DIPC 2024

Donostia International Physics Center

ON THE COVER

ADDING ROCKS TO THE SOUP

The elegant model of the early Earth designed by Miller-Urey demonstrated that applying lightning to a primitive reducing atmosphere and an alkaline sea could create a primordial soup containing the molecular building blocks of life. However, they overlooked the importance of minerals. We now understand that the experiment succeeds due to the role of silica and silicate minerals. These rocks also promote the formation of a solid organic film that self-organizes into protocells (seen in the image), thus recreating a chemical Hadean Proto-world capable of evolving towards greater chemical complexity and ultimately to primeval biochemistry. This discovery also has significant implications for detecting primitive life on Earth and elsewhere.

Image **Christian Jenewein / Alicia González Segura**

2024

DIPC ACTIVITY REPORT

Building Connections

In today's rapidly evolving world, we navigate a complex global landscape. Geopolitical tensions have intensified and the international exchange of goods, ideas, and people seems increasingly threatened by mistrust and fragmentation. There remain however some powerful forces that continue to connect us. One of them is science, which is based on openness, collaboration, trust, and the free movement of ideas and people across cultures and continents. At DIPC, we are proud to be a part of this tradition.

Our research activity is international and interdisciplinary. Scientists from a wide variety of backgrounds work side by side, building connections that transcend borders. We believe that collective efforts are key to advancing knowledge. The great scientific challenges of our time—whether in quantum technologies, artificial intelligence, or fundamental physics—can only be addressed through global cooperation.

This vision of continuous collaboration and interconnectedness is mirrored by our own growth as an institution. The year 2024 has brought with it a defining development: the ongoing construction of a new building for DIPC, funded by the Department of Science, Universities and Innovation of the Basque Government. More than just a structural expansion, this project reflects the momentum that DIPC has gained in recent years—scientifically, intellectually, and socially. With more than 6,000 square meters of additional space and designed to host offices, experimental laboratories, and communal areas, the new facility will allow us to attract new talent, foster deeper collaboration, and embark on ambitious new research projects.

The new building will support and amplify our scientific core, now organized around four main thematic areas: QUANTUM, NANO, LIFE, and COSMOS. These areas encompass a dynamic research activity, which benefit from close partnerships with both local and international institutions. They reflect DIPC's commitment to science as a basis for long-term social and economic progress.

Beyond research, DIPC embraces the responsibility to be a cultural agent that engages with society. We want to contribute to a culture that values knowledge, creativity, and critical thinking. We believe that scientific culture is a cornerstone of a more open and tolerant society. In times of uncertainty and conflict, this mission becomes all the more urgent. Our outreach program, conceived with this very purpose, stands as one of the flagships of DIPC's activity. It reflects our belief in the transformative power of science within society.

None of this would be possible without the trust and support of our Board of Partners, which brings together public institutions and private organizations committed to the advancement of science. The meeting of the Board in December presided over by the new President of the Basque Government, Imanol Pradales, was a moment of recognition for DIPC's achievements. On this occasion, IBM officially joined the Board of Partners, further strengthening the ecosystem that sustains and drives our research forward. During the meeting, President Pradales remarked the importance of the Board's support in light of the center's growing size and impact and invited to all Partners to nurture the center's activity with a renewed ambition.

Ricardo Díez Muiño, Director and **Pedro Miguel Echenique**, President

This vision of continuous collaboration and interconnectedness is mirrored by our own growth as an institution.

Last but not least, let us mention that the achievements of DIPC are the result of the exceptional efforts of our scientific, technical, and administrative staff. Their work is the driving force behind every achievement and every project of DIPC.

In a world of growing walls, science builds bridges. In a time of fragmentation, science offers connection. This belief guides our work at DIPC and inspires our vision for the years to come.

Donostia International Physics Center (DIPC) is a research center opened in the year 2000. DIPC's mission is to carry out and catalyze research in physics and related disciplines, as well as to convey scientific culture to society. DIPC is a Foundation in which both public institutions (Basque Government, Gipuzkoa Provincial Council, San Sebastian City Council, and University of the Basque Country) and private entities (currently Kutxa Fundazioa, CAF, Telefónica, Fundación EDP and IBM) participate and contribute to its funding. In 2008, DIPC was awarded the distinction of 'Basque Excellence Research Center' (BERC) by the Basque Government's Department of Education. In 2019, DIPC was recognized as a 'Severo Ochoa' Center of Excellence by the Spanish Ministry of Science and Innovation.

Board of Partners

Pedro Miguel Echenique Landiribar President
Juan Colmenero de León Vice President
Ricardo Díez Muiño Director
Alberto López Basaguren Secretary

Basque Government
Science, Universities and Innovation Department
Industry, Energy Transition and Sustainability Department

Jokin Bildarratz Sorron Minister of Education (until December 2024)
Arantza Tapia Otaegi Minister of Economic Development and Infrastructures (until December 2024)
Juan Ignacio Pérez Iglesias Minister of Science, Universities and Innovation (as of December 2024)
Mikel Jauregi Letemendia Minister of Industry, Energy Transition and Sustainability (as of December 2024)
Adolfo Moráis Ezquerro Deputy Minister of Science and Innovation
Estíbaliz Hernáez Laviña Deputy Minister of Technology, Innovation and Digital Transformation (until December 2024)
Jaione Ganzarain Epelde Deputy Minister for Technology, Innovation and Digital Transformation (as of December 2024)
Amaia Esquisabel Alegría Research Director

University of the Basque Country

Eva Ferreira García Rector
Inmaculada Arostegui Madariaga Vice Rector for Research

Gipuzkoa Provincial Council

Eider Mendoza Larrañaga Deputy General
Ane Insausti Altuna Deputy of Economic Development and Strategic Projects
José Ignacio Asensio Bazterra Deputy of Sustainability (until December 2024)
Miriam Oca Pascual Director of Environmental Management (as of December 2024)

Donostia/San Sebastián City Council

Eneko Goia Laso Mayor

Fundación Bancaria Kutxa-Kutxa Banku Fundazioa

Rafael Amasorrain Zabala President
Ander Aizpurua Susperregui General Director of Kutxa Fundazioa

Fundación EDP

Manuel Menéndez Menéndez President

Telefónica S.A.U.

Manuel Ángel Alonso Pérez Director of Northern Territory at Telefónica España

Construcciones y Auxiliar de Ferrocarriles

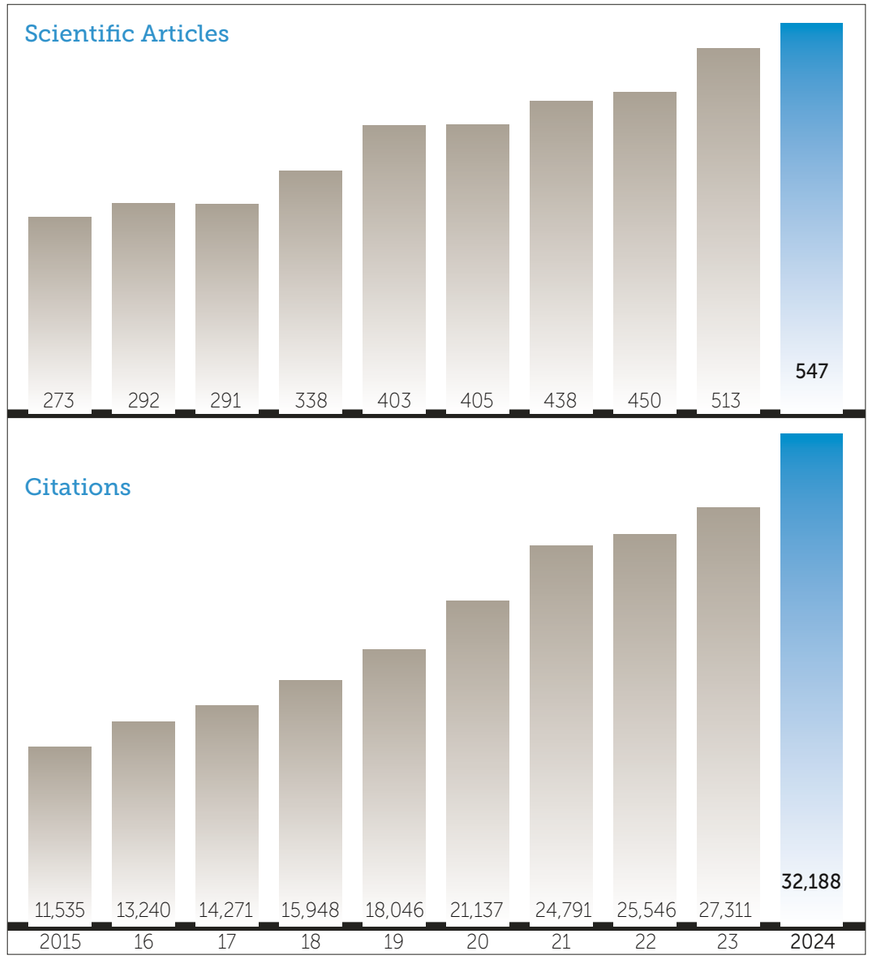
Andrés Arizkorreta García President

IBM

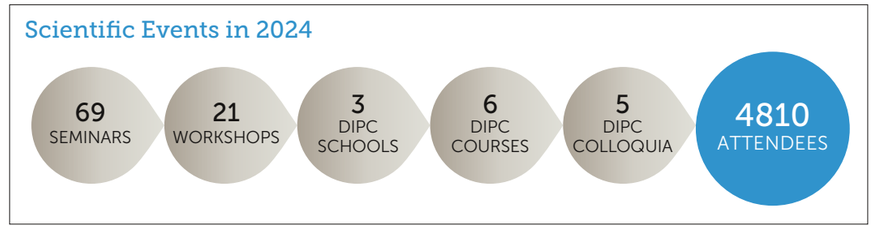
Horacio Morell Gálvez General Manager for Spain, Portugal, Greece and Israel (as of December 2024)

Research Activity at a Glance

The scientific production and impact of DIPC has grown year after year. In 2024, the center's scientific production set a record with **547 articles published**. But most important is the remarkable increase in the number of citations received by DIPC publications. Since 2000, DIPC has published a total of **6,350 ISI articles** and has received more than **262,200 citations**.



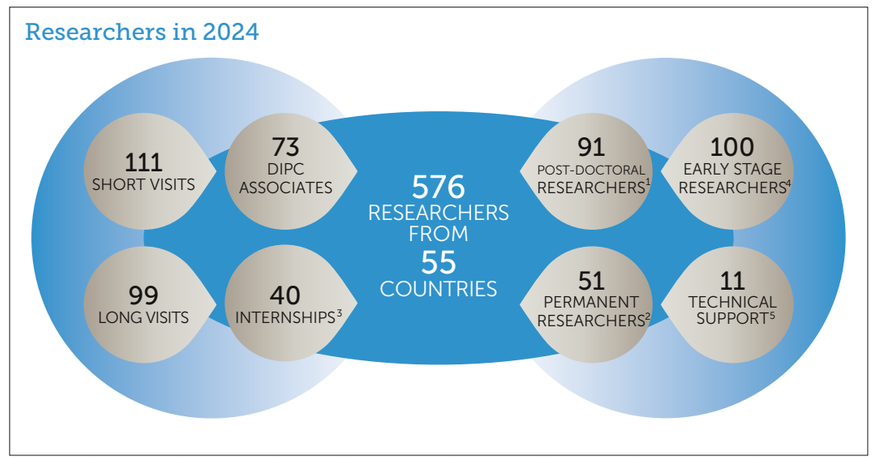
Source Web of Science Core Collection (all years and all indexes, 24/04/2025)



In addition to doing research, DIPC's annual strategic agenda of actions foster exchange with scientists from around the world. Our Scientific Events include several formats. Seminars, given by international experts, cover research topics of particular interest to our community, whereas international Workshops highlight specific subjects of interest. There are also DIPC Schools and Courses, especially aimed at young researchers and focused on learning particular skills. As well as DIPC Colloquia, which are colloquium-style lectures by outstanding speakers covering all areas of natural sciences. To reach a larger audience most of the programmed activities were also streamed live.

Driving Force of DIPC's Research Activity: Our Highly Dynamic Community

The core of the DIPC Community is made up of senior scientists and technicians, as well as PhD students and postdoctoral researchers. These young scientists complete their training and hone their expertise at the Center. In addition, DIPC counts on DIPC Associates, who are hired by other institutions but develop part of their research activity at DIPC. Last but not least, our scientists act as hosts for a large number of international visiting researchers that greatly contribute to DIPC's scientific activity. All in all, the vibrant energy of our research community creates a stimulating environment that fosters creativity.



1 Postdoctoral Positions and Research Collaborators 2 Ikerbasque, Distinguished Researchers and Fellows
3 Internships and Undergraduate Students 4 PhD Students and Research Assistants 5 Technical Assistants and Engineers

DIPC Supercomputing Center

The Supercomputing Center at DIPC is its great strategic infrastructure and serves as a fundamental tool for the excellent research carried out by our researchers and those of other research centers in the Basque Country

Computational physics and chemistry are among the strongest research fields in the Basque Country and the Supercomputing Center is one of its key resources. In recent years the Supercomputing Center has also started offering its services to other type of research lines related to Cosmology, Genetics, Artificial Intelligence, Mathematics... With its current level of physical, human and technical resources, this high performance computing (HPC) center has become a focus of technological knowledge, training, and innovation. Its status and influence transcend its primary mission, not only as a tool but also as a discipline in itself. There is no more powerful computing center of its type in the Basque Country.

DIPC Supercomputing Center's team.

Current computing resources

The Center has two rooms to host the HPC systems. These rooms have an isolated electrical connection, communications infrastructure, humidity, electricity consumption and temperature control sensors, various uninterrupted power supply systems, refrigeration systems, automatic fire-extinguishing systems and intrusion detection.

As of 2024, the Center operates several supercomputers covering a wide range of computational needs. Its flagship system is the HYPERION supercomputer, inaugurated in February with the attendance of the Minister of Education of the Basque Government, Jokin Bildarratz.

HYPERION is a cluster featuring Xeon nodes, ranging from small nodes with 48 cores and 96 GB of RAM to large shared-memory nodes with 64 cores and 2 TB of RAM under a single operating system image. The supercomputing infrastructure includes 72 NVIDIA Tesla A100 GPUs, which are particularly suited for training large AI models. With over 16,000 cores and 200 TB of RAM, it ranks among the most powerful supercomputers in Spain. The construction of HYPERION was part of the overall strategy of the Basque Government to provide the scientific community with the necessary tools and infrastructures to carry out its work, in alignment with the strategic areas identified by the IKUR Strategy.

TOTAL CAPACITY

Cores	RAM	Scratch Disks	Home Directories
16,204	200.56 TB	1 PB	850 TB

NON-STOP SERVICE 24 HOURS / 365 DAYS

More than 600 researchers from DIPC and other research centers of the Basque Country such as UPV/EHU, Ikerbasque, the BERC centers, Achucarro, BC3, BCBL, BCAM, CFM/MPC, Biofisika, and BCMaterials, as well as, BioGipuzkoa, CIC BiomaGUNE, CIC NanoGUNE, Tecnalia, ESS Bilbao, Tecnun, Biobizkaia, Neiker, Orai, CIC BioGUNE, Deusto University, CIC EnergiGUNE, HiTZ Center, CEIT, Orai-Elhuyar, Vicomtech, BioAraba, AZTI, Aranzadi or Polymat used this computational infrastructure in 2024.

The Supercomputing Center team and DIPC's President and Director, along with the Minister of Education of the Basque Government Jokin Bildarratz, Deputy Minister of Universities and Research Adolfo Morais, and Director of Research Amaia Esquisabel during a visit to HYPERION supercomputer at DIPC.

Science Communication

2024 was a year of consolidation and further expansion of DIPC's science outreach program. One of the most iconic activities, Cinema and Science, attracted a record number of people in several cities, surpassing the **5,000 mark** for the number of participants for the second year in a row. Emakumeak Zientzian, a celebration of the International Day of Girls and Women in Science was even more popular, with **13,500 people** taking part in the numerous activities organized by 32 scientific and technological institutions in the Basque Country. In total, DIPC organized more than **160 activities** throughout the year and reached over **38,000 people**. This growing public interest encourages us to continue working to bring scientific knowledge closer to society. ■

Emakumeak Zientzian opening ceremony at the Intxaurrondo Cultural Center in Donostia/San Sebastián.

EMAKUMEAK ZIENTZIAN

08-16/02/2024

The eighth edition of Emakumeak Zientzian brought together 32 science and technology institutions from the Basque Country to celebrate the International Day of Girls and Women in Science, which takes place on February 11th.

Over the years, this collaborative project has spread throughout the Basque Country. In 2024, **sixty activities** were organized, 3 exhibitions, a video competition and a program of visits by female scientists to educational centers. In addition, a campaign under the slogan '**Living beyond science**' was carried out on social networks to promote the reconciliation of a scientific career with a full life.

The main objectives of Emakumeak Zientzian are to increase the visibility of women in science, to challenge gender stereotypes associated with scientific and technical fields, and to encourage girls and young women to pursue careers in science.

A record number of **13,558 people** took part in the various activities in 2024. In total, it is estimated that **30,000 people** have been reached directly in the eight editions, demonstrating the attractiveness and social impact of Emakumeak Zientzian.

This success is mainly due to the enthusiasm and determination of **hundreds of volunteer scientists** (more than 300 in 2024) who participate in the project, but also to the institutions that have supported it.

In 2024, the collaboration agreements reached with Fomento San Sebastián, the Provincial Council of Gipuzkoa, the Provincial Council of Bizkaia and BRTA were maintained, and new sponsors such as Ikerbasque and the companies SALTO and Casio joined the project. Other entities such as Donostia Kultura and Emakunde also collaborated through co-programming or the allocation of spaces.

The following activities were organized or had direct involvement of DIPC:

08/02/2024 Intxaurrondo Cultural Center
Donostia/San Sebastián
Opening ceremony with all the volunteers

09/02/2024
Virtual tour of DIPC and CFM centers with our female scientists
Schools

09/02/2024 Victoria Eugenia Club Aretoa,
Donostia/San Sebastián
16/02/2024 Bidebarrieta Library, Bilbao
Women scientists of yesterday and today
Public lectures
General public

08/02/2024 Artium Museum, Vitoria-Gasteiz
09/02/2024 Tabakalera, Donostia/San Sebastián
10/02/2024 Bizkaia Hall (UPV/EHU), Bilbao
13/02/2024 Golem Baiona Cinema, Pamplona
Within Cinema and Science
"Bombshell. The Hedy Lamarr Story"

Screening presented by:
Physicist **Maia Garcia-Vergniory** DIPC,
Max Planck Institute for Chemical Physics of Solids

Telecommunications Engineer **Ane Insausti**
Provincial Council of Gipuzkoa, Mubil Fundazioa

Computer Engineer **Mari Luz Guenaga**
Deusto University

General public

For more information visit
https://emakumeakzientzian.eus

CINEMA AND SCIENCE

The seventh Cinema and Science festival, organized jointly by DIPC, the Basque Film Archive, and the San Sebastián International Film Festival, took place from January to March. Ten films were presented by scientists in five cities, in the venues of our collaborators: Tabakalera (Donostia/San Sebastián), Bizkaia Aretoa of UPV/EHU (Bilbao), in lieu of the Bilbao Fine Arts Museum during the course of its expansion works, Artium (Vitoria-Gasteiz), Cines Golem (Pamplona) and Cinéma Le Sélect (Saint Jean de Luz, France).

This year's theme was the dilemmas and struggles of the scientific community, always aware of the historical moments that affect it. In total, more than 5,641 people attended the 47 programmed sessions.

General Sessions

Films projected in
(1) Vitoria-Gasteiz (2) Donostia/San Sebastián
(3) Bilbao (4) Pamplona (5) Saint Jean de Luz

Oppenheimer (Christopher Nolan, 2023)*/**
(1) 11/01/2024 (2) 11/01/2024 (3) 13/01/2024
(4) 16/01/2024 (5) 22/03/2024
Physicist **Arantzazu Garcia-Lekue**, DIPC, Ikerbasque
Physicist **Pedro Miguel Echenique**, UPV/EHU, DIPC
Physicochemist **Didier Roux**, Membre de l'Académie des Sciences et des Technologies

Semmelweis (André De Toth, 1940)*
(1) 18/01/2024 (2) 22/03/2024 (3) 20/01/2024
(4) 23/01/2024 (5) 15/01/2024
Physician **Miguel Angel Goenaga**,
Hospital Universitario Donostia, OSI Donostialdea
Microbiologist **Ignacio Lopez Goñi**, Universidad de Navarra, UNAV
Historian **Joxean Fernández**, Basque Film Archive

Out of Africa (Sydney Pollack, 1985)*/**
(1) 25/01/2024 (2) 26/01/2024 (3) 27/01/2024
(4) 30/01/2024 (5) 29/01/2024
Biologist **Juan Ignacio Pérez Iglesias**, UPV/EHU, DIPC
Historian **Joxean Fernández**, Basque Film Archive

*Subtitles and presentation in *Spanish, **French, and ***Basque.*

The Perfect Storm (Wolfgang Petersen, 2000)***
(1) 01/02/2024 (2) 02/02/2024
(3) 23/03/2024 (4) 06/02/2024
Physicist **Onintze Salazar**, Euskalmet, Tecnalia
Physicist **Maialen Martija**, Euskalmet, Tecnalia

Bombshell. The Hedy Lamarr Story (Alexandra Dean, 2017)*
(1) 08/02/2024 (2) 09/02/2024
(3) 10/02/2024 (4) 13/02/2024
Physicist **Maia García-Vergniory**, DIPC, Max Planck Institute for Chemical Physics of Solids
Engineer **Ane Insausti**, Gipuzkoako Diputazioa, Mubil Fundazioa
Engineer **Mari Luz Guenaga**, Universidad de Deusto
Organized in collaboration with Emakumeak Zientzian

Tiempo de Silencio (Vicente Aranda, 1986)*
(1) 15/02/2024 (2) 16/02/2024
(3) 17/02/2024 (4) 20/02/2024
Biochemist **Itziar Alkorta**, UPV/EHU
Chemist **Fernando Cossío**, UPV/EHU, Ikerbasque

Plan 75 (Chie Hayakawa, 2022)*
(1) 22/02/2024 (2) 23/02/2024
(3) 24/02/2024 (4) 27/02/2024
Physician **Itziar Vergara**, IIS Biogipuzkoa
Organized in collaboration with Biogipuzkoa

Bringing Up Baby (Howard Hawks, 1938)**/***
(1) 29/02/2024 (2) 01/03/2024
(3) 02/03/2024 (4) 05/03/2024 (5) 04/03/2024
Physicist **Javier Aizpurua**, DIPC, Ikerbasque
Chemist **Idoia Mujika**, CFM (CSIC-UPV/EHU)
Physicist **Ricardo Díez Muiño**, DIPC, Ikerbasque

Mars Express (Jérémie Périn, 2023)**/***
(1) 07/03/2024 (2) 08/03/2024
(3) 09/03/2024 (4) 12/03/2024 (5) 12/02/2024
Engineer **Amaia Bernaras**, Euskadiko Parke Teknologikoa
Physicist **Ricardo Díez Muiño**, DIPC, Ikerbasque

Theater of Thought (Werner Herzog, 2023)*
(1) 14/03/2024 (2) 15/03/2024
(3) 16/03/2024 (4) 19/03/2024
Physicist **Aitzol García Etxarri** DIPC, Ikerbasque

School Sessions

Special morning sessions were organized for high school students in San Sebastián and Bilbao. The selected film, **"Mars Express"** (Jérémie Périn, 2023) which calls for reflection on artificial intelligence, was presented by scientists from **HiTZ Zentroa** a reference center for language technologies that promotes research, training, technology transfer and innovation in artificial intelligence with a focus on language and speech.

Tabakalera
Donostia/San Sebastián
28/02/2024***

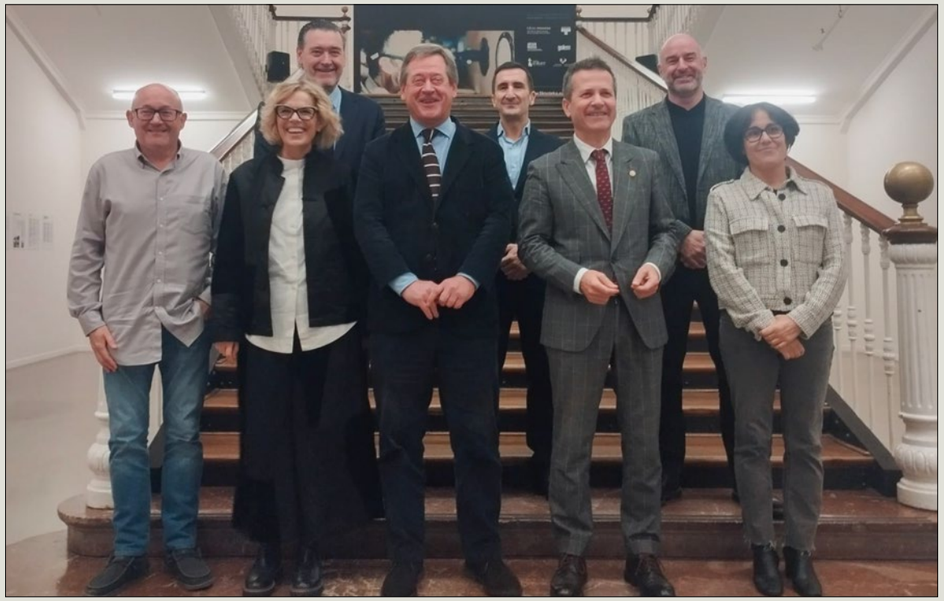
Presentations
Computer Engineer
Rodrigo Agerri
HiTZ Zentroa - UPV/EHU

Computer Engineer
Izaskun Etxeberria
HiTZ Zentroa - UPV/EHU

Bizkaia Aretoa UPV/EHU
Bilbao
05/03/2024***

Presentations
Telecommunication Engineer
Inma Hernáez
HiTZ Zentroa - UPV/EHU

Telecommunication Engineer
Jon Sanchez
HiTZ Zentroa - UPV/EHU



Representatives from different institutions at the presentation of the seventh edition of Cinema and Science.

ON ZIENTZIA

DIPC and Elhuyar organized the 14th edition of the On Zientzia video contest. The aim of this competition is to promote the production and dissemination of short, original videos on science and technology for all types of audiences. This year we reached a new record of participation with 100 videos, submitted in Basque, Spanish, and English, with a good gender balance among the participants. Most of the entries came from the Basque Country but there were also videos from countries such as Argentina, Chile and Mexico.

The 2024 award ceremony was held on June 7 at Kutxa Fundazioa Plaza in Tabakalera.

In each category, the following videos were awarded:

BEST DISSEMINATION VIDEO
El viaje de SiO_2
Paula Alonso and Pablo Fernández

BEST VIDEO IN BASQUE
Txantxangorri kuantikoa eta bestelako izaki magikoak
Jon Puignau

YOUNG PRIZE
Dolly ardia
Miren Ayerdi, Arhane Torres and Malen Irurzun

SPECIAL MENTIONS
Adimen Artifiziala: funtzionamendua eta erronkak
Maddi Piris
Korronte ozeanikoez
Patxi Juaristi

AUDIENCE AWARD
Minaren sekretuak, ezagutzen dituzu?
Noa Manso and Lydia Duro

To watch the videos visit
www.onzientzia.tv

WOMEN AND SCIENCE

The Women and Science program, launched by the Gipuzkoa Provincial Council and DIPC in 2021, aims to promote the presence of women of excellence in science, in line with DIPC's mission and the Council's objective to promote gender equality in all areas and especially in those where this inequality is most evident.

As part of this initiative, DIPC and the Gipuzkoa Provincial Council organized a seminar where Talat S. Rahman presented some programs that have helped the Physics Department at the University of Central Florida (UCF) to enhance diversity, equity and inclusion in its composition and mission.

22/03/2024
Diversity Matters – some strategies that could broaden participation
Talat S. Rahman, University of Central Florida

Talat Rahman is a UCF Trustee Chair Professor and a Pegasus Professor of Physics. At UCF, she has been involved in efforts to increase the participation of women and minorities, particularly through the American Physical Society's Bridge Program, one of whose sites she helped establish at UCF with the goal of increasing the number of physics PhDs from underrepresented minority (URM) groups.

IKUR QUANTUM TALKS

Leaders and specialists in quantum technologies from DIPC, UPV/EHU and BCAM organized the IKUR Quantum Talks series to raise awareness of the scientific foundation and potential of quantum technologies.

