session opened with a special recognition ceremony, chaired by Luis Viña, IFIMAC member and President of the Royal Spanish Physics Society (RSEF), and UAM Rector Amaya Mendikoetxea. The ceremony honored two IFIMAC researchers who had received the 2025 RSEF-Fundación BBVA Physics Award.

Francisco José García Vidal received the Gold Medal for his pioneering work in nanophotonics. His presentation, "The first thirty years of Nanophotonics: a personal journey," traced the field's evolution from theoretical foundations to current applications in controlling light at the nanoscale—a journey he himself helped chart.

Julio Gómez Herrero received the Physics, Innovation and Technology Award for his contributions to scanning probe microscopy. In his talk, "A Journey into the Nanoworld with Scanning Probe Microscopy," he demonstrated how advanced microscopy techniques have transformed our understanding of materials at the atomic level.



Video: <https://www.youtube.com/watch?v=ylnkN8XrhRQ>

Following a networking lunch at Plaza Mayor, a Knowledge Transfer and Entrepreneurship session led by Jorge Álvarez Cercadillo (UAM Emprende) and chaired by Félix Zamora, Vice-Rector for Innovation and Transfer, explored translating fundamental research into practical applications and building innovation ecosystems.

The day concluded with a poster session and reception where young researchers presented their research, fostering interdisciplinary discussions and collaborations between senior faculty and early-career researchers—embodying IFIMAC's collaborative spirit.

RESEARCH PROJECTS



International R&D Projects

1 Development of operando techniques and multiscale modelling to face the zero-excess solid-state battery challenge - OPERA.

Reference: GA 101103834
Funding Institution: European Commission
Period: 01/06/2023 - 31/05/2026
PI: Polop Jorda, Celia.

2 Engineered carrier transport in nanostructured semiconductors using functional disorder.



Reference: GA 101125962
Funding Institution: European Commission
Period: 01/04/2024 - 31/03/2029
PI: Prins, Ferry.

3 Future data storage using colloidal memory technology.

Reference: GA 101130615
Funding Institution: European Commission
Period: 01/11/2023 - 31/10/2026
PI: Delgado Buscalioni, Rafael.

4 Improving the sustainability of the European Magnetic Field Laboratory.

Reference: GA 871106
Funding Institution: European Commission
Period: 01/11/2020 - 31/10/2025
PI: Suderow Rodriguez, Hermann Jesus.

5 Integrative characterisation of Novel adenovirus VECTors aimed at Therapeutic Applications - INVECTA.

Reference: GA 101129778
Funding Institution: European Commission
Period: 01/12/2023 - 30/11/2027
PI: de Pablo Gomez, Pedro Jose.

6 Magnetoelectric 3D printing technology - the revolution of actuatable composites.

Reference: GA 101047081
Funding Institution: European Commission
Period: 01/10/2022 - 30/09/2026
PI: Zamora Abanades, Felix Juan.

7 Mid-infrared quantum technology for sensing.

Reference: GA 101070700
Funding Institution: European Commission
Period: 01/10/2022 - 31/03/2026
PI: Fernandez Dominguez, Antonio Isaac.

8 NOTsoQUANTUM: Realistic simulations of polaritonic chemistry.

Reference: GA 101029384
Funding Institution: European Commission
Period: 01/09/2022 - 10/01/2025
PI: Feist, Johannes Maximilian.

9 Quantum information science and Ultrafast nonlinear coherent control at the ATTOsecond timescale.

Reference: GA 101168628
Funding Institution: European Commission
Period: 01/09/2024 - 31/08/2028
PI: Palacios Cañas, Alicia.

10 Strong-coupling-enhanced nanoparticle array organic light emitting diode - SCOLED.

Reference: GA 101098813
Funding Institution: European Commission
Period: 01/05/2023 - 30/04/2026
PI: Feist, Johannes Maximilian.

11 Superconducting nanodevices and quantum materials for coherent manipulation - SUPERQUMAP.

Reference: CA 21144
Funding Institution: European Commission
Period: 06/10/2022 - 05/10/2026
PI: Suderow Rodriguez, Hermann Jesus.

12 TIME-Varying Nanophotonics for New Regimes of QED LIGHT-Matter Interactions - TIMELIGHT.

Reference: GA 101115792
Funding Institution: European Commission
Period: 01/10/2024 - 30/09/2029
PI: Arroyo Huidobro, Paloma.

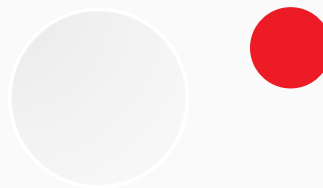


13 Tuning heat transport in 2D materials with defects.

NEW



Reference: GA 101163902
Funding Institution: European Commission
Period: 01/01/2025 - 31/12/2029
PI: Ares Garcia, Pablo.



National R&D Projects

1 Acreditación a unidades de excelencia María de Maeztu.



Reference: CEX2023-001316-M
Funding Institution: Agencia Estatal de Investigación
Period: 01/04/2024 - 31/03/2028
PI: Perez Perez, Ruben.

2 Activación de Gases de Efecto Invernadero para Aplicaciones de Energía Limpia: un Estudio Combinado de Haces Moleculares y XPS.

Reference: PID2023-147466OB-C21
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2024 - 31/12/2027
PI: Farias Tejerina, Daniel.



3 Biomateriales para electrónica transitoria (BIOTREL).

NEW

Reference: CNS2024-154593
Funding Institution: Agencia Estatal de Investigación
Period: 01/04/2025 - 31/03/2027
PI: Zotti, Linda Angela.

4 Canalización de energía en semiconductores nanoestructurados.

Reference: PID2022-1415790B-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2023 - 31/08/2026
PI: Prins, Ferry.

5 Caracterización de excitaciones ópticas en materiales 2d con resolución atómica.

Reference: PID2021-128011NB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2022 - 31/08/2026
PI: Lopez Vazquez de Parga, Amadeo and Otero Martin, Roberto.

6 Conexión entre óptica cuántica y nanofotónica.

Reference: EUR2023-143478
Funding Institution: Agencia Estatal de Investigación
Period: 01/12/2023 - 30/11/2025
PI: Feist, Johannes Maximilian.

7 Configuración de la estructura electrónica de materiales 2D: fotorrespuesta y propiedades de espín.

Reference: PID2021-123295NB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2022 - 28/02/2026
PI: Garcia Michel, Enrique.

8 Control químico de redes metal-orgánicas de zirconio para la captura y detección óptica de contaminantes ambientales.

Reference: PID2021-1238390B-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2022 - 31/08/2026
PI: Platero Prats, Ana Eva.

9 Controlando átomo a átomo los dispositivos de grafeno.

Reference: PID2023-149106NB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2024 - 31/12/2027
PI: Brihuega Alvarez, Ivan.

10 Controlando el Transporte Coherente de Calor en la Nanoscala y sus Implicaciones Termoeléctricas.

NEW

Reference: PID2024-157536NB-C22
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2025 - 31/08/2028
PI: Cuevas Rodriguez, Juan Carlos.

11 Correlaciones cuánticas e interferencia de fotones interactuantes en estructuras materia-luz bidimensionales.

Reference: PID2020-113415RB-C22
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2021 - 31/08/2025
PI: Marchetti, Francesca Maria and Valle Reboul, Elena del.

12 Corrientes de calor en la escala nanométrica: fluctuaciones y efectos no lineales.

Reference: PID2022-142911NB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2023 - 31/12/2025
PI: Sanchez Rodrigo, Rafael.

13 Cuántica.

Reference: PID2023-150420NB-C31
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2024 - 31/12/2027
PI: Marchetti, Francesca Maria and Valle Reboul, Elena del.

14 Defectos y transporte térmico de materiales 2D en la nanoescala.

Reference: CNS2023-143713
Funding Institution: Agencia Estatal de Investigación
Period: 01/04/2024 - 30/06/2026
PI: Ares Garcia, Pablo.

15 Deformación del material y dinámica excitónica.

Reference: CNS2022-135803
Funding Institution: Agencia Estatal de Investigación
Period: 01/07/2023 - 30/06/2025
PI: Picon Alvarez, Antonio.

16 Desarrollando la Óptica Cuántica en el Terahercio.

NEW
Reference: PID2024-156077OB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2025 - 31/08/2028
PI: Martin Cano, Diego and Fernandez Dominguez, Antonio Isaac.

17 Descifrando las propiedades magnéticas de sistemas basados en nanohilos y nanopartículas para imanes permanentes.

Reference: TED2021-130957B-C55
Funding Institution: Agencia Estatal de Investigación
Period: 01/12/2022 - 31/05/2025
PI: Burzuri Linares, Enrique.

18 Dinámica de attosegundos inducida por luz XUV y de rayos X en átomos y moléculas en fase gas.

Reference: PID2022-138288NB-C32
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2023 - 31/08/2026
PI: Palacios Cañas, Alicia.

19 Dinámica electrónica y técnicas ultrarrápidas.

Reference: PID2021-126560NB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2022 - 31/08/2025
PI: Picon Alvarez, Antonio.

20 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 Investigación
Period: 01/09/2022 - 31/05/2026
PI: Aliev Kazanski, Farkhad.

21 Diseño átomo a átomo de nanocatalizadores de TI-SI para la producción de hidrógeno verde por disociación del agua.

NEW
Reference: CNS2024-154772
Funding Institution: Agencia Estatal de Investigación
Period: 01/04/2025 - 31/03/2027
PI: Martinez Galera, Antonio Javier.

22 Diseño de materiales 2D para aplicaciones en energía II: diseño y procesabilidad.

Reference: PID2022-138908NB-C31
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2023 - 31/08/2026
PI: Zamora Abanades, Felix Juan.

23 Dispositivos ópticos basados en patrones de nanopartículas para aplicaciones novedosas en tecnologías de detección sostenibles.

Reference: PID2023-151078OB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2024 - 31/12/2027
PI: Hernando Perez, Mercedes.

24 Dotación adicional Juan de la Cierva

Reference: IJC2020-042755-I
Funding Institution: Agencia Estatal de Investigación
Period: 01/03/2022 - 28/02/2025
PI: Lopez-Polin Peña, Guillermo.

25 Dotación adicional Ramón y Cajal

Reference: RYC2022-037744-I
Funding Institution: Agencia Estatal de Investigación
Period: 01/01/2024 - 31/12/2028
PI: Assenza, Salvatore.

26 Dotación adicional Ramón y Cajal

Reference: RYC2021-031050-I
Funding Institution: Agencia Estatal de Investigación
Period: 01/01/2023 - 31/12/2025
PI: Gonzalez Herrero, Hector.

27 Dotación adicional Ramón y Cajal

Reference: RYC2023-044003-I
Funding Institution: Agencia Estatal de Investigación
Period: 01/12/2024 - 30/11/2029
PI: Lopez-Polin Peña, Guillermo.

28 Dotación adicional Ramón y Cajal

Reference: RYC2022-038197-I
Funding Institution: Agencia Estatal de Investigación
Period: 01/01/2024 - 31/12/2028
PI: Martinez Galera, Antonio Javier.

29 Dotación adicional Ramón y Cajal

Reference: RYC2021-030929-I
Funding Institution: Agencia Estatal de Investigación
Period: 01/01/2023 - 24/05/2026
PI: Hernando Perez, Mercedes.

30 Dotación adicional Ramón y Cajal

Reference: RYC2021-031568-I
Funding Institution: Agencia Estatal de Investigación
Period: 01/12/2022 - 21/03/2026
PI: Arroyo Huidobro, Paloma.

31 Dotación adicional Ramón y Cajal

Reference: RYC2018-024328-I
Funding Institution: Agencia Estatal de Investigación
Period: 01/11/2020 - 02/01/2026
PI: Platero Prats, Ana Eva.

32 Dotación adicional Ramón y Cajal

Reference: RYC2020-029730-I
Funding Institution: Agencia Estatal de Investigación
Period: 01/05/2022 - 30/04/2027
PI: Martin Cano, Diego.

33 Dotación adicional Ramón y Cajal

Reference: RYC2019-028429-I
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2021 - 03/01/2027
PI: Burzuri Linares, Enrique.

34 Dotación adicional Ramón y Cajal

Reference: RYC2019-028189-I
Funding Institution: Agencia Estatal de Investigación
Period: 01/05/2021 - 30/04/2026
PI: Aragones Gomez, Juan Luis.

35 Dotación adicional Ramón y Cajal

Reference: RYC2020-030302-I
Funding Institution: Agencia Estatal de Investigación
Period: 01/03/2022 - 28/02/2027
PI: Ares Garcia, Pablo.

37 Electrónica coherente en dispositivos superconductores.

Reference: PID2020-117992GA-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2021 - 31/08/2025
PI: Bursset Atienza, Pablo.

39 Emisores y controladores de luz cuántica.

Reference: PID2023-148061NB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2024 - 31/12/2027
PI: Anton Solanas, Carlos and Viña Liste, Luis María Antonio.

41 Enhancing the mechanical stability of interfaces in solid-state li-ion batteries for energy-intensive applications.

Reference: PCI2022-132998 (plan MRR)
Funding Institution: Agencia Estatal de Investigación
Period: 01/05/2022 - 30/10/2025
PI: Polop Jorda, Celia.

43 Estudios computacionales de materiales biomoleculares y bioinspirados.

Reference: PID2021-125604NB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2022 - 31/12/2026
PI: Zotti, Linda Angela and Ortega Mateo, Jose.

36 Ecosistema siesta de técnicas de simulación de materiales (SIESTA-UAM).

Reference: PID2022-139776NB-C64
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2023 - 31/08/2026
PI: Soler Torroja, Jose Maria and Alvarez Carrera, Jose Vicente.

38 Electrónica cuántica coherente superconductora.

Reference: CNS2022-135950
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2023 - 31/12/2025
PI: Bursset Atienza, Pablo.

40 Enfoques predictivos teórico-experimentales integrados para modelización de procesos disipativos en materia blanda y biomoléculas.

NEW

Reference: PID2024-1589940B-C41
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2025 - 31/08/2028
PI: Delgado Buscalioni, Rafael.

42 Entorno Cuántico para Circuitos Térmicos Coherentes.

NEW

Reference: PID2024-157821NB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2025 - 31/08/2028
PI: Bursset Atienza, Pablo and Sanchez Rodrigo, Rafael.

44 Explorando interacción y fuerzas luz-materia en redes complejas de partículas.

Reference: PID2022-137569NB-C43
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2023 - 31/08/2026
PI: Marques Ponce, Manuel Ignacio.

45 Explorando las propiedades biofísicas de virus individuales con medios fisicoquímicos: liberación de genoma y dispositivos optomecánicos.

NEW

Reference: PID2024-160924OB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2025 - 31/08/2028
PI: de Pablo Gomez, Pedro Jose.

47 Fundamentos microscópicos del microscopio de fuerzas atómicas y microbalanzas de cuarzo para sensar biomoléculas.

Reference: PID2020-117080RB-C51
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2021 - 30/04/2025
PI: Tarazona Lafarga, Pedro Jose and Delgado Buscalioni, Rafael.

49 Green materials for sustainable magneto-electronic memories.

NEW

Reference: PCI2025-163257
Funding Institution: Agencia Estatal de Investigación
Period: 01/12/2025 - 30/11/2028
PI: Velez Centoral, Saül.

51 Hacia un nuevo qubit de shiba basado en puntos cuánticos híbridos superconductor-semiconductor.

Reference: TED2021-130292B-C41
Funding Institution: Agencia Estatal de Investigación
Period: 01/12/2022 - 30/09/2025
PI: Levy-Yeyati Mizrahi, Alfredo.

46 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 Investigación
Period: 01/09/2022 - 30/04/2026
PI: de Pablo Gomez, Pedro Jose.

48 Generación de Energía Mediante Efectos Termoeléctricos Gigantes Controlados por Estado Magnético en Híbridos de Superconductor-Ferromagnético.

NEW

Reference: PID2024-155399NB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2025 - 31/08/2028
PI: Aliev Kazanski, Farkhad.

50 Hacia superconductores de alta temperatura y campo crítico: manipulando y comprendiendo correlaciones electrónicas en dos dimensiones.

Reference: PID2023-150148OB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2024 - 31/12/2027
PI: Suderow Rodriguez, Hermann Jesus and Guillamon Gomez, Isabel.

52 Herramientas de simulación y aprendizaje automático para la caracterización de la estructura y la respuesta mecánica de materiales avanzados y biomoléculas.

Reference: PID2023-149150OB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2024 - 31/12/2027
PI: Assenza, Salvatore and



53 Heteroestructuras 2D de van der waals superconductoras-magnéticas para magnónica cuántica avanzada.

NEW

Reference: CNS2024-154501
Funding Institution: Agencia Estatal de Investigación
Period: 01/04/2025 - 31/03/2027
PI: Burzuri Linares, Enrique.

54 Heteroestructuras híbridas con funcionalidades activas magnéticas, ferroeléctricas, orbitales y de espín.

NEW

Reference: PID2024-1571120B-C54
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2025 - 31/08/2028
PI: VELEZ CENTORAL, Saül.

55 Influencia de la nanoestructuración en las propiedades mecanoquímicas de cátodos composite zero-strain para baterías de ion LI de estado sólido.

Reference: PID2021-1246670B-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2022 - 31/08/2026
PI: Polop Jorda, Celia.

56 Ingeniería cuántica de luz Y materia en la nanoescala.

Reference: PID2021-1269640B-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2022 - 30/04/2026
PI: Martin Cano, Diego and Fernandez Dominguez, Antonio Isaac.

57 Integración de GPUs y almacenamiento para proyectos de Inteligencia Artificial.

Reference: EQC2024-008476-P
Funding Institution: Agencia Estatal de Investigación
Period: 01/01/2024 - 30/06/2026
PI: Garcia Vidal, Francisco Jose.

58 Integración monolítica de materiales híbridos ferroeléctricos/plasmónicos/2D para nanofotónica integrada.

Reference: PID2022-137444NB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2023 - 31/08/2026
PI: Ramirez Herrero, Maria De La O and Bausa Lopez, Luisa Eugenia.

59 Interacción entre mecanismos físicos y moleculares en la regulación de la formación de la retina de vertebrados.

Reference: PID2022-140421NB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2023 - 31/08/2026
PI: Miguez Gomez, David.

60 Interacciones cuánticas luz-materia en escalas extremas.

NEW

Reference: PID2024-161142NB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2025 - 31/08/2028
PI: Feist, Johannes Maximilian.

61 Magnónica cuántica para espintrónica en el límite 2D.

Reference: PID2022-140923NB-C22
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2023 - 31/08/2027
PI: Burzuri Linares, Enrique.

62 Manipular la materia mediante las fluctuaciones del vacío.

Reference: PID2021-125894NB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2022 - 31/08/2025
PI: Feist, Johannes Maximilian and Garcia Vidal, Francisco Jose.

- 63 Materiales con ordenamiento ferroeléctrico y antiferromagnético para aplicaciones espintrónicas ultrarrápidas y controlables eléctricamente.**
Reference: PID2021-1229800A-C53
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2022 - 31/08/2026
PI: Velez Centoral, Saül.
- 64 Materiales no centrosimétricos de baja dimensionalidad: teoría y experimentos.**
Reference: PID2022-141712NB-C21
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2023 - 31/08/2026
PI: Rubio Bollinger, Gabino and Palacios Burgos, Juan Jose.
- 65 Materiales porosos avanzados en separaciones energéticas de baja energía de gases de interés medioambiental.**
Reference: TED2021-129886B-C42
Funding Institution: Agencia Estatal de Investigación
Period: 01/12/2022 - 31/08/2025
PI: Zamora Abanades, Felix Juan.
- 66 Materiales tisulares basados en vesículas: respuestas colectivas emergentes bajo campos eléctricos.**
Reference: CNS2023-145460
Funding Institution: Agencia Estatal de Investigación
Period: 01/04/2024 - 30/06/2026
PI: Rodriguez Arriaga, Laura.
- 67 Materiales topológicos para fotovoltaica.**
Reference: TED2021-131323B-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/12/2022 - 30/09/2025
PI: Rubio Bollinger, Gabino and Palacios Burgos, Juan Jose.
- 68 Materiales y sensores cuánticos mediante implantación de iones a MEV.**
Reference: PID2021-127498NB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2022 - 28/02/2026
PI: Ramos Ruiz, Miguel Angel.
- 69 Mecánica del calor: uniendo transporte de calor y fricción en la nanoescala.**
Reference: TED2021-132219A-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/12/2022 - 30/09/2025
PI: Ares Garcia, Pablo.
- 70 Medios con variación temporal para electrodinámica clásica y cuántica.**
Reference: PID2022-141036NA-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2023 - 31/08/2026
PI: Arroyo Huidobro, Paloma.
- 71 Micro-robots autónomos con capacidad de detección.**
Reference: CNS2023-145447
Funding Institution: Agencia Estatal de Investigación
Period: 01/04/2024 - 30/06/2026
PI: Aragonés Gomez, Juan Luis.
- 72 Nanoestructuras híbridas: del transporte térmico a los dispositivos cuánticos.**
Reference: PID2023-150224NB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2024 - 31/12/2027
PI: Levy-Yeyati Mizrahi, Alfredo.

73 **Nanoingeniería de dispositivos de estado sólido para computación neuromórfica.**

Reference: PID2020-116181RB-C31
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2021 - 31/08/2025
PI: Camarero de Diego, Julio.

75 **Nuevos conceptos y métodos para la comprensión y caracterización de materia cuántica topológica fuertemente interactuante.**

Reference: PID2022-139995NB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2023 - 31/08/2026
PI: Bravo Abad, Jorge and Merino Troncoso, Jaime.

77 **Orbitrónica: un giro en electrónica.**

NEW

Reference: CNS2024-154658
Funding Institution: Agencia Estatal de Investigación
Period: 01/04/2025 - 31/03/2027
PI: Velez Centoral, Saül.

79 **OSCAR, an object segmentation, counter, analysis resource.**

Reference: PDC2022-133147-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/12/2022 - 30/09/2025
PI: Miguez Gomez, David.

81 **Producción de hidrógeno por disociación electroquímica de agua asistida por fotocatalizadores con control de espín.**

Reference: TED2021-131042B-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/12/2022 - 31/07/2025
PI: Miguel Llorente, Juan Jose de.

74 **Nuevas aplicaciones con fuentes extremas de luz.**

Reference: CNS2023-145254
Funding Institution: Agencia Estatal de Investigación
Period: 01/04/2024 - 30/06/2026
PI: Feist, Johannes Maximilian.

76 **Optimización de materiales bidimensionales para aplicaciones en energía II: recolección de energía mediante dispositivos termo y flexoelectrónicos.**

Reference: PID2022-138908NB-C32
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2023 - 31/08/2026
PI: Gomez Herrero, Julio and Lopez-Polin Peña, Guillermo.

78 **Orden y autoensamblaje entrópico en fluidos en dos dimensiones.**

Reference: PID2023-148633NB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2024 - 31/12/2027
PI: Cinacchi, Giorgio and Velasco Caravaca, Enrique.

80 **Planta de licuefacción de helio para la ciencia y tecnología cerca del cero absoluto.**

Reference: EQC2021-007277-P
Funding Institution: Agencia Estatal de Investigación
Period: 01/06/2021 - 31/12/2025
PI: Suderow Rodriguez, Hermann Jesús.

82 **Propiedades físicas intrínsecas de materiales 2D en la nanoescala.**

Reference: PID2022-142331NB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2023 - 31/08/2026
PI: Ares Garcia, Pablo and Gomez-Navarro Gonzalez, Cristina.

83 Quantum communications with bright solid-state single-photon emitters at room temperature.

Reference: TED2021-131042B-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/12/2022 - 31/07/2025
PI: Miguel Llorente, Juan Jose de.

84 Reactividad ultrarrápida en la nanoescala.

Reference: PID2022-138470NB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2023 - 31/08/2026
PI: Diaz-Tendero Victoria, Sergio.

85 Redes metal-orgánicas como plataformas para la detección de contaminantes ambientales.

Reference: CNS2022-135261
Funding Institution: Agencia Estatal de Investigación
Period: 01/07/2023 - 30/09/2025
PI: Platero Prats, Ana Eva.

86 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 Investigación
Period: 01/12/2022 - 30/09/2025
PI: Suderow Rodriguez, Hermann Jesus and Guillamon Gomez, Isabel.

87 Simulación multiescala de materiales porosos avanzados.

Reference: TED2021-129886B-C44
Funding Institution: Agencia Estatal de Investigación
Period: 01/12/2022 - 31/08/2025
PI: Tarazona Lafarga, Pedro Jose and Velasco Caravaca, Enrique.

88 Soluciones para aumentar la productividad y eficiencia de la planta de producción de helio líquido del Campus de Cantoblanco.

Reference: EQC2024-008001-P
Funding Institution: Agencia Estatal de Investigación
Period: 01/01/2024 - 30/06/2026
PI: Suderow Rodriguez, Hermann Jesus.

89 Superando la difusión: transporte dinámico en medios complejos.

Reference: PID2022-143010NB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2023 - 31/08/2027
PI: Aragones Gomez, Juan Luis and Rodriguez Arriaga, Laura.

90 Superconductividad en la nanoescala: dispositivos cuánticos de 0 A 2D.

Reference: PID2020-117671GB-I00
Funding Institution: Agencia Estatal de Investigación
Period: 01/09/2021 - 31/08/2025
PI: Levy-Yeyati Mizrahi, Alfredo.

91 Uniones josephson basados en acoplamiento espin-orbita para memorias criogénicas no disipativas.

Reference: TED2021-130196B-C22
Funding Institution: Agencia Estatal de Investigación
Period: 01/12/2022 - 30/09/2025
PI: Aliev Kazanski, Farkhad.

92 Visualizar el transporte de energía en semiconductores desordenados.

Reference: CNS2023-143577
Funding Institution: Agencia Estatal de Investigación
Period: 01/04/2024 - 30/06/2026
PI: Prins, Ferry.



1 Ayuda para la realización del doctorado industrial: Eva Ortiz Mansilla.

Reference: IND2022/IND-23536
Period: 01/01/2023 - 31/12/2025
PI: Cuevas Rodriguez, Juan Carlos.

2 Ayuda para la realización del doctorado industrial: Patricia Martínez Muñoz

Reference: IND2023/IND-27975
Period: 08/01/2024 - 07/01/2027
PI: Zamora Abanades, Felix Juan.

3 Convenio entre la Comunidad de Madrid y la Universidad Complutense de Madrid para la Concesion de una Subvencion Directa para la Realización del Proyecto Materiales Disruptivos Bidimensionales (2D) dentro del Plan Complementario en el Área de Materiales Avanzados en el Marco del Componente 17, Inversión 01 del Plan de Recuperación, Transformación y Resiliencia Financiado por la Unión Europea Next Generation-Eu por importe de 10.500.000 Euros.

Reference: IND2022/IND-23536
Period: 01/01/2023 - 31/12/2025
PI: Cuevas Rodriguez, Juan Carlos.

4 Covalent and Metalorganic Frameworks for Water Purification of Pharmaceutical Contaminants.

Reference: TEC-2024/ECO-332 - NANOFORCES_UAM
Period: 01/01/2025 - 31/12/2028
PI: Ares Garcia, Pablo, Perez Perez, Ruben and Zamora Abanades, Felix Juan.

5 Dotación adicional captación de talento CM

Reference: IND2022/IND-23536
Period: 01/01/2023 - 31/12/2025
PI: Cuevas Rodriguez, Juan Carlos.

6 Dotación adicional captación de talento CM

Reference: 2020-T1/IND-20041
Period: 01/01/2022 - 31/12/2026
PI: Velez Centoral, Saül.

7 Laboratorios Inteligentes para la Ciencia del Futuro: Descubrimiento de materiales avanzados para Fotosíntesis Artificial.