In 2024, two public lectures given by internationally renowned experts in the field were programmed, gathering around 200 attendees:

20/01/2024 San Telmo Museum
Donostia/San Sebastián
From atoms to stars: the universe according to Pauli
Jean Philip Solovej Mathematician and mathematical physicist, University of Copenhagen
Interview by Arantzazu García Lekue, DIPC, Ikerbasque

08/03/2024 Bidebarrieta Auditorium, Bilbao
Bell inequalities: from curiosity to security
Artur Ekert Physicist, University of Oxford
Interview by Luz Roncal, BCAM, Ikerbasque

JOT DOWN SCIENCE 2024

03-04/05/2024
Tabakalera, Donostia/San Sebastián

For its 11th edition, after visiting Jaca and Sevilla, the Jot Down Science event returned to San Sebastián. This time it was organized by the cultural magazine Jot Down and DIPC, with the collaboration of Kutxa Fundazioa.

The 2024 edition focused on hominids—the primate family that includes modern humans (Homo sapiens), their direct ancestors, and other extinct relatives. The program featured a diverse range of formats, including lectures, interviews, and panel discussions with leading experts in paleoanthropology, archaeology, human evolution, physics, and geology.

As always, the event was also the scenario for the awards ceremony of the annual Jot Down Science popularization competition, in which DIPC has been collaborating since 2015. The contest currently includes four categories: scientific photography, scientific illustration, scientific dissemination essay and science fiction narrative. It is sponsored by Donostia International Physics Center (DIPC), the Laboratorio Subterráneo de Canfranc (LSC), the museum Laboratorium of Bergara and Jot Down with support from the Universidad de Sevilla, Mercurio Magazine, and Nextdoor Publisher.

03/05/2024
Lectures
Humanos, homínidos, y otros simios perdidos **Emiliano Bruner**, CENIEH, CIEN
¿Por qué surgió la agricultura? **Amaia Arranz**, UPV/EHU, Ikerbasque
La espeleología. Última frontera de la exploración humana en la Tierra **Sergio García Dils**, International Cave Exploration Team CAVEX

Round table on Art and Science
Clara Montero, Tabakalera, **Mauricio Antón** palaeo-illustrator and **Marina Otero**, Columbia University GSAPP
Moderator: **Ángel L. Fernández**, Jot Down

04/05/2024
Lectures
Seducción cristalina **Juan Manuel García Ruiz**, DIPC, Ikerbasque, CSIC
Por quién doblan las campanas. Violencia y evolución humana **María Martinón-Torres**, CENIEH

Book presentation
Primates al este del edén by **Juan Ignacio Pérez Iglesias**, UPV/EHU, DIPC
Interviewer: **María Martinón-Torres**, CENIEH

Lecture
Una mirada a la evolución **Conchi Lillo**, Universidad de Salamanca Instituto de Neurociencias de Castilla y León, INCYL

Book presentation
Nación Neanderthal by **Juan José Gómez Cadenas**, DIPC, Ikerbasque
Interviewer: **Ángel L. Fernández**, Jot Down

The program also included complementary activities designed for children and families.
Workshop for children
Animalien eboluzioa: lehoiak, oreinak, gorilak eta gizakiak
Dynamisers: **Jexux Tapia** and **Manu Ceberio**, Aranzadi Zientzia Elkartea

Jot Down 2024 Science Outreach Contest

Best Scientific Dissemination Essay
🔗 *Orce: piedras que se asemejan a huesos* | Juan Manuel Jiménez Arenas

Best Science Fiction Narrative Award (joint winners)
🔗 *Madres* | Juan Carlos Pereletegui
🔗 *Un edén improbable* | Rebeca García Nieto

Best Scientific Illustration
🔗 *El primer paso* | Andrés Diam

Best Scientific Photography
🔗 *Metamorfosis homínida* | Jose Conceptes

CRYSTALLIZATION OF DANCE

La Cristalización de la Danza (Crystallization of Dance) is an original proposal created by the crystallographer Juan Manuel García-Ruiz, and the dancer and choreographer Vanesa Aibar. The show invites us to reflect on their complementary visions of art, confronting the idea of abstraction, represented here by the inorganic and crystalline, with the empathy embodied by the biological and natural. The first performance in the Basque Country was in 2024:

12/04/2024 Barakaldo Theatre, Barakaldo
La Cristalización de la Danza
Dance lecture on art and science

Vanesa Aibar, Dancer
Juan Manuel García-Ruiz, DIPC, Ikerbasque
María Marín, Musician

QUANTUM TECHNOLOGIES SERIES

Donostia is preparing to receive the world's sixth quantum supercomputer deployed by IBM, but what do we really know about this technology that could revolutionize science, education and industry?

The answer to these and other questions was tackled by the "Quantum Technologies" series, organized by DIPC and San Telmo Museoa in a new edition of *Donostia, Zientzia Hiria* initiative which was attended by over 150 people. This annual collaboration is part of the 'Challenges' program at San Telmo Museoa.

In 2024, the series included the following:

19/04/2024
Teknologia kuantikoak: zer da hori?
Javier Aizpurua, BasQ, DIPC, Ikerbasque

26/04/2024
Acercándonos a las tecnologías cuánticas
Celia Rogero, CFM (CSIC-UPV/EHU)
Kepa Ruiz Mirazo, UPV/EHU
and Biophysics Institute
Aitor Moreno, Ayesa
Cristina Sanz, IBM
Moderator: Javier Aizpurua, BasQ,
DIPC, Ikerbasque

SCIENCE WEEK

07-09/11/2024
Tabakalera

Once again, DIPC participated in the Science Week of the University of the Basque Country (UPV/EHU), together with CIC nanoGUNE, the Materials Physics Center (CFM CSIC-UPV/EHU) and POLYMAT research centers.

In 2024, researchers from the four centers led the usual stand with hands-on experiments in materials science and nanoscience, which was open to the public in the "Txokos" section. In addition, the program included two workshops; the already classic one for children focused on experimenting and visualizing the tiny world, and a new workshop developed in collaboration with the experimental particle physics researchers from DIPC.

07-09/11/2024
Stand "Exploring the world of materials"

08/11/2024
Zientzia Club
Diamonds are (quantum) physics' best friends
Gabriel Molina CFM, Ikerbasque, DIPC

08/11/2024
Cosmic Rays and Elementary Particles
Workshop for schools (12-16 years old)

09/11/2024
Scale your World
Workshop for children (4-8 years old)

Screening of EL SECRETO DE LA NATURALEZA

El secreto de la naturaleza (José Antonio Pérez Ledo, 2018) is a documentary film co-produced by the Chair of Scientific Culture of UPV/EHU and K2000 which traces the life and scientific legacy of Pedro Miguel Echenique through his reflections on science and beauty. Two screenings were organized in 2024:

12/09/2024
Tabakalera, Donostia/San Sebastián

The Basque Film Archive and the Chair of Scientific Culture of the UPV/EHU organized the screening in San Sebastian. Juan Ignacio Pérez Iglesias, Minister of Science, Universities and Innovation, and Joxean Fernández, Director of the Basque Film Archive, introduced the film. After the screening, Prof. Echenique was interviewed by Edurne Ormazabal, general director of Tabakalera, and answered the questions from the audience. The screening was organized in collaboration with DIPC and the San Sebastian International Film Festival.

15/11/2024
San Agustin Kulturgunea, Durango

The documentary was screened as part of the "Zientziaren Ertzetik" series of scientific talks, and was supported by Durango City Council, Bizenta Mogel Library, the Chair of Scientific Culture of the UPV/EHU, DIPC and the Basque Government. After the screening Pedro Miguel Echenique and Jone Guenetxea, director of the weekly magazine Anboto, led a colloquium.

SESSIONS FOR KIDS: San Sebastián International Film Festival

20, 23-27/09/2024
Ikastetxeak Belodromoan, Anoeta Velodrome

As part of the San Sebastian International Film Festival (SSIFF), thousands of children between the ages of 6 and 11 come together to enjoy children's film screenings. Co-organized by SSIFF, DIPC, and the Basque Film Archive since 2019, the initiative aims to promote a positive image of science among local schoolchildren, highlighting the city's strong ties to scientific research. The slogan *City of Cinema, City of Science* reflects this goal.

This time round, Ikastetxeak Belodromoan focused on extraterrestrial life. The Velodrome's giant screen showed **Little Allan – The Human Antenna (Alan giza antena)**, a Danish animated movie directed by **Amalie Næsby** about the relationship between a little alien girl and an 11-year-old boy and his UFO-obsessed neighbor. The screening of the film, dubbed into Basque, included an original introduction with several surprises.

This year's invited scientist was astrophysicist **Naiara Barrado** from the Planetary Sciences Group of the Bilbao School of Engineering (UPV/EHU). Together with Naiara, the Velodrome embarked on a journey through the universe trying to answer the big question about the existence of extraterrestrial life.

One of the surprises was the return of the already 'famous' social robot **Pepper** and his new friend **Aatxe**, a quadruped robot with all kinds of acrobatic skills. This special session was made possible thanks to the collaboration of **Elena Lazkano**, **Igor Rodriguez**, **Unai Zabala** and **Eneko Atxa**, members of the robotics research group Robotics and Autonomous Systems (RSAIT) from the University of the Basque Country (UPV/EHU). At the end of the event, there was a real party where Pepper and Aatxe danced together with an enthusiastic audience.

Premier of OLATU BATEN ISTORIOA

12/11/2024
Bilbao

The Bilbao Zinebi International Documentary and Short Film Festival presented the premiere of Olatu Baten Istorioa (The Story of a Wave), a short film produced by El Santo Films and directed by **Nagore Eceiza** which explores the connection between the physics of waves and the passion for surfing.

The film features the surfer **Kepa Acero** and includes the scientific collaboration of the physicist **Maia García-Vergniory**, researcher at DIPC and at the time, professor of condensed matter physics at Sherbrooke University in Canada.

This interdisciplinary project has its origins in *Donostia, Zientzia Hiria* initiative, promoted by DIPC, the Chair of Scientific Culture of the UPV/EHU and Donostia Kultura. Its first edition in 2022, focused on Surf and Science and included the participation of Kepa Acero and Maia García Vergniory with a joint lecture entitled Olatu Baten Istorioa (The Story of a Wave). Two years later the short film of the same name was born.

The production was possible thanks to the support of the Basque Government, Fundación EDP, DIPC, Euskampus and the Chair of Scientific Culture of the UPV/EHU.

EL PALO DE ERATÓSTENES – ZIENTZIA ELKARRIZKETAK

Aranzadi Science Society continued the lecture series *El Palo de Eratóstenes – Zientzia Elkarrizketak* during 2024 in collaboration with Eureka! Zientzia Museoa and DIPC.

The series was named after the scientist Eratosthenes who, 2,000 years ago, measured the circumference of the Earth using the shadow cast by a stick. It is a science outreach program focusing on astronomy, astrophysics, cosmology and other scientific fields.

The following scientists participated in the series organized from March to June:

14/03/2024 **Ignacio Tanco**, ESA
09/04/2024 **Silvia Bonoli**, DIPC, Ikerbasque
14/05/2024 **Eduardo Zubia**, Aranzadi
11/06/2024 **Raúl Angulo**, DIPC, Ikerbasque

HIGH SCHOOL VISITS

For the tenth consecutive year, DIPC and the Materials Physics Center (CSIC-UPV/EHU) organized the well-established DIPC/CFM Visits Program. The aim of the program is to promote scientific careers among young students by showing them our daily activity, the research areas we work in and our facilities. To carry out this activity, we count on scientists who volunteer to show their work and accompany the visitors during the 2-hour visit. In 2024, six on-site visits and two virtual visits were scheduled, one of them held as part of the Emakumeak Zientzian initiative. A total of 25 high schools and 1,160 students were hosted during the year.

In addition, two special visits were organized as part of UPV/EHU's orientation program *Egokitu*, and students from the Computer Science Faculty of UPV/EHU and Universidad Europea paid a special visit to the DIPC Supercomputing Center. Moreover, winners of *Elhuyar Zientzia Azoka* visited our research center.

STRØM - Inclusive Astronomy

The STRØM – Inclusive Astronomy exhibition, created by DIPC for Passion for Knowledge 2023, was inaugurated at the Pamplona Planetarium in December 2024 as part of a collaboration agreement signed between the two institutions.

The Pamplona Planetarium is the first institution after Tabakalera in San Sebastian, to host this touring exhibition which invites visitors to explore the cosmos through tactile, sound and audiovisual experiences with the aim of guaranteeing access to science for all citizens without barriers of any kind.

From left to right: Paula Noya (NICDO), Patricia Fanlo (Government of Navarre), Pedro Miguel Echenique (DIPC, UPV/EHU), Izaskun Azcona (Fundación La Caixa) and Silvia Bonoli (Ikerbasque, DIPC).

The opening ceremony was attended by Paula Noya, Head of Cultural Infrastructures of NICDO; Patricia Fanlo, regional minister for Universities, Innovation and Digital Transformation of the Government of Navarre; Izaskun Azcona, La Caixa Foundation's representative in Navarre; Pedro Miguel Echenique, president of DIPC and professor emeritus of the University of the Basque Country (UPV/EHU), and Silvia Bonoli, Ikerbasque research professor at DIPC and scientific curator of STRØM.

From the inauguration, on December 19, to the last day of 2024, the exhibition received a total of 970 visitors, of which 84 were guided tours and 886 were members of the general public.

As a result of a fire that affected the Pamplona Planetarium's dome, the exhibition will be relocated in 2025, with the hope of reopening to the public in Pamplona.

top@DIPC ENCOUNTERS Zientziarekin Solasean

On November 28, we celebrated the XIV edition of top@DIPC Zientziarekin Solasean! at Eureka! Zientzia Museoa, an event that brings together top-level scientists and high school students from the Basque Country.

In this edition, the students had the opportunity to interact with Nobel Laureate Jean-Pierre Sauvage, the president of the European Physical Society, Mairi Sakellariadou, and the vice-president of the CERN Science Policy Committee, Pilar Hernández. The physicist and DIPC's president Pedro Miguel Echenique moderated the discussion, during which the invited scientists shared insights into their professional careers and answered the students' questions.

The main objective of this gathering is to encourage young people in the Basque Country to pursue studies in science and technology, and to instill a passion for knowledge. DIPC organized the event, with the support of the Department of Science, Universities and Innovation of the Basque Government and Kutxa Fundazioa, as well as the special collaboration of Telefónica, which awarded the prize for the most interesting and original question among the participants.

Students and teachers from around the Basque Country gather at the XIV edition of top@DIPC Encounters in front of the Eureka! Zientzia Museoa in Donostia/San Sebastián.

28/11/2024 Eureka! Zientzia Museoa
Jean-Pierre Sauvage, Université de Strasbourg
Mairi Sakellariadou, King's College London
Pilar Hernández, Universitat de València, IFIC, CERN
Moderated by **Pedro Miguel Echenique**,
President of DIPC

Hosts:
Ander Aizpurua, General Director of Kutxa Fundazioa
Javier Benito, Director of Telefónica Euskadi
Adolfo Morais, Vice-minister of Universities and Research, Department of Science, Universities and Innovation of the Basque Government

NEW PATHS OF SCIENCE

Co-organized by the Ernest Lluch Cultural Center of Donostia Kultura and DIPC, the aim of this series of lectures is to bring the research done by local scientists closer to citizens. This year, two talks were held and gathered over 75 attendees.

The lectures are available in podcast format at Donostia Kultura Irratia.

22/10/2024
🔗 *Nanozientzia eta Kuantika, benetan?*
Arantzazu Garcia Lekue, DIPC, Ikerbasque

26/11/2024
🔗 *Mapeando la cultura. Enredando ciencias y humanidades*
Gustavo Ariel Schwartz, CFM CSIC-UPV/EHU, DIPC

MESTIZAJES

During 2024, the Mestizajes project has continued to foster dialogue between science, literature, and the other branches of humanities. The project is promoted and organized by DIPC within the framework of Euskampus and coordinated by Gustavo Ariel Schwartz. Within the Mestizajes program, different research and outreach activities such as conferences, seminars, presentations or collaborative projects have been carried out during the last 14 years. These activities have been organized in collaboration with Donostia Kultura, Tabakalera and the Vice Rectorate of the Gipuzkoa Campus of the University of the Basque Country (UPV/EHU).

In 2024, research on complex networks applied to cultural analytics has continued actively through our collaboration with The CulturePlex Lab (Canada), which began in 2021. This interdisciplinary project explores the emergence of genius and revolutionary ideas using data mining, complex network analysis, and machine learning. By modeling cultural networks around iconic figures and transformative moments —such as the early 20th-century intersections of art, science, and literature— the project bridges quantitative analysis with traditional humanities research.

OTHER COLLABORATIONS

In addition to our outreach program, we sponsor and support various initiatives every year thanks to the participation of our researchers. In 2024, these initiatives include: *Inspira Bizitzak*, organized by Kutxa Fundazioa to inspire new generations of students to pursue scientific careers; *Pint of Science*, an international initiative featuring informal talks by local scientists in bars around the city; the *Scientific Bidebarrieta cycle*, organized by the Chair of Scientific Culture of UPV/EHU and the Bidebarrieta Library; the special event *Machine Learning application in streaming platforms* organized by DIPC and Kutxa Fundazioa; and the presentation of the documentary *El misterio de los cristales gigantes* at the *36th Urrelur Mineralogy and Paleontology Week*.

STEAM SARE: Gravitating Bodies

In the framework of the STEAM Euskadi strategy, promoted by the Department of Education of the Basque Government through Innobasque, DIPC participated in 2022, in the co-creation of the activity "Gravitating Bodies", in collaboration with teachers from the Ikastola Lauaxeta (Bizkaia) and the artist Saioa Olmo.

The pilot test of this activity was carried out by DIPC post-doctoral researchers Marcos Pellejero and Sergio Contreras, and took place at the Lauaxeta center. After a positive assessment by the teaching staff, "Gravitating Bodies" became part of the STEAM Sare catalog of activities offered to secondary and high school students in the Basque Country. In 2024, the activity was led by DIPC researchers Sergio Contreras, Irati Lizaso, Sara Ortega and Irene Valderrama, in the following schools:

29/02/2024 Ategorri BHI, Erandio, Bizkaia
15/11/2024 Lauaxeta Ikastola, Amorebieta-Etxano, Bizkaia
26/11/2024 Nazaret, Donostia/San Sebastián, Gipuzkoa

DONOSTIA WeekINN 2024

25-31/10/2024

As every year, DIPC collaborated in the Innovation Week "Donostia WeekINN" organized by Fomento of San Sebastián.

As part of the 2024 edition, CFM and DIPC research centers offered a materials science workshop conducted by researchers from both institutions. DIPC also participated in a special event that brought together citizens and R+D+i agents to discuss the social impact of science: San Sebastian Science Society.

28/10/2024 Kursaal
Ciencia con Impacto Social, ¿cómo lo definimos?
Javier Aizpurua, BasQ, Ikerbasque, DIPC

29/10/2024 Santo Tomas Lizeoa
Materials Science Workshop for students by CFM and DIPC
Irene Vittori, Marco Gobbi and Shayan Edalatmanesh

DIPC 2024 THE YEAR IN MEDIA

254	34	17	+800
newspaper articles	radio broadcasts	television appearances	online impacts

Equality at DIPC

In 2024, we continued to advance gender equality through various projects and initiatives. The Emakumeak Zientzian alliance has strengthened networks, raised awareness, and made a meaningful impact on society through a diverse program of activities around February 11th, the International Day of Women and Girls in Science.

Presentation of Emakumeak Zientzian 2024.

Emakumeak Zientzian

Emakumeak Zientzian is a strategic equality project in the Basque Country that has received several awards. It has been promoted by DIPC since its inception and has successfully expanded its network of partners. In 2024, 32 Basque institutions joined forces to organize the International Day of Women and Girls in Science, which is celebrated on February 11th. These institutions have committed themselves to the objectives of the initiative by signing a cooperation agreement. The aim is to showcase the activities of women in science, to break gender stereotypes in scientific and technical fields, and to encourage girls and young women to pursue scientific careers. The program has successfully achieved its goals through the implementation of 65 aligned actions, involving **13,500 people** of all ages, including children, teenagers, and adults. It is estimated that in its 8 editions, the Emakumeak Zientzian project has had a significant social impact, reaching more than **30,000 people** in the Basque Country.

DIPC Equality Plan

The first DIPC Equality Plan was launched by DIPC in 2020. It was designed as a framework consisting of four main areas identified as key challenges during the diagnostic process: organizational culture, workforce diversity, sexual harassment in the workplace, and work-life balance. One of our main goals at DIPC is to foster an inclusive organizational culture with gender-diverse leadership and transparency at its core. Each year, we share significant actions with the community to reinforce our commitment.

In addition, we recognize the importance of promoting diversity and inclusion internally by implementing inclusive language across various communication channels. To promote a diverse workforce, we have raised awareness and increased the visibility of underrepresented researcher collectives (gender, ethnic background, etc.) as role models in local community events.

Furthermore, in 2024, we continued the special **"Women and Science"** program, created in partnership with the Gipuzkoa Provincial Council, to promote the careers of outstanding female scientists.

In 2021, a protocol was established to ensure and maintain a dignified working environment for all DIPC employees, **free from violence** of any kind, including violence against women and minorities. This applies both within and outside the physical space of DIPC, as well as to instances occurring through virtual or symbolic means of communication. The implementation of this Protocol, which has been in place for three years, represents one of the most significant milestones of our Gender Equality Plan. Every year, awareness and prevention campaigns are carried out with the active participation of our community.

Protocol Against Harassment

First DIPC Equality Plan

Looking ahead to next year, one of our key challenges will be the renewal of our First DIPC Equality Plan and the subsequent development of the Second DIPC Equality Plan. This new plan, spanning the next four years, will strengthen our commitment to diversity, equity, and inclusion. We will achieve this by implementing impactful initiatives, raising awareness, and ensuring fair and inclusive practices across DIPC.

Personnel Segregated by Gender

	Total Staff	Women	Men
Direction and Management			
Directors	1	0%	100%
Management	6	67%	33%
Total	7	57%	43%
Scientists			
Early Stage Researchers	77	31%	69%
Post-doctoral Researchers	60	17%	83%
Permanent Researchers	30	20%	80%
Research Fellows	7	43%	57%
Technical Support	10	11%	89%
Total	184	23%	77%
Administration and Services			
Administration	11	72%	28%
IT Personnel	9	33%	67%
Outreach Personnel	4	100%	0%
Maintenance	2	0%	100%
Projects	4	50%	50%
Total	30	57%	43%
TOTAL	**221**	28%	72%

Associates and Visiting Researchers

	Total Staff	Women	Men
DIPC Associates	72	24%	76%
Visiting Researchers	210	17%	83%

Data as of 31/12/2024. DIPC includes the non-binary gender definition, but none has been recorded to date.

Scientific Highlights

DIPC HIGHLIGHT 2024

Enantiopure [6]-azairidahelicene by dynamic kinetic resolution of a configurationally labile [4]-helicene

Pazos A, Cruz CM, Cuerva JM, Rivilla I, Cossio FP, and Freixa Z
Angewandte Chemie International Edition 63, e202406663 (2024)

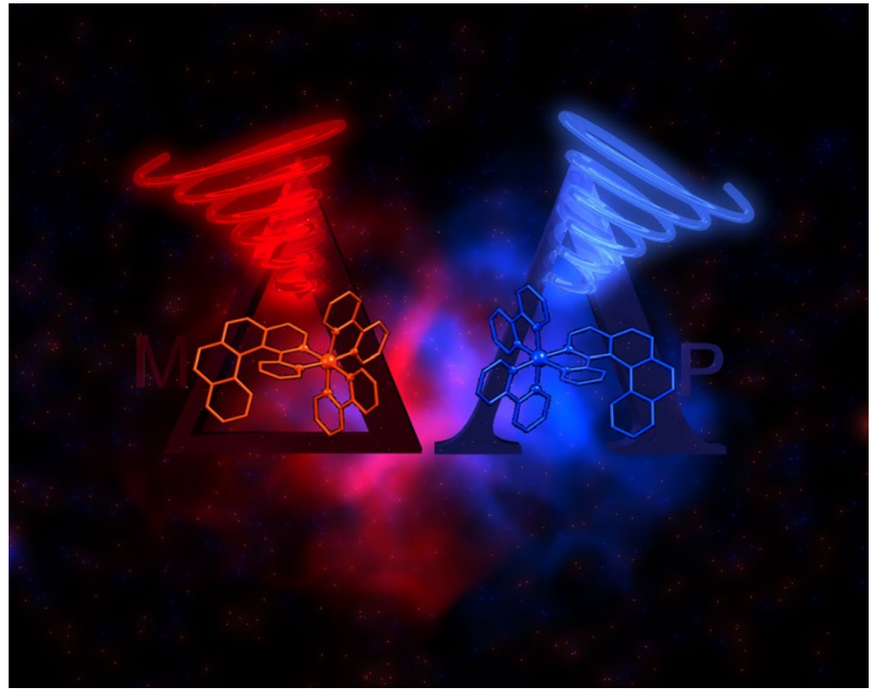
"Helicene" is the name introduced by Newman in 1955, to describe the benzologues of phenanthrene in which the extra ortho-condensed rings give rise to a (regular) cylindrical helix. The pioneer work of Newman in this field cannot be overemphasized; his brillant synthesis and resolution of [6]helicene will remain as a landmark, for it opened the way to the study of a fascinating class of synthetic molecules.

Formally, helicenes are ortho-fused polycyclic aromatic or heteroaromatic compounds in which all rings (minimum five) are angularly arranged so as to give helically shaped molecules, which are thus chiral. This chirality results from the handedness of the helicity itself, lacking both asymmetric carbons and chiral centers. The clockwise and counterclockwise helices are non-superposable. By convention, a left-handed helix is minus and labelled (M), a right-handed helix is plus and labelled (P). The chemistry of helicenes has attracted continuing attention because of their unique structural, spectral, and optical features.

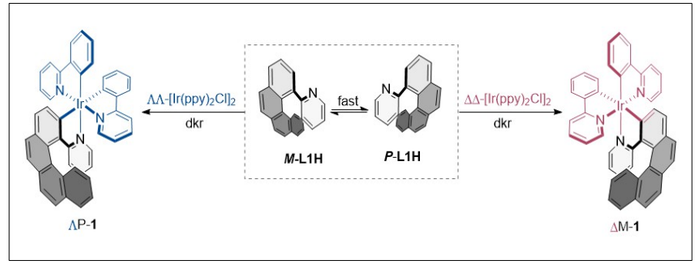
Organometallic helicenes are appealing chiral entities. By combining the chiroptical properties of helicenes with those inherent to the metal centre, they are suitable for the development of multifunctional molecules. Among them, few examples of iridahelicenes appeared in the literature, intended to exploit the outstanding photophysics of iridium(III) bis- or tris cyclometalated complexes, combined with the central chirality imposed by the organometallic core and the helicenic structure.

Now, a team of researchers reports the synthesis of a pair of enantiopure [6]-azairidahelicenes incorporating chirality at the metal center and on the helicenic ligand. These two organometallic helicenes are readily accessible by an effective dynamic kinetic resolution (dkr) of a configurationally labile [4]-helicenic ligand. The two isolated enantiomers exhibit perfect mirrored electronic circular dichroism (ECD) and circularly polarized phosphorescence (CPP) signals.

According to the results, dkr is strongly directed by structural features on the reaction intermediates towards cyclometalation, imposed by the C_2-symmetric bis-cyclometalated organometallic core. This type of arrangement is common in many organometallic compounds. Consequently, this synthetic strategy can be extended to obtain not only a variety of chiral [6]-azairidahelicenes but also other metallahelicenes by simple combinations of ready-available chiral-at-metal bis-chelated precursors conformationally stable and epimerizable [4]-helicene derivatives.



Cover image of the issue, representing the enantiomeric irida[6]helicenes exhibiting perfect mirrored electronic circular dichroism (ECD) and circularly polarized phosphorescence (CPP) signals.