NEW Reference: TEC-2024/TEC-308 - LOCAL-MATER
Period: 01/01/2025 - 31/12/2028
PI: Platero Prats, Ana Eva.

8 Materia en Acción con Láseres Ópticos y de Rayos-X / Matter in Action with ulTRafast optlcal and X-ray lasers.

NEW Reference: TEC-2024/TEC-85 - UAM-TCC
Period: 01/01/2025 - 31/12/2028
PI: Palacios Cañas, Alicia.

9 Soluciones sostenibles del NanoMAGnetismo para TIC.

NEW Reference: TEC-2024/TEC-380
Funding Institution: COMUNIDAD DE MADRID
Period: 01/01/2025 - 31/12/2028
PI: Suderow Rodriguez, Hermann Jesus.





Private Funding

1 Distribución cuántica de claves con emisores de fotones a temperatura ambiente.

Reference: LEO23-1-8740
Funding Institution: Fundacion BBVA
Period: 19/05/2023 - 31/12/2025
PI: Anton Solanas, Carlos.

2 Fuentes ultrabrillantes de fotones en cavidades abiertas (ULTRA-BRIGHT).

Reference: ULTRA-BRIGHT
Funding Institution: Fundacion Ramon Areces
Period: 14/04/2023 - 14/04/2026
PI: Anton Solanas, Carlos.

3 Light materials for next generation electronics (LIGHT-MATER).

NEW Reference: CIVP22S18216
Funding Institution: Fundacion Ramon Areces
Period: 19/02/2025 - 18/02/2028
PI: Velez Centoral, Saul.

4 Nanophotonic-based quantum sensing and simulation.

NEW Reference: EIC24-1-17304
Funding Institution: Fundacion BBVA
Period: 31/10/2025 - 31/10/2028
PI: Fernandez Dominguez, Antonio Isaac.



UAM Funding

1 Complejidad en física de la materia condensada.

Reference: UAM2023-UAM/201
Period: 06/10/2023 - 31/12/2027
PI: Garcia Michel, Enrique.

2 Control coherente de Andreev en nanoestructuras híbridas.

NEW Reference: UAM2025-RL004
Period: 01/04/2025 - 31/03/2028
PI: Levy-Yeyati Mizrahi, Alfredo.

3 Dotación para proyecto de Edouardos Loukopoulos para Research Cost CIVIS 3i.

Period: 16/12/2023 - 15/12/2025
PI: Platero Prats, Ana Eva.

4 Dotación para proyecto de Ruth Elena Tichauer para Research Cost - CIVIS 3i.

Period: 01/11/2023 - 31/10/2025
PI: Feist, Johannes Maximilian.

5 Emergencia y complejidad en Física de la Materia Condensada.

Reference: UAM/179
Period: 15/06/2022 - 31/12/2026
PI: Gomez Herrero, Julio.

6 Estrategia Integral para la Captura, Control y Caracterización de Nanopartículas.

NEW Reference: UAM/252
Period: 01/03/2025 - 28/02/2028
PI: Hernando Perez, Mercedes.

7 Física virológica con AFM y fluorescencia: desempaquetamiento de cargo y ácidos nucleicos.

Reference: UAM/240
Period: 01/10/2024 - 30/09/2028
PI: de Pablo Gomez, Pedro Jose.

9 Incentivo participación proyectos europeos Héctor González.

Reference: UAM/222
Period: 20/05/2024 - 19/05/2025
PI: Gonzalez Herrero, Hector.

11 Incentivo participación proyectos europeos Salvatore Assenza

Reference: UAM/237
Period: 20/05/2024 - 19/05/2025
PI: Assenza, Salvatore.

13 Materiales disruptivos bidimensionales (2D) - MAD2DCM.

Reference: UAM/187
Period: 01/03/2023 - 31/12/2025
PI: Lopez Vazquez de Parga, Amadeo.

15 Nuevas formas de interacción luz-materia.

NEW Reference: UAM2025-RL018
Period: 10/10/2025 - 30/09/2029
PI: Arroyo Huidobro, Paloma.

17 Transporte de calor y defectos en 2Ds.

NEW Reference: UAM2025-RL001
Period: 01/01/2025 - 31/12/2026
PI: Ares Garcia, Pablo.

19 UAM/244.

Reference: UAM2024-UAM/244
Period: 01/09/2024 - 31/08/2027
PI: Prins, Ferry.

21 Uso de microscopia de campos magneticos extremos para visualizar materiales con correlaciones electrónicas.

Reference: UAM/117
Period: 01/09/2018 - 30/06/2026
PI: Guillamon Gomez, Isabel.

8. Incentivo participación proyectos europeos Celia Polop.

Reference: UAM/217
Period: 20/05/2024 - 19/05/2025
PI: Polop Jorda, Celia.

10 Incentivo participación proyectos europeos Pablo Ares.

Reference: UAM/234
Period: 20/05/2024 - 19/05/2025
PI: Ares Garcia, Pablo.

12 Interacción luz-materia cuántica ultrarrápida

NEW Reference: UAM2025-RL020
Period: 01/11/2025 - 31/10/2028
PI: Feist, Johannes Maximilian.

14 Medidas de torque magnético en muestras basadas en metales ligeros.

Reference: UAM/215
Period: 01/06/2024 - 31/05/2026
PI: Velez Centoral, Saül.

16 Propiedades ópticas de excitones en semiconductores.

Reference: UAM/160
Period: 01/01/2021 - 31/12/2027
PI: Viña Liste, Luis María Antonio.

18 Transporte electronico a traves de biomoleculas.

Reference: UAM/127
Period: 06/03/2019 - 31/12/2026
PI: Zotti, Linda Angela.

20 UAM2023-UAM/208: Gestión de I+D asociada a las actividades de investigación, solicitudes de proyectos y ejecución de los vigentes.

Reference: UAM/208
Period: 01/01/2024 - 31/12/2026
PI: Perez Perez, Ruben.



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198. Zhao, WJ; Fukaya, Y; Buset, P; Cayao, J; Tanaka, Y; Lu, B. (2025). Orientation-dependent transport in junctions formed by d-wave altermagnets and d-wave superconductors. **PHYSICAL REVIEW B**, 111(18). DOI:10.1103/PhysRevB.111.184515
199. Åhlén, M; Kong, XY; Zhao, W; Zamora, F; Xu, C. (2025). Overcoming Boundaries: Towards the Ambient Aqueous Synthesis of Covalent Organic Frameworks. **ANGEWANDTE CHEMIE-INTERNATIONAL EDITION**, 64(15). DOI:10.1002/anie.202425426

INVITED LECTURES

- 1 A new toolbox for linear and non-linear optical response in 2D+ crystals. **International Conference on Layered Materials and Devices: From Atoms to Chips**. (04/11/2025). Braga (Portugal), Juan José Palacios.
- 2 Advanced Atomic Force Microscopy: a tool for Nanoscience and Nanotechnology. **Sino-Spanish Joint Research Center in Advanced Materials: Kick-Off Meeting**. (22/09/2025). Madrid (Spain), Pablo Ares.
- 3 Advances in fundamental ElectroMagnetic properties of 2D materials: piezoelectricity, ferroelectricity, and magnetic shielding. **Nanoworkshop 2025**. (09/09/2025). La Rábida, Huelva (Spain), Pablo Ares.
- 4 Anomalous metal phase in Al-InAs nanowires due to inverse proximity effect. **Workshop on Superconductor, Disorder, Interactions and Quantum Technologies**. (10/06/2025). Salamanca (Spain), Eduardo Lee.
- 5 Charge Transport through Proteins and Peptide-Based Materials. **IEEE Nano 2025**. (14/07/2025). Washington DC (US), Linda Angela Zotti.
- 6 Chirality-Induced Spin Selectivity and Seebeck Effect in Helicenes. **IEEE Nano 2025**. (13/07/2025). Washington (US), Juan José Palacios.

- 7** Combining Ferroelectrics and 2D Materials for Nanophotonics. **OPTICS & PHOTONICS International Congress 2025 / Symposium: 11th Tiny Integrated Lasers and Laser Ignition Conference 2025**. (23/04/2025). Yokohama (Japón). Luisa E Bausá.
- 8** Conductance Oscillations in Helicene-Based Junctions. **IEEE Nano 2025**. (14/07/2025). Washington DC (US), Linda Angela Zotti.
- 9** Cooperative electron-vibron interactions in Surface-Enhanced Raman Scattering (SERS). **META 2025**. (23/07/2025). Málaga (Spain), Diego Martín Cano.
- 10** Dynamics of electric dipoles in fluctuating electromagnetic fields. **Donev**. (18/09/2025). Zaragoza (Spain), Manuel Marqués.
- 11** Electromagnetic field quantization in nanophotonic systems. **Strong Coupling with Organic Molecules, SCOM 2025**. (16/06/2025). Odense (Dinamarca), Antonio I. Fernández-Domínguez.
- 12** Electron delocalization in a 2D Mott insulator. **Deutsche Physikalische Gesellschaft (DPG) Spring Meeting 2025**. (18/03/2025). Regensburg (Germany), Amadeo L. Vázquez de Parga.
- 13** Electron delocalization in a 2D Mott insulator. **Microscopy at the frontiers of Science 2025 (MFS25)**. (26/09/2025). Valencia (Spain), Amadeo L. Vázquez de Parga.
- 14** Emergent topology by Landau level mixing in quantum Hall-superconductor nanostructures. **30th International Conference on Low Temperature Physics**. (13/08/2025). Bilbao (Spain), Alfredo Levy Yeyati.
- 15** Emergent topology by Landau level mixing in quantum Hall-superconductor nanostructures. **QTech Conference**. (24/09/2025). Budapest (Hungary), Alfredo Levy Yeyati.
- 16** Emergent topology by Landau level mixing in quantum Hall-superconductor nanostructures. **X Reunión Nacional de Sólidos**. (11/12/2025). San Carlos de Bariloche (Argentina), Alfredo Levy Yeyati.
- 17** Emulsion-Templated Vesicles: From Fundamentals to Applications. **10th Bubble and Drop Conference**. (11/06/2025). Prague (Czech Republic), Laura R. Arriaga.
- 18** Enhanced Second Harmonic Generation in 2D TMDs via Ferroelectric Substrate Engineering. **XXIII B-MRS Meeting**. (28/09/2025). Bahia (Salvador). Mariola O Ramirez.
- 19** From Fermi & Bose polaron polaritons to quantum droplets of light. **15th European Conference on Atoms Molecules and Photons (ECAMP15)**. (04/07/2025). Innsbruck, Austria. Francesca Maria Marchetti.
- 20** Fully differential photon statistics in complex nanophotonic systems. **MULTIPHOTONICS 2025**. (08/10/2025). Madrid (Spain), Johannes Feist.
- 21** Fully differential photon statistics in complex nanophotonic systems. **Quantum Correlated Light and Matter 2025**. (03/11/2025). Helsinki (Finland), Johannes Feist.
- 22** Graphene-based altermagnets. **Workshop on Altermagnets and School on Magnetic Symmetry**. (11/06/2025). Shanghai (China), Juan José Palacios.

- 23** How fluid membranes transduce forces into motion. **Soft Matter Science and Beyond: From Inert to Living Matter**. (04/06/2025). Benasque (Spain), Laura R. Arriaga.
- 24** Identifying Ce³⁺ Sites at the reduced CeO₂ (111) Surface: Role of water molecules and AFM imaging. **38th European Conference on Surface Science (ECOSS-38)**. (26.08.2025). Braga (Portugal), Rubén Pérez.
- 25** Integration of Ferroelectrics and 2D Materials for Nanophotonics. **49th International Conference and Exposition on Advanced Ceramics and Composites**. (27/01/2025). Daytona (US). Luisa Bausá.
- 26** Joule spectroscopy and heating effects in hybrid superconductor-semiconductor nanodevices. **30th International Conference on Low Temperature Physics**. (07/08/2025). Bilbao (Spain), Eduardo Lee.
- 27** Linear and non-linear optical response in 2D crystals with Xatu. **CINERAMA 2025**. (26/05/2025). San Sebastián (Spain), Juan José Palacios.
- 28** Magnetic Field Screening by 2D Materials. **2D Transition Metal Dichalcogenides (2D TMDs) 2025**. (23/07/2025). Cambridge (UK), Pablo Ares.
- 29** Magnetic Field Screening by 2D Materials. **I Reunión Española sobre Materiales Avanzados y Redes de Dispositivos en 2D (MARE2D)**. (18/06/2025). Valencia (Spain), Pablo Ares.
- 30** Magnetic Field Screening of Graphene, Graphene Oxide and MoS₂. **2D Transition Metal Dichalcogenides 2025 (2D TMDs 2025)**. (23/07/2025). Cambridge (UK), Pablo Ares.
- 31** Magneto-optical Particles in Isotropic Spinning Fields Mimic Magnetic Monopoles. **Nanoplasmata 2025**. (23/02/2025). Oporto (Portugal), Manuel Marqués.
- 32** Mechanics of Defective 2D Materials. **10th Multifrequency AFM Conference**. (19/05/2025). Madrid (Spain), Cristina Gomez-Navarro.
- 33** Multiphoton emission from a single-photon source and Single-photon emission from multiple levels. **Physics of Light-Matter Coupling in Nanostructures 2025**. (10/04/2025). Xiamen (China), Elena del Valle Reboul.
- 34** Nanophotonics of time varying media. **CEN, Spanish Conference on Nanophotonics**. (11/06/2025). Madrid (Spain), Paloma Arroyo Huidobro.
- 35** Nanophotonics of time varying media. **Metamaterials**. (02/09/2025). Amsterdam (Netherlands) Paloma Arroyo Huidobro.
- 36** Nonlinear Optical Properties of 2D-Ferroelectric Heterostructures. **49th International Conference on Advanced Ceramics and Composites (ICAAC'25)**. (26/01/2025). Daytona Beach (US), Mariola O Ramirez.
- 37** Nucleation and early-stage growth of Li and Na anodes in ZESSBs at the nanoscale by synchrotron-PEEM and AFM. **10th Multifrequency AFM Conference**. (28/05/2025). Madrid (Spain), Celia Polop.
- 38** Nucleation and growth of Li and Na anodes at the nanoscale in ZESSBs. **5th World Conference on Solid Electrolytes for Advanced Applications: Garnets and Beyond (LLZO5WC)**. (28/05/2025). Stanford (US), Celia Polop