Enantiopure irida [6]helicenes combining chirality at the metal center and at the helicenic fragment are obtained by dynamic kinetic resolution of configurationally labile [4]helicenic ligands

DIPC HIGHLIGHT 2024

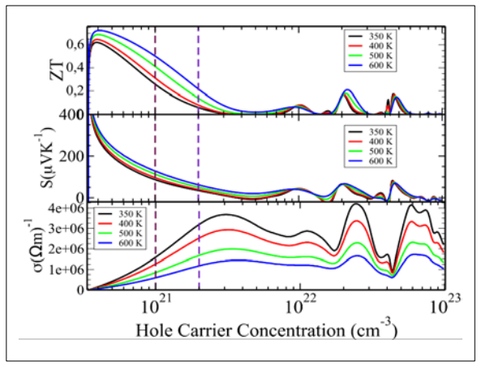
Thermoelectric properties of the main species present in Portland cement pastes

Agbaoye RO, Janovec J, Ayuela A, and Dolado JS
Cement and Concrete Research 183, 107587 (2024)

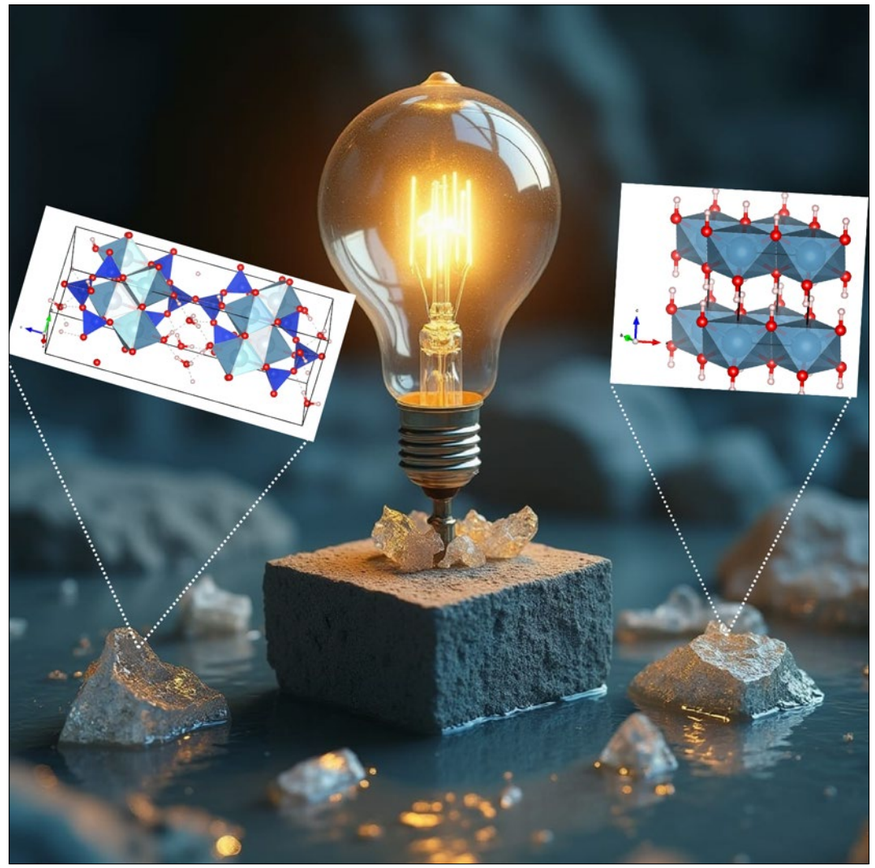
In the pursuit of sustainable energy solutions, thermoelectricity offers a compelling pathway converting wasted heat into usable electrical energy. While promising, its success hinges on enhancing the efficiency of thermoelectric materials.

Cement and concrete, despite their ubiquity, remain under-explored in this context, with reported figures of merit still lingering between 10^{-7} and 10^{-9}. Unlocking their energy-harvesting potential requires improving the intrinsic thermoelectric properties of their core components. Notably, portlandite and tobermorite-11 exhibit inherently low lattice thermal conductivity, a critical advantage that significantly boosts their thermoelectric performance and positions them as promising candidates for next-generation smart construction materials.

Tobermorite-11, a key mineral found in cement, has shown unexpected promise as a thermoelectric material capable of converting heat into electricity. Within a hole carrier concentration range of 10^{20} to 10^{21} cm^{-3}, it delivers an impressive Seebeck coefficient of up to 400 µV/K, and a thermoelectric figure of merit (Z) between 0.5 and 0.79 across a practical temperature window of 350 K to 600 K. To enhance these properties, we explored p-type doping by replacing a silicon atom in the tobermorite structure with aluminum. This substitution introduces one hole per unit cell, effectively reaching an ideal carrier concentration of 10^{21} cm^{-3} and achieving a Z value of 0.5 at 600 K. However, while adding more aluminum increases electrical conductivity, it comes at a cost reducing both the Seebeck coefficient and the overall efficiency. Our findings reveal that optimal performance is achieved when one silicon atom is replaced by aluminum in every ten unit cells, maintaining a balance between conductivity and thermoelectric efficiency. These insights highlight a powerful strategy: through selective n- and p-type doping, we can engineer cement-based materials not just to build, but to actively harvest energy transforming concrete into a functional component of sustainable, energy-aware infrastructure.



Hole carrier concentration-based thermoelectronic properties of normal tobermorite-11.


Crystal structures of $Ca(OH)_2$ and normal tobermorite-11.

With precise p-type doping-elegantly replacing silicon with aluminum in tobermorite, we unlock a dramatic rise in performance

The result: A bold leap toward energy-harvesting cement composites that redefine what infrastructure can do

DIPC HIGHLIGHT 2024

Mixed stereochemistry macrocycle acts as a helix-stabilizing peptide N-cap

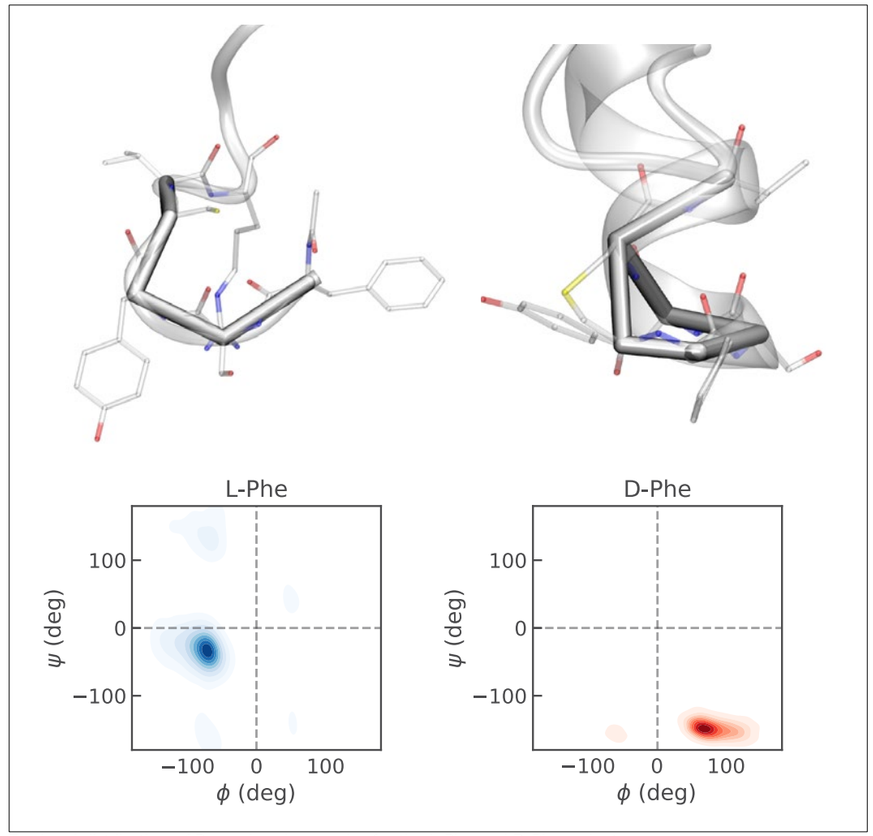
Hink F, Aduriz-Arrizabalaga J, Lopez X, Suga H, De Sancho D, and Roger JM
Journal of the American Chemical Society 146, 24348 (2024)

Peptides are a promising class of compounds for inhibiting protein-protein interactions, as they can mimic the behavior of natural intrinsically disordered proteins (IDPs). However, short linear peptides typically lack a defined structure in isolation and must fold upon binding, which incurs an entropic penalty that reduces binding affinity.

Macrocyclization —the formation of rings containing twelve or more atoms— has emerged as an effective strategy to "preorganize" peptides by stabilizing their bioactive conformations, particularly α-helices. In addition to rational design approaches, the RaPID system (Random non-standard Peptides Integrated Discovery) enables the discovery of de-novo macrocyclic peptides from genetically reprogrammed libraries incorporating non-canonical amino acids. While most peptides identified by the RaPID system adopt coil or sheet-like conformations, only a few form α-helices. This raises the question of whether such short N-terminal-to-side-chain macrocycles can effectively mimic longer helical motifs.

To investigate this question, a research team composed of experimentalists from the University of Copenhagen and computational chemists from DIPC and UPV/EHU focused on Mcl-1 — a clinically relevant apoptosis regulator and member of the Bcl-2 protein family that recognizes α-helical BH3 motifs from pro-apoptotic proteins such as Bid. Using the RaPID system, they identified potent binders, termed "Heliats", which feature a four-residue macrocycle (formed via a thioether bond) fused to a short linear segment that mimics BH3 motifs. These Heliats bound Mcl-1 with nanomolar affinity and effectively disrupted its interaction with native ligands. Notably, macrocyclization was found to both enhance binding affinity and promote α-helical structure.

Computational studies conducted by the DIPC and UPV/EHU team provided detailed mechanistic insights into the stabilization effect. Molecular dynamics simulations demonstrated that macrocyclization increased α-helical content compared to linear analogs, particularly near the macrocyclic region, and promoted key i to i+4 hydrogen bonds. Quantum chemical calculations corroborated the presence of these interactions, especially involving the D-stereocenter at position 1, which adopted polyproline II torsion angles conducive to helix stabilization and thioether linkage formation. The simulations also revealed that this D-stereochemistry favors macrocyclic geometries and intramolecular hydrogen bonding, effectively pre-organizing the peptide for target binding. Together, these findings underscore the utility of a minimal, mixed-stereochemistry macrocyclic N-cap that is synthetically accessible and broadly graftable — offering a versatile platform for helix stabilization and improved peptide–protein interactions in drug discovery.



Torsional distribution of Ramachandran angles for the L-Phe and D-Phe variants.

Researchers have developed "heliats", peptides that mimic α-helical motifs to block protein-protein interactions, with simulations revealing how macrocyclization enhances both structural preorganization and binding affinity

DIPC HIGHLIGHT 2024

Interfacing two-dimensional and magnetic topological insulators: Bi bilayer on $MnBi_2Te_4$-family materials

Klimovskikh II, Eremeev SV, Estyunin DA, Filnov SO, Shimada K, Golyashov VA, Solovova NY, Tereshchenko OE, Kokh KA, Frolov AS, Sergeev AI, Stolyarov VS, Trontl VM, Petaccia L, Di Santo G, Tallarida M, Dai J, Blanco Canosa S, Valla T, Shikin AM and Chulkov EV

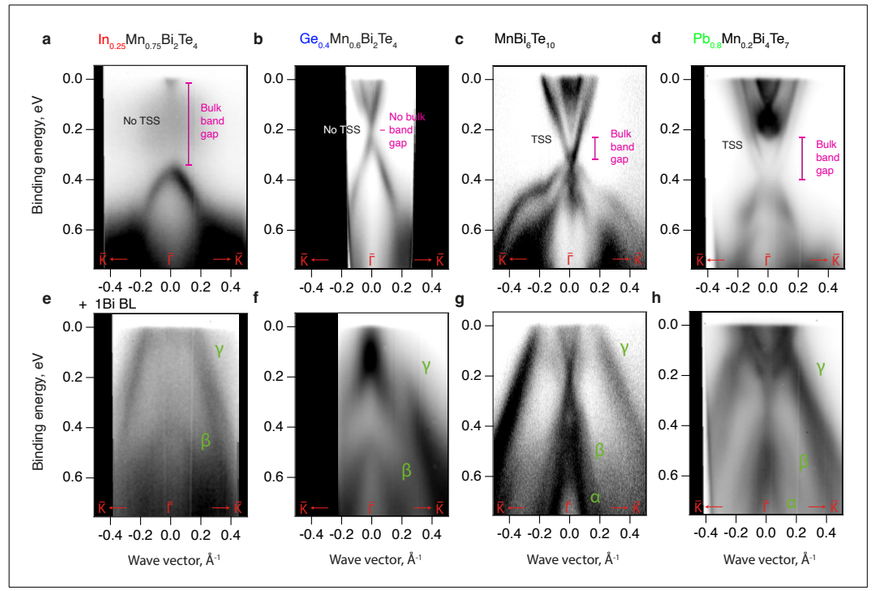
Materials Today Advances 23, 100511 (2024)

Recently observed axion quasiparticle in Chern insulator $MnBi_2Te_4$ ignites its use for dark matter detector. Heterostructuring of $MnBi_2Te_4$ with another topological insulator, 2D bismuth layer, extends the applications even broader, possibly resulting in high and tunable Chern number systems.

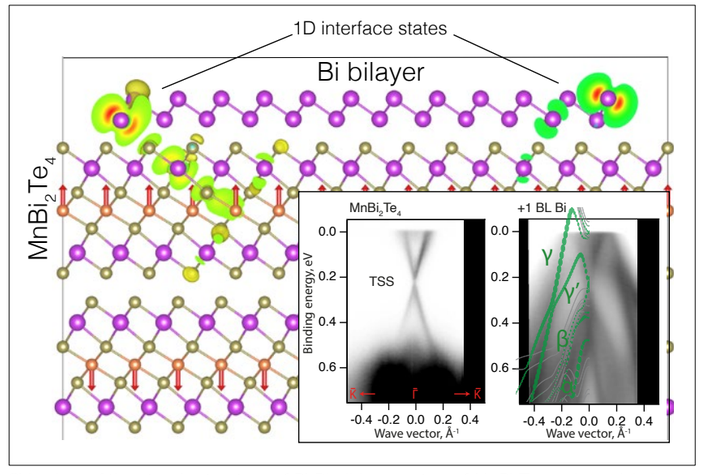
Discovery of non-trivial topological phases opened one of the most fruitful area in solid state physics and chemistry. Recently, it was shown that when the non-trivial topology meets magnetism, new phases and phenomena, such as Quantum Anomalous Hall Effect (QAHE) and Majorana zero modes emerge. QAHE in the first 3D intrinsic magnetic topological insulator (IMTI), $MnBi_2Te_4$, with Chern number (C= 1) was greatly enhanced, but further gain is expected for magnetic topological heterostructures. Recently, intriguing possibility of tunable QAHE with high and tunable Chern numbers (C=±1, ±3) was predicted for heterostructures consisting of 2D topological insulators and IMTIs.

The Chern number corresponds to the number of the 1D gapless chiral modes residing at the Chern insulator film's edge. These edge modes conduct electricity without dissipation, which could be useful for the construction of novel highly efficient chiral interconnects for low-power-consumption electronics. However, the contact resistance between a metal electrode and Chern insulator in the envisioned interconnect devices is a bottleneck limiting their performance. To reduce this resistance as much as possible, the number of chiral edge modes should be as large as possible. Therefore, it is of great interest and importance to engineer TIs with high Chern numbers.

We have synthesized and characterized the heterostructures consisting of 2D topological insulator Bi bilayer (Bi-BL) and IMTIs in the $MnBi_2Te_4$ family. Using angle-resolved photoemission spectroscopy (ARPES), the electronic structure of the interface is detected that uncovers the interaction of the substrate surface states with the Bi-BL states, in agreement with our DFT calculations. Further, our calculations predict exchange-split 1D topological states at the Bi-BL edges that may result in a number of intriguing quantum phenomena beyond the high temperature QAHE, such as TRS-broken QSHE phase and tunable Chern number system.



ARPES dispersion relations in the low energy region in the K – Γ – K direction of BZ of $MnBi_2Te_4$-family samples taken at 17 K before (upper panels) and after (lower panels) Bi deposition. The photon energies are 20 eV for (a,d,e,f,h), 9 eV for (b), 30 eV for (c,g).



Side view of the atomic structure of Bi-BL ribbon on top of $MnBi_2Te_4$ and spacial charge distribution of the 1D states calculated by means of DFT. ARPES measurements of the $MnBi_2Te_4$ surface before and after Bi-BL deposition are shown at the inset with superimposed DFT bandstructure.

Magnetic topological substrate "transfers" its unique properties to 2D bismuth film on top

DIPC HIGHLIGHT 2024

Enhancing haloarene coupling reaction efficiency on an oxide surface by metal atom addition

Abadia M, Piquero-Zulaica I, Brede J, Verdini A, Floreano L, Barth JV, Lobo-Checa J, Corso M, and Rogero C
Nano Letters 24, 1923 (2024)

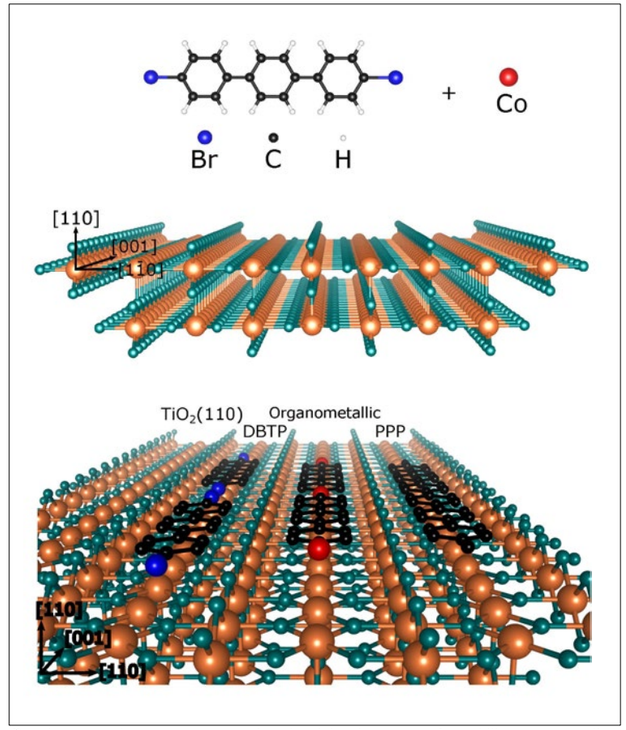
This study presents a new strategy for implementing the on-surface Ullmann-like reaction with high efficiency on poorly reactive semiconducting or insulating surfaces such as TiO_2(110), opening a promising avenue for synthesizing graphene-based nanostructures, such as graphene nanoribbons and nanoporous graphene structures, directly on more technologically relevant surfaces.

Throughout the past decade, on-surface chemistry has proven to be an extraordinary tool for building sp^2 bond-based carbon nanostructures with unprecedented atomic precision. Motivated by the fact that such carbon structures, which are hard to synthesize by common wet chemistry methods, have prominent electronic properties deserving implementation into electronic devices, the interest of exploring surface-induced molecular reactions has grown exponentially.

The Ullmann coupling reaction, in conjunction with a subsequent cyclodehydrogenation step, is recognized as the most promising pathway toward designing carbon-based nanostructures for molecular electronics on surfaces. However, bringing such materials into nanodevices remains a challenge, as the surface-assisted Ullmann reaction is mostly employed in ultrahigh vacuum (UHV) conditions on single-crystal noble metal substrates (gold, silver, and copper) given their catalytic activity. Nevertheless, these metal-adsorbed nanostructures present limitations since they remain electronically coupled to the underlying catalyzing substrate. Thus, the decoupling of the synthesized nanostructures must be achieved afterward for their implementation into devices, which is currently performed by cumbersome post-growth transfer methods.

The bottom-up synthesis of carbon-based nanomaterials directly on semiconductor surfaces allows for the decoupling of their electronic and magnetic properties from the substrates. However, the typically reduced reactivity of such nonmetallic surfaces adversely affects the course of these reactions.

Now, a team of researchers achieve a high polymerization yield (it is practically tripled) of halogenated polyphenyl molecular building blocks on the semiconducting TiO_2(110) surface via concomitant surface decoration with cobalt atoms, which catalyze the Ullmann coupling reaction.



On the top, the components involved in the on-surface Ullmann coupling reaction are shown: DBTP as the molecular precursor, cobalt as the external catalyst, and TiO_2(110) as the template substrate. On the bottom, the adsorption of DBTP on the TiO_2(110).

Metal additions boost key surface chemical reactions for future technologies

Specifically, cobalt atoms trigger the debromination of 4,4"-dibromo-p-terphenyl molecules on TiO_2(110) and mediate the formation of an intermediate organometallic phase already at room temperature. As the debromination temperature is drastically reduced (lowered by 55 K), homocoupling and polymerization readily proceed, preventing presursor desorption from the substrate and entailing a drastic increase of the poly-para-phenylene polymerization yield. The general efficacy of this mechanism is shown with an iodinated terphenyl derivative, which exhibits similar dehalogenation and reaction yield.

DIPC HIGHLIGHT 2024

Impact of single-melamine tautomerization on the excitation of molecular vibrations in inelastic electron tunneling spectroscopy

Alkorta M, Cizek R, Neel N, Frederiksen T, and Kroeger J
Nano Letters 24, 7195 (2024)

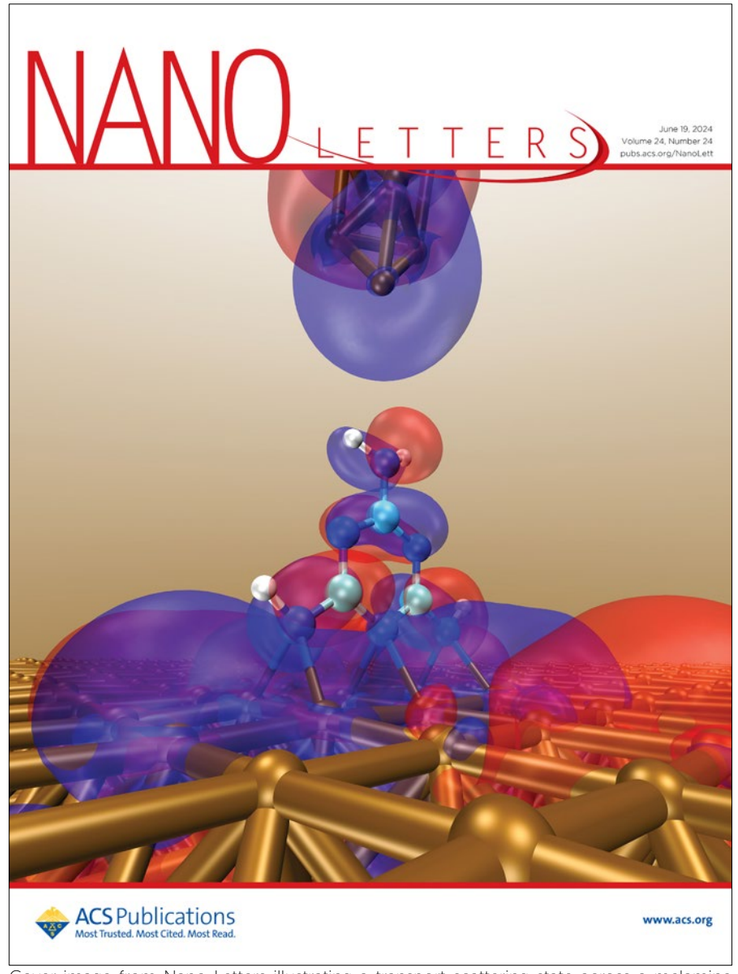
Understanding how molecular transformations affect quantum properties at the atomic scale is essential for advancing nanoscale electronics and surface chemistry. This study investigates how tautomerization in single melamine molecules modulates vibrational spectra using STM-IETS.

The reversible switching of a single melamine molecule on a copper surface reveals how minute changes in chemical structure can lead to measurable shifts in quantum mechanical behavior. Using inelastic electron tunneling spectroscopy (IETS) in a scanning tunneling microscope (STM), researchers observed significant changes in low-energy vibrational spectra following a tautomerization reaction— a subtle proton transfer within the molecule. This reaction, triggered by electron injection or by bringing the probe tip into contact with the molecule, alters the symmetry of the molecule and thereby modulates its inelastic electron scattering signature.

Key to the discovery is the identification of a redshift in an internal bending vibrational mode upon tautomerization, supported by detailed simulations. These changes are not merely structural curiosities—they demonstrate how electronic transport and vibrational coupling in a molecular junction are governed by both molecular conformation and the local electronic environment. Notably, forming a chemical bond between the scanning tip and the molecule not only quenched the inelastic signal but also effectively drove the tautomerization, suggesting a method to control molecular states mechanically and electronically.

Combining experimental scanning tunneling spectroscopy with advanced transport calculations allowed the researchers to pinpoint the active vibrational modes and identify symmetry rules that govern the observed signal changes. These findings provide foundational insights for designing molecular devices with switchable properties and contribute to our understanding of fundamental processes in single-molecule electronics.

Beyond its implications for molecular electronics, this study underscores the strength of combining precise experimental manipulation with theory driven interpretation in surface science. The ability to reversibly switch molecular states and resolve their vibrational signatures with sub-millivolt resolution showcases how far scanning probe techniques have advanced. The observed sensitivity of vibrational spectra to subtle structural and bonding changes highlights the value of IETS as a powerful diagnostic for probing reaction pathways at the atomic level. That bond formation with the STM tip can initiate tautomerization further demonstrates how mechanical and electronic interactions can be harnessed to explore chemical reactivity with single-molecule precision. Together, these results reflect significant strides in understanding and manipulating molecular behavior on surfaces.



Cover image from Nano Letters illustrating a transport scattering state across a melamine molecule on Cu(100) contacted with an atomically sharp STM tip.

Mechanically induced switching: Bonding the STM tip to the molecule triggers a reversible chemical transformation, paving the way for controllable molecular junctions

DIPC HIGHLIGHT 2024

Deceptive orbital confinement at edges and pores of carbon-based 1D and 2D nanoarchitectures

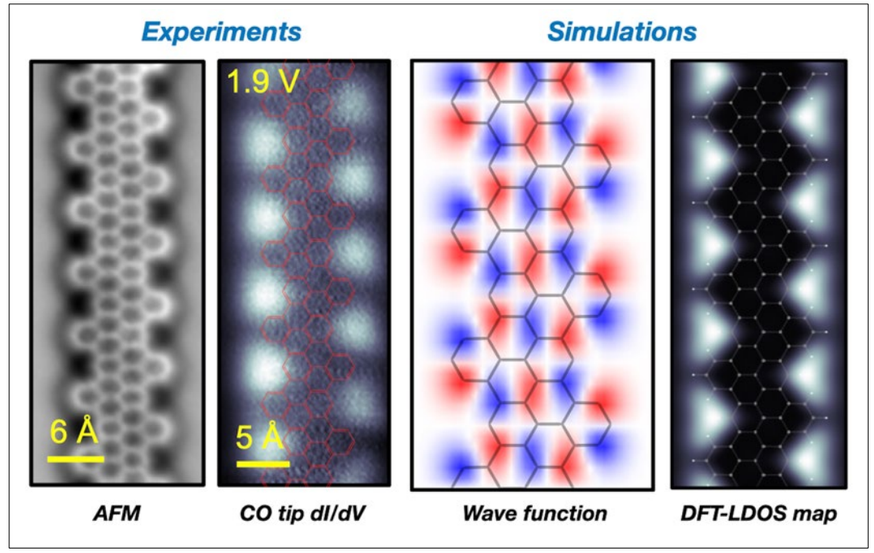
Piquero-Zulaica I, Corral-Rascón E, Diaz de Cerio X, Riss A, Yang B, Garcia-Lekue A, Kher-Elden MA, Abd El-Fattah ZM, Nobusue S, Kojima T, Seufert K, Sakaguchi H, Auwärter W, and Barth JV
Nature Communications 15, 1062 (2024)

Over the past decade, on-surface chemistry has enabled the atomically precise synthesis of target carbon-based nanoarchitectures, such as graphene nanoribbons and nanoporous graphene structures. The electronic properties of these materials are highly sensitive to single-atom variations in their atomic structure and chemical composition, making atomic-scale characterization tools essential.

Scanning tunneling microscopy (STM) is a powerful tool to explore the electronic structure of these nanoarchitectures with nanoscale resolution by correlating the measured dI/dV maps with the local electronic density of states.

However, Söde et al. found that the interpretation of STM experiments could misleadingly suggest electronic density confinement at the edges of uniform armchair graphene nanoribbons (GNRs), whereas theoretical predictions do not support the presence of intrinsically localized edge states. This deceptive confinement effect was attributed to a lack of cancellation between positive and negative regions of the wave function along the edges. Numerous subsequent studies have reported dI/dV data showing confinement of electronic density at the edges and pores of more complex geometries, yet there remains a lack of consensus on its interpretation.

In this work, researchers from DIPC in collaboration with researchers from the Technical University of Munich (TUM), Al-Azhar University and Kyoto University demonstrate that dI/dV mapping in carbon-based nanoarchitectures is influenced by a wave function decay effect that can result in a deceptive spatial distribution of electronic density. This effect is examined in semiconducting gulf-type GNRs and nanoporous graphene (NPG) structures synthesized on-surface, where dI/dV maps show the confinement of valence and conduction band states at the edges and nanopores of both structures. Density Functional Theory (DFT) calculations confirm that these measurements correspond to electronic states delocalized across the entire carbon nanoarchitecture, ruling out any intrinsic wave function localization. The deceptive confinement effect is explained by the faster decay of high-momentum Fourier components



On the left, atomic structure of a gulf-type GNR taken with atomic force microscopy (AFM), and the corresponding dI/dV map taken at positive bias voltage showing the confinement of conduction band states to the gulf-type edges. On the right, calculated conduction band state wave-function, which is delocalized over the entire GNR backbone, and the corresponding local density of states (LDOS) map simulation at realistic tip-sample distances, their spatial dependence being quite different. The LDOS map simulations account for the Fourier filtering effect and reproduce the experimental data.