- 39** Nuevas microscopías Visualizando fenómenos colectivos en Física de la Materia Condensada. **Congreso de Estudiantes de Física de la Universidad de la Laguna.** (09/04/2025). Tenerife (Spain), Hermann Suderow.
- 40** Preparation of quantum emitter states with nanophotonics tools. **Multiphotonics 2025.** (08/10/2025). Madrid (Spain), Antonio I. Fernández-Domínguez.
- 41** Probing & tuning Rydberg excitons/polaritons in 2D semiconductors via a magnetic field. **8th International Workshop of Rydberg Excitons (Rydexc8).** (17/06/2025). Toulouse (France), Francesca Maria Marchetti.
- 42** Quantum optical description of nanophotonic systems. **META 2025.** (24/07/2025). Torremolinos, (Spain), Johannes Feist.
- 43** Quantum optical description of nanophotonic systems. **PIERS 2025.** (07/11/2025). Chiba (Japan), Johannes Feist.
- 44** Quantum optical description of nanophotonic systems. **Quantum Nanophotonics 2025.** (25/03/2025). Benasque (Spain), Johannes Feist.
- 45** Quantum Optics with Organic molecules: Surface Enhanced Raman and THz single photons. **FISMAT2025.** (10/07/2025). Florence (Italy), Diego Martín Cano.
- 46** Quantum state preparation and the role of spatial symmetries in nanophotonics. **Telluride Workshop on Engineering Light-Matter Interactions: Nanostructures and Polaritons.** (14/07/2025). Telluride (US), Antonio I. Fernández-Domínguez.
- 47** Quantum State Preparation with Nanophotonics Tools. **Photoptics 2025.** (22/02/2025). Oporto (Portugal), Antonio I. Fernández Domínguez.
- 48** Quest for amorphous superconductors of Bi-Sb alloys by irradiation with swift heavy ions. **Topology and Geometry Beyond Perfect Crystals.** (30/05/2025). Stockholm (Sweden), Miguel Ángel Ramos.
- 49** 49. Reactivity in clusters of amino acids induced by ion-collisions in the gas phase. **ISIAC2025 – 29th International Symposium on Ion-Atom Collisions.** (25/07/2025). Kyoto (Japan), Sergio Díaz-Tendero.
- 50** Scanning tunneling microscopy and quasiparticle interference. Novel Phases, Superconductivity and Emergent Electronic Properties in Quantum Materials. (30/09/2025). Les Houches (France), Hermann Suderow.
- 51** Scanning tunneling microscopy at very low temperatures in heavy fermions. Flat Bands, Strong Correlations, and Heavy Fermions. (02/04/2025). Dresden (Germany), Hermann Suderow.
- 52** Scanning tunneling microscopy at very low temperatures in heavy fermions. Superconducting Nanodevices and Quantum Materials for Coherent Manipulation: Topological states in superconductors and magnetic materials. (08/05/2025). Prague (Czech Republic), Hermann Suderow.

- 53** Scanning tunneling microscopy in heavy fermions: New results in UTe₂. **Conference on Strongly Correlated Electron Systems (SCES 2025)**. (07/07/2025). Montreal (Canada), Hermann Suderow.
- 54** Self-Q-switched Plasmon assisted Nanolasing. **Optics & Photonics International Congress 2025 (TILALIC2025)**. (21/04/2025). Yokohama (Japan), Mariola O Ramirez.
- 55** Strong Electron-electron-nuclei Correlations in Multiphoton Single and Double Ionization: towards attochemistry. **Atomics Physics 2025 (ATOM2025)**. (24/11/2025). Dresden (Germany), Alicia Palacios.
- 56** Surface Charge Density Wave in UTe₂. **Advances in Solid State Physics and New Materials 30 years of the Center for Solid State Physics and New Materials**. (20/05/2025). Belgrade (Serbia), Hermann Suderow.
- 57** The boson peak and two-level systems in glasses and disordered crystals: a tale of two cities. **10th International Discussion Meeting on Relaxations in Complex Systems**. (21/07/2025). Barcelona (Spain). Miguel Angel Ramos.
- 58** The feedback driven atomic scale Josephson microscope. **Frontiers of Quantum Microscopy (FQM25)**. (24/09/2025). Oxford (UK), Hermann Suderow.
- 59** There is no ultrastrong coupling with photons. **PIERS 2025**. (07/11/2025). Chiba (Japan), Johannes Feist.
- 60** Ultrafast dynamics of ionized molecules and molecular clusters in the gas phase. **IMAMPC2025 – 14th International Meeting on Atomic and Molecular Physics and Chemistry**. (17/06/2025). Caen (France), Sergio Díaz-Tendero V.
- 61** Ultrastable glasses: The road to ideal glasses?. **TC03 meeting of the International Commission on Glass (ICG)**. (29/09/2025). Madrid, (Spain), Miguel Ángel Ramos.
- 62** Understanding and Breaking Barriers for Women in Science. **Physical Virology: across length scales**. (03/06/2025). Sant Feliu de Guixols (Spain), Cristina Gomez-Navarro.
- 63** Unraveling Different Contributions to Spin Orbit Coupling in Superconductor/Ferromagnet Hybrids. **SolSkyMag2025**. (30/06/2025). San Sebastian (Spain), Farkhad Aliev Kazanski
- 64** Unraveling Different Contributions to Spin Orbit Coupling in Superconductor/Ferromagnet Hybrids. **SPINTRONICS XVIII**. (03/08/2025). San Diego (US), Farkhad Aliev.
- 65** Unraveling the potential of atomic force microscopy with DFT-based simulations and Deep Learning. **From Electrons to Atoms to Molecules and Materials (Lennard-Jones Centre / CECAM Meeting)**. (02.09.2025). Cambridge (UK), Ruben Perez.
- 66** Unraveling the potential of atomic force microscopy with DFT-based simulations and Deep Learning. **XIII Workshop on Applications of Scanning Probe Microscopy (STM/AFM 2025)**. (29.11.2025). Zakopane (Ponad), Ruben Perez
- 67** Using quantized light in new regimes. **Light-Matter Interaction: Focusing on Polariton Chemistry and Physics**. (26/05/2025). Vidin (Bulgaria), Johannes Feist.

ORGANIZATION OF CONGRESSES

- 1** **30th International Conference on Low Temperature Physics** (07/08/2025, Bilbao) Organizers: A.L. Yeyati, H. Suderow, S. Bergeret and F. Luis
- 2** **3rd Spanish Soft Matter 1 1/2 Day** (03/11/2025, Benasque) Organizers: Juan L. Aragoes, Laura R. Arriaga, Alberto Fernandez-Nieves and Miguel Ruiz-Garcia.
- 3** **4th Edition Conference on Global Nanotechnology (NanoSeries)** (17/06/2025, Valencia) Organizers: Pablo Ares.
- 4** **European Workshop on Battery Interfaces: High-Resolution Techniques and Multiscale Modelling** (03/04/2025, Córdoba) Organizers: Celia Polop and Santhana Eswara.
- 5** **Fuerzas y túnel** (08/07/2025, Oviedo) Organizers: Mercedes Hernando, Jonathan Rodríguez, Dimas Oteigi, Bruno de la Torre and Eider Bergara.
- 6** **International Conference on Advanced Ceramics and Composites, ICACC 2025 / Symposium on Crystalline Materials for electrical, optical and medical applications** (26/01/2025, Daytona) Organizers: Luisa Bausá
- 7** **IX Spanish Conference on Nanophotonics (CEN2025)** (19/06/2025, Madrid) Organizers: Luisa Bausá and Mariola O Ramirez.
- 8** **Low-Temperature Quantum Detectors: from fundamentals to applications** (03/08/2025, Helsinki) Organizers: Peter Makk, Chuan Li, Jose Lado, Vitaly Shumeiko, Alfredo Levi-Yeyati, Miroslav Grajcar, Yasunobu Nakamura, J. S. Tsai, Yang Yu and Hermann Suderow.
- 9** **MAGNONICS 2025** (28/07/2025, Mallorca) Organizers: IFIMAC and Universidad de Munster
- 10** **Molecular Polaritonics** (21/09/2025, Miraflores de la Sierra) Organizers: Johannes Feist, Costanza Tonineli, Claudiu Genes and Paloma A. Huidobro.
- 11** **NanoSeries2025, 4th Edition Conference on Global Nanotechnology** (17/06/2025, Valencia) Organizers: Pablo Ares.
- 12** **Quantum and Nonlinear Optics Topical Meeting, European Optical Society Anual Meeting** (24/08/2025) Organizers: European Optical Society.
- 13** **Quantum Matter 2025** (20/05/2025, Grenoble) Organizers: Alfredo Levy Yeyati.
- 14** **Spanish Conference on Nanophotonics** (10/06/2025, Madrid) Organizers: Luisa Bausa and Mariola Ramírez.

- 15** Special session "Molecular conductors: spin filtering and thermoelectric properties " within IEEE Nano2025 (13/07/2025, Washington DC) Organizers: Linda A. Zotti and Carlos Sabater.
- 16** Superconducting Nanodevices and Quantum Materials for Coherent Manipulation: Topological states in superconductors and magnetic materials (06/05/2025, Liblice Chateau) Organizers: Hermann Suderow, Francesco Tafuri, Anna Böhmer, Beena Kalisky and Szabolcs Csonka.
- 17** Symposium Materials and Methods for Quantum Technologies, Bienal de Física (15/07/2025, San Sebastián) Organizers: Hermann Suderow, Edwin Herrera, Katerina Vaxevani, José Ignacio Pascual and Javier Aizpurua.
- 18** Ultrafast phenomena in Chemistry: Laser-matter interactions at the femto- and atto-second time scales (19/05/2025, Zaragoza) Organizers: Alicia Palacios and Felipe Zapata
- 19** Waves in Time Varying Media (20/05/2025, Madrid) Organizers: Paloma Arroyo Huidobro, Emanuele Galiffi, Riccardo Sapienza, Yonatan Sivan and Iñigo Liberal.
- 20** XXIII Brazilian Material Research Society Meeting 2025 (B-MRS 2025) (28/09/2025, Salvador de Bahia)

SPONSORSHIPS

- 1** 3rd Spanish Soft Matter Day (Benasque, 2nd to 5th November 2025) organized by J. Aragonés (IFIMAC), L. Arriaga (IFIMAC), A. Fernández-Nieves (UB - ICREA) and M. Ruiz-García (UCM). More information: <https://www.benasque.org/2025ssm/>
- 2** 30th International Conference in Low Temperature Physics (Bilbao, 7th to 11th August 2025) organized by IFIMAC, DIPC, Nanogune, CFM, INMA, BasqueQ and UPV/EHU. More information: <https://www.lt30.es/>
- 3** IX Spanish Conference on Nanophotonics (Madrid, 10th to 13 June 2025) organized by Luisa Bausa and Mariola Ramírez. More information <https://www.benasque.org/2025cen/>
- 4** European Workshop on Battery Interfaces: High-Resolution Techniques and Multiscale Modelling (Córdoba, 3th to 4th April 2025) organized by ASEVA. More information: <https://aseva.es/european-workshop-on-battery-interfaces/>
- 5** Fuerzas y Túnel 2025 (Oviedo, 8th to 11th July 2025) organized by IFIMAC. More information <https://fyt2025.com/>
- 6** QUANTUMatter 2025 (Grenoble, 20th to 23th May 2025) organized by Phantoms Foundation. More information: <https://www.quantumconf.eu/2025/program.php>

TRANSFER ACTIVITIES



Patent applications

1 Dispositivo de redireccionamiento de haz múltiple basado en nanoantenas ópticas plasmónicas

Manuel Marqués Ponce, María Carmen Vázquez García and Alicia Fresno Hernández.

Application number: PCT/ES2025/070343
UC3M & UAM

2 Material poroso de red-metal orgánica fluorinada y uso del mismo

Ana Eva Platero Prats, Edouardos Loukopoulos and Sergio Marugán Benito.

Application number: 202530757
UAM

3 Método de fabricación de material recubierto, material recubierto, sistema, aplicaciones y usos

Félix Zamora Abanades, Julio Gómez Herrero, Guillermo Hernanz Borrego and David Rodríguez San Miguel,

Application number: 202530508
UAM



UAM Emprende

Between 2022 and 2025, IFIMAC researchers participated in the UAM Emprende Investiga programmes across the General, Industry, and Health tracks. These activities demonstrate a sustained commitment to research valorisation, knowledge transfer, market validation, and entrepreneurship-oriented innovation:

1. **Juan Luis Aragonés Gómez:** Health Programme (2025)
2. **Rafael Delgado Buscalioni:** Industry Programme (2024)
3. **Snezana Lazic:** Industry Programme (2024)
4. **Juan José Palacios Burgos:** Industry Programme (2024)
5. **Rubén Pérez Pérez:** Industry Programme (2024)
6. **Antonio Picón Álvarez:** Industry Programme (2024)
7. **Saül Vélez Centoral:** Industry Programme (2024)
8. **Félix Zamora Abanades:** General Programme (2023)
9. **David Míguez Gómez:** General Programme (2022)



Knowledge-based Companies

During the period 2022–2025, one Knowledge-Based Company (KBC) has been established: Porous Energy Technologies S.L.



Article 60

During 2025, 4 agreements were concluded under Article 60, for a total amount of €116,454.30.

AWARDS

Ranking of the World Scientists: World Top 2% Scientists by Stanford University

16.47% IFIMAC researchers are among the most influential in the world, following the publication of the latest edition of the "Ranking of the World Scientists: World Top 2% Scientists," compiled by Stanford University and the consulting firm Elsevier.

IFIMAC EXCELENCIA MARÍA DE MAEZTU

Félix Zamora

Francisco José García Vidal

Elena del Valle

Juan Carlos Cuevas

Rubén Pérez

Alfredo Levy

Pedro José de Pablo

Fernando Flores

Luis Viña

Pedro Tarazona

Johannes Feist

Paula Mori, Ana Platero and Félix Yndurain



More information: <https://elsevier.digitalcommonsdata.com/datasets/btchxktzyw/8>

Prof. Francisco José García-Vidal receives the REAL SOCIEDAD ESPAÑOLA DE FÍSICA – FUNDACIÓN BBVA 2025 Medal of the Royal Spanish Society of Physics.

The jury recognized his outstanding career in nanophotonics, plasmonics, and metamaterials. His key achievements include advances in light manipulation with applications in sensors and communications, novel mechanisms for light-driven molecular modification relevant to solar cells and chemical reactions, and his ability to inspire experimental groups to verify his theoretical predictions.



Link to interview by Fundación BBVA:
https://www.youtube.com/watch?v=87g-7Btwb_I

Prof. Julio Gómez Herrero receives the REAL SOCIEDAD ESPAÑOLA DE FÍSICA – FUNDACIÓN BBVA 2025 Physics, Innovation and Technology Award.

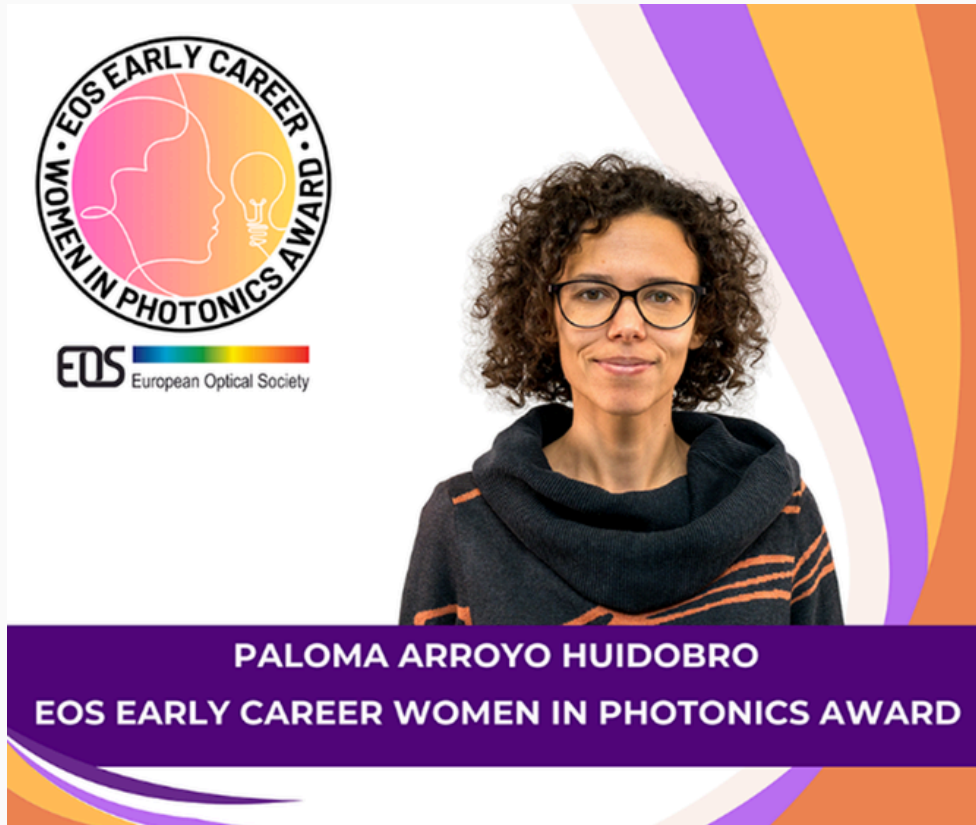
This award recognizes his pioneering work in nanotechnology, particularly his development of advanced instruments for atomic-scale research. His innovations have spawned technology companies and benefited academic researchers and industries in electronics, healthcare, and energy



Link to interview by Fundación BBVA:
<https://www.youtube.com/watch?v=fJ5ygosLDNI&t=6s>

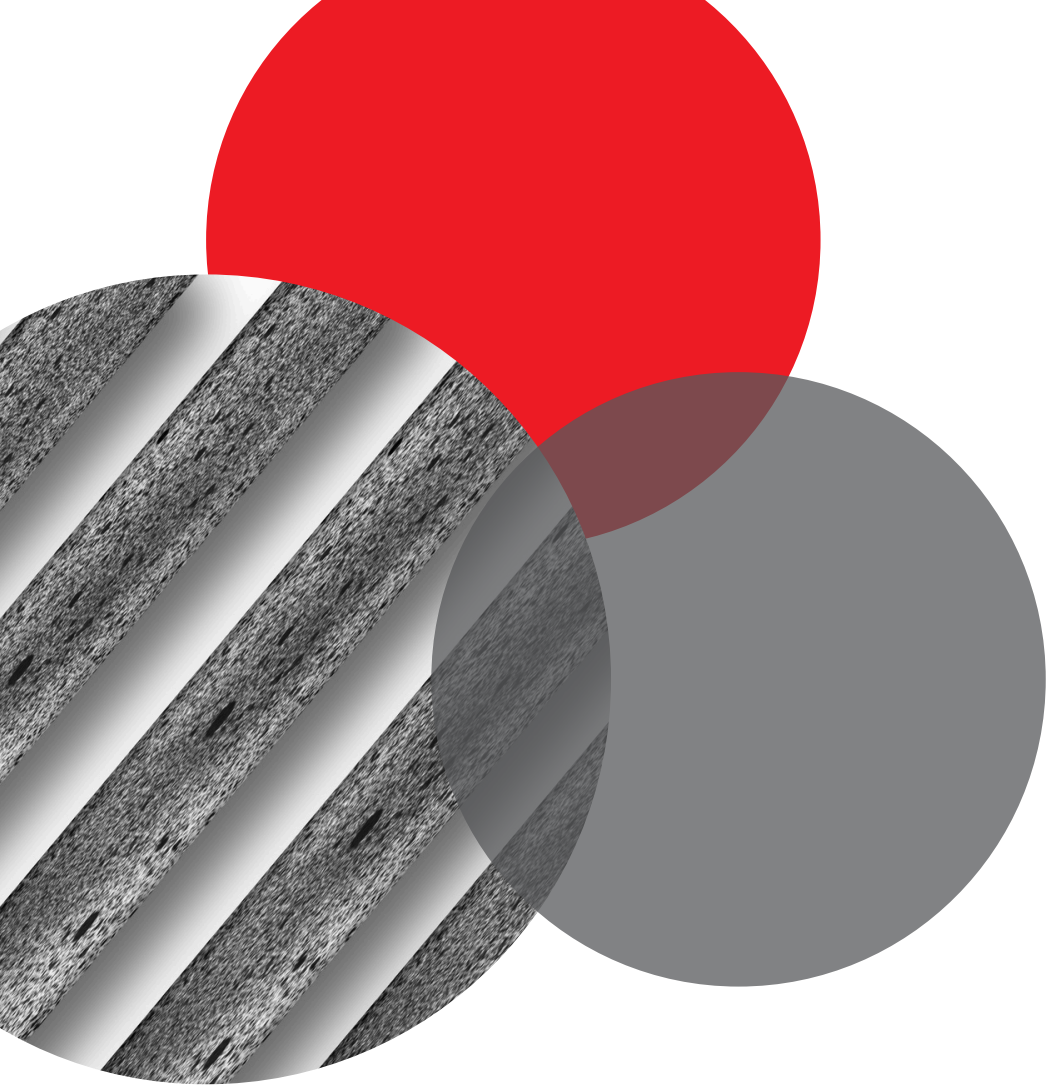
Paloma Arroyo Huidobro receives the EOS Early Career Women in Photonics Award and the UAM Young Researcher Award in Mathematical Sciences and Theoretical Physics

Both awards recognize Paloma's contributions as a young researcher exploring light-matter interactions in time-varying, topological and quantum nanophotonics. She is ERC Starting Grant awardee and Ramón y Cajal Fellow at IFIMAC and the Condensed Matter Theory Department at UAM.



Link to the web:

<https://www.europeanoptics.org/pages/distinctions/awards/early-career-women.html>



5



TRAINING ACTIVITIES

PREDOCTORAL FELLOWSHIPS PROGRAM OF THE SPANISH AEI

Through the María de Maeztu Unit of Excellence approved in 2024, IFIMAC has secured six FPI grants. In 2024, two positions were announced, and the selected students will join us in January 2025. In 2025, the remaining four positions were announced, and the selected candidates joined IFIMAC in January 2026.

Call resolution 2024:



RESOLUCIÓN DE 6 DE NOVIEMBRE DE 2024 DE LA RECTORA DE LA UNIVERSIDAD AUTÓNOMA DE MADRID POR LA QUE SE RESUELVE LA CONVOCATORIA PÚBLICA DE 2 CONTRATOS PREDOCTORALES PARA LA FORMACIÓN DE DOCTORES CORRESPONDIENTES A LAS ACTUACIONES PARA LA FORMACIÓN DE PERSONAL INVESTIGADOR PREDOCTORAL DEL CENTRO DE INVESTIGACIÓN DE FÍSICA DE LA MATERIA CONDENSADA, ENMARCADAS EN LA CONVOCATORIA DE CONCESIÓN DE ACREDITACIONES Y AYUDAS PÚBLICAS DE «CENTROS DE EXCELENCIA SEVERO OCHOA» Y DE «UNIDADES DE EXCELENCIA MARÍA DE MAEZTU», EN EL MARCO DEL PLAN ESTATAL DE INVESTIGACIÓN CIENTÍFICA, TÉCNICA Y DE INNOVACIÓN 2021-2023.

Por Resolución de 1 de octubre de 2024 se efectuó la convocatoria pública de 2 contratos predoctorales para la formación de doctores correspondientes a las actuaciones para la formación de personal investigador predoctoral del centro de investigación de física de la materia condensada, enmarcadas en la convocatoria de concesión de acreditaciones y ayudas públicas de «Centros de Excelencia Severo Ochoa» y de «Unidades de Excelencia María de Maeztu», en el marco del plan estatal de investigación científica, técnica y de innovación 2021-2023.

Finalizado el proceso de selección conforme a lo establecido en los apartados 2 y 5 de las bases de la Convocatoria y vista la propuesta formulada por la Comisión de Valoración, este Rectorado en uso de sus atribuciones conferidas en el artículo 50.1 de la Ley Orgánica del Sistema Universitario 2/2023, de Universidades y en particular por el artículo 40 de los Estatutos de la UAM, HA RESUELTO:

PROPONER COMO CANDIDATO/A TITULAR DE LA PLAZA 1ª A, JAVIER CASTRO LUACES

PROPONER COMO CANDIDATO/A TITULAR DE LA PLAZA 2ª A, TERESA ESPINOSA GONZÁLEZ

PROPONER COMO SUPLENTES A:
CHRISTOS PASPALIDES,
DOMINGO DE GUZMÁN OROERO GÁMEZ,
PABLO HERNÁNDEZ MARTÍN,
PAULA OBLADEN AGUILERA y
HAMED MEHDI

De no formalizar el contrato en plazo establecido, por causa imputable a el/la interesado/a, el/la candidata/a decaerá en su derecho.

Contra la presente Resolución, que pone fin a la vía administrativa, podrá interponerse recurso contencioso-administrativo ante los Juzgados de lo Contencioso-Administrativo de Madrid, en el plazo de dos meses desde el día siguiente a la fecha de su publicación. Sin perjuicio de lo anterior, la presente Resolución podrá ser recurrida potestativamente mediante recurso de reposición ante el Rector de esta Universidad en el plazo de un mes desde el día siguiente a dicha publicación. En este caso no podrá interponerse recurso contencioso-administrativo hasta que no sea resultado expresamente o se haya producido la desestimación presunta del recurso de reposición interpuesto, de conformidad con lo dispuesto en los artículos 123 y 124 de la Ley 39/2015, de 1 de octubre, del Procedimiento Administrativo Común de las Administraciones Públicas.

Madrid, 6 de noviembre de 2024
LA RECTORA
P.D.: El Vicerrector de Política Científica,
(Resolución de 02/07/2021, BOCM de 08/07/2021)

Daniel Jaque García



More information:

https://www.uam.es/ssdlv/Satellite?c=BASE_Investig_C&cid=1606963642603&pagename=UAM-R%2FBASE_Investig_C%2FDetalle



Código Seguro De Verificación	6538-4838-4E4CP5647-4733	Fecha	06/11/2024
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Uri De Verificación	https://mede.uam.es/ValidacionNov11es?codigoFirma=6538-4838-4E4CP5647-4733	Página	1/1





RESOLUCIÓN DE 17 DE NOVIEMBRE DE 2025 DE LA UNIVERSIDAD AUTÓNOMA DE MADRID POR LA QUE SE RESUELVE LA CONVOCATORIA PÚBLICA DE 4 CONTRATOS PREDOCTORALES PARA LA FORMACIÓN DE DOCTORES CORRESPONDIENTES A LAS ACTUACIONES PARA LA FORMACIÓN DE PERSONAL INVESTIGADOR PREDOCTORAL DEL CENTRO DE INVESTIGACIÓN DE FÍSICA DE LA MATERIA CONDENSADA, ENMARCADAS EN LA CONVOCATORIA DE CONCESIÓN DE ACREDITACIONES Y AYUDAS PÚBLICAS DE «CENTROS DE EXCELENCIA SEVERO OCHOA» Y DE «UNIDADES DE EXCELENCIA MARÍA DE MAEZTU», EN EL MARCO DEL PLAN ESTATAL DE INVESTIGACIÓN CIENTÍFICA, TÉCNICA Y DE INNOVACIÓN 2021-2023.