STM measurements are subject to a wave function decay into the vacuum that masks the undisturbed electronic orbital shape

of the wave function into the vacuum region above the sample. As the wave function decays to realistic tip-sample distances, only the lowest momentum Fourier components contribute to its spatial distribution, which appears localized at the edges and nanopores.

Although the decay of electronic orbitals into vacuum is a well-known effect observed in many surfaces and molecular assemblies, the unique edge and nanopore morphologies significantly influence the apparent orbital confinement in carbon-based nanoarchitectures. Thus, this work provides crucial understanding for the accurate interpretation of STM experiments and highlights the essential insights provided by theoretical calculations.

DIPC HIGHLIGHT 2024

Uncovering low-frequency vibrations in surface-enhanced Raman Scattering of organic molecules

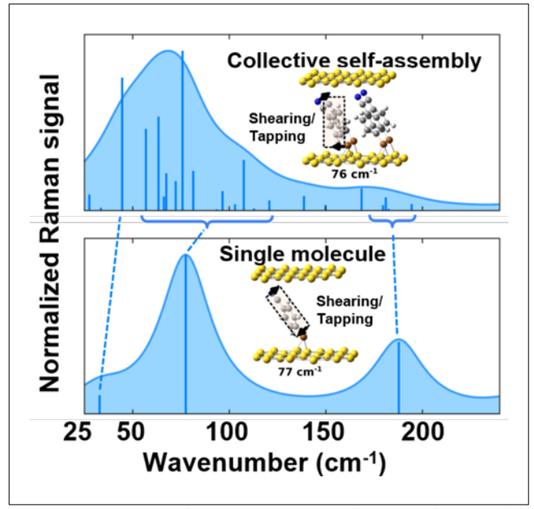
Boehmke Amoruso A, Boto RA, Elliot E, de Nijs E, Esteban R, Foldes T, Aguilar-Galindo F, Rosta E, Aizpurua J, and Baumberg JJ
Nature Communications 15, 6733 (2024)

Raman Scattering is a powerful spectroscopic technique to optically characterize molecules by interrogating their vibrational properties. When molecules are placed near the surface of metallic nanocavities that confine light into extremely small regions through plasmonic resonances, the resulting Surface-Enhanced Raman Spectroscopy (SERS) signal becomes enhanced, and thus sensitive to tiny amounts of analyte, and even to single molecules.

However, most of the research on SERS of organic molecules focuses on vibrations of relatively large energy, associated with the localized motion of a specific bondings involving two or three atoms within the molecule. Typical vibrational modes of this kind are, for instance, stretching or bending modes within pairs of atoms, which show scattering peaks at a particular wavevector values running from about 200 cm^{-1} up to 3,000 cm^{-1} in the Raman spectrum. These vibrations serve to identify the presence of a particular metabolite, or the occurrence of a specific chemical reaction.

A much less explored, and often elusive range of vibrational energies in the Raman spectrum occurs for wavevector excitation below 200 cm^{-1}, reaching even a few tens of cm^{-1} in the TeraHertz range (THz). These low-energy vibrational modes involve more complex motions along the molecule, often involving many atoms, or even collective motion along chains of molecules where the vibrational modes acquire a phonon-like propagating nature. To access this regime of low-energy vibrational excitation is very challenging experimentally, as these vibrational peaks are often masked by a strong emission background. The theoretical interpretation of the modes is equally challenging as the motion of several hundreds atoms in complex motions along molecular rings and chains, requires a considerable capacity of computation and classification.

In this work, researchers at DIPC and the Center for Materials Physics in San Sebastian, together with the Nanophotonics group at the University of Cambridge, analyze the low-energy vibrations of SERS spectra of seven canonical organic molecules forming self-assembled monolayers sandwiched in Nanoparticle-on-a-Mirror (NPoM) plasmonic structures. By combining a careful experimental procedure to eliminate the strong low-energy background with quantum simulations of the low-energy vibrational modes that include the details of the chemical interaction between the molecules in the layer as well as with the metallic surface, the authors unveil and classify the main THz spectral features of such molecular assemblies. The results show that the low-energy vibrations are sensitive to molecule-molecule interactions and to the atomistic configuration with respect to the metallic surface, which could lead to improved characterization of molecule-metal interactions at the atomic scale. Furthermore, by exploiting the formation of metallic picocavities (atomic protrusions further localizing the electromagnetic field produced within the NPoM cavity), light is able to excite vibrations in only one or very few individual molecules of the whole assembly, and thus narrow SERS spectral features can be observed. This indicates that the broad THz lines observed in a typical SERS experiment can be largely attributed to inhomogeneous broadening and molecule-molecule interactions. The use of plasmonic nanocavities and picocavities could thus open a novel roadmap to access the elusive THz vibrations in SERS.



Example of some of the low energy vibrations identified in the Raman spectra of molecules self-assembled in a nanocavity. The vibrational modes are associated with tapping/shearing motion of atoms along the molecule. A comparison of the vibrational modes as theoretically obtained with (top) and without (bottom) molecule-molecule interactions reveals the presence of collective phononic effects at these low energies along the self-assembly. The vibrations of the single molecules (marked by vertical lines in the bottom panel) split into multiple hybridized vibrations once the molecule-molecule interactions are included, providing a key ingredient to interpret SERS spectra at THz frequencies.

Low-energy vibrations in SERS at THz frequencies experimentally revealed and theoretically interpreted in state-of-the-art plasmonic nano- and pico-cavities

DIPC HIGHLIGHT 2024

On-chip phonon-enhanced IR near-field detection of molecular vibrations

Bylinkin A, Castilla S, Slipchenko TM, Domina K, Calavalle F, Pusapati V-V, Autore M, Casanova F, Hueso LE, Martin-Moreno L, Nikitin AY, Koppens FHL, and Hillenbrand R
Nature Communications 15, 8907 (2024)

Molecules have some sort of fingerprints, unique features that can be used to differentiate them. Each type of molecule, when illuminated with the right light, vibrates at a characteristic frequency (its resonance frequency, which typically occurs at infrared frequencies) and strength. Similar to what can be done with human fingerprints, one can exploit this information to distinguish different types of molecules or gases from each other. That can also protect us from potential dangers, by identifying poisonous and dangerous substances or gases instead of criminals.

One conventional approach is infrared fingerprint spectroscopy, which uses infrared reflection or transmission spectra to identify different molecules. However, the small size of organic molecules compared to the infrared wavelength results in a weak scattering signal, making it challenging to detect small quantities of material. In recent years, this limitation has been addressed using Surface-Enhanced Infrared Absorption (SEIRA) spectroscopy. SEIRA spectroscopy leverages infrared near-field enhancement provided by rough metal surfaces or metallic nanostructure to amplify the molecular vibrational signals. The main advantage of SEIRA spectroscopy is its ability to measure and study minute material quantities.

Recently, phonon polaritons—coupled excitations of electromagnetic waves with atomic lattice vibrations—particularly hyperbolic phonon polaritons in thin layers of hexagonal boron nitride (h-BN), have emerged as promising candidates for boosting the sensitivity of SEIRA spectroscopy. Previously, we demonstrated that phonon polaritons can be applied for SEIRA spectroscopy of nanometer-thin molecular layers and gas sensing, thanks to their long lifetimes and ultra-high field confinement.

However, SEIRA spectroscopy remains a far-field technique that requires bulky equipment, such as light sources, SEIRA substrates, and typically nitrogen-cooled infrared detectors. This reliance on large instruments limits its potential for miniaturization and on-chip applications. In parallel, we have been investigating graphene-based infrared detectors that operate at room temperature, and we have shown that phonon polaritons can be electrically detected and can enhance detector sensitivity.

By combining these two progresses, a team of researchers has now successfully demonstrated the first on-chip phononic SEIRA detection of molecular vibrations. This result was made possible through the joint experimental efforts of CIC nanoGUNE and ICFO researchers, along with theoretical support from the groups of Dr. Alexey Nikitin at DIPC and Prof. Luis Martín-Moreno at the Instituto de Nanociencia y Materiales de Aragón (CSIC- Universidad de Zaragoza). The researchers employed ultra-confined HPhPs to detect molecular fingerprints in nanometer-thin molecular layers directly in the photocurrent of a graphene-based detector, eliminating the need for traditional bulky IR detectors.

Image credit: Dr. David Alcaraz, ICFO

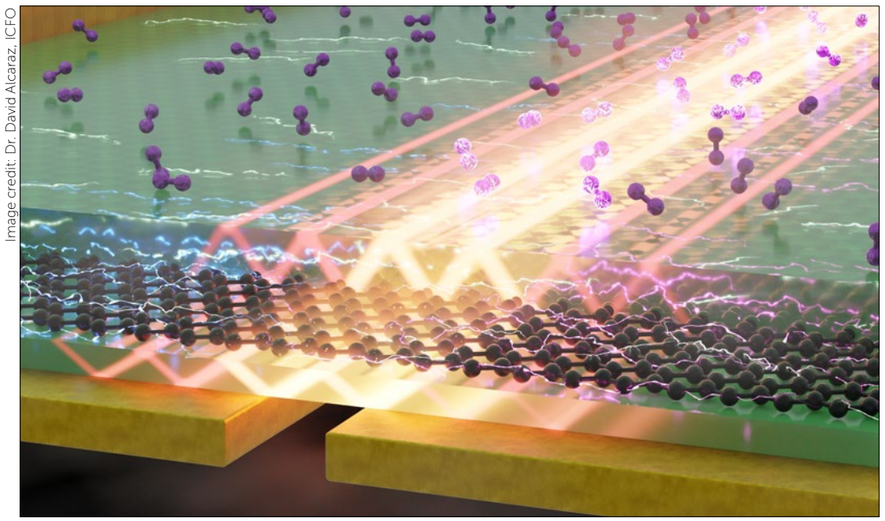


Illustration of an on-chip molecular vibration sensor based on a graphene IR detector, where phonon polaritons (bright rays) enhance the molecular fingerprint signal encoded in the photocurrent.

Graphene-based sensor reads molecular fingerprints through electric current at room temperature.

One of the most exciting aspects of this approach is that this graphene-based detector opens the way towards miniaturization. By integrating this detector with microfluidic channels, we could create a true ‘lab-on-a-chip’, capable of identifying specific molecules in small liquid samples— paving the way for medical diagnostics and environmental monitoring.

In a longer-term picture, we believe that on-chip infrared detectors operating at room temperature could enable rapid molecular identification, potentially integrated into smartphones or wearable electronics. We further believes that this would offer a platform for compact sensitive, room-temperature infrared spectroscopy.

DIPC HIGHLIGHT 2024

Fluorescence imaging of individual ions and molecules in pressurized noble gases for barium tagging in ^{136}Xe

Byrnes NK, Dey E, Foss FW, Jones BJP, Madigan R, McDonald AD, Miller RL, Norman LR, Navarro KE, Nygren DR, and NEXT Collaboration
Nature Communications 15, 10595 (2024)

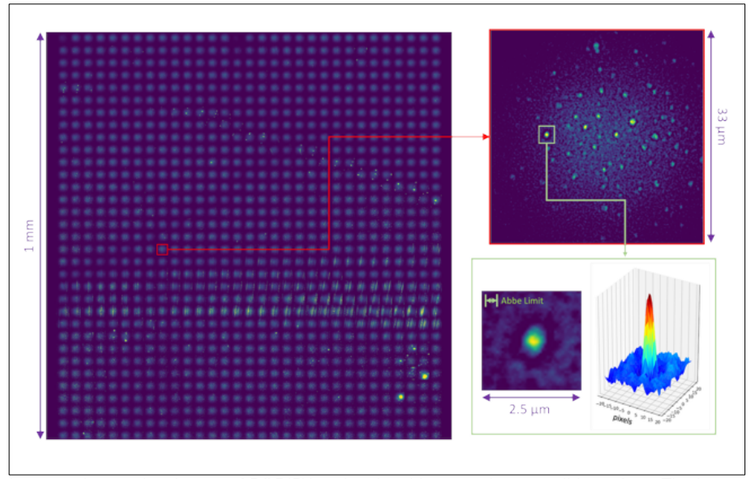
The search for neutrinoless double beta decay (0νββ) remains one of the most important searches in particle physics, as its discovery would confirm the Majorana nature of neutrinos and might provide experimental basis to theories that can explain the asymmetry between matter and antimatter in the universe.

A promising avenue to enable a background-free search involves tagging the barium ion (Ba^{2+}) produced in the decay of ^{136}Xe, together with the emission of two electrons. This technique is being pioneered by the NEXT collaboration and in this study the authors report the first demonstration of selective imaging of individual Ba^{2+} ions at the gas-solid interface in a pressurized noble gas, achieving a crucial technological milestone for barium tagging.

Using molecular chemosensors specifically designed for Ba^{2+}, the researchers were able to detect fluorescence signals from single ions within 10 bar of xenon gas. The ions were resolved with a diffraction-limited optical system over a 1 × 1 cm^2 scan area. This setting closely mimics the conditions that would be found in a future large-scale xenon gas detector. The ability to image individual ions under these conditions represents a major step forward, overcoming challenges such as maintaining optical resolution and suppressing background signals in dense gases.

This achievement significantly strengthens the feasibility of background-free 0νββ searches. Additionally, the microscopy platform developed for this experiment opens a new window into the photophysics of fluorescent molecules and chemosensors at the solid-gas interface.

The system can be implemented within the pressure vessel of a time projection chamber such the one of the NEXT experiment with only small modifications. As such, this result advances the technology available for 0νββ experiments and introduces a powerful method for studying single-molecule phenomena under conditions previously inaccessible. Imaging single Ba^{2+} ions in xenon represents a critical step toward realization of a background-free, ton-to-multi-ton scale 0νββ experiment based on barium tagging.



Large scale raw data image of BODIPY molecules drip-coated onto a slide surface. The image is resolved with point-spread function close to the Abbe Diffraction Limit. Bright points consistent with single molecule fluorescence are observed over a scan region of 1 mm^2.

Single Ba^{2+} ions have been imaged in high pressure xenon gas using turn-on fluorophores, representing the first demonstration of imaging of individual Ba^{2+} ions within a candidate active medium of a time projection chamber for 0νββ

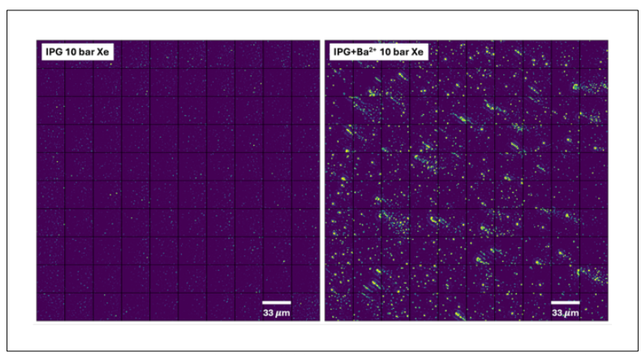


Image of a slide spin-coated in IPG-1 chemosensor, showing the activity with (right) and without (left) added Ba^{2+}.

DIPC HIGHLIGHT 2024

A deep learning method that identifies cellular heterogeneity using nanoscale nuclear features

Carnevali D, Zhong L, González-Almela E, Viana C, Rotkevich M, Wang A, Franco-Barranco D, Gonzalez-Marfil A, Neguembor MV, Castells-Garcia A, Arganda-Carreras I, and Pia Cosma M
Nature Machine Intelligence 6, 1021 (2024)

Technology paves the way for new diagnostic and monitoring strategies for disease by capturing and scanning images of cells. The tool, AINU (AI of the NUcleus), scans high-resolution images of cells.

The images are obtained with a special microscopy technique called STORM, which creates a picture that captures many finer details than what regular microscopes can see. The high-definition snapshots reveal structures at nanoscale resolution. The AI can detect rearrangements inside cells as small as 20 nm, or 5,000 times smaller than the width of a human hair. These alterations are too small and subtle for human observers to find with traditional methods alone.

AINU is a convolutional neural network (CNN), the same type of AI behind facial recognition and self-driving car vision. In medicine, CNNs help detect signs of disease in images like mammograms or MRIs. AINU uses this visual intelligence to analyze how cellular components are arranged in 3D, especially within the nucleus.

Researchers trained AINU using nanoscale images of many different cells. The AI learned to distinguish between normal and cancerous cells based on nuclear features like DNA organization or enzyme distribution. It also spotted early signs of infection by herpes simplex virus type-1 — detecting changes just one hour after infection, long before symptoms appear.

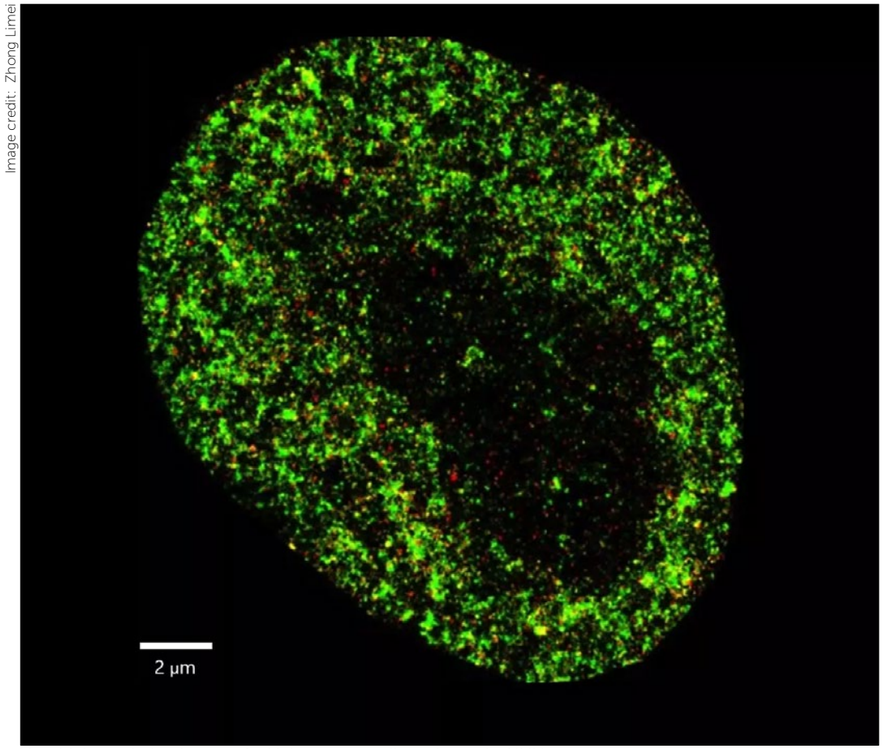
Our method sees microscopic nuclear changes immediately after a virus enters. This could help in diagnosing infections faster, or in designing better treatments and vaccines.

The ultimate goal is to use AINU clinically, allowing doctors to detect disease or infection from simple blood or tissue samples. However, current STORM imaging is only available in specialized labs, and it captures only a few cells per scan. Clinical applications would require broader imaging and more accessible equipment.

Despite these hurdles, AINU is already proving valuable in research. It accurately identifies pluripotent stem cells—cells that can become any other cell type — without relying on animal testing. AINU offers a faster, more ethical way to spot high-quality stem cells, helping make therapies safer.

This technology could one day personalize treatments and improve outcomes. With such precise information, we hope to give doctors a head start in diagnosing and treating disease.

Image credit: Zhong Limei



Very high resolution image of a HeLa cancer cell used to train AINU.

Our method can detect cells that have been infected by a virus very soon after infection begins

DIPC HIGHLIGHT 2024

Efficient near-infrared organic light-emitting diodes with emission from spin doublet excitons

Cho HH, Gorgon S, Londi G, Giannini S, Cho C, Ghosh P, Tonnelé C, Casanova D, Olivier Y, Baikie TK, Li F, Beljonne D, Greenham NC, Friend RH, and Evans EW
Nature Photonics 18, 905–912 (2024)

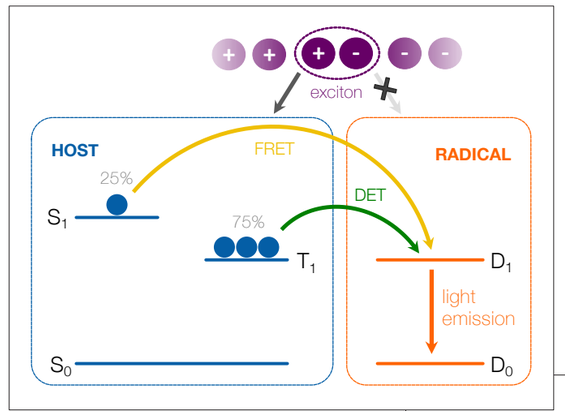
The development of luminescent organic radicals has resulted in materials with excellent optical properties for near-infrared (NIR) emission. Light generation in this range could be used for organic light-emitting diodes (OLEDs), as well as healthcare diagnosis and treatment to surveillance, communications and other security applications.

Although an external quantum efficiency greater than 20% in electroluminescence has been demonstrated for visible-light OLEDs, and commercial displays are commonplace, the performance of NIR OLEDs is generally limited to 5% external quantum efficiency using fully organic emitters with emission peak wavelengths at 800 nm and longer. The materials approach and mechanisms for efficient visible-light OLEDs by maximizing luminescence from singlet and triplet excitons have not translated to efficient NIR OLEDs.

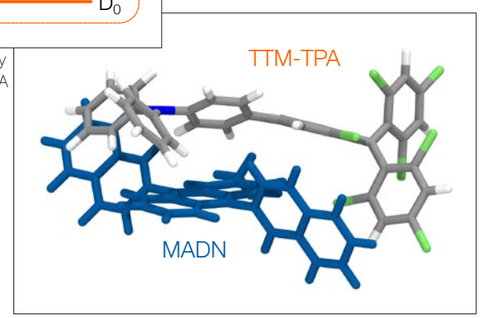
Doublet fluorescence from organic radicals is an emerging basis for the development of highly efficient NIR light-emitting devices that exploit favorable optical, electronic and spin properties. Almost 100% internal quantum efficiency for electroluminescence was demonstrated in radical OLEDs exploiting tris(2,4,6-trichlorophenyl)methyl (TTM)-based radicals. This performance shows that using radical emitters with spin-allowed doublet emission is a conceptually superior solution to elegantly circumvent the spin statistics limited efficiency issue inherent to conventional closed-shell organic materials (25% internal quantum efficiency).

Although the unpaired electron arrangements of radicals enable efficient radiative transitions within the doublet-spin manifold in organic light-emitting diodes, their performance is limited by non-radiative pathways introduced in electroluminescence.

Now, a team of researchers uses a host-guest design for organic light-emitting diodes that exploits energy transfer with a boost of external quantum efficiency for 800 nm emission. The tris(2,4,6-trichlorophenyl)methyl-triphenyl-amine (TTM-TPA) radical guest is energy-matched to the triplet state in a charge-transporting anthracene-derivative (MADN) host.



Schematic illustration of intersystem dual energy transfer between host MADN and radical TTM-TPA in doublet electroluminescence devices.



Spin-allowed energy transfer and state matching drive efficient delayed emission, offering a pathway to minimize non-radiative losses in NIR devices

The researchers show from optical spectroscopy and quantum-chemical modelling that reversible host-guest triplet-doublet energy transfer allows efficient harvesting of host triplet excitons. The luminescent NIR radical system is implemented in high-performing OLEDs with a maximum external quantum efficiency of 9.6% for electroluminescence at 800 nm that operate to the high maximum radiance of ~68,000 mW sr^{-1} m^{-2}, with low efficiency roll-off and enhanced stability. This new design boosts performance in radical-based OLEDs and has broad implications for reducing non-radiative losses in devices beyond light-emitting applications with NIR light.

Bending rigidity, sound propagation and ripples in flat graphene

Aseginolaza U, Diego J, Cea T, Bianco R, Monacelli L, Libbi F, Calandra M, Bergara A, Mauri F, and Errea I
Nature Physics 20, 1288 (2024)

Understanding why 2D materials are stable remains in some ways unsolved. This paper, led by the Quantum Theory of Materials group at CFM, with the participation of DIPC associates, brings together various factors that are important — symmetry and anharmonicity — and combines them to propose a resolution to this long-standing puzzle.

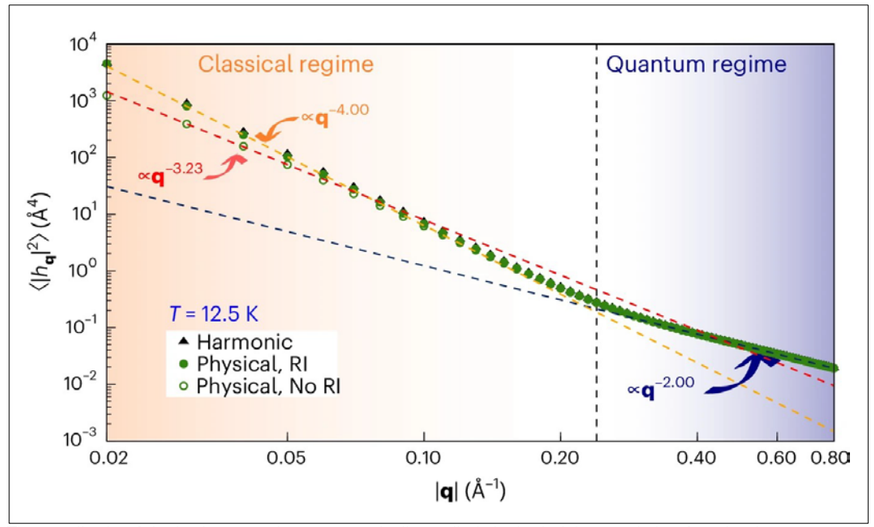
This study addresses a longstanding puzzle in the mechanical understanding of graphene and all two-dimensional (2D) materials: how out-of-plane flexural vibrations (bending modes) behave and how they affect physical properties like sound propagation and bending rigidity. The core finding is that rotational symmetry protects the quadratic dispersion of these flexural modes, even when accounting for anharmonic phonon–phonon interactions. This makes the bending rigidity non-divergent, challenging previous theories.

In the standard harmonic approximation, flexural vibrations in graphene are predicted to have a quadratic dispersion. However, this leads to the unphysical result that in-plane acoustic waves cannot propagate sound, prompting some to argue that interactions between phonons must linearize the dispersion. While this explanation permits sound propagation, it leads to a paradox: the bending rigidity becomes dependent on the system size, suggesting it diverges — an unsatisfactory outcome for a material known for its remarkable strength.

The authors propose a resolution based on a symmetry principle. Both harmonic and anharmonic phonons are derived from second derivatives of energy functions — the potential energy in the harmonic case and the full free energy in the anharmonic case — both of which are rotationally invariant. This symmetry requires that the dispersion of flexural modes remains quadratic even with anharmonic interactions.

The theory was tested using atomistic simulations and membrane models, and both confirmed that the quadratic nature of the flexural modes is preserved. Importantly, while a quadratic dispersion in the harmonic theory prevented sound propagation, in the anharmonic framework sound still propagates as it has to.

One major implication is that the bending rigidity remains finite, regardless of the system size — overturning the common assumption that it diverges due to linearized flexural modes.



The amplitude of ripples in a membrane are typically studied via the height correlation function in momentum space, $\langle |h_q|^2 \rangle$. Here, the height fluctuations of graphene are presented from the Fourier transform of the height–height correlation function, versus the wave number q, at 12.5 K. When there is the full rotational invariance (RI), the physical result scales as q^{-4} in the classical regime; but the exponent is lower when rotational invariance is broken (no RI). The physical RI results coincides practically with the harmonic solution. Bending rigidity scales as the correlation function times q^4 and so diverges in the absence of rotational symmetry, though not when rotational symmetry holds.

This paper addresses the long-standing puzzle of 2D material stability by unifying key factors such as symmetry and anharmonicity into a proposed resolution

While these results significantly improve our understanding of 2D materials' mechanical behavior, they apply only to ideal, unstrained, flat systems. In real-world applications, substrates or external strains might break rotational symmetry, altering such behavior. Future work will investigate whether static ripples naturally form in unstrained graphene and if their formation is energetically favorable.

Ultimately, this work provides a new, symmetry-based framework for understanding thermal and mechanical properties of all 2D materials like graphene.

DIPC HIGHLIGHT 2024

Detection of a universal core-halo transition in dwarf galaxies as predicted by Bose-Einstein dark matter

Pozo A, Broadhurst T, de Martino I, Chiueh T, Smoot GF, Bonoli S, and Angulo R
Physical Review D 110, 043534 (2024)

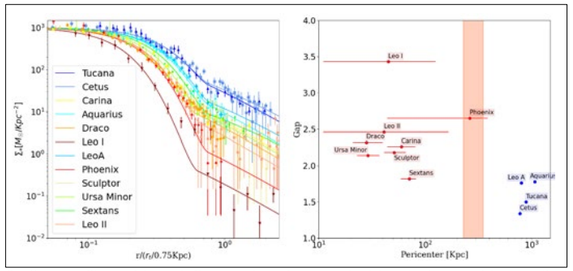
In this work, we analyze stellar profiles and velocity dispersions of a representative sample of dwarf galaxies, including both Milky Way satellites and isolated Local Group members. We find that all these systems exhibit a clear core-halo structure, with a pronounced transition in density at a radius of approximately 1 kpc.