Por Resolución de 1 de octubre de 2025 se efectuó la convocatoria pública de 4 contratos doctorales para la formación de doctores correspondientes a las actuaciones para la formación de personal investigador predoctoral del centro de investigación de física de la materia condensada, enmarcadas en la convocatoria de concesión de acreditaciones y ayudas públicas de «Centros de Excelencia Severo Ochoa» y de «Unidades de Excelencia María de Maeztu», en el marco del plan estatal de investigación científica, técnica y de innovación 2021-2023.

Finalizado el proceso de selección conforme a lo establecido en los apartados 2 y 5 de las bases de la Convocatoria y vista la propuesta formulada por la Comisión de Valoración, este Rectorado en uso de sus atribuciones conferidas en el artículo 50.1 de la Ley Orgánica del Sistema Universitario 2/2023, de Universidades y en particular por el artículo 40 de los Estatutos de la UAM, HA RESUELTO:

PROPONER COMO CANDIDATO/A TITULAR DE LA PLAZA 1ª A, LUCÍA ROMERO SÁNCHEZ

PROPONER COMO CANDIDATO/A TITULAR DE LA PLAZA 2ª A, ALEJANDRO SEBASTIÁN GÓMEZ GÓMEZ

PROPONER COMO CANDIDATO/A TITULAR DE LA PLAZA 2ª A, TOMÁS MIGUEL SINTES PINEDA

PROPONER COMO CANDIDATO/A TITULAR DE LA PLAZA 2ª A, GUALBERTO MIGUEL LEÓN CUESTA

PROPONER COMO SUPLENTE A:

- SUPLENTE 1. ÁLVARO GALLEGO DE ROA
- SUPLENTE 2. DOMINGO DE GUZMAN ORERO GAMEZ
- SUPLENTE 3. JOAN JAVIER RONQUILLO TUTIVEN
- SUPLENTE 4. PABLO DIEZ SILVA
- SUPLENTE 5. ALEJANDRO SANJURJO MORENO
- SUPLENTE 6. ADRIAN CAMARA BALLESTERO
- SUPLENTE 7. GEMMA NAVARRO MARTÍNEZ
- SUPLENTE 8. PABLO HERNANDEZ MARTIN
- SUPLENTE 9. THOMAS GELFERT
- SUPLENTE 10. PABLO TUERO ALVAREZ
- SUPLENTE 11. JAIME MARTÍNEZ-ALMEIDA ORDÁS
- SUPLENTE 12. ELENA SENDARRUBIAS ARIAS-CAMISÓN
- SUPLENTE 13. OSCAR BOU MARQUES
- SUPLENTE 14. MEHDI HAMED
- SUPLENTE 15. AHMET KUTAY OZYURT
- SUPLENTE 16. DIEGO HENRIQUEZ GUGLIOTTA
- SUPLENTE 17. DENNIS CACHAGO PILLAJO
- SUPLENTE 18. JAIME RUMEU OZORES



More information:
<https://www.uam.es/uam/investigacion/ofertas-empleo/contrato-rp>



Código Seguro De Verificación	5568-3152-6638P3078-3335	Fecha	17/11/2025
Firmado Por	Maria de los Angeles Martin Cabrejas - Vicerrectora - Vicerrectorado de Política Científica		
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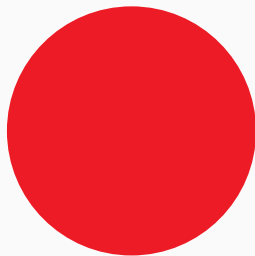
De no formalizar el contrato en plazo establecido, por causa imputable a el/la interesado/a, el/la candidata/a decaerá en su derecho.

Contra la presente Resolución, que pone fin a la vía administrativa, podrá interponerse recurso contencioso-administrativo ante los Juzgados de lo Contencioso-Administrativo de Madrid, en el plazo de dos meses desde el día siguiente a la fecha de su publicación. Sin perjuicio de lo anterior, la presente Resolución podrá ser recurrida potestativamente mediante recurso de reposición ante el Rector de esta Universidad en el plazo de un mes desde el día siguiente a dicha publicación. En este caso no podrá interponerse recurso contencioso-administrativo hasta que no sea resultado expreso o se haya producido la desestimación presunta del recurso de reposición interpuesto, de conformidad con lo dispuesto en los artículos 123 y 124 de la Ley 39/2015, de 1 de octubre, del Procedimiento Administrativo Común de las Administraciones Públicas.

Madrid, 17 de noviembre de 2025

La Rectora, P.D. La Vicerrectora de Política Científica
 (Resolución de 02/07/2025, BOCM de 10/07/2025)

Mª Ángeles Martín Cabrejas



MASTER AND DOCTORATE PROGRAMS

IFIMAC members are actively involved in the **Master Programs**:

- 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 programs**:

- Física de la Materia Condensada, Nanociencia y Biofísica.
- Programa de Doctorado en Materiales Avanzados y Nanotecnología.
- Química Teórica y Modelización Computacional.
- Química Aplicada.

IFIMAC'S MASTER GRANTS

IFIMAC has offered 10 grants for the best students starting the **Masters of Condensed Matter Physics** within UAM.

2024/2025 course: five Master grants awarded.

de la Fuente Pico, David. TFM Supervisor: Marchetti, Francesca
Planelles Prensa, Pablo. TFM Supervisor: Pou Bell, Pablo
Rodríguez Fernández, Asensio. TFM Supervisor: Picón, Antonio
Romero Sánchez, Lucía. TFM Supervisor: Brihuega, Iván
Sintes Pineda, Tomás Miguel. TFM Supervisor: Cuevas, Juan Carlos



[More information: https://www.ifimac.uam.es/jobs-opportunities/ifimacs-master-grants-for-2024-2025/](https://www.ifimac.uam.es/jobs-opportunities/ifimacs-master-grants-for-2024-2025/)

2025/2026 course: five Master grants awarded.

Cascales Álvarez, Ismael. TFM Supervisor: Félix Zamora Abanades y Raquel Gavara Castell
Estrela Ferrandis, Andreu. TFM Supervisor: Hermann Suderow
Juárez Leardini, Antonio. TFM Supervisor: David Miguez Gomez
López Rodríguez, Alberto. TFM Supervisor: Salvatore Assenza
Rodríguez Guzmán, María José. TFM Supervisor: Celia Polop Jorda



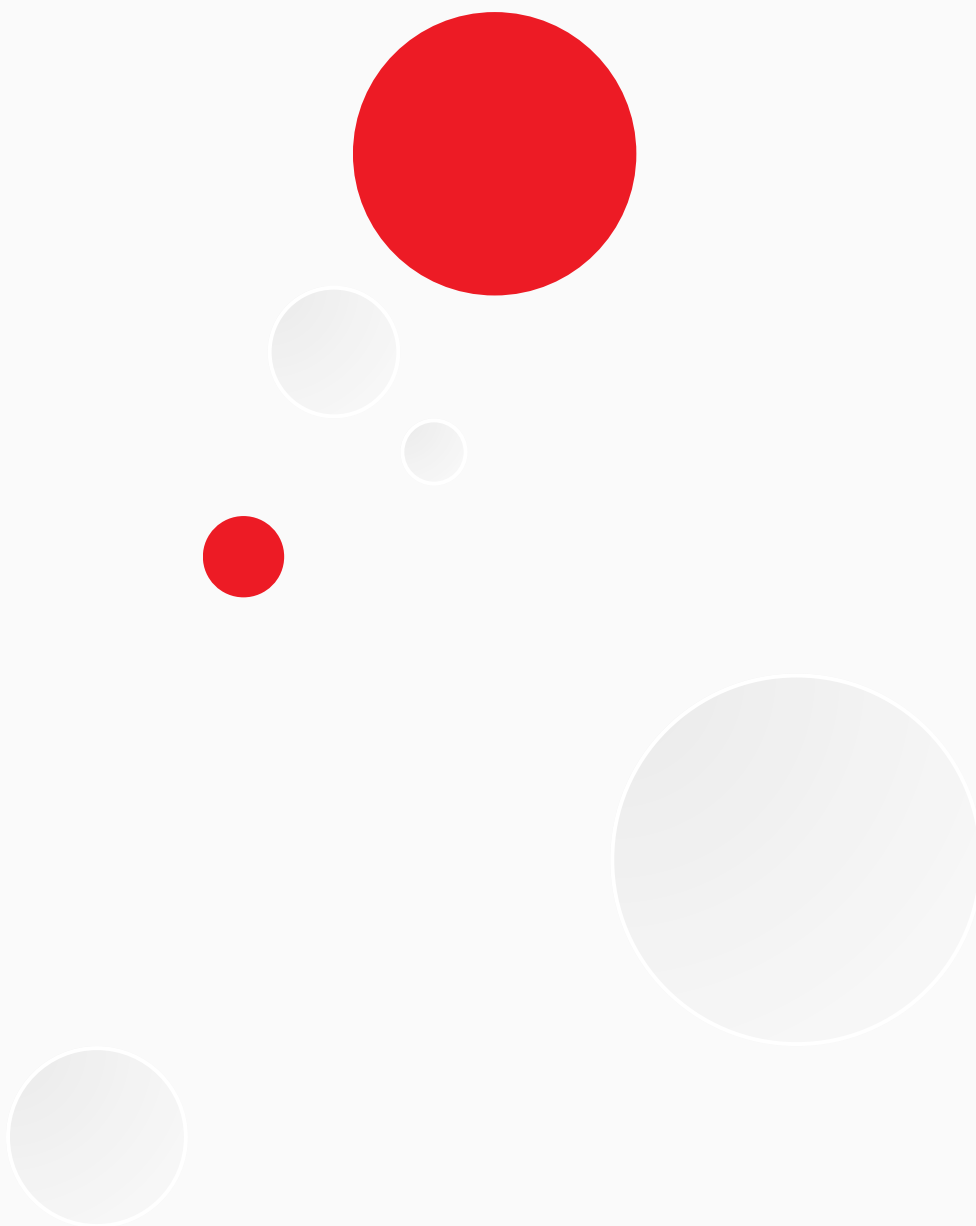
[More information: https://www.ifimac.uam.es/jobs-opportunities/ifimacs-master-grants-for-2025-2026/](https://www.ifimac.uam.es/jobs-opportunities/ifimacs-master-grants-for-2025-2026/)

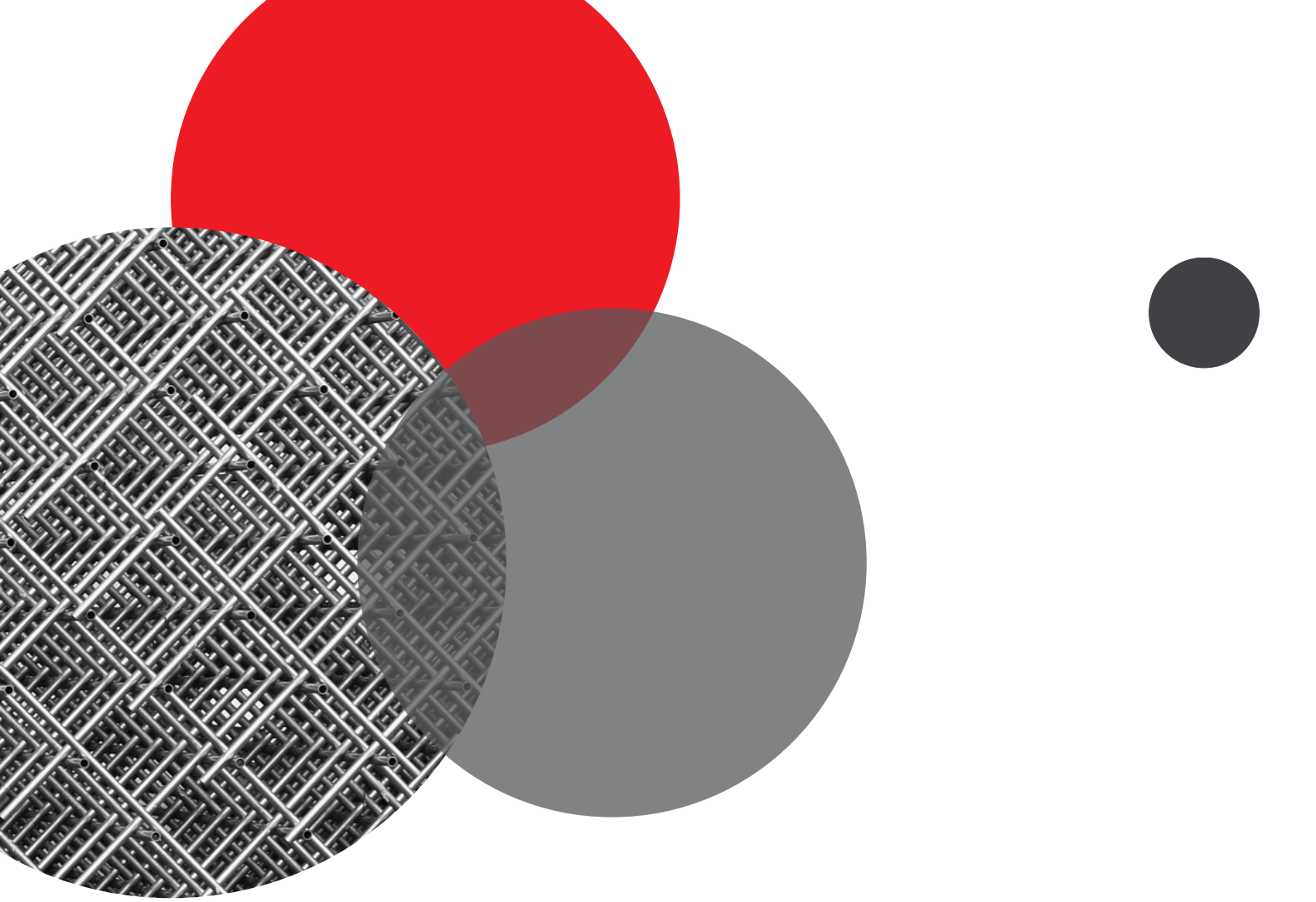
RESEARCH AWARDS FOR PHYSICS STUDENTS

The Condensed Matter Physics Center provides two of the six awards called by The Nicolás Cabrera Institute. The candidates awarded by IFIMAC in the 2025 edition are Juan Manuel Sánchez Arrua and Lucía Echevarría Soto.