Such a structure is unexpected in the standard CDM paradigm, which predicts cuspy, concentrated density profiles with no inherent transition. Instead, the observed profiles align remarkably well with the predictions of Bose-Einstein condensate dark matter (ψDM), a model where dark matter behaves as a coherent wave. ψDM naturally forms a dense central soliton core surrounded by a diffuse halo generated by wave interference patterns.

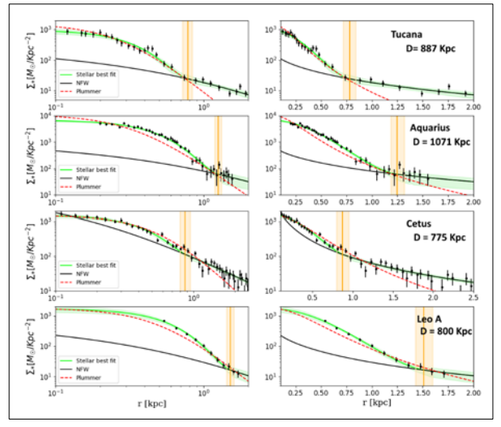
We show that the observed stellar density profiles are well fit by the ψDM core-halo structure, with only one free parameter: the boson mass. Additionally, we find that the measured velocity dispersions in these galaxies peak at the core radius and decline outward—again, consistent with the ψDM prediction. This agreement supports a boson mass of approximately 1.5×10^{-22} eV, in line with independent dynamical modeling.

These findings suggest that stars in these dark-matter-dominated galaxies trace the underlying wave structure of a quantum dark matter field. Light bosonic particles, such as axions predicted by string theory, provide a compelling alternative to heavy particle dark matter in explaining the structure and kinematics of dwarf galaxies.

Our results provide observational support for ψDM and reinforce the idea that core-halo transitions are not exceptional features, but rather a generic signature of wave dark matter dynamics.

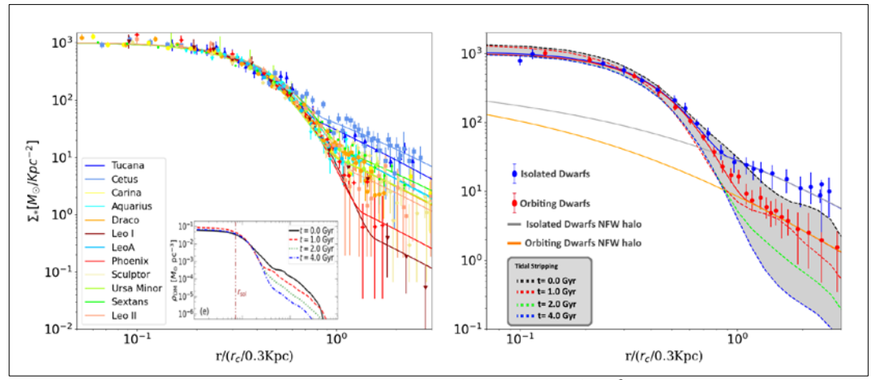


Stellar profiles of Local Group dwarfs, rescaled by their transition radius, reveal a common core-halo structure, with orbiting dwarfs showing more pronounced gaps correlated with their pericenter distance from the Milky Way.



A common core-halo structure is observed in dwarf galaxies, with a sharp density transition near 1 kpc

Isolated Dwarf Galaxies: This figure shows the star count profiles versus dwarf galaxy radius for the well studied "isolated" dwarf galaxies in the local group, lying outside the virial radius of the Milky Way. (In the right panels D˜ shows the distance from the Milky Way galaxy center.) Each dwarf galaxy has an extended halo of stars stretching to ~2 kpc and most evident on the linear scale of right hand panel. Cores are also evident on a scale <1 kpc in each dwarf. A standard Plummer profile (red curve) is seen to fit approximately the core region but falls well short at large radius. Our predictions for light boson dark matter, ψDM, are shown in green, where the distinctive soliton profile provides an excellent fit to the observed cores with the surrounded halo of excited states that average azimuthally to an approximately NFW-like profile beyond the soliton radius. The observed cores are in excellent agreement with the predicted soliton, best seen on a log scale in the left panels, and the predicted ψDM halo (grey curve) is also seen to match well the observed halos, including the characteristic density.

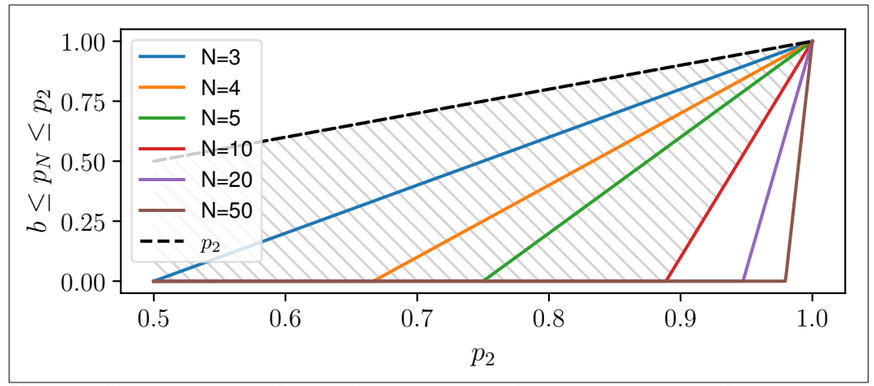


The left hand panel compares all the dwarf profiles scaled (Σ_{0*} = 1000 M /Kpc^{-2}) and all the core radii set to 0.3 kpc. The profiles are very similar in the core region, differing in the extended halo region relative to the core, with the isolated galaxies (bluer colors) having denser halos than the orbiting dwarfs (redder colors). The right hand panel shows the projected simulation profiles for ψDM by Schive, Chiueh & Broadhurst (2020), where little dependence on the degree of tidal stripping is predicted for the core region, in contrast to the halo region bracketed in grey where stripping is significant. The duration of stripping is indicated by the legend and also shown in the inset of the left hand panel spanning 1–4 Gyrs, and matching well the observed range of halo profiles. Note, the simulations predict the halo slope is relatively shallow and fairly independent of the degree of stripping, in good agreement with the mean halo profile of the isolated dwarfs (averages of the normalized profiles shown in the left panel, blue data) and the orbiting dwarfs (red data points), including the larger core-halo transition of the orbiting dwarfs. The NFW profile fits to the halos are also shown and can be seen to fall well below the prominent cores. These last two (orange and grey lines) are examples of the required pure NFW profiles that fit the observed stellar halo slopes of the isolated and orbiting dwarfs, respectively.

DIPC HIGHLIGHT 2024

Indistinguishability of identical bosons from a quantum information theory perspective

Englbrecht M, Kraft T, Dittel C, Buchleitner A, Giedke G, and Kraus B
Physical Review Letters 132, 050201 (2024)



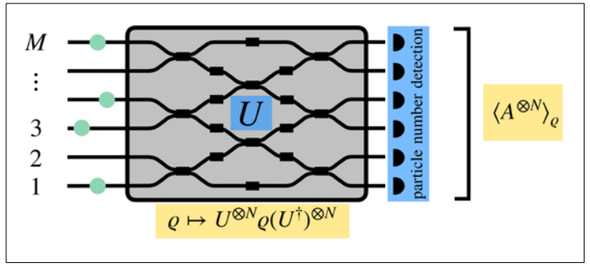
Boson sampling experiments and linear-optics quantum computing send a large number of photons through an interferometer and measure the particle number in the output ports. The difficulty of classically simulating this process depends on how indistinguishable the input photons are.

Fundamentally, all identical particles are indistinguishable. This has profound consequences for the properties of many-body systems and plays a crucial role for certain bosonic quantum computing approaches such as boson sampling or the KLM scheme that are based on letting many photons interfere in a multi-mode interferometer and only measure the photon number in the output modes.

In practice, not all degrees of freedom of the bosons can be perfectly controlled (e.g., due to time jitter or frequency fluctuations of the photon source). This raises the question how good a given state of N bosons is and to judge the quality of a many-boson state or the source that produces it. A practically relevant question is whether these bosons behave indistinguishably if they coincide in all accessible degrees of freedom or not because of other, inaccessible degrees of freedom that distinguish them.

This paper develops a general way to quantify how indistinguishable identical bosons are in quantum experiments involving linear optics. Using ideas from quantum information theory, the authors define a measurable quantity p_N, the expectation value of the projector on the symmetric N-particle subspace, that captures how "boson-like" the particles are, even when they may have hidden differences. This generalizes and unifies previous definitions of many-particle indistinguishability. However, like all these quantities, for large particle number p_N is exponentially difficult to measure or compute. But the authors derive a lower bound in terms of a two-particle indistinguishability measurement, that can be efficiently obtained and that provides a tight bound for highly indistinguishable states. Additionally, the authors show that the measurements enabled by the interferometric setting are tomographically complete (that is, they allow to distinguish all states that are distinct in terms of their accessible degrees of freedom) and introduce a compatible notion of what it means for states to describe perfectly distinguishable bosons and show that the set of these states is not convex.

For many photons and modes, p_N is exponentially hard to compute or measure. But it can be bounded from below using the two-particle indistinguishability p_2.



States of many indistinguishable photons are a resource for quantum computation. Here we derive a general method to quantify how indistinguishable the photons are

Universal features of entanglement entropy in the honeycomb Hubbard model

D'Emidio J, Orus R, Laflorencie N, and de Juan F
Physical Review Letters 132, 076502 (2024)

Entanglement entropy is a measure of the degree of quantum entanglement between two subsystems constituting a two-part composite quantum system. But entanglement entropy also quantifies the information shared between a subsystem and its environment in a quantum many-body wavefunction.

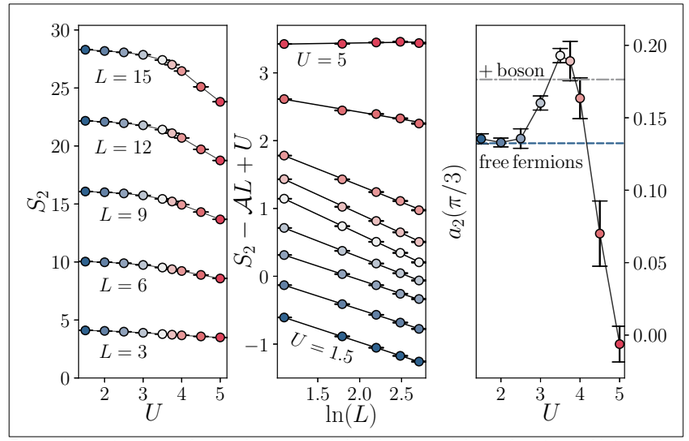
Interestingly, the finite-size scaling form of entanglement entropy has contributions that depend uniquely on universal physical quantities, making it a powerful probe to characterize strongly correlated systems. A widely known example of this is found in one-dimensional critical systems, where entanglement entropy grows logarithmically in the subsystem size with a prefactor given by the central charge.

In two dimensions, things get more complicated. On one hand, the leading term of the entanglement entropy grows at most proportionally with the boundary of the subsystem, the so-called "area law". On the other, if the subsystem contains sharp corners, critical ground states display a subleading universal logarithmic contribution.

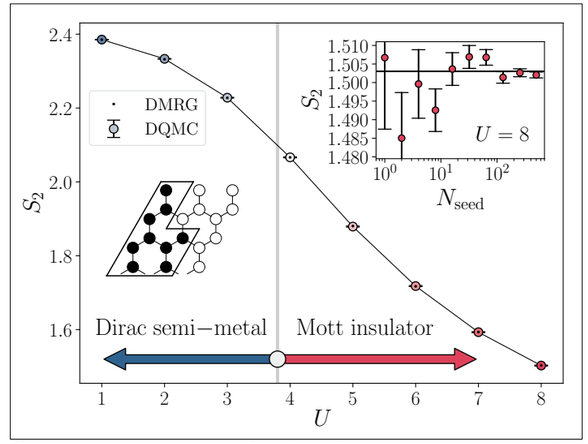
Despite a wide variety of numerical work investigating spin and boson systems, the universal features of entanglement entropy of two-dimensional interacting fermions have remained, for the most part, an unexplored frontier. The pioneering work of Grover introduced auxiliary-field determinental quantum Monte Carlo (DQMC) simulations as a promising route to large-scale calculations of the Rényi entanglement entropy of interacting fermions. But the sampling from uncorrelated replica configurations make the estimator suffer from rare events that dominate the statistical average. Consequently, the universal features of entanglement entropy in 2D have remained out of reach for these methods.

Now, a team of researchers presents an improved method to compute the Rényi entanglement entropy in DQMC that solves the above mentioned sampling problem and enables unprecedented precision. To do so, the team develops an improved equilibrium method for DQMC simulations.

The approach harnesses the power of importance sampling by introducing an extended ensemble of Monte Carlo configurations in which the entangling region is allowed to fluctuate. Remarkably, the original Grover's formulation admits such an extended ensemble that can be simulated efficiently using standard DQMC techniques. To demonstrate the power of this technique, the scientists use it to study a benchmark system, a classic model of interacting fermions in two dimensions, the half-filled honeycomb Hubbard model at T = 0. Doing so, they detect, for the first time, logarithmic corrections to the area law in a 2D model of interacting fermions. Importantly, they find that such logarithmic terms can be sensitive to the type of entanglement cut that is used.



Entanglement entropy for the honeycomb Hubbard model as a function of interaction strength. The inset shows the fluctuating entangling region used to compute the entanglement entropy.



Entanglement entropy as a function of system size and interaction strength U in a triangle geometry. The method extracts for the first time the corner subleading logarithmic corrections and shows their interaction dependence, peaking at the critical point U=3.8.

A new Quantum Monte Carlo method exploiting importance sampling computes subleading logarithmic corrections to entanglement entropy, opening the way to a reliable path to probe quantum critical effects through entanglement

DIPC HIGHLIGHT 2024

Evolution of superconductivity in twisted graphene multilayers

Long M, Jimeno-Pozo A, Sainz-Cruz H, Pantaleon PA, and Guinea F.
Proceedings of the National Academy of Sciences 121, e2405259121 (2024)

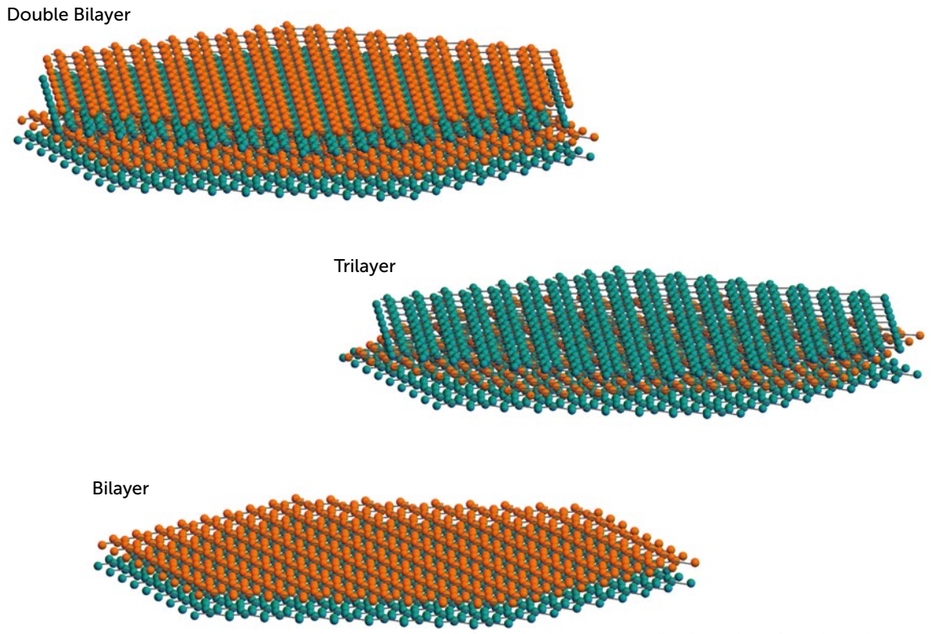
Superconductivity, the phenomenon where electrical current flows without resistance, holds promise for revolutionizing technologies, from power grids to magnetic levitation. This study delves into the intriguing world of graphene based superconductors, shedding light on how twisting multiple layers of graphene can influence their superconducting properties.

The angle at which graphene layers are twisted plays a pivotal role in determining their electronic properties. When layers are misaligned by a "magic angle" of approximately 1.1 degrees, the electronic interactions between the layers create a unique energy landscape. This configuration leads to the formation of "moiré patterns", large-scale interference patterns that significantly alter the material's electronic behavior. In twisted bilayer graphene, these moiré patterns have been linked to the emergence of superconductivity and other correlated electronic phases.

Building upon the insights from twisted bilayer graphene, this study is focused on "twisted double bilayer graphene" and "helical trilayer graphene." In twisted double bilayer graphene, two bilayer graphene sheets are stacked with a twist, while helical trilayer graphene consists of three layers twisted in a specific sequence. These configurations introduce new complexities and opportunities in understanding superconductivity.

The researchers employed advanced theoretical models to analyze how long-range charge fluctuations —variations in the distribution of electric charge over distances— affect superconductivity in these multilayer graphene systems. Their findings reveal that the critical temperature and the order parameter differ significantly between twisted double bilayers and helical trilayers on one hand, and twisted bilayer graphene on the other. The temperature at which a material becomes superconducting, known as the critical temperature, differs significantly between the systems studied. Twisted double bilayer and helical trilayer graphene exhibit distinct critical temperatures compared to twisted bilayer graphene, suggesting that adding more layers and varying twist angles can tune the superconducting properties. The order parameter is a measure that describes the state of the superconducting phase. Variations in this parameter among the different graphene configurations indicate that the nature of the superconducting state changes with the number of layers and their arrangement.

The study highlights the role of moiré Umklapp processes, interactions where electrons scatter in a manner influenced by the moiré pattern. These processes differ between the systems, contributing to the observed variations in superconducting behavior.



Configuration of graphene layers.

Differences in the arrangement of graphene layers point out to the origin of superconductivity

Understanding how twisting and layering graphene affects its superconducting properties is more than an academic pursuit; it has practical implications for developing advanced materials and technologies. By manipulating the twist angles and stacking sequences, scientists can engineer graphene-based materials with tailored superconducting characteristics, potentially leading to more efficient energy transmission, novel electronic devices, and quantum computing components.

DIPC HIGHLIGHT 2024

Catalog of topological phonon materials

Xu Y, Vergniory MG, Ma DS, Mañes JL, Song ZD, Bernevig BA, Regnault N, and Elcoro L
Science 384, eadf8458 (2024)

The spectrum of phonons —essentially the energy as a function of momentum— and their wave functions, which represent their probability distribution in real space, can be computed using *ab initio* first principle codes. However, these calculations have so far lacked a unifying principle. For the quantum behavior of electrons, topology —a branch of mathematics— has successfully classified the electronic bands in materials. Can topology also characterize phonons?

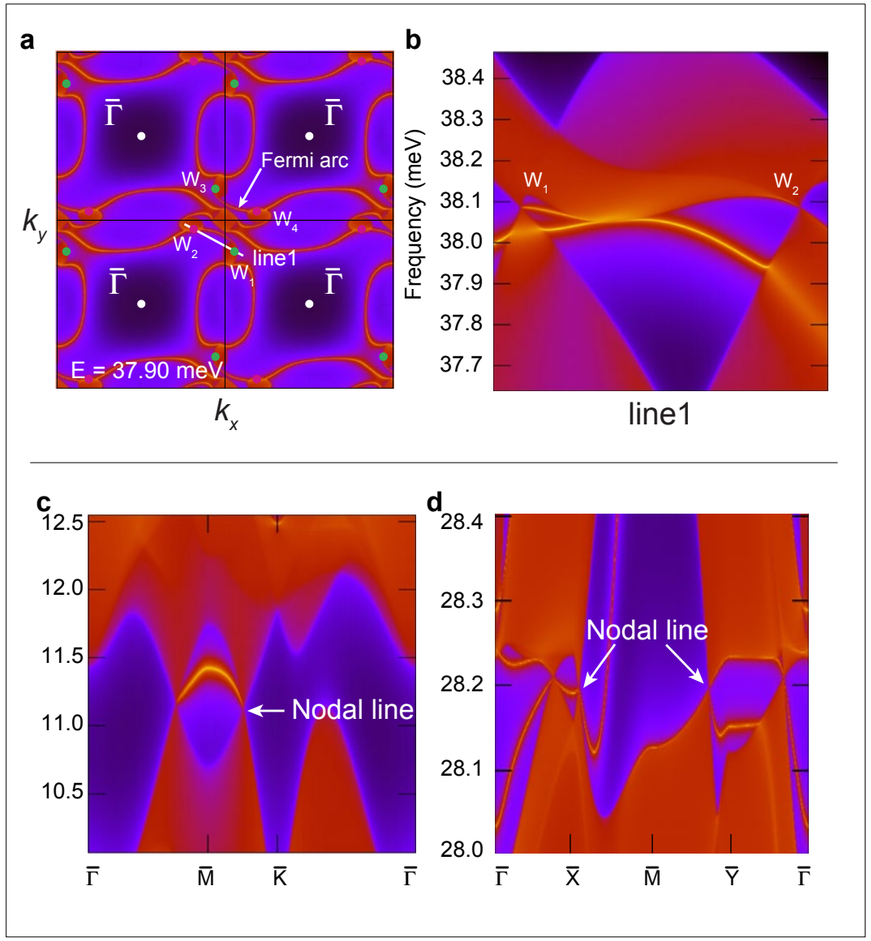
In this article we uncovered that a wide range of materials could host topological phonons. We first computed the phonon bands of thousands of quantum materials, identifying their wavefunctions and characterizing them by their symmetries, which provide a sort of local structure of the phonons. After completing this step, we employed topology to classify the global behavior of the phonon bands.

Several phonon structure databases have been meticulously analyzed, revealing that at least half of the materials exhibit at least one non-atomic cumulative phononic band set. The team employed a formalism similar to that developed for characterizing electronic bands, as outlined in their previous work on Topological Quantum Chemistry (TQC).

Phonon offer a new avenue for achieving nontrivial band topologies in solid-state materials, potentially leading to phonon surface states that could complement or enhance electronic surface states. The robustness of the topological surface phonon states can be leveraged for applications like frequency filtering or mechanical energy attenuation under imperfect conditions, as well as for heat transfer and infrared photoelectronics. Topological phonons could also pave the way for creating phonon diodes or acoustic waveguides. Analyzing data from over ten thousand materials, gathered from *ab-initio* calculations and stored in databases like PhononDB@kyoto-u and the Materials Project, we found that 50% of materials exhibit at least one non-trivial gap.

We discovered more topological structures in phonons than we initially expected, and we anticipate that topological phonons will lead to rich and unconventional physics, much like topological electrons have. We emphasized the importance of validating predictions for materials hosting topological phonons, noting that such experiments might be more challenging than those for electronic topology, due to lack of direct imaging techniques. The phonons have been cataloged in a public repository (https://www.topologicalquantumchemistry.com/topophonons), where researchers can access specific materials. Every phononic surface state is listed in this database; the next step would be for experimentalists to measure them.

The team envisions new physics that may emerge from the coupling between topological electrons and phonons. If topological electron surface states coexist with phononic ones, this could facilitate strong electron-phonon coupling on the surface —though potentially not in the bulk— potentially leading to surface superconductivity.



Surface state calculations for various protoypical topological phonon materials.

We have discovered more topological structures in phonons than we initially expected, and we anticipate that topological phonons will lead to rich and unconventional physics, much like topological electrons

DIPC HIGHLIGHT 2024

Morphological sensitivity to pH of silica and chalk nanocrystalline self-organized biomorphs

Menichetti A, Manzi J, Otálora F, Montalti M, and García-Ruiz JM
Small Science 4, 2400090 (2024)

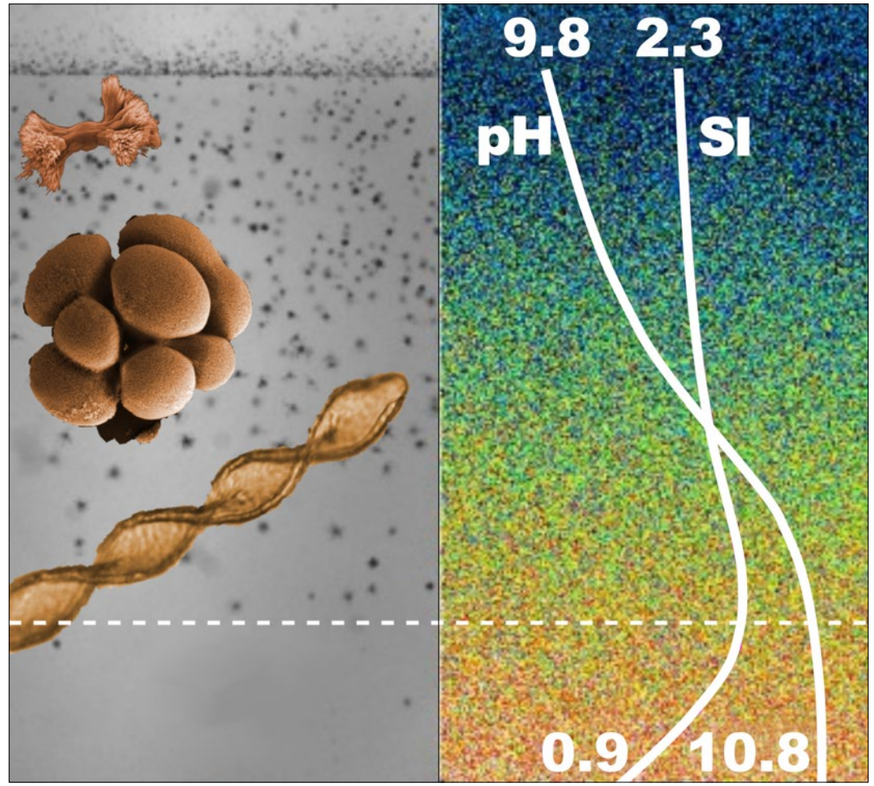
The bottom-up design of hierarchically organized nanostructures is a powerful strategy for achieving new materials with innovative functionalities. Biomorphs consist of thousands of carbonate nanocrystals aligned through silica-induced interactions, forming curved, non-crystallographic, and hierarchically textured structures. Their formation is considered an autocatalytic process driven by the inverse pH solubility of alkaline-earth carbonates and silica. As carbonate crystals form, the pH drops due to carbonate removal, which triggers silica precipitation. This, in turn, raises the pH again, initiating further carbonate nucleation and sustaining the coprecipitation cycle. The morphology and texture of biomorphs can be controlled by adjusting local conditions, namely temperature, pCO_2, and pH.

A pioneering study of the spatial and temporal evolution of pH inside silica gels during the precipitation of witherite biomorphs correlated pH with a photographic record of the spatial and temporal evolution of the morphologies of the aggregates. The work demonstrated that understanding the role of pH in morphogenesis requires measuring the pH locally in real-time using a non-invasive technique.

Now, a team of DIPC and University of Bologna researchers has developed a technique utilizing fluorescence imaging to detect pH on the growing front of biomorph in solution, reporting evidence of oscillations in the local pH at the front. The new ratiometric approach employs a probe that can be excited at two different wavelengths, producing two distinct fluorescence signals with varying pH dependencies. The ratio of the two signals remains independent of the local probe concentration and can be used to calculate pH.

This methodology eliminated artifacts in the pH measurements caused by probe concentration inhomogeneity due to diffusion, transport, photobleaching, or chemical degradation in the harsh alkaline conditions of the silica gel. The researchers demonstrate the use of the ratiometric fluorescent pH chemosensor to measure the variation of pH over time and across the silica gel during the growth of barium carbonate biomorphs. Changes in local pH were correlated with nucleation and biomorphic growth by combining optical transmission with fluorescence imaging.

The team measured the variation of pH in situ during a counter-diffusion precipitation experiment that formed barium carbonate biomorphs and compared it with a computer simulation of the growth



Precipitation simulations and in-situ noninvasive optical methods reveal pH's temporal and spatial evolution during biomorph morphogenesis.

Biomorphs are silica-carbonate curved architectures with hierarchical textures reminiscent of structural principles found in natural biominerals

experiment under identical starting conditions. The results demonstrate the envisaged existence of only two pH-dependent regimes in the formation of biomorphs: fractal growth and biomorphic growth.

Interestingly, the morphogenetic process controlling the complex shaping of biomorphs is independent of silica speciation. This indicates that while pH (and subsequently silica species) has a substantial effect on the transition from fractal to biomorphic growth, the morphogenetic mechanism responsible for different biomorphic shapes is independent of pH and must be inherent to the propagation of the growth front.

Publications

1 Enhanced vacuum ultraviolet photoemission from graphene nanoribbons
Corso M, Lobo-Checa J, Weber AP, Piquero-Zulaica I, El-Fattah ZMA, Le Fevre P, Ortega JE, and Krasovskii E.
2D Materials 11, 015008 (2024).

2 First principles study of electronic structure and transport in graphene grain boundaries
Lorentzen AB, Gao F, Boggild P, Jauho AP, and Brandbyge M.
2D Materials 11, 035001 (2024).

3 Pseudomagnetic fields in fully relaxed twisted bilayer and trilayer graphene
Ceferino A, and Guinea F.
2D Materials 11, 035015 (2024).

4 CO and O_2 interaction with kinked Pt surfaces
Garcia-Martinez F, Turco E, Schiller F, and Ortega JE.
ACS Catalysis 14, 6319 (2024).

5 Near-ambient pressure oxidation of silver in the presence of steps: electrophilic oxygen and sulfur impurities
Schiller F, Ali K, Makarova AA, Auras SV, Garcia-Martinez F, Bakhit AMI, Castrillo-Bodero R, Villar-Garcia IJ, Ortega JE, and Perez-Dieste V.
ACS Catalysis 14, 12865 (2024).

6 Selectivity of N_2-CH_4 mixed clathrate hydrates: a grand canonical Monte Carlo study
Joliat J, Vardanega-Bonneton D, Patt A, and Picaud S.
ACS Earth and Space Chemistry 8, 1586 (2024).

7 Selectivity of the binary CO_2-N_2 and CO_2-CO clathrate hydrates: a grand canonical Monte Carlo simulation study
Patt A, and Picaud S.
ACS Earth and Space Chemistry 8, 1877 (2024).

8 Giant quantum electrodynamic effects on single SiV color centers in nanosized diamonds
Bezard M, Babaze A, Mindarava Y, Blinder R, Davydov VA, Agafonov V, Esteban R, Tamarat P, Aizpurua J, Jelezko F, and Lounis B.
ACS Nano 18, 6406 (2024).

9 High-mobility compensated semimetals, orbital magnetization, and Umklapp scattering in bilayer graphene moire superlattices
Shilov AL, Kashchenko MA, Peralta PAP, Wang Y, Kravtsov M, Kudriashov A, Zhan Z, Taniguchi T, Watanabe K, Slizovskiy S, et al.
ACS Nano 18, 11769 (2024).

10 Unified understanding of the structure, thermodynamics, and diffusion of single-chain nanoparticle fluids
Mei B, Moreno AJ, and Schweizer KS.
ACS Nano 18, 15529 (2024).

11 Self-stacked 1T-1H layers in 6R-NbSeTe and the emergence of charge and magnetic correlations due to ligand disorder
Mahatha SK, Phillips J, Corral-Sertal J, Subires D, Korshunov A, Kar A, Buck J, Diekmann F, Garbarino G, Ivanov YP, et al.
ACS Nano 18, 21052 (2024).

12 Tuning the spin interaction in nonplanar organic diradicals through mechanical manipulation
Vegliante A, Fernandez S, Ortiz R, Vilas-Varela M, Baum TY, Friedrich N, Romero-Lara F, Aguirre A, Vaxevani K, Wang D, et al.
ACS Nano 18, 26514 (2024).

13 Designing moire patterns by shearing
Pantaleon PA, Sainz-Cruz H, and Guinea F.
ACS Nano 18, 28575 (2024).

14 Impact of surface enhanced Raman spectroscopy in catalysis
Stefancu A, Aizpurua J, Alessandri I, Bald I, Baumberg JJ, Besteiro LV, Christopher P, Correa-Duarte M, de Nijs B, Demetriadou A, et al.
ACS Nano 18, 29337 (2024).

15 Topological superconductivity in heavily doped single-layer graphene
Herrera SA, Parra-Martinez G, Rosenzweig P, Matta B, Polley CM, Kuester K, Starke U, Guinea F, Silva-Guillen JA, Naumis GG, and Pantaleon PA.
ACS Nano 18, 34842 (2024).

16 Kaolin clay-based geopolymer for ionic thermoelectric energy harvesting
Goracci G, Ogundiran MB, Barzegar M, Iturrospe A, Arbe A, and Dolado JS.
ACS Omega 9, 13728 (2024).

17 Fundamentals of polaritons in strongly anisotropic thin crystal layers
Voronin KV, Alvarez-Perez G, Lanza C, Alonso-Gonzalez P, and Nikitin AY.
ACS Photonics 11, 550 (2024).

18 On-axis optical trapping with vortex beams: the role of the multipolar decomposition
Gomez-Viloria I, Nodar A, Molezuelas-Ferreras M, Olmos-Trigo J, Cifuentes A, Martinez M, Varga M, and Molina-Terriza G.
ACS Photonics 11, 626 (2024).

19 Unveiling the mechanism of phonon-polariton damping in α-MoO_3
Taboada-Gutierrez J, Zhou Y, Tresguerres-Mata AIF, Lanza C, Martinez-Suarez A, Alvarez-Perez G, Duan J, Ignacio Martin J, Velez M, Prieto I, et al.
ACS Photonics 11, 3570 (2024).

20 Cool concrete incorporating carbonated Periwinkle shell: a sustainable solution for mitigating urban heat island effects
Goracci G, Saeed E, Ogundiran MB, Iturrospe A, Arbe A, Aymonier C, and Dolado JS.
ACS Sustainable Chemistry & Engineering 12, 1911 (2024).

21 Searching materials space for hydride superconductors at ambient pressure
Cerqueira TFT, Fang YW, Errea I, Sanna A, and Marques MAL.
Advanced Functional Materials 34, 2404043 (2024).

22 Artificial spores as multi-functional biocatalysts to perform biosynthetic cascades
Iturralde M, Ripoll M, di Silvio D, Gallego M, Grajales-Hernandez DA, Lopez X, Betancor L, and Lopez-Gallego F.
Advanced Functional Materials 34, 2406097 (2024).

23 Exploring the intracellular distribution of Se compounds delivered by biodegradable polyelectrolyte capsules using X-ray fluorescence imaging
Skiba M, Reszegi RR, Huang Y, Roy S, Han J, Brueckner D, Sanchez-Cano C, Zhao Y, Hassan M, Feliu N, Falkenberg G, and Parak WJ.
Advanced Functional Materials 35, 2408539 (2024).

24 Tunable magnetism in 2D organic-ion-intercalated $MnPS_3$ via molecule-dependent vacancy generation
Tezze D, Pereira JM, Tutar D, Ramos M, Regner J, Gargiani P, Schiller F, Casanova F, Alegria A, Martin-Garcia B, et al.
Advanced Functional Materials 35, 2412771 (2024).

25 Ultraconfined plasmons in atomically thin crystalline silver nanostructures
Mkhitaryan V, Weber AP, Abdullah S, Fernandez L, El-Fattah ZMA, Piquero-Zulaica I, Agarwal H, Garcia Diez K, Schiller F, Ortega JE, and Garcia de Abajo FJ.
Advanced Materials 36, 2302520 (2024).

26 Giant room-temperature topological Hall effect in a square-net ferromagnet $LaMn_2Ge_2$
Roychowdhury S, Yanda P, Samanta K, Yi C, Yao M, Orlandi F, Manuel P, Khalyavin D, Valle EGD, Constantinou P, et al.
Advanced Materials 36, 2305916 (2024).

27 Epitaxial growth of large-scale 2D $CrTe_2$ films on amorphous silicon wafers with low thermal budget
Zhang X, Li Y, Lu Q, Xiang X, Sun X, Tang C, Mahdi M, Conner C, Cook J, Xiong Y, et al.
Advanced Materials 36, 2311591 (2024).

28 Topological spin textures in an insulating van der Waals ferromagnet
Grebenchuk S, Mckeever C, Grzeszczyk M, Chen Z, Siskins M, McCray ARC, Li Y, Petford-Long AK, Phatak CM, Ruihuan D, et al.
Advanced Materials 36, 2311949 (2024).

29 Spin-glass states generated in a van der Waals magnet by alkali-ion intercalation
Khan S, Aw ESY, Nagle-Cocco LAV, Sud A, Ghosh S, Subhan MKB, Xue Z, Freeman C, Sagkovits D, Gutierrez-Llorente A, et al.
Advanced Materials 36, 2400270 (2024).

30 Microscale chiral rectennas for energy harvesting
Suarez-Rodriguez M, Martin-Garcia B, Skowronski W, Staszek K, Calavalle F, Fert A, Gobbi M, Casanova F, and Hueso LE.
Advanced Materials 36, 2400729 (2024).

31 Ferromagnetic order in 2D layers of transition metal dichlorides
Aguirre A, Sole AP, Polo DS, Gonzalez-Orellana C, Thakur A, Ortuzar J, Stesovych O, Kumar M, Pena-Diaz M, Weber A, et al.
Advanced Materials 36, 2402723 (2024).

32 Charge transfer-induced SERS enhancement of MoS_2/dopants dependent on their interaction difference
Chen L, Merino JP, Torrent-Sucarrat M, Hou HL, and Prato M.
Advanced Materials Interfaces 11, 2400272 (2024).

33 Simple encoded circularly polarized protein lighting
Gruembel S, Hasler M, Ferrara S, Patrian M, Banda-Vazquez JA, Coto PB, Werner JPF, and Costa RD.
Advanced Optical Materials 12, 2400106 (2024).

34 Circularly polarized photoluminescence in chiral hybrid organic-inorganic manganese halide perovskites: from bulk materials to exfoliated flakes
Asensio Y, Jalali HB, Marras S, Gobbi M, Casanova F, Mateo-Alonso A, Di Stasio F, Rivilla I, Hueso LE, and Martin-Garcia B.
Advanced Optical Materials 12, 2400554 (2024).

35 Unveiling electron-phonon and electron-magnon interactions in the weak itinerant ferromagnet $LaCo_2P_2$
Usachov DY, Ali K, Poelchen G, Mende M, Schulz S, Peters M, Bokai K, Sklyadneva IY, Stolyarov V, Chulkov EV, et al.
Advanced Physics Research 4, 2400137 (2024).

36 Implementation and characterization of the dice lattice in the electron quantum simulator
Tassi C, and Bercioux D.
Advanced Physics Research 3, 2400038 (2024).

37 Topological properties of a non-Hermitian quasi-1D chain with a flat band
Martinez-Strasser C, Herrera MAJ, Garcia-Etxarri A, Palumbo G, Kunst FK, and Bercioux D.
Advanced Quantum Technologies 7, 2300225 (2024).

38 Ubiquitous order-disorder transition in the Mn antisite sublattice of the $(MnBi_2Te_4)(Bi_2Te_3)_n$ magnetic topological insulators
Sahoo M, Onuorah IJ, Folkers LC, Kochetkova E, Chulkov EV, Otrokov MM, Aliev ZS, Amiraslanov IR, Wolter AUB, Buechner B, et al.
Advanced Science 11, 2402753 (2024).

39 Extended Berry curvature tail in ferromagnetic Weyl semimetals NiMnSb and PtMnSb
Singh S, Garcia-Page A, Noky J, Roychowdhury S, Vergniory MG, Borrmann H, Klauss HH, Felser C, and Shekhar C.
Advanced Science 11, 2404495 (2024).

40 Programmable carbon nanotube networks: controlling optical properties through orientation and interaction
Voronin KV, Ermolaev GA, Burdanova MG, Slavich AS, Toksumakov AN, Yakubovsky DI, Paukov MI, Xie Y, Qian L, Kopylova DS, et al.
Advanced Science 11, 2404694 (2024).

41 Comparison of gap-enhanced Raman tags and nanoparticle aggregates with polarization dependent super-sesolution spectral SERS imaging
Shoup DN, Fan S, Zapata-Herrera M, Schorr HC, Aizpurua J, and Schultz ZD.
Analytical Chemistry 96, 11422 (2024).

42 Enantiopure [6]-azairidahelicene by dynamic kinetic resolution of a configurationally labile [4]-helicene
Pazos A, Cruz CM, Cuerva JM, Rivilla I, Cossio FP, and Freixa Z.
Angewandte Chemie International Edition 63, e202406663 (2024).

43 [19]Starphene: combined in-solution and on-surface synthesis towards the largest starphene
Besteiro-Saez J, Mateo LM, Salaverria S, Wang T, Angulo-Portugal P, Calupitan JP, Rodriguez-Fernandez J, Garcia-Fuente A, Ferrer J, Perez D, et al.
Angewandte Chemie International Edition 63, e202411861 (2024).

44 Dibenzoquinone cyclopentadithiophene diradicaloids show optical transitions of different spin states and anomalous near-infrared emission
Privado M, Quintero SM, Barrejon M, de La Cruz P, Babu PMJ, Casanova D, Langa F, and Casado J.
Angewandte Chemie International Edition 64, e202413988 (2024).

45 Planar pentacoordinate halogens
Cui LJ, Miao LH, Orozco-Ic M, Li L, Pan S, Merino G, and Cui ZH.
Angewandte Chemie International Edition 64, e202416057 (2024).

46 Dicyclopenta[4,3,2,1-cde:4′,3′,2′,1′-pqr]-peri-tetracene: synthesis and an example of annulene-within-an-annulene aromaticity in different redox states
Jiang Q, Han Y, Hou X, Wu S, Xu T, Orozco-Ic M, Merino G, and Chi C.
Angewandte Chemie International Edition 64, e202416833 (2024).

47 On-demand reversible switching of the emission mode of individual semiconductor quantum emitters using plasmonic metasurfaces
Olejniczak A, Lawera Z, Zapata-Herrera M, Chuvilin A, Samokhvalov P, Nabiev I, Grzelczak M, Rakovich Y, and Krivenkov V.
APL Photonics 9, 016107 (2024).

48 Electronic structure-property relationship in an $Al_{0.5}TiZrPdCuNi$ high-entropy alloy
Babic E, Figueroa IA, Miksic Trontl V, Pervan P, Pletikosic I, Ristic R, Salcinovic Fetic A, Skoko Z, Staresinic D, Valla T, and Zadro K.
Applied Physics Letters 124, 221903 (2024).

49 Magnetic topological Kondo semimetal phases of matter
Ok S, Legner M, Vergniory MG, Neupert T, and Cook AM.
Applied Physics Letters 125, 073101 (2024).

50 Topological and chiral matter-Physics and applications
Vergniory MG, Kondo T, Kotov NA, and Balandin AA.
Applied Physics Letters 125, 160401 (2024).

51 Floquet modification of the bandgaps and energy spectrum in flat-band pseudospin-1 Dirac materials
Iurov A, Mattis M, Zhemchuzhna L, Gumbs G, and Huang D.
Applied Sciences 14, 6027 (2024).

52 Understanding polymers through transfer learning and explainable AI
Miccio LA.
Applied Sciences 14, 10413 (2024).

53 PdTi alloys as an excellent catalyst for semi-hydrogenation reactions
Bergua RM, Pavloudis T, Ugartemendia A, Palmer RE, and Jimenez-Izal E.
Applied Surface Science 672, 160798 (2024).

54 BUFFALO/flashlights: constraints on the abundance of lensed supergiant stars in the Spock galaxy at redshift 1
Diego JM, Li SK, Meena AK, Niemiec A, Acebron A, Jauzac M, Struble MF, Amruth A, Broadhurst TJ, Cerny C, et al.
Astronomy & Astrophysics 681, A124 (2024).

55 Massive black holes in nuclear star clusters investigation with SRG/eROSITA X-ray data
Hoyer N, Arcodia R, Bonoli S, Merloni A, Neumayer N, Zhang Y, and Comparat J.
Astronomy & Astrophysics 682, A36 (2024).

56 EWOCS-I: The catalog of X-ray sources in Westerlund 1 from the Extended Westerlund 1 and 2 Open Clusters Survey
Guarcello MG, Flaccomio E, Albacete-Colombo JF, Almendros-Abad V, Anastasopoulou K, Andersen M, Argiroffi C, Bayo A, Bartlett ES, Bastian N, et al.
Astronomy & Astrophysics 682, A49 (2024).

57 J-PLUS: Toward a homogeneous photometric calibration using Gaia BP/RP low-resolution spectra
Lopez-Sanjuan C, Ramio HV, Xiao K, Yuan H, Carrasco JM, Varela J, Cristobal-Hornillos D, Tremblay PE, Ederoclite A, Marin-Franch A, et al.
Astronomy & Astrophysics 683, A29 (2024).

58 The miniJPAS survey: Maximising the photo-z accuracy from multi-survey datasets with probability conflation
Hernan-Caballero A, Akhlaghi M, Lopez-Sanjuan C, Ramio HV, Laur J, Varela J, Civera T, Muniesa D, Finoguenov A, Fernandez-Ontiveros JA, et al.
Astronomy & Astrophysics 684, A61 (2024).

59 Supernova environments in J-PLUS
Gonzalez-Diaz R, Galbany L, Kangas T, Garcia-Benito R, Anderson JP, Lyman J, Varela J, Oltra L, Garcia RL, Rojo GV, et al.
Astronomy & Astrophysics 684, A104 (2024).

60 The rise and fall of bars in disc galaxies from z=1 to z=0. The role of environment
Rosas-Guevara Y, Bonoli S, Moreira CM, and Izquierdo-Villalba D.
Astronomy & Astrophysics 684, A179 (2024).

61 Characterizing structure formation through instance segmentation
Lopez-Cano D, Stuecker J, Pellejero Ibanez M, Angulo RE, and Franco-Barranco D.
Astronomy & Astrophysics 685, A37 (2024).

62 The miniJPAS survey
Doubrawa L, Cypriano ES, Finoguenov A, Lopes PAA, Gonzalez AH, Maturi M, Dupke RA, Gonzalez Delgado RM, Abramo R, Benitez N, et al.
Astronomy & Astrophysics 685, A98 (2024).

63 SPICE connection mosaics to link the Sun's surface and the heliosphere
Varesano T, Hassler DM, Zambrana Prado N, Plowman J, Del Zanna G, Parenti S, Mason HE, Giunta A, Auchere F, Carlsson M, et al.
Astronomy & Astrophysics 685, A146 (2024).

64 Connecting low-redshift LISA massive black hole mergers to the nHz stochastic gravitational wave background
Izquierdo-Villalba D, Sesana A, Colpi M, Spinoso D, Bonetti M, Bonoli S, and Valiante R.
Astronomy & Astrophysics 686, A183 (2024).

65 Euclid preparation XLI. Galaxy power spectrum modelling in real space
Pezzotta A, Moretti C, Zennaro M, Moradinezhad Dizgah A, Crocce M, Sefusatti E, Ferrero I, Pardede K, Eggemeier A, Barreira A, et al.
Astronomy & Astrophysics 687, A216 (2024).

66 The miniJPAS Survey: The radial distribution of star formation rates in faint X-ray active galactic nuclei
Acharya N, Bonoli S, Salvato M, Cortesi A, Delgado RMG, Lopez IE, Marquez I, Martinez-Solaeche G, Abdurro'uf, Alexander D, et al.
Astronomy & Astrophysics 687, A285 (2024).

67 The miniJPAS survey: evolution of luminosity and stellar mass functions of galaxies up to z ∼ 0.7
Diaz-Garcia LA, Delgado RMG, Garcia-Benito R, Martinez-Solaeche G, Rodriguez-Martin JE, Lopez-Sanjuan C, Hernan-Caballero A, Marquez I, Vilchez JM, Abramo R, et al.
Astronomy & Astrophysics 688, A113 (2024).

68 Efficiency of black hole formation via collisions in stellar systems
Vergara MC, Schleicher DRG, Escala A, Reinoso B, Dotti FF, Kamlah AWH, Liempi M, Hoyer N, Neumayer N, and Spurzem R.
Astronomy & Astrophysics 689, A34 (2024).

69 SHAMe-SF: predicting the clustering of star-forming galaxies with an enhanced abundance matching model
Ortega-Martinez S, Contreras S, and Angulo R.
Astronomy & Astrophysics 689, A66 (2024).

70 PNG-UNITsims: Halo clustering response to primordial non-Gaussianities as a function of mass
Gutierrez Adame A, Avila S, Gonzalez-Perez V, Yepes G, Pellejero M, Wang MS, Chuang CH, Feng Y, Garcia-Bellido J, and Knebe A.
Astronomy & Astrophysics 689, A69 (2024).

71 Photometric segregation of dwarf and giant FGK stars using the SVO Filter Profile Service and photometric tools
Rodrigo C, Cruz P, Aguilar JF, Aller A, Solano E, Galvez-Ortiz MC, Jimenez-Esteban F, Mas-Buitrago P, Bayo A, Cortes-Contreras M, et al.
Astronomy & Astrophysics 689, A93 (2024).

72 Hubble Space Telescope proper motions of Large Magellanic Cloud star clusters I. Catalogues and results for NGC 1850
Niederhofer F, Bellini A, Kozhurina-Platais V, Libralato M, Haeberle M, Kacharov N, Kamann S, Bastian N, Cabrera-Ziri I, Cioni MRL, et al.
Astronomy & Astrophysics 689, A162 (2024).

73 Imaging dark matter at the smallest scales with z ≈ 1 lensed stars
Diego JM, Li SK, Amruth A, Meena AK, Broadhurst TJ, Kelly PL, Filippenko AV, Williams LLR, Zitrin A, Harris WE, et al.
Astronomy & Astrophysics 689, A167 (2024).

74 Demographics of tidal disruption events with L-Galaxies: I. Volumetric TDE rates and the abundance of nuclear star clusters
Polkas M, Bonoli D, Bortolas E, Izquierdo-Villalba D, Sesana A, Broggi L, Hoyer N, and Spinoso D.
Astronomy & Astrophysics 689, A204 (2024).

75 JWST's PEARLS: 119 multiply imaged galaxies behind MACS0416, lensing properties of caustic crossing galaxies, and the relation between halo mass and number of globular clusters at z = 0.4
Diego JM, Adams NJ, Willner SP, Harvey T, Broadhurst T, Cohen SH, Jansen RA, Summers J, Windhorst RA, D'Silva JCJ, et al.
Astronomy & Astrophysics 690, A114 (2024).

76 Baryonification extended to thermal Sunyaev Zel'dovich
Arico G, and Angulo RE.
Astronomy & Astrophysics 690, A188 (2024).

77 Testing the sources of the peculiar abundances in globular clusters
Vaca RJ, Cabrera-Ziri I, Magris GC, Bastian N, and Salaris M.
Astronomy & Astrophysics 690, A199 (2024).

78 Validating the clustering predictions of empirical models with the FLAMINGO simulations
Contreras S, Angulo RE, Chaves-Montero J, Kugel R, Schaller M, and Schaye J.
Astronomy & Astrophysics 690, A311 (2024).

79 A high-resolution view of the source-plane magnification near cluster caustics in wave dark matter models
Diego JM, Amruth A, Palencia JM, Broadhurst T, Li SK, Lim J, Windhorst RA, Zitrin A, Filippenko AV, Williams LLR, et al.
Astronomy & Astrophysics 690, A359 (2024).

80 Euclid preparation: L. Calibration of the halo linear bias in Λ(ν)CDM cosmologies
Castro T, Fumagalli A, Angulo RE, Bocquet S, Borgani S, Costanzi M, Dakin J, Dolag K, Monaco P, Saro A, et al.
Astronomy & Astrophysics 691, A62 (2024).

81 J-PLUS: The fraction of calcium white dwarfs along the cooling sequence
Lopez-Sanjuan C, Tremblay PE, O'Brien MW, Spinoso D, Ederoclite A, Ramio HV, Cenarro AJ, Marin-Franch A, Civera T, Carrasco JM, et al.
Astronomy & Astrophysics 691, A211 (2024).

82 J-PLUS: Bayesian object classification with a strum of BANNJOS
Del Pino A, Lopez-Sanjuan C, Hernan-Caballero A, Dominguez-Sanchez H, von Marttens R, Fernandez-Ontiveros JA, Coelho PRT, Lumbreras-Calle A, Vega-Ferrero J, Jimenez-Esteban F, et al.
Astronomy & Astrophysics 691, A221 (2024).

83 The e-MANTIS emulator: fast and accurate predictions of the halo mass function in *f(R)*CDM and *w*CDM cosmologies
Saez-Casares I, Rasera Y, Richardson TRG, and Corasaniti PS.
Astronomy & Astrophysics 691, A323 (2024).

84 Enhancing photometric redshift catalogs through color-space analysis: Application to KiDS-bright galaxies
Jalan P, Bilicki M, Hellwing WA, Wright AH, Dvornik A, Georgiou C, Heymans C, Hildebrandt H, Joudaki S, Kuijken K, et al.
Astronomy & Astrophysics 692, A177 (2024).

85 A CIGALE module tailored (not only) for low-luminosity active galactic nuclei
Lopez IE, Yang G, Mountrichas G, Brusa M, Alexander DM, Baldi RD, Bertola E, Bonoli S, Comastri A, Shankar F, et al.
Astronomy & Astrophysics 692, A209 (2024).

86 *In Vitro* biocompatibility and endothelial permeability of branched polyglycidols generated by ring-opening polymerization of glycidol with $B(C_6F_5)_3$ under dry and wet conditions
Pagnacco CA, Kravicz MH, Sica FS, Fontanini V, de San Roman EG, Lund R, Re F, and Barroso-Bujans F.
Biomacromolecules 25, 3583 (2024).

87 Identification of Riluzole derivatives as novel calmodulin inhibitors with neuroprotective activity by a joint synthesis, biosensor, and computational guided strategy
Baltasar-Marchueta M, Llona L, M-Alicante S, Barbolla I, Ibarluzea MG, Ramis R, Salomon AM, Fundora B, Araujo A, Muguruza-Montero A, et al.
Biomedicine & Pharmacotherapy 174, 116602 (2024).

88 Metabolites from marine macroorganisms of the Red sea acting as promoters or inhibitors of amylin aggregation
Alghrably M, Tammam MA, Koutsaviti A, Roussis V, Lopez X, Bennici G, Sharfalddin A, Almahasheer H, Duarte CM, Emwas AH, Ioannou E, and Jaremko M.
Biomolecules 14, 951 (2024).

89 Biallelic variants in SNUPN cause a limb girdle muscular dystrophy with myofibrillar-like features
Iruzubieta P, Damborenea A, Ioghen M, Bajew S, Fernandez-Torron R, Topf A, Herrero-Reiriz A, Epure D, Vill K, Hernandez-Lain A, et al.
Brain 147, 2867 (2024).

90 Large hysteretic hydrogen adsorption in double wall carbon nanotubes bundles
Cabrillo C, Fernandez-Perea R, Bermejo FJ, Mondelli C, Gonzalez MA, Fernandez-Alonso F, Enciso E, and Saboungi ML.
Carbon 219, 118766 (2024).

91 Thermal conductivity of Portlandite: molecular dynamics based approach
Sarkar PK, Goracci G, and Dolado JS.
Cement and Concrete Research 175, 107347 (2024).

92 Thermoelectric properties of the main species present in Portland cement
Agbaoye RO, Janovec J, Ayuela A, and Dolado JS.
Cement and Concrete Research 183, 107587 (2024).

93 Colour tuning in Eu/Ag-co-doped transparent LaF_3 glass-ceramics
Sedano M, Duran A, Mather GC, Fernandez J, Balda R, and Pascual MJ.
Ceramics International 50, 23839 (2024).

94 Deposited PtGe clusters as active and durable catalysts for CO oxidation
Ugartemendia A, Mercero JM, de Cozar A, Melander MM, Akola J, and Jimenez-Izal E.
ChemCatChem 16, e202301137 (2024).

95 Hydrogen bond types which do not fit accepted definitions
Grabowski SJ.
Chemical Communications 60, 6239 (2024).

96 Promoting exchange coupling in $(Cp^{iPr_5})_2Gd_2X_3$ complexes
David G, Le Guennic B, and Reta D.
Chemical Communications 60, 11988 (2024).

97 A hydration model of actinide complexes by exploring their multiple minima hypersurface: the case of uranyl cation
Guerra-Barroso A, Perez-Badell Y, Montero-Alejo AL, Montero-Cabrera ME, and Montero-Cabrera LA.
Chemical Physics Letters 856, 141667 (2024).

98 Deciphering the chemical bonding of the trivalent oxygen atom in oxygendoped graphene
Ugartemendia A, Casademont-Reig I, Zhao L, Zhang Z, Frenking G, Ugalde JM, Garcia-Lekue A, and Jimenez-Izal E.
Chemical Science 15, 9858 (2024).

99 Core-electron contributions to the magnetic response of molecules with heavy elements and their significance in aromaticity assessments
Orozco-Ic M, Soriano-Agueda L, Sundholm D, Matito E, and Merino G.
Chemical Science 15, 12906 (2024).

100 Exploring the potential of natural orbital functionals
Piris M.
Chemical Science 15, 17284 (2024).

101 Perylene-derivative singlet exciton fission in water solution
Magne C, Streckaite S, Boto RA, Dominguez-Ojeda E, Gromova M, Echeverri A, Brigiano FS, Ha-Thi MH, Franckevicius M, Jasinskas V, et al.
Chemical Science 15, 17831 (2024).