More information: <https://www.inc.uam.es/list-awards-2025/>





6

OUTREACH ACTIVITIES

SCIENCE OUTREACH ACTIVITIES



International Day of Women and Girls in Science 2025

To celebrate the 10th anniversary of the International Day of Women and Girls in Science, IFIMAC organised its third science fair on 8 February at the Science faculty in Cantoblanco campus.

The fair aimed to foster curiosity and enthusiasm for science among the general public, particularly families with children. The event also highlighted the scientific contributions of women at IFIMAC and its students, and recognised the achievements of pioneering women in the history of science.

The 2025 programme included hands-on activities for participants of all ages, such as creating waves with musical instruments and prisms, exploring light polarisation for bee navigation, levitating objects with superconducting magnets, building batteries from lemons, recreating Eunice Foote's greenhouse effect experiment, observing objects disappearing in water through refraction and inflating objects with dry ice sublimation.

By working alongside IFIMAC researchers during these demonstrations, visitors of all ages developed intuitive understanding of complex physical principles through direct participation and observation.

Día Internacional de la Mujer y la Niña en la Ciencia 2026



IFIMAC
te invita a disfrutar
de sus talleres

La física en tus manos

Sábado
7 Feb

Para todos los públicos
11:00 - 14:00h
Facultad de Ciencias, UAM
C/ Francisco Tomás y Valiente 7
Campus Cantoblanco



Link to video:
https://youtu.be/tEaH-aE6_00





Workshop "Good Vibrations: The Physics of Music" - Majadahonda Professional Music Conservatory

During the Cultural Week 2025 programme at Majadahonda Professional Music Conservatory, physicist Francesca Maria Marchetti conducted an interactive workshop titled "Good Vibrations: The Physics of Music" on 4 April. The workshop enabled participants to engage with the fundamental scientific principles governing musical acoustics. Attendees examined the acoustic properties that differentiate instrumental timbral characteristics and explored the theoretical frameworks underlying harmonic phenomena. Through practical demonstrations, participants observed how key concepts—including standing waves, acoustic resonance, and Fourier analysis—elucidate the acoustic behaviour of diverse instruments, encompassing both the complex tonal qualities of stringed instruments and the characteristic resonance profiles of wind instruments. This interdisciplinary approach, integrating acoustical physics with musicological principles, illustrated that music fundamentally constitutes the deliberate application of vibrational phenomena to generate sound.



Workshops at Instituto de Libre Enseñanza (ILE)

As part of an ongoing collaboration with the Instituto de Libre Enseñanza of the Fundación Giner, IFIMAC PhD students led a series of workshops in Madrid. Through hands-on experiments, participants explored fundamental physics concepts spanning optics, soft matter, density, and waves.

On January 11, Amalia Coro presented "Optics: Photonics in Your Everyday Life," introducing key photonics concepts. Berta Tinao followed on January 18 with "Soft Matter: Gummy Bears for Acid Detection," while Aitor Zambuido led an interactive session on November 15 titled "Archimedes and Flotation: Density and Changes of State." Before finalizing 2025, on December 13, master's students Lucía Romero and Arianna Barreto from UAM presented "Waves and Music," engaging participants with the physics behind sound and vibration.

This collaboration will continue with an additional workshop scheduled for early 2026.



Workshops with Cáritas - The Science Behind Climate Change

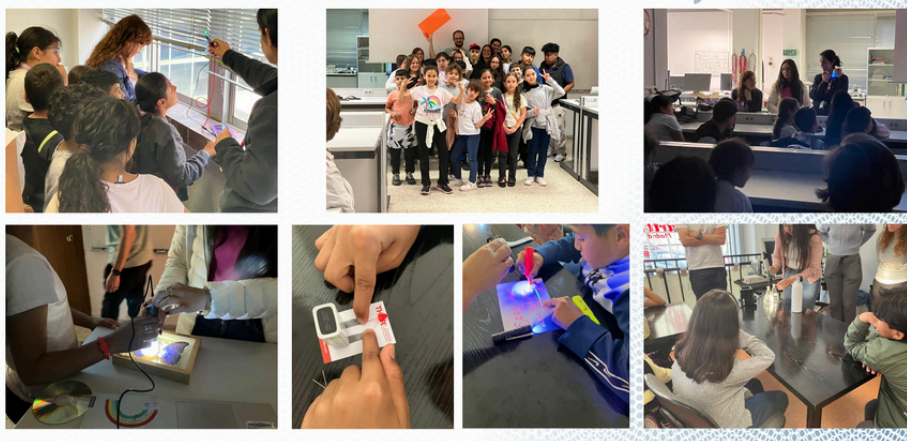
Over three sessions, Amalia Coro, Antonella Cutrupi, Raquel Utrera Melero, and Ferry Prins engaged participants in exploring climate change and renewable energy through interactive activities. These workshops were part of the Researchers at Schools (RAS) initiative, hosted during European Researchers' Night Madrid 2024-2025, a project run by the Universidad Autónoma de Madrid.

Primary and secondary school students replicated Eunice Foote's classic experiment to understand how carbon dioxide affects our atmosphere and drives climate change. The workshops also examined the connections between energy systems and climate events, with attendees learning how renewable energy technologies can generate power. A university visit gave students firsthand exposure to active research environments and scientific equipment, providing insight into professional scientific practice.

Through these experiences, the organizers hoped to inspire scientific curiosity and encourage students to consider careers in science.

IfIMAC Outreach
Condensed Matter Physics Center

EXCELENCIA
MARÍA
DE MAEZTU



European Researchers Night 2025

On September 26th, the Main Plaza of the Cantoblanco campus hosted European Researchers' Night 2025, with IFIMAC contributing the interactive activity "Transform Yourself with Energy." Led by a dedicated student team supported by Celia Polop - Miriam Moreno Sierra, Josune Sarasa Iroz, Emma Fierro López, María Cristina López Arenas, Lucía Mejía, Hugo Sarasa, Teresa García Lorenzo, and Mario Ruiz Cano - the initiative invited visitors to discover how energy transforms and powers our planet.

The activity offered participants a comprehensive exploration of energy systems, from renewable energy sources and their real-world implementation challenges to the chemistry behind batteries. Young attendees engaged in hands-on workshops where they constructed cars and windmills from recycled materials, directly experiencing energy transformation in action.

European Researchers Night 2025.



Science and Innovation Week 2025

During the 25th Week of Science and Innovation of Madrid Fundación para el Conocimiento madri+d, IFIMAC presented three scientific activities for the general public. The interactive workshop-talk "Vaya hueso, the scientist and their method with Profesor10," directed by scientific communicator Profesor10demates, guided attendees through the exploration of the contributions of Newton, Archimedes, and Einstein. Practical demonstrations of various scientific concepts engaged the audience in hands-on learning.

Juan Carlos Cuevas delivered the talk "Many-body quantum mechanics: More is better," commemorating the centenary of quantum mechanics. He explained in an engaging and accessible way how condensed matter physics emerged from quantum mechanics and explored its fascinating applications in contemporary science.

Ferry Prins, together with Emma López Ortin, Lucía Mejía Sáez, Hugo Sarasa, Raquel Utrera Melero, Antonella Cutrupi, Juan Rodríguez Lorente, Iolanda Di Bernardo, and Elena Tamayo, presented the EnCambio project, funded by FECYT (www.encambio.org).

XXV Semana de la Ciencia y la Innovación de Madrid



Participants engaged with educational videos about climate change and hands-on activities exploring energy transformation and renewable energy generation. An interactive game helped attendees understand carbon footprints and how chemical batteries work.



Exploring Condensed Matter Physics from Príncipe de Asturias School: Science Workshops with IFIMAC

In November 2025, researchers from IFIMAC conducted the second edition of the project titled "Exploring Condensed Matter Physics from Príncipe de Asturias School: Science Workshops with IFIMAC". Led by Diego Martín Cano, the project delivered six hands-on workshops designed to introduce students to fundamental scientific concepts: The Scientific Method, a Great Ally!; What is Matter Made Of?; Laws of Motion; Where Does Colour Come From?; Science Gives You Wings; and It's Not Magic, It's Pressure!

Supported by a Cultural Transfer Grant from UAM, this initiative strengthens IFIMAC's scientific outreach efforts and deepens its engagement with the primary education community. In its second edition, students in grades 4–6 explored physics through practical activities, fostering scientific curiosity and cultivating critical thinking and observational skills.



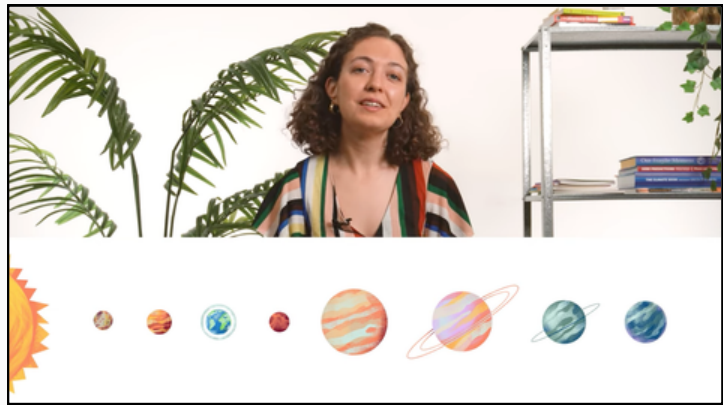
Link to video: <https://youtu.be/oo2IHoLTJXE>



Project: "En Cambio: Educación Transversal acerca del Cambio Climático"

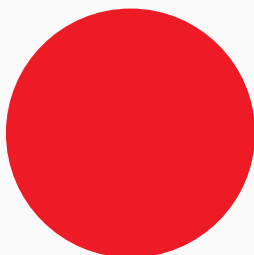
The EnCambio project, funded by Fecyt (FCT-24-21047), is developing interdisciplinary educational resources to integrate climate change content across primary school levels to complement subjects, such as Natural Sciences, Geography, Language, and Values Education.

Led by Ferry Prins, the team is producing educational videos (in Spanish) in collaboration with CEIP Príncipe de Asturias, in which climate change evidence is discussed. In 2025, two videos were launched: Which is the warmest planet in the solar system? In this video, Laura Rojo explores Venus's extreme atmosphere and explains how the greenhouse effect drives climate change on Earth. <https://youtu.be/LMn83wJsGC8>



Meet Eunice Foote, pioneer of change: In this video, Laura Rojo explains how Eunice Foote's groundbreaking work on how carbon dioxide traps heat was largely overlooked for over a century because she was a woman. Her research laid the foundation for our modern understanding of the greenhouse effect and climate change. <https://youtu.be/d2Yr6gQWkYU>

This project runs from July 2025 to June 2026.



IFIMAC ON MEDIA



IFIMAC Newsletter

The IFIMAC Newsletter, established by the Communications Committee in 2023, functions as a principal dissemination channel for institutional activities and periodic reporting of research accomplishments to our scientific personnel. This communications strategy facilitates interdisciplinary collaboration and organizational cohesion within the Centre. The digital newsletter is distributed via email to our researchers.

IFIMAC YOUTUBE CHANNEL



IFIMAC Colloquium

IFIMAC invites colloquium speakers to participate in interviews. In 2025, seven interviews were conducted by IFIMAC PhD students Jaime Echave Sustaeta, Pablo Diez Silva, Paula Obladen and Upasana Das.

These conversations offer students direct access to leading researchers, providing insights into cutting-edge research and career paths. We share the interviews on the IFIMAC YouTube channel, making them available to students, early-career researchers, and anyone interested in condensed matter physics. Through this initiative, we foster dialogue, mentorship, and knowledge exchange within and beyond our scientific community.

Interviews:

Interview with Jordi García-Ojalvo: <https://youtu.be/abb80ZZ-9fo>

Interview with William D. Oliver: <https://youtu.be/lrNJFXF2vxk>

Interview with Raffaele Mezzenga: <https://youtu.be/fsy9QY3GaHE>

Interview with Päivi Tórmä: <https://youtu.be/e7f57d1Fu3Y>

Interview with Jérôme Faist: <https://youtu.be/nLYsl69-8Jc>

Interview with Jaroslav Favian: <https://youtu.be/2eGpCyHCXdk>

Interview with Vidya Madhava: <https://youtu.be/NVvEel34lwI>

We also create YouTube Shorts that highlight the key moments from these interviews. Visit our channel to find out more!



IFIMAC-UAM Climate Colloquium

This initiative, organized by Ferry Prins and Daniel Farías members of IFIMAC as a spin-off of their transversal course on climate change, aims to bring global experts on climate change to the UAM community.

Jorge Olcina, professor at Universidad de Alicante gave a colloquium entitled: “Cambio climático en España: evidencias, adaptación y comunicación”. Professor Olcina addressed the critical need for effective climate change communication in Spain and beyond. The speaker emphasized that climate change is no longer a distant concern.

Colloquium: <https://youtu.be/f7sRfOHK-Yw>

Professor Stefan Rahmstorf, oceanographer and climatologist, presented a colloquium on the risks associated with the destabilization of the Atlantic Meridional Overturning Circulation (AMOC) and its potential consequences for the global climate.

Colloquium: <https://youtu.be/IPc4BlqIx7I>
 Interview: <https://youtu.be/8oCV2ZV3YnQ>



2025 – A Century on Quantum Science and Technology

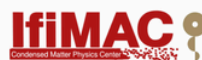
As part of the International Year of Quantum Science and Technology, IFIMAC organized a series of talks celebrating a century of quantum mechanics and its profound impact on science and technology.

The sessions explored quantum theory from multiple angles: its interpretation in condensed matter physics through Quantum Bayesianism, its role in developing next-generation technologies, the use of quantum light for information security, and the counterintuitive phenomena that emerge in many-body quantum systems. Together, all five talks illustrated how quantum principles continue to reshape computing, materials science, and emerging technologies in the 21st century.