102 Strong-field effects in the photo-induced dissociation of the hydrogen molecule on a silver nanoshell
Koval NE, Juaristi JI, and Alducin M.
Chemical Science 15, 18581 (2024).

103 Unveiling the spatial rearrangements of exhausted immobilised multi-enzyme systems through cryo-X-ray fluorescence nanoprobe imaging
Santiago-Arcos J, Salome M, Lopez-Gallego F, and Sanchez-Cano C.
Chemical Science 15, 20515 (2024).

104 $\%V_{Bur}$ index and steric maps: from predictive catalysis to machine learning
Escayola S, Bahri-Laleh N, and Poater A.
Chemical Society Reviews 53, 853 (2024).

105 Temperature-modulated reversible clustering of gold nanorods driven by small surface ligands
Kruse J, Rao A, Sanchez-Iglesias A, Montano-Priede JL, Ibarra AI, Lopez E, Seifert A, Arbe A, and Grzelczak M.
Chemistry-A European Journal 30, e202302793 (2024).

106 3,4-Dimethylenecyclobutene: a building block for design of macrocycles with excited state aromatic low-lying high-spin states
Preethalayam P, Roldao JC, Castet F, Casanova D, Radenkovic S, and Ottosson H.
Chemistry-A European Journal 30, e202303549 (2024).

107 Gold-promoted biocompatible selenium arylation of small molecules, peptides and proteins
Nakahata DH, Kanavos I, Zubiria-Ulacia M, Inague A, Salassa L, Lobinski R, Miyamoto S, Matxain JM, Ronga L, and de Paiva REF.
Chemistry-A European Journal 30, e202304050 (2024).

108 Can aromaticity be evaluated using atomic partitions based on the Hilbert-space?
Grèbol-Tomàs J, Matito E, and Salvador P.
Chemistry-A European Journal 30, e202401282 (2024).

109 Oxygen-promoted on-surface synthesis of polyboroxine molecules
Toffoli D, Turco E, Stredansky M, Costantini R, Dell Angela M, Floreano L, Goldoni A, Morgante A, Kladnik G, Cvetko D, et al.
Chemistry-A European Journal 30, e202401565 (2024).

110 On-surface stepwise double dehydrogenation for the formation of a para-quinodimethane-containing undecacene isomer
Sarkar S, Alvarez B, Au-Yeung KH, Cobas A, Robles R, Lorente N, Pena D, Perez D, and Moresco F.
Chemistry-A European Journal 30, e202402297 (2024).

111 Tuning electron-transfer driving force in photosynthetic special pair models
Ramirez-Wierzbicki I, Merlinsky LS, Pieslinger GE, Dominguez S, Slep LD, Baraldo LM, and Cadranel A.
Chemistry-A European Journal 31, e202402700 (2024).

112 Revisiting El-Sayed synthesis: Bayesian optimization for revealing new insights during the growth of gold nanorods
Rao A, and Grzelczak M.
Chemistry of Materials 36, 2577 (2024).

113 Compression eliminates charge traps by stabilizing perovskite grain boundary structures: an ab initio analysis with machine learning force field
Liu D, Wu Y, Samatov MR, Vasenko AS, Chulkov EV, and Prezhdo OV.
Chemistry of Materials 36, 2898 (2024).

114 Antiviral activity of Pd(II) complexes with aminoadamantanes against arboviruses
Silva LB, Barbosa Cruz A, Pereira DH, Cassani NM, Ruiz UEA, Santos IA, Martins DOS, Nakahata DH, de Alencar SD, Kanavos I, et al.
ChemistrySelect 9, e202404225 (2024).

115 Theoretical insights into bifurcated intramolecular dihydrogen bonds
Gholami S, Aarabi M, and Grabowski SJ.
ChemPhysChem 25, e202300849 (2024).

116 Doping efects on ethane/ethylene dehydrogenation catalyzed by Pt_2X nanoclusters
Ugartemendia A, Mercero JM, Jimenez-Izal E, and de Cozar A.
ChemPhysChem 25, E202400095 (2024).

117 Localized light-induced precipitation of inorganic materials
Mordini D, Besirske P, Garcia-Ruiz JM, Montalti M, and Menichetti A.
ChemPlusChem 90, e202400487 (2024).

118 Recent progress on surface chemistry I: assembly and reaction
Li X, Xu Z, Bu D, Cai J, Chen H, Chen Q, Chen T, Cheng F, Chi L, Dong W, et al.
Chinese Chemical Letters 35, 110055 (2024).

119 On-surface synthesis of porous graphene nanoribbons mediated by phenyl migration
Moreno C, Diaz de Cerio X, Tenorio M, Gao F, Vilas-Varela M, Sarasola A, Pena D, Garcia-Lekue A, and Mugarza A.
Communications Chemistry 7, 219 (2024).

120 Assessing the feasibility of near-ambient conditions superconductivity in the Lu-N-H system
Fang YW, Dangic D, and Errea I.
Communications Materials 5, 61 (2024).

121 Charge density waves and the effects of uniaxial strain on the electronic structure of 2H-$NbSe_2$
Kundu AK, Rajapitamahuni A, Vescovo E, Klimovskikh II, Berger H, and Valla T.
Communications Materials 5, 208 (2024).

122 Phonon collapse and anharmonic melting of the 3D charge-density wave in kagome metals
Gutierrez-Amigo M, Dangic D, Guo C, Felser C, Moll PJW, Vergniory MG, and Errea I.
Communications Materials 5, 234 (2024).

123 Synthetic dimensions for topological and quantum phases
Argüello-Luengo J, Bhattacharya U, Celi A, Chhajlany RW, Grass T, Płodzień M, Rakshit D, Salamon T, Stornati P, Tarruell L, and Lewenstein M.
Communications Physics 7, 143 (2024).

124 Large impact of phonon lineshapes on the superconductivity of solid hydrogen
Dangic D, Monacelli L, Bianco R, Mauri F, and Errea I.
Communications Physics 7, 150 (2024).

125 Unveiling the electronic origin of lanthanide based metal organic framework with ideal spin filtering capacity
Gastearena X, Ugalde JM, Pieslinger GE, San Sebastian E, and Jimenez-Izal E.
Communications Physics 7, 158 (2024).

126 Magnetic Dirac semimetal state of (Mn,Ge)Bi_2Te_4
Frolov AS, Usachov DY, Tarasov V, Fedorov V, Bokai KA, Klimovskikh I, Stolyarov VS, Sergeev I, Lavrov AN, Golyashov VA, et al.
Communications Physics 7, 180 (2024).

127 Anomalous quantum transport in fractal lattices
Rojo-Francas A, Pansari P, Bhattacharya U, Julia-Diaz B, and Grass T.
Communications Physics 7, 259 (2024).

128 Kitaev honeycomb antiferromagnet in a field: quantum phase diagram for general spin
Jahromi SS, Hoermann M, Adelhardt P, Fey S, Karamnejad H, Orus R, and Schmidt KP.
Communications Physics 7, 319 (2024).

129 Role of coherence in many-body Quantum Reservoir Computing
Palacios A, Martinez-Pena R, Soriano MC, Giorgi GL, and Zambrini R.
Communications Physics 7, 369 (2024).

130 A glimpse inside materials: polymer structure - glass transition temperature relationship as observed by a trained artificial intelligence
Miccio LA, Borredon C, and Schwartz GA.
Computational Materials Science 236, 112863 (2024).

131 Transfer learning-driven artificial intelligence model for glass transition temperature estimation of molecular glass formers mixtures
Borredon C, Miccio LA, and Schwartz GA.
Computational Materials Science 238, 112931 (2024).

132 Pt_3Zr alloy as a protective coating against oxidation and hydrogen attack on Zr-based components in nuclear reactors
Arellano JS, Molina LM, López MJ, and Alonso JA.
Computational Materials Science 245, 113313 (2024).

133 The PointGroupNRG code for numerical renormalization group calculations with discrete point-group symmetries
Calvo-Fernandez A, Blanco-Rey M, and Eiguren A.
Computer Physics Communications 296, 109032 (2024).

134 The electron–phonon interaction in non-stoichiometric $Bi_2Sr_2CaCu_2O_{8+\delta}$ superconductor obtained from the diffuse elastic scattering of helium atoms
Benedek G, Manson JR, Miret-Artés S, Schmicker D, and Toennies JP.
Condensed Matter 9, 51 (2024).

135 Sustainable geopolymer concrete for thermoelectric energy harvesting
Barzegar M, Goracci G, Martauz P, and Dolado JS.
Construction & Building Materials 411, 134398 (2024).

136 Modulated spin dynamics of [Co_2] coordination helicates via differential strand composition
Barrios LA, Capo N, Boulehjour H, Reta D, Tejedor I, Roubeau O, and Aromi G.
Dalton Transactions 53, 7611 (2024).

137 [Ag(IPr)(bpy)][PF_6]: brightness and darkness playing with aggregation induced phosphorescence for light-emitting electrochemical cells
Giobbio G, Coto PB, Lohier JF, Renaud JL, Gaillard S, and Costa RD.
Dalton Transactions 53, 12307 (2024).

138 Impact of the purification procedure on the properties of all-inorganic $CsPbI_{3-x}Br_x$ mixed-halide perovskite quantum dots
Hussein M, Farghali AA, Barroso-Bujans F, and Saad L.
Egyptian Journal of Chemistry 67, 4 (2024).

139 Metastability and polymorphism in dihydroxybenzenes - implications for thermal energy storage
De la Fuente TSN, Gaboardi M, Ismail KM, Di Lisio V, Cangialosi D, Otero de la Roza A, Coto PB, and Fernandez-Alonso F.
Energy Advances 3, 413 (2024).

140 Transformer-based fall detection in videos
Nunez-Marcos A, and Arganda-Carreras I.
Engineering Applications of Artificial Intelligence 132, 107937 (2024).

141 Multifold topological semimetals
Robredo I, Schroeter NBM, Felser C, Cano J, Bradlyn B, and Vergniory MG.
EPL 147, 46001 (2024).

142 An obituary: Dr. Helmut Cölfen 1965–2023
Demeler B, Gebauer D, Brookes E, Fagan J, Walter J, García de la Torre J, García-Ruiz JM, Schilling K, Chen M, Dobler L, et al.
European Biophysics Journal 53, 249 (2024).

143 On the role of the solvent in the synthesis of spirocycles from alkyne cations catalyzed by triflic acid: a DFT study
De Cozar A, Arrieta A, and Cossio FP.
European Journal of Organic Chemistry 27, e202400347 (2024).

144 Sustainable innovations in food packaging: antioxidant basil-enriched cassava starch films with UV protection and enhanced water and mechanical resistance
Lacovone C, Guz L, and Fama L.
Food Packaging Shelf Life 45, 101324 (2024).

145 On the binding of auranofin to Prdx6 and its potential role in cancer cell sensitivity to treatment
Inague A, Nakahata DH, Viviani LG, Alegria TGP, Lima RS, Iijima TS, Netto LES, Angeli JPF, Miyamoto S, and de Paiva REF.
Free Radical Biology and Medicine 224, 346 (2024).

146 Quantum-centric supercomputing for materials science: a perspective on challenges and future directions
Alexeev Y, Amsler M, Barroca MA, Bassini S, Battelle T, Camps D, Casanova D, Choi YJ, Chong FT, Chung C, et al.
Future Generation Computer Systems 160, 666 (2024).

147 Cybersecurity in critical infrastructures: a post-quantum cryptography perspective
Oliva del Moral J, deMarti iOlius A, Vidal G, Crespo PM, and Etxezarreta Martinez J.
IEEE Internet of Things Journal 11, 30217 (2024).

148 Understanding pressure effects on structural, optical, and magnetic properties of $CsMnF_4$ and other $3d^n$ compounds
Santamaria G, Fernandez-Ruiz T, Garcia-Lastra JM, Garcia-Fernandez P, Sanchez-Movellan I, Moreno M, and Antonio Aramburu J.
Inorganic Chemistry 63, 13231 (2024).

149 $In_nTl_{4-n}H^+$ (n=0~4): tetracoordinate hydrogen in a planar fashion?
Cui LJ, Liu XB, Zhang HY, Yan B, Orozco-Ic M, Pan S, and Cui ZH.
Inorganic Chemistry 63, 13938 (2024).

150 Alloxazine-based ligands and their ruthenium complexes as NADH oxidation catalysts and G4 binders
Plata MJM, Marretta L, Gaztelumendi L, Pieslinger GE, Carballo RR, Rezabal E, Barone G, Martinez-Martinez V, Terenzi A, and Salassa L.
Inorganic Chemistry 63, 16362 (2024).

151 Chemical bonding in $[Fe(\eta^4\text{-}P_4)_2]^{2-}$ and related complexes
Ding C, Pan S, and Frenking G.
Inorganic Chemistry 63, 18223 (2024).

152 From (sub)porphyrins to (sub)phthalocyanines: aromaticity signatures in the UV-Vis absorption spectra
Escayola S, Labella J, Szczepanik DW, Poater A, Torres T, Sola M, and Matito E.
Inorganic Chemistry 63, 18251 (2024).

153 KMg_4Bi_3: a narrow band gap semiconductor with a channel structure
Ochs AM, Oprea DG, Cardenas-Gamboa J, Moore CE, Heremans JP, Felser C, Vergniory MG, and Goldberger JE.
Inorganic Chemistry 63, 20133 (2024).

154 Crystal structure and anti-proliferative and mutagenic evaluation of the palladium(II) complex of deoxyalliin
Candido TZ, Quintanilha MM, Schimitd BA, Simoni D de A, Nakahata DH, de Paiva REF, Cerqueira IH, Resende FA, Carvalho JE, Ruiz ALTG, Lima CSP, and Corbi PP.
Inorganics 12, 194 (2024).

155 Automatic mapping of aquaculture activity in the Atlantic Ocean
Lekunberri X, Ballester-Berman JD, Arganda-Carreras I, and Fernandes-Salvador JA.
International Journal of Applied Earth Observation and Geoinformation 132, 104061 (2024).

156 Boosting synergistic effects between PtGe nanoalloys and 2D materials for PEMFC applications
Ugartemendia A, Bergua RM, Mercero JM, and Jimenez-Izal E.
International Journal of Hydrogen Energy 89, 233 (2024).

157 Probing the cellular fate of the protein corona around nanoparticles with nanofocused X-ray fluorescence imaging
Skiba M, Guedes G, Karpov D, Feliu N, Cortajarena AL, Parak WJ, and Sanchez-Cano C.
International Journal of Molecular Sciences 25, 528 (2024).

158 MLe-KCNQ2: an artificial intelligence model for the prognosis of missense KCNQ2 gene variants
Saez-Matia A, Ibarluzea MG, M-Alicante S, Muguruza-Montero A, Nunez E, Ramis R, Ballesteros OR, Lasa-Goicuria D, Fons C, Gallego M, et al.
International Journal of Molecular Sciences 25, 2910 (2024).

159 Evaluation of the electronic density at critical points of hydrogen bonds: PM7 a good alternative to ab-initio methods
Soriano-Agueda L.
International Journal of Quantum Chemistry 124, e27352 (2024).

160 Prediction of long-term creep modulus of thermoplastics using brief tests and interpretable machine learning
Lobato H, Cernuda C, Zulueta K, Arriaga A, Matxain JM, and Burgoa A.
International Journal of Solids and Structures 304, 113014 (2024).

161 Understanding the photoinduced desorption and oxidation of CO on Ru(0001) using a neural network potential energy surface
Zugec I, Tetenoire A, Muzas AS, Zhang Y, Jiang B, Alducin M, and Juaristi JI.
JACS Au 4, 1997 (2024).

162 Ball milling and annealing effect in structural and magnetic properties of copper ferrite by ceramic synthesis
Cobos MA, Jimenez JA, Llorente I, de la Presa P, and Hernando A.
Journal of Alloys and Compounds 1006, 176206 (2024).

163 Practical courses on advanced methods in macromolecular crystallization: 20 years of history and future perspectives
Havlickova P, Gavira JA, Mesters JR, Koutska A, Kascakova B, Prudnikova T, Hilgenfeld R, Garcia-Ruiz JM, Rezacova P, and Smatanova IK.
Journal of Applied Crystallography 57, 1609 (2024).

164 Electromagnetic estimation of mechanical stress in steel elements by using magnetic induction
Garcia MA, Vinolas J, Alonso MSG, and Hernando A.
Journal of Applied Physics 135, 245101 (2024).

165 High-throughput virtual search of small molecules for controlling the mechanical stability of human CD4
Reifs A, Fernandez-Calvo A, Alonso-Lerma B, Schonfelder J, Franco D, Ortega-Munoz M, Casares S, Jimenez-Lopez C, Saa L, Cortajarena AL, et al.
Journal of Biological Chemistry 300, 107133 (2024).

166 Small-occupation density functional correlation energy correction to wave function approximations
Rodriguez-Jimenez JA, Carreras A, and Casanova D.
Journal of Chemical Theory and Computation 20, 1118 (2024).

167 Excited states by coupling Piris natural orbital functionals with the extended random-phase approximation
Lew-Yee JFH, Bonfil-Rivera IA, Piris M, and del Campo JM.
Journal of Chemical Theory and Computation 20, 2140 (2024).

168 Spurious oscillations caused by density functional approximations: Who is to blame? Exchange or correlation?
Sitkiewicz SP, Ferradas RR, Ramos-Cordoba E, Zalesny R, Matito E, and Luis JM.
Journal of Chemical Theory and Computation 20, 3144 (2024).

169 Electronic couplings for triplet-triplet annihilation upconversion in cystal rubrene
Diaz-Andres A, Tonnele C, and Casanova D.
Journal of Chemical Theory and Computation 20, 4288 (2024).

170 Physically motivated improvements of variational quantum eigensolvers
Vaquero-Sabater N, Carreras A, Orus R, Mayhall NJ, and Casanova D.
Journal of Chemical Theory and Computation 20, 5133 (2024).

171 Electron-spin relaxation in boron-doped graphene nanoribbons
Boto RA, Cebreiro-Gallardo A, Menchon RE, and Casanova D.
Journal of Chemical Theory and Computation 20, 9906 (2024).

172 Adaptive multi-stage integration schemes for Hamiltonian Monte Carlo
Nagar L, Fernandez-Pendas M, Sanz-Serna JM, and Akhmatskaya E.
Journal of Computational Physics 502, 112800 (2024).

173 The effective field theory of large-scale structure and multi-tracer II: redshift space and realistic tracers
Mergulhao T, Rubirab H, and Voivodicc R.
Journal of Cosmology and Astroparticle Physics 2024(01), 8 (2024).

174 Galaxy bias in the era of LSST: perturbative bias expansions
Nicola A, Hadzhiyska B, Findlay N, Garcia-Garcia C, Alonso D, Slosar A, Guo Z, Kokron N, Angulo R, Aviles A, et al.
Journal of Cosmology and Astroparticle Physics 2024(02), 15 (2024).

175 Growth history and quasar bias evolution at z < 3 from Quaia
Piccirilli G, Fabbian G, Alonso D, Storey-Fisher K, Carron J, Lewis A, and Garcia-Garcia C.
Journal of Cosmology and Astroparticle Physics 2024(06), 12 (2024).

176 Cosmic shear with small scales: DES-Y3, KiDS-1000 and HSC-DR1
Garcia-Garcia C, Zennaro M, Arico G, Alonso D, and Angulo RE.
Journal of Cosmology and Astroparticle Physics 2024(08), 24 (2024).

177 Theory of circular dichroism in angle- and spin-resolved photoemission from the surface state on Bi(111)
Krasovskii EE.
Journal of Electron Spectroscopy and Related Phenomena 277, 147501 (2024).

178 Study of paraffinic and biobased microencapsulated PCMs with reduced graphene oxide as thermal energy storage elements in cement-based materials for building applications
Erkizia E, Strunz C, Dauvergne JL, Goracci G, Peralta I, Serrano A, Ortega A, Alonso B, Zanoni F, Duengfelder M, et al.
Journal of Energy Storage 84, 110675 (2024).

179 Exploring the role of surface roughness in concrete-based thermal energy storage systems: A computational study
Rahjoo M, Rojas E, Goracci G, and Dolado JS.
Journal of Energy Storage 88, 111515 (2024).

180 Luminescence of Nd^{3+}-doped LaF_3 glass-ceramics enhanced with Ag nanoparticles
Sedano M, Gorni G, Mather GC, Duran A, Fernandez J, Balda R, and Pascual MJ.
Journal of the European Ceramic Society 44, 2427 (2024).

181 Measurement of energy resolution with the NEXT-White silicon photomultipliers
Contreras T, Palmeiro B, Almazan H, Para A, Martinez-Lema G, Guenette R, Adams C, Alvarez V, Aparicio B, Aranburu I, et al.
Journal of High Energy Physics 2024, 112 (2024).

182 Search for hidden neutrinos at the European Spallation Source: the SHiNESS experiment
Soleti SR, Coloma P, Gomez Cadenas JJ, and Cabrera A.
Journal of High Energy Physics 2024, 148 (2024).

183 A refreshing approach to understanding the action on DNA of vanadium (IV) and (V) complexes derived from the anticancer VCp_2Cl_2
Soriano-Agueda L, and Guevara-Garcia A.
Journal of Inorganic Biochemistry 261, 112705 (2024).

184 The PETALO project
Iguiniz NS, and PETALO Collaboration.
Journal of Instrumentation 19, C03059 (2024).

185 GanESS: detecting coherent elastic neutrino-nucleus scattering with noble gases
Simon A, and GanESS experiment.
Journal of Instrumentation 19, C04041 (2024).

186 Towards a fiber barrel detector for next-generation high-pressure gaseous xenon TPCs
Soleti SR, and NEXT Collaboration.
Journal of Instrumentation 19, C04042 (2024).

187 Design, characterization and installation of the NEXT-100 cathode and electroluminescence regions
Mistry K, Rogers L, Jones BJP, Munson B, Norman L, Oliver D, Pingulkar S, Rodriguez-Tiscareno M, Silva K, Stogsdill K, et al.
Journal of Instrumentation 19, P02007 (2024).

188 Exploring the compositional space of a metal-organic framework with ionic liquids to develop porous ionic conductors for enhanced signal and selectivity in VOC capacitive sensors
Goncalves BF, Fernandez E, Valverde A, Gaboardi M, Salazar H, Petrenko V, Porro JM, Cavalcanti LP, Urtiaga K, Esperanca JMSS, et al.
Journal of Materials Chemistry A 12, 14595 (2024).

189 C_6N_2S monolayer: an auxetic material with ultralow diffusion barrier and high storage capacity for potassium-ion batteries
Gao J, Zhang W, Bergara A, and Yang G.
Journal of Materials Chemistry A 12, 17557 (2024).

190 A ciprofloxacin derived task specific ionic liquid as a highly selective extractant of thorium versus uranium
Lledo D, Grindlay G, Gunaratne HQN, de Cozar A, Sirvent A, and Sansano JM.
Journal of Materials Chemistry A 12, 31557 (2024).

191 Superconducting Ce_2P_3 and CeP_2 with an interesting planar P layer
Li X, Bergara A, Zhang X, Li F, Liu Y, and Yang G.
Journal of Materials Chemistry C 12, 2526 (2024).

192 Modeling of pressure-induced charge transfer character in piezoluminescent pyridylvinylanthracene crystals
Owona J, Casanova D, Truflandier L, Castet F, and Tonnele C.
Journal of Materials Chemistry C 12, 13495 (2024).

193 The interplay between magnetism and structure in Co/Fe-CdSe diluted magnetic quantum dots
Ibraheem F, Gabrouny E, Nadi S, Mahdy MA, Mahdy IA, Ortega JE, Rogero C, Corso M, and El-Sayed A.
Journal of Materials Chemistry C 12, 16120 (2024).

194 Understanding aromaticity in [5]helicene-bridged cyclophanes: a comprehensive study
Orozco-Ic M, Soriano-Agueda L, Escayola S, Sundholm D, Merino G, and Matito E.
Journal of Organic Chemistry 89, 2459 (2024).

195 Exploring the reactivity of rigid 1-azadienes derived from methyleneγ-lactams. Applications to the stereoselective synthesis of spiro-γ-lactams
Lopez-Frances A, Serna-Burgos Z, del Corte X, de los Santos JM, de Cozar A, and Vicario J.
Journal of Organic Chemistry 89, 9502 (2024).

196 Cycloaddition of butadiene with perfluoroethylene: prediction of a periselectivity switch under pressure
Loukili M, Rivilla I, Cossio FP, Cammi R, and Chen B.
Journal of Organic Chemistry 89, 17768 (2024).

197 Triosmium cluster bearing a metalated dibenzylideneacetone ligand: synthesis, structure, redox and electronic properties
Hasanuzzaman M, Khaleque MA, Kannan TS, Kole GK, Nesterov VN, Pieslinger GE, and Ghosh S.
Journal of Organometallic Chemistry 1011, 123141 (2024).

198 Spin wave excitations in low dimensional systems with large magnetic anisotropy
Delgado F, Otrokov MM, and Arnau A.
Journal of Physics: Materials 7, 035005 (2024).

199 Adsorption of As nano-clusters on different graphene environments
Aguilera del Toro RH, Garcia-Garcia A, Moreno-Barcenas A, and Aguilera-Granja F.
Journal of Physics and Chemistry of Solids 196, 112383 (2024).

200 Nanocomposite materials as observed by mass-selective neutron spectroscopy
Krzystyniak M, Romanelli G, Grabowska B, and Fernandez-Alonso F.
Journal of Physics Communications 8, 022001 (2024).

201 Anisotropic optical conductivities of model topological nodal-line semimetals
Kandel S, Gumbs G, and Berman OL.
Journal of Physics-Condensed Matter 36, 025301 (2024).

202 Ground-state phase diagram and universality of sequential topological valence-bond-solid quantum transitions in a mixed tetramer chain
Verissimo LM, Pereira MSS, Strecka J, and Lyra ML.
Journal of Physics-Condensed Matter 36, 165802 (2024).

203 Optical properties and plasmons in moiré structures
Kuang X, Pantaleon Peralta PA, Silva-Guillen JA, Yuan S, Guinea F, and Zhan Z.
Journal of Physics-Condensed Matter 36, 173001 (2024).

204 Reentrant semiconducting behavior in polymerized fullerite structures with increasing sp^3-carbon content
Laranjeira J, Marques L, Melle-Franco M, and Strutynski K.
Journal of Physics-Condensed Matter 36, 365302 (2024).

205 Physical aging and vitrification in polymers and other glasses: complex behavior and size effects
Cangialosi D.
Journal of Polymer Science 62, 1953 (2024).

206 Zwitterionic ring expansion polymerization of tert-butyl glycidyl ether with $B(C_6F_5)_3$ towards the generation of cyclic chains
Pagnacco CA, Gastearena X, de San Roman EG, Matxain JM, and Barroso-Bujans F.
Journal of Polymer Science 62, 2704 (2024).

207 A comparative simulation study of light-matter coupling in 1D photonic crystals with 2D perovskite active layer
Thuat NT, Hoang HC, Truong TT, Do KD, Le DN, Tran CKT, Le LK, and Dang LS.
Journal of Science-Advanced Materials and Devices 9, 100766 (2024).

208 Chemical bonding induces one-dimensional physics in bulk crystal $BiIr_4Se_8$
Pollak CJ, Skorupskii G, Gutierrez-Amigo M, Singha R, Stiles JW, Kamm F, Pielnhofer F, Ong NP, Errea I, Vergniory MG, and Schoop LM.
Journal of the American Chemical Society 146, 6784 (2024).

209 Artificial photosynthases: single-chain nanoparticles with manifold visible-light photocatalytic activity for challenging "in Water" organic reactions
Arena D, Verde-Sesto E, Rivilla I, and Pomposo JA.
Journal of the American Chemical Society 146, 14397 (2024).

210 Choreographing oscillatory hydrodynamics with DNA-coated gold nanoparticles
Rao A, Iglesias AS, and Grzelczak M.
Journal of the American Chemical Society 146, 18236 (2024).

211 Mixed stereochemistry macrocycle acts as a helix-stabilizing peptide N-cap
Hink F, Aduriz-Arrizabalaga J, Lopez X, Suga H, de Sancho D, and Rogers JM.
Journal of the American Chemical Society 146, 24348 (2024).

212 Thermal rates and high-temperature tunneling from surface reaction dynamics and first-principles
Nitz F, Zhang L, Hertl N, Rahinov I, Galparsoro O, Kandratsenka A, Kitsopoulos TN, Auerbach DJ, Guo H, Wodtke AM, and Borodin D.
Journal of the American Chemical Society 146, 31538 (2024).

213 Canonical and Poynting currents in propagation and diffraction of structured light: tutorial
Ghosh B, Daniel A, Gorzkowski B, Bekshaev AY, Lapkiewicz R, and Bliokh KY.
Journal of the Optical Society of America B 41, 1276 (2024).