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IFIMAC CELEBRA EL CENTENARIO DE LA MECÁNICA CUÁNTICA

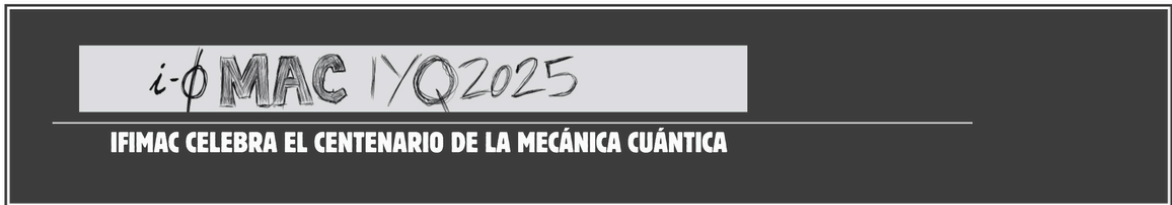
<p>Pedro Tarazona Bayesianismo Cuántico (Qbism): Interpretación natural de la Mecánica Cuántica desde la Física de la Materia Condensada</p>	<p>Iván Brihuega Cuántica: Cuando la Física Cuántica se une a la Tecnología Cuántica.</p>
<p>Elena del Valle & Carlos Antón Hackers vs Fotones mensajeros: Cómo la luz cuántica protege la información - introducción a la criptografía cuántica.</p>	<p>Juan Carlos Cuevas Mecánica cuántica de muchos cuerpos: Más es mejor</p>
<p>Eduardo Lee Iga Cuando la electrónica se vuelve cuántica: El camino hacia un computador cuántico a partir de superconductores y semiconductores</p>	



The talks are available:

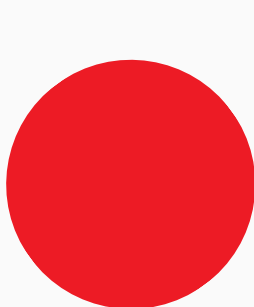


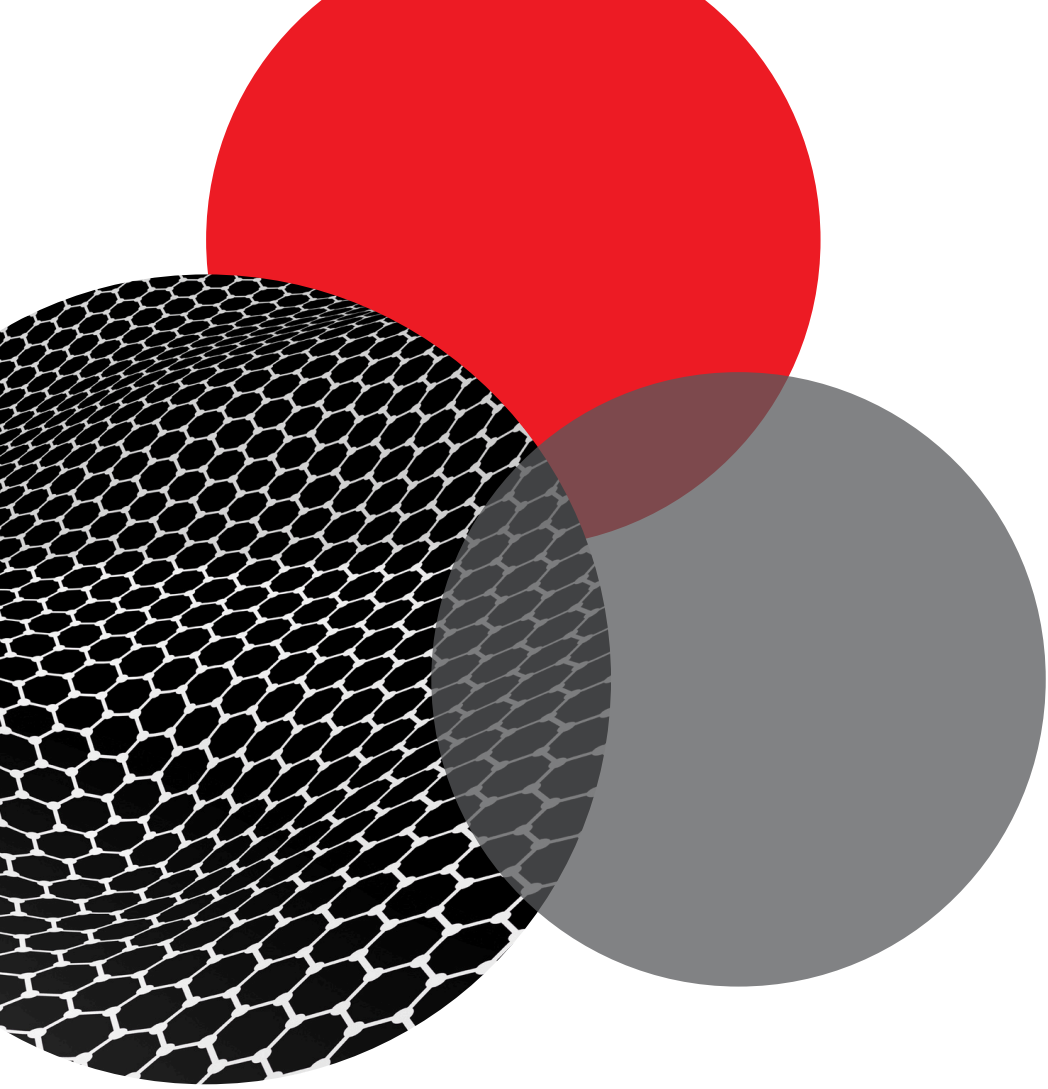
Pedro Tarazona: <https://youtu.be/AcXfBAi3HWk>
Iván Brihuega: <https://youtu.be/6-F8FgvKtBE>
Elena del Valle y Carlos Antón: <https://youtu.be/CCFnhHKFjvY>
Juan Carlos Cuevas: <https://youtu.be/BWqmhsy6bcM>
Eduardo Lee: <https://youtu.be/ysKfQzyjt7k>



IFIMAC SOCIAL MEDIA

In 2025, we expanded our #CondensedMatterPioneers initiative across social media, launching a new Instagram account to reach a broader audience.



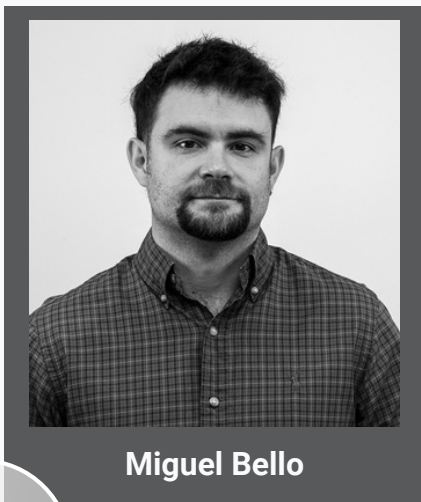


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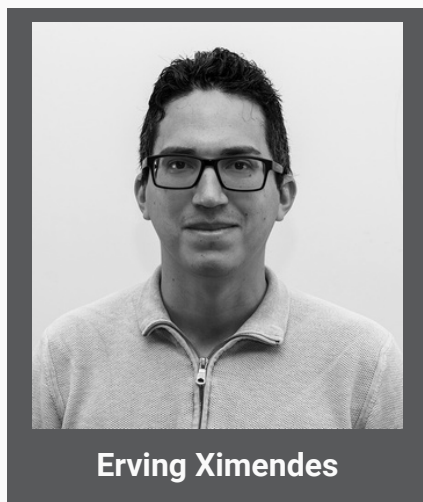


HUMAN RESOURCES

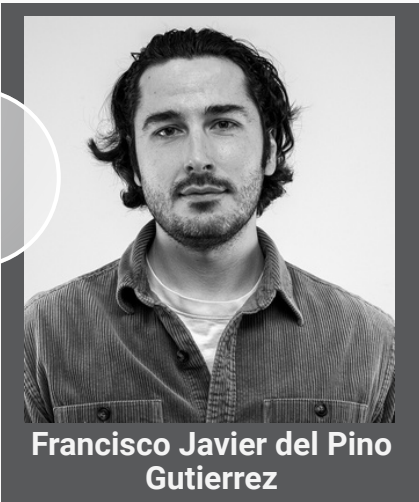
NEW MEMBERS PROPOSED BY IFIMAC RESEARCHERS



Miguel Bello is a theoretical physicist working at the interface of quantum optics and condensed matter physics. He did his PhD at the Materials Science Institute of Madrid, under the supervision of Prof. Gloria Platero. In January 2020, he defended his thesis at the UAM. After that, he joined the Theory Division of the Max-Planck Institute of Quantum Optics in Garching (Germany) as a postdoctoral researcher, working under the supervision of Prof. Ignacio Cirac. In November 2024, he won the IFIMAC Young Leader position, funded by the Maria de Maeztu excellence program, and the next year, the Talento “César Nombrela” grant, funded by the Community of Madrid. His main lines of research include topological quantum optics, quantum many-body dynamics and collective phenomena in open quantum systems.



Erving Ximendes’s research focuses on luminescent nanomaterials and optical sensing for advanced thermometry and multiparametric imaging, with particular emphasis on near-infrared luminescence, nanothermometry, and data-driven analysis for biomedical and harsh-environment applications. He obtained his PhD in Physics (UFAL, Brazil) working on optical spectroscopy, and subsequently carried out postdoctoral research in Europe, developing expertise at the interface of photonics, nanomaterials, and bio-optics. After joining UAM, he has established an independent research line centered on luminescence-based sensing, hyperspectral and time-resolved imaging, and the integration of machine learning techniques to overcome cross-sensitivities in optical measurements. His work combines materials synthesis and characterization with advanced optical instrumentation and data analysis, targeting applications ranging from biomedicine to functional materials. In 2023, he was awarded a Ramón y Cajal Fellowship, and he currently carries out his research at UAM within the Department of Física de Materiales, actively engaging in interdisciplinary collaborations.



**Francisco Javier del Pino
Gutierrez**

Javier del Pino's research examines collective behavior far from equilibrium in quantum-engineered platforms relevant to condensed matter physics, including photonic and mechanical systems. He earned his PhD at Universidad Autónoma de Madrid in 2018 on cavity quantum electrodynamics with organic molecules and their hybrid light-matter excitations, receiving the Extraordinary PhD Thesis Prize. He then joined AMOLF (Amsterdam) as a postdoctoral researcher, as the sole theorist in an experimental group, developing schemes to engineer artificial magnetic fields that enable one-way sound propagation in opto-mechanical systems. With an ETH Postdoctoral Fellowship at the Institute for Theoretical Physics, ETH (Zurich) he expanded this work to topological effects in driven-dissipative nonlinear systems and quantum simulation. From 2023 to 2025 he was Interim Professor (W2) at the University of Konstanz. In 2025, he returned to Madrid as a Ramón y Cajal Researcher at IFIMAC, Universidad Autónoma de Madrid. His current work builds theory on driven-dissipative quantum matter, using topology, nonequilibrium dynamics, and nonlinearity to guide the design of emerging photonic, mechanical, and hybrid quantum platforms.



Iolanda Di Bernardo

Iolanda Di Bernardo is a Ramon y Cajal fellow at Universidad Autónoma de Madrid, where she leads efforts in the synthesis and exploration of strongly-correlated two dimensional materials. Her research combines atomically resolved microscopy with advanced spectroscopic techniques to discover quantum phenomena that emerge at the nanometric scale. She obtained her Ph.D. from Sapienza, Università di Roma, then worked at several prestigious research centres in Australia - Queensland University of Technology, Australian National University, Monash University - before moving to Madrid. Over the years, she was awarded several prestigious individual fellowships, like the postdoctoral Women in FLEET fellowship (in Melbourne), the MarieCurie Postdoctoral Fellowship, the Juan de la Cierva fellowship and the Ramón y Cajal fellowship.



Edouardos Loukopoulos

Edouardos Loukopoulos obtained his PhD in Chemistry in 2018 (University of Sussex, United Kingdom). His main research interest is the design, synthesis and modification of novel metal-organic compounds to develop advanced functional materials through structure-property correlations. In 2020 he joined University of Crete (Greece) as a postdoctoral researcher to work on metal-organic frameworks (MOFs) for advanced sorption/separation applications. In 2022 he joined Universidad Autónoma de Madrid (Spain) as a postdoctoral researcher, developing MOFs for water remediation. In 2023, he was awarded an MSCA fellowship to continue his research in UAM. In 2025, he joined IFIMAC-UAM as a Junior Group Leader to initiate his independent research profile, developing functional porous materials for sustainability. His expertise includes synthetic inorganic and materials chemistry, combining an extensive crystallographic background and advanced synchrotron characterization techniques.



Sanchar Sharma

Sanchar Sharma's theoretical research centers on the intersection of magnetism and quantum information. After completing graduate studies in Electrical Engineering at the Indian Institute of Technology Bombay (IIT-B), they switched to physics upon joining TU Delft for a PhD, focusing on the interaction of magnons and photons. In 2019, they moved to the Max Planck Institute (MPI) in Erlangen, Germany as a postdoctoral researcher, where they began developing the then-nascent field of quantum magnonics. This work continued after relocating to RWTH Aachen, Germany in 2023. The following year, they joined the École Normale Supérieure (ENS) in Paris, investigating topological quantum solitons in magnets.

In 2025, they joined IFIMAC as a "la Caixa" Junior Leader, where they currently develop theoretical frameworks for quantum transport of magnons in ferromagnetic insulators.



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Departments

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

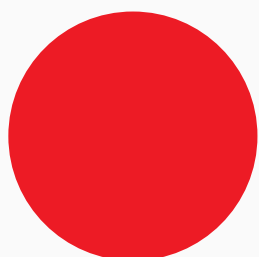
Research Lines

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



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