214 Efficient antibiotic removal from water using europium-doped poly(vinyl alcohol) nanofiber mats esterified with citric acid
Coin F, Rodriguez-Ramirez CA, Oyarbide FS, Picon D, Goyanes S, and Cerveny S.
Journal of Water Process Engineering 63, 105447 (2024).

215 The search for neutrinoless double-beta decay
Gomez-Cadenas JJ, Martin-Albo J, Menendez J, Mezzetto M, Monrabal F, and Sorel M.
La Rivista del Nuovo Cimento 46, 619 (2024).

216 Breakdown of Langmuir adsorption isotherm in small closed systems
Zangi R.
Langmuir 40, 3900 (2024).

217 Characterizing the backscattered spectrum of Mie spheres
Molezuelas-Ferreras M, Nodar A, Barra-Burillo M, Olmos-Trigo J, Lasa-Alonso J, Gomez-Viloria I, Posada E, Varga JJM, Esteban R, Aizpurua J, et al.
Laser & Photonics Review 18, 2300665 (2024).

218 Chiral photonic super-crystals based on helical van der Waals homostructures
Voronin KV, Toksumakov AN, Ermolaev GA, Slavich AS, Tatmyshevskiy MK, Novikov SM, Vyshnevyy AA, Arsenin AV, Novoselov KS, Ghazaryan DA, Volkov VS, and Baranov DG.
Laser & Photonics Review 18, 2301113 (2024).

219 Exploring van der Waals materials with high anisotropy: geometrical and optical approaches
Slavich AS, Ermolaev GA, Tatmyshevskiy MK, Toksumakov AN, Matveeva OG, Grudinin DV, Voronin KV, Mazitov A, Kravtsov KV, Syuy AV, et al.
Light: Science & Applications 13, 68 (2024).

220 Anopore confinement in the cyanobiphenyl-based liquid crystal dimer CB7CB. A dielectric study
Robles-Hernandez B, Sebastian N, de la Fuente MR, Lopez DO, Salud J, and Diez-Berart S.
Liquid Crystals 51, 1537 (2024).

221 Towards self-conscious AI using deep image net models: application for blood cell classification
Abou Ali M, Dornaika F, and Arganda-Carreras I.
Machine Learning and Knowledge Extraction 6, 2400 (2024).

222 Why single-chain nanoparticles from weak polyelectrolytes can be synthesized at large scale in concentrated solution?
Pomposo JA, Arena D, Verde-Sesto E, Maiz J, de Molina PM, and Moreno AJ.
Macromolecular Rapid Communications 45, 2400453 (2024).

223 Dynamics of single-chain nanoparticles under crowding: a neutron spin echo study
Robles-Hernandez B, de Molina PM, Asenjo-Sanz I, Gonzalez-Burgos M, Pasini S, Pomposo JA, Arbe A, and Colmenero J.
Macromolecules 57, 4706 (2024).

224 Nonmonotonic composition dependence of viscosity upon adding single-chain nanoparticles to entangled polymers
Pyromali C, Patelis N, Cutrano M, Gosika M, Glynos E, Moreno AJ, Sakellariou G, Smrek J, and Vlassopoulos D.
Macromolecules 57, 4826 (2024).

225 Segmental and chain dynamics of polyisoprene-based model vitrimers
Alegria A, Arbe A, Colmenero J, Bhaumik S, Ntetsikas K, and Hadjichristidis N.
Macromolecules 57, 5639 (2024).

226 Quantum-size effects in ultra-thin gold films on Pt(111) surface
Koroteev YM, Silkin IV, Silkin VM, and Chulkov EV.
Materials 17, 63 (2024).

227 Advancements and challenges in plasmon-exciton quantum emitters based on colloidal quantum dots and perovskite nanocrystals
Olejniczak A, Rakovich Y, and Krivenkov V.
Materials for Quantum Technology 4, 032001 (2024).

228 Interfacing two-dimensional and magnetic topological insulators: Bi bilayer on $MnBi_2Te_4$-family materials
Klimovskikh II, Eremeev V, Estyunin DA, Filnov SO, Shimada K, Golyashov VA, Solovova NY, Tereshchenko OE, Kokh KA, Frolov AS, et al.
Materials Today Advances 23, 100511 (2024).

229 Kinetics of heterogeneous polymerization of glycidol with $B(C_6F_5)_3$ in toluene in the absence and presence of water
Urreizti EG, Gastearena X, Lam A, Gonzalez de San Roman E, Miranda JI, Matxain JM, and Barroso-Bujans F.
Materials Today Chemistry 37, 101993 (2024).

230 Thermal conductivity of layered minerals using molecular dynamics simulation: a case study on calcium sulfates
Sarkar PK, Mitra N, and Dolado JS.
Materials Today Communications 38, 108101 (2024).

231 Refractory and thermoelectric properties of stabilized Tricalcium aluminate allotrope: a first-principles calculation approach
Agbaoye RO, Ayuela A, and Dolado JS.
Materials Today Communications 39, 108757 (2024).

232 Mathematical analysis of the electromotive induced force in a magnetically damped suspension
Aberturas S, Aguilera JD, Olazagoitia JL, Garcia MA, and Hernando A.
Mathematics 12, 1004 (2024).

233 Design of high-temperature superconductors at moderate pressures by alloying AlH_3 or GaH_3
Liang X, Wei X, Zurek E, Bergara A, Li P, Gao G, and Tian Y.
Matter and Radiation at Extremes 9, 018401 (2024).

234 Cyclodextrin-based nanosponges for the dispersive-solid phase extraction of pesticides from environmental waters
Felli N, Lorenzet A, Di Lisio V, Bussetti V, Dal Bosco C, Migneco LM, Gentili A, and Francolini I.
Microchemical Journal 207, 112135 (2024).

235 Gypsum crystals formed by the anhydrite-gypsum transformation at low temperatures: implications for the formation of the geode of Pulpí
Cotellucci A, Garcia-Ruiz JM, Otalora F, Canals A, Bruno M, Wehrung Q, Pellegrino L, Aquilano D, and Pastero L.
Minerals 14, 1074 (2024).

236 J-PLUS: galaxy-star-quasar classification for DR3
Von Marttens R, Marra V, Quartin M, Casarini L, Baqui PO, Alvarez-Candal A, Galindo-Guil FJ, Fernandez-Ontiveros JA, del Pino A, Diaz-Garcia LA, et al.
Monthly Notices of the Royal Astronomical Society 527, 3347 (2024).

237 Phase-space simulations of prompt cusps: simulating the formation of the first haloes without artificial fragmentation
Ondaro-Mallea L, Angulo RE, Stuecker J, Hahn O, and White SDM.
Monthly Notices of the Royal Astronomical Society 527, 10802 (2024).

238 Reaching for the stars - JWST/NIRSpec spectroscopy of a lensed star candidate at z=4.76
Furtak LJ, Meena AK, Zackrisson E, Zitrin A, Brammer GB, Coe D, Diego JM, Eldridge JJ, Jimenez-Teja Y, Kokorev V, et al.
Monthly Notices of the Royal Astronomical Society 527, L7 (2024).

239 Multiwavelength exploration of extreme emission line galaxies detected in miniJPAS survey
Breda I, Amarantidis S, Vilchez JM, Perez-Montero E, Kehrig C, Iglesias-Paramo J, Arroyo-Polonio A, Fernandez-Ontiveros JA, Gonzalez Delgado RM, Diaz-Garcia LA, et al.
Monthly Notices of the Royal Astronomical Society 528, 3340 (2024).

240 A post-merger enhancement only in star-forming Type 2 Seyfert galaxies: the deep learning view
Avirett-Mackenzie MS, Villforth C, Huertas-Company M, Wuyts S, Alexander DM, Bonoli S, Lapi A, Lopez IE, Almeida CR, and Shankar F.
Monthly Notices of the Royal Astronomical Society 528, 6915 (2024).

241 Hybrid bias and displacement emulators for field-level modelling of galaxy clustering in real and redshift space
Ibanez MP, Angulo RE, Jamieson D, and Li Y.
Monthly Notices of the Royal Astronomical Society 529, 89 (2024).

242 An improved halo occupation distribution prescription from UNITsim Hα emission-line galaxies: conformity and modified radial profile
Reyes-Peraza G, Avila S, Gonzalez-Perez V, Lopez-Cano D, Knebe A, Ramakrishnan S, and Yepes G.
Monthly Notices of the Royal Astronomical Society 529, 3877 (2024).

243 Origin of the correlation between stellar kinematics and globular cluster system richness in ultradiffuse galaxies
Pfeffer J, Janssens SR, Buzzo ML, Gannon JS, Bastian N, Bekki K, Brodie JP, Couch WJ, Crain RA, Forbes DA, Kruijssen JMD, and Romanowsky AJ.
Monthly Notices of the Royal Astronomical Society 529, 4914 (2024).

244 The metallicity gradients of star-forming regions store information of the assembly history of galaxies
Jara-Ferreira F, Tissera PB, Sillero E, Rosas-Guevara Y, Pedrosa SE, De Rossi ME, Theuns T, and Bignone L.
Monthly Notices of the Royal Astronomical Society 530, 1369 (2024).

245 The wide-field, multiplexed, spectroscopic facility WEAVE: survey design, overview, and simulated implementation
Jin S, Trager SC, Dalton GB, Aguerri JAL, Drew JE, Falcon-Barroso J, Gaensicke BT, Hill V, Iovino A, Pieri MM, et al.
Monthly Notices of the Royal Astronomical Society 530, 2688 (2024).

246 A dusty protocluster surrounding the binary galaxy HerBS-70 at z=2.3
Bakx TJLC, Berta S, Dannerbauer H, Cox P, Butler KM, Hagimoto M, Hughes DH, Riechers DA, van der Werf PP, Yang C, et al.
Monthly Notices of the Royal Astronomical Society 530, 4578 (2024).

247 HYMALAIA: a hybrid lagrangian model for intrinsic alignments
Maion F, Angulo RE, Bakx T, Chisari NE, Kurita T, and Pellejero-Ibanez M.
Monthly Notices of the Royal Astronomical Society 531, 2684 (2024).

248 Scrutinizing evidence for the triggering of active galactic nuclei in the outskirts of massive galaxy clusters at z ≈ 1
Munoz Rodriguez I, Georgakakis A, Shankar F, Ruiz A, Bonoli S, Comparat J, Fu H, Koulouridis E, Lapi A, and Almeida CR.
Monthly Notices of the Royal Astronomical Society 532, 336 (2024).

249 Accretion properties of X-ray AGN: evidence for radiation-regulated obscuration with redshift-dependent host galaxy contribution
Laloux B, Georgakakis A, Alexander DM, Buchner J, Andonie C, Acharya N, Aird J, Alonso-Tetilla V, Bongiorno A, Hickox RC, et al.
Monthly Notices of the Royal Astronomical Society 532, 3459 (2024).

250 Explaining the oblate morphology of dwarf spheroidals with wave dark matter perturbations
Della Monica R, de Martino I, and Broadhurst T.
Monthly Notices of the Royal Astronomical Society 534, 2196 (2024).

251 Cosmological constraints from the full-shape galaxy power spectrum in SDSS-III BOSS using the BACCO hybrid Lagrangian bias emulator
Ibanez MP, Angulo RE, and Peacock JA.
Monthly Notices of the Royal Astronomical Society 534, 3595 (2024).

252 A link to the past: characterizing wandering black holes in Milky Way-type galaxies
Untzaga J, Bonoli S, Izquierdo-Villalba D, Mezcua M, and Spinoso D.
Monthly Notices of the Royal Astronomical Society 535, 3293 (2024).

253 Constraining the AGN formation channel for detected black hole binary mergers up to z=1.5 with the Quaia catalogue
Veronesi N, van Velzen S, Rossi EM, and Storey-Fisher K.
Monthly Notices of the Royal Astronomical Society 536, 375 (2024).

254 Comparing E-MOSAICS predictions of high-redshift proto-globular clusters with JWST observations in lensed galaxies
Pfeffer J, Forbes DA, Romanowsky AJ, Bastian N, Crain RA, Kruijssen JMD, Bekki K, Brodie JP, Chevance M, Couch WJ, and Gannon JS.
Monthly Notices of the Royal Astronomical Society 536, 1878 (2024).

255 Kondo effect of Co-porphyrin: remarkable sensitivity to adsorption sites and orientations
Meng X, Moeller J, Menchon RE, Weismann A, Sanchez-Portal D, Garcia-Lekue A, Herges R, and Berndt R.
Nano Letters 24, 180 (2024).

256 Enhancing haloarene coupling reaction efficiency on an oxide surface by metal atom addition
Abadia M, Piquero-Zulaica I, Brede J, Verdini A, Floreano L, Barth JV, Lobo-Checa J, Corso M, and Rogero C.
Nano Letters 24, 1923 (2024).

257 Impact of single-melamine tautomerization on the excitation of molecular vibrations in inelastic electron tunneling spectroscopy
Alkorta M, Cizek R, Neel N, Frederiksen T, and Kroeger J.
Nano Letters 24, 7195 (2024).

258 Prediction of a novel electromechanical response in polar polymers with rigid backbones: contrasting furan-derived nanothreads to poly(vinylidene fluoride)
Wang T, Gao Y, Chen B, Crespi VH, and van Duin ACT.
Nano Letters 24, 9195 (2024).

259 Unveiling the interlayer interaction in a 1H/1T TaS_2 van der Waals heterostructure
Ayani CG, Bosnar M, Calleja F, Sole AP, Stetsovych O, Ibarburu IM, Rebanal C, Garnica M, Miranda R, Otrokov MM, et al.
Nano Letters 24, 10805 (2024).

260 Progressive control of Rashba state on topological Dirac semimetal KZnBi
Lee G, Koo J, Lee Y, Cha J, Hyun J, Han K, Lim CY, Denlinger JD, Kim S, Kim SW, and Kim Y.
Nano Letters 24, 13727 (2024).

261 Unveiling intrinsic bulk photovoltaic effect in atomically thin ReS_2
Ramos M, Ahmed T, Tu BQ, Chatzikyriakou E, Olano-Vegas L, Martin-Garcia B, Calvo MR, Tsirkin SS, Souza I, Casanova F, et al.
Nano Letters 24, 14728 (2024).

262 Infrared spectroscopy for diagnosing superlattice minibands in twisted bilayer graphene near the magic angle
Li G, Kumar RK, Stepanov P, Pantaleon PA, Zhan Z, Agarwal H, Bercher A, Barrier J, Watanabe K, Taniguchi T, et al.
Nano Letters 24, 15956 (2024).

263 Unveiling the synergy of coupled gold nanoparticles and J-aggregates in plexcitonic systems for enhanced photochemical applications
Jumbo-Nogales A, Rao A, Olejniczak A, Grzelczak M, and Rakovich Y.
Nanomaterials 14, 35 (2024).

264 Plasmon resonance in a system of Bi nanoparticles embedded into (Al,Ga)As matrix
Ushanov VI, Eremeev SV, Silkin VM, and Chaldyshev VV.
Nanomaterials 14, 109 (2024).

265 Unveiling influence of dielectric losses on the localized surface plasmon resonance in (Al,Ga)As:Sb metamaterials
Ushanov VI, Eremeev SV, Silkin VM, and Chaldyshev VV.
Nanomaterials 14, 167 (2024).

266 Effect of substitutional metallic impurities on the optical absorption properties of TiO_2
Cisternas E, Aguilera del Toro R, Aguilera-Granja F, and Vogel EE.
Nanomaterials 14, 1224 (2024).

267 New two-dimensional materials obtained by functionalization of boron graphdiyne layers with nickel
German E, Lopez MJ, and Alonso JA.
Nanomaterials 14, 1706 (2024).

268 Optically driven plasmons in graphene/hBN van der Waals heterostructures: simulating s-SNOM measurements
Golenic N, de Gironcoli S, and Despoja V.
Nanophotonics 13, 2765 (2024).

269 Twist-tunable in-plane anisotropic polaritonic crystals
Capote-Robayna N, Tresguerres-Mata AIF, Tarazaga Martin-Luengo A, Teran-Garcia E, Martin-Moreno L, Alonso-Gonzalez P, and Nikitin AY.
Nanophotonics 13, 4761 (2024).

270 An overview on plasmon-enhanced photoluminescence via metallic nanoantennas
Montano-Priede JL, Zapata-Herrera M, Esteban R, Zabala N, and Aizpurua J.
Nanophotonics 13, 4771 (2024).

271 The effect of water on gold supported chiral graphene nanoribbons: rupture of conjugation by an alternating hydrogenation pattern
Berdonces-Layunta A, Matej A, Jimenez-Martin A, Lawrence J, Mohammed MSG, Wang T, Mallada B, de la Torre B, Martinez A, Vilas-Varela M, et al.
Nanoscale 16, 734 (2024).

272 Photocatalytic activity of dual defect modified graphitic carbon nitride is robust to tautomerism: machine learning assisted ab initio quantum dynamics
Agrawal S, Wang B, Wu Y, Casanova D, and Prezhdo OV.
Nanoscale 16, 8986 (2024).

273 Giant supermagnonic Bloch point velocities in cylindrical ferromagnetic nanowires
Tejo F, Fernandez-Roldan JA, Guslienko KY, Otxoa RM, and Chubykalo-Fesenko O.
Nanoscale 16, 10737 (2024).

274 Quantum-confined bismuth iodide perovskite nanocrystals in mesoporous matrices
Dupe S, Liu D, Ghosh A, Vasenko AS, Pouget S, Schlutig S, Vidal M, Lebeau B, Ling WL, Reiss P, et al.
Nanoscale 16, 11223 (2024).

275 Plasmonic nanoparticle sensors: current progress, challenges, and future prospects
Kant K, Beeram R, Cao Y, dos Santos PSS, Gonzalez-Cabaleiro L, Garcia-Lojo D, Guo H, Joung Y, Kothadiya S, Lafuente M, et al.
Nanoscale Horizons 9, 2085 (2024).

276 Two-dimensional heavy fermions in the van der Waals metal CeSiI
Posey VA, Turkel S, Rezaee M, Devarakonda A, Kundu AK, Ong CS, Thinel M, Chica DG, Vitalone RA, Jing R, et al.
Nature 625, 7995 (2024).

277 Strong electron-phonon coupling in magic-angle twisted bilayer graphene
Chen C, Nuckolls KP, Ding S, Miao W, Wong D, Oh M, Lee RL, He S, Peng C, Pei D, et al.
Nature 636, 342 (2024).

278 Multi-source connectivity as the driver of solar wind variability in the heliosphere
Yardley SL, Brooks DH, D'Amicis R, Owen CJ, Long DM, Baker D, Demoulin P, Owens MJ, Lockwood M, Mihailescu T, et al.
Nature Astronomy 8, 953 (2024).

279 Bistability between π-diradical open-shell and closed-shell states in indeno[1,2-α]fluorene
Mishra S, Vilas-Varela M, Lieske LA, Ortiz R, Fatayer S, Roncevic I, Albrecht F, Frederiksen T, Pena D, and Gross L.
Nature Chemistry 16, 755 (2024).

280 Vibronic effects on the quantum tunnelling of magnetisation in Kramers single-molecule magnets
Mattioni A, Staab JK, Blackmore WJA, Reta D, Iles-Smith J, Nazir A, and Chilton NF.
Nature Communications 15, 485 (2024).

281 Deceptive orbital confinement at edges and pores of carbon-based 1D and 2D nanoarchitectures
Piquero-Zulaica I, Corral-Rascón E, Diaz de Cerio X, Riss A, Yang B, Garcia-Lekue A, Kher-Elden MA, Abd El-Fattah ZM, Nobusue S, Kojima T, et al.
Nature Communications 15, 1062 (2024).

282 Interacting topological quantum chemistry in 2D with many-body real space invariants
Herzog-Arbeitman J, Bernevig BA, and Song ZD.
Nature Communications 15, 1171 (2024).

283 Wandering principal optical axes in van der Waals triclinic materials
Ermolaev GA, Voronin KV, Toksumakov AN, Grudinin DV, Fradkin IM, Mazitov A, Slavich AS, Tatmyshevskiy MK, Yakubovsky DI, Solovey VR, et al.
Nature Communications 15, 1552 (2024).

284 Ferromagnetism on an atom-thick & extended 2D metal-organic coordination network
Lobo-Checa J, Hernandez-Lopez L, Otrokov MM, Piquero-Zulaica I, Candia AE, Gargiani P, Serrate D, Delgado F, Valvidares M, Cerda J, Arnau A, and Bartolome F.
Nature Communications 15, 1858 (2024).

285 Toward sub-second solution exchange dynamics in flow reactors for liquid-phase transmission electron microscopy
Merkens S, Tollan C, De Salvo G, Bejtka K, Fontana M, Chiodoni A, Kruse J, Iriarte-Alonso MA, Grzelczak M, Seifert A, and Chuvilin A.
Nature Communications 15, 2522 (2024).

286 Topological minibands and interaction driven quantum anomalous Hall state in topological insulator based moiré heterostructures
Yang K, Xu Z, Feng Y, Schindler F, Xu Y, Bi Z, Bernevig BA, Tang P, and Liu CX.
Nature Communications 15, 2670 (2024).

287 Observation of naturally canalized phonon polaritons in LiV_2O_5 thin layers
Tresguerres-Mata AIF, Lanza C, Taboada-Gutierrez J, Matson JR, Alvarez-Perez G, Isobe M, Tarazaga-Martin-Luengo A, Duan J, Partel S, Velez M, et al.
Nature Communications 15, 2696 (2024).

288 Observation of Kekulé vortices around hydrogen adatoms in graphene
Guan Y, Dutreix C, Gonzalez-Herrero H, Ugeda MM, Brihuega I, Katsnelson MI, Yazyev OV, and Renard VT.
Nature Communications 15, 2927 (2024).

289 Weyl spin-momentum locking in a chiral topological semimetal
Krieger JA, Stolz S, Robredo I, Manna K, Mcfarlane EC, Date M, Pal B, Yang J, Guedes EB, Dil JH, et al.
Nature Communications 15, 3720 (2024).

290 Superconducting spintronic heat engine
De Araujo CIL, Virtanen P, Spies M, Gonzalez-Orellana C, Kerschbaumer S, Ilyn M, Rogero C, Heikkila TT, Giazotto F, and Strambini E.
Nature Communications 15, 4823 (2024).

291 Low-energy electronic structure in the unconventional charge-ordered state of ScV_6Sn_6
Kundu AK, Huang X, Seewald E, Ritz E, Pakhira S, Zhang S, Sun D, Turkel S, Shabani S, Yilmaz T, et al.
Nature Communications 15, 5008 (2024).

292 Emergent flat band and topological Kondo semimetal driven by orbital-selective correlations
Chen L, Xie F, Sur S, Hu H, Paschen S, Cano J, and Si Q.
Nature Communications 15, 5242 (2024).

293 Topological heavy fermions in magnetic field
Singh K, Chew A, Herzog-Arbeitman J, Bernevig BA, and Vafek O.
Nature Communications 15, 5257 (2024).

294 Topological Fermi-arc surface state covered by floating electrons on a two-dimensional electride
Lim CY, Kim MS, Lim DC, Kim S, Lee Y, Cha J, Lee G, Song SY, Thapa D, Denlinger JD, et al.
Nature Communications 15, 5615 (2024).

295 Direct observation of twisted stacking domains in the van der Waals magnet CrI_3
Jang M, Lee S, Cantos-Prieto F, Kosic I, Li Y, McCray ARC, Jung MH, Yoon JY, Boddapati L, Deepak FL, et al.
Nature Communications 15, 5925 (2024).

296 Imaging nanomagnetism and magnetic phase transitions in atomically thin CrSBr
Tschudin MA, Broadway DA, Siegwolf P, Schrader C, Telford EJ, Gross B, Cox J, Dubois AEE, Chica DG, Rama-Eiroa R, et al.
Nature Communications 15, 6005 (2024).

297 Uncovering low-frequency vibrations in surface-enhanced Raman of organic molecules
Boehmke Amoruso A, Boto RA, Elliot E, de Nijs B, Esteban R, Foldes T, Aguilar-Galindo F, Rosta E, Aizpurua J, and Baumberg JJ.
Nature Communications 15, 6733 (2024).

298 Axion topology in photonic crystal domain walls
Devescovi C, Morales-Perez A, Hwang Y, Garcia-Diez M, Robredo I, Manes JL, Bradlyn B, Garcia-Etxarri A, and Vergniory MG.
Nature Communications 15, 6814 (2024).

299 Orbital selective commensurate modulations of the local density of states in ScV_6Sn_6 probed by nuclear spins
Guehne R, Noky J, Yi C, Shekhar C, Vergniory MG, Baenitz M, and Felser C.
Nature Communications 15, 8213 (2024).

300 Robust flat bands in twisted trilayer graphene moiré quasicrystals
Hao CY, Zhan Z, Pantaleon PA, He JQ, Zhao YX, Watanabe K, Taniguchi T, Guinea F, and He L.
Nature Communications 15, 8437 (2024).

301 On-chip phonon-enhanced IR near-field detection of molecular vibrations
Bylinkin A, Castilla S, Slipchenko TM, Domina K, Calavalle F, Pusapati VV, Autore M, Casanova F, Hueso LE, Martin-Moreno L, et al.
Nature Communications 15, 8907 (2024).

302 Unidirectional ray polaritons in twisted asymmetric stacks
Alvarez-Cuervo J, Obst M, Dixit S, Carini G, Tresguerres-Mata AIF, Lanza C, Teran-Garcia E, Alvarez-Perez G, Alvarez-Tomillo LF, Diaz-Granados K, et al.
Nature Communications 15, 9042 (2024).

303 Fluorescence from a single-molecule probe directly attached to a plasmonic STM tip
Friedrich N, Roslawska A, Arrieta X, Kaiser K, Romeo M, Le Moal E, Scheurer F, Aizpurua J, Borisov AG, Neuman T, and Schull G.
Nature Communications 15, 9733 (2024).

304 Designing giant Hall response in layered topological semimetals
Skorupskii G, Orlandi F, Robredo I, Jovanovic M, Yamada R, Katmer F, Vergniory MG, Manuel P, Hirschberger M, and Schoop LM.
Nature Communications 15, 10112 (2024).

305 Fluorescence imaging of individual ions and molecules in pressurized noble gases for barium tagging in ^{136}Xe
Byrnes NK, Dey E, Foss FW, Jones BJP, Madigan R, McDonald AD, Miller RL, Norman LR, Navarro KE, Nygren DR, and NEXT Collaboration.
Nature Communications 15, 10595 (2024).

306 A seamless graphene spin valve based on proximity to van der Waals magnet $Cr_2Ge_2Te_6$
Yang H, Gobbi M, Herling F, Pham VT, Calavalle F, Martin-Garcia B, Fert A, Hueso LE, and Casanova F.
Nature Electronics 8, 15 (2024).

307 A deep learning method that identifies cellular heterogeneity using nanoscale nuclear features
Carnevali D, Zhong L, González-Almela E, Viana C, Rotkevich M, Wang A, Franco-Barranco D, Gonzalez-Marfil A, Neguembor MV, Castells-Garcia A, Arganda-Carreras I, and Pia Cosma M.
Nature Machine Intelligence 6, 1021 (2024).

308 Multistep magnetization switching in orthogonally twisted ferromagnetic monolayers
Boix-Constant C, Jenkins S, Rama-Eiroa R, Santos EJG, Manas-Valero S, and Coronado E.
Nature Materials 23, 212 (2024).

309 DL4MicEverywhere: deep learning for microscopy made flexible, shareable and reproducible
Hidalgo-Cenalmor I, Pylvanainen JW, Ferreira MG, Russell CT, Saguy A, Arganda-Carreras I, Shechtman Y, Jacquemet G, Henriques R, Gomez de Mariscal E, and AI4Life Horizon Europe Program.
Nature Methods 21, 925 (2024).

310 Unravelling topological states in quantum spin chains
Choi DJ, and Bercioux D.
Nature Nanotechnology 19, 1763 (2024).

311 Efficient near-infrared organic light-emitting diodes with emission from spin doublet excitons
Cho HH, Gorgon S, Londi G, Giannini S, Cho C, Ghosh P, Tonnelé C, Casanova D, Olivier Y, Baikie TK, et al.
Nature Photonics 18, 905 (2024).

312 Time in a glass
Ruta B, and Cangialosi D.
Nature Physics 20, 544 (2024).

313 Correlated order at the tipping point in the kagome metal CsV_3Sb_5
Guo C, Wagner G, Putzke C, Chen D, Wang K, Zhang L, Gutierrez-Amigo M, Errea I, Vergniory MG, Felser C, et al.
Nature Physics 20, 579 (2024).

314 Non-trivial quantum geometry and the strength of electron-phonon coupling
Yu J, Ciccarino CJ, Bianco R, Errea I, Narang P, and Bernevig BA.
Nature Physics 20, 1262 (2024).

315 Bending rigidity, sound propagation and ripples in flat graphene
Aseginolaza U, Diego J, Cea T, Bianco R, Monacelli L, Libbi F, Calandra M, Bergara A, Mauri F, and Errea I.
Nature Physics 20, 1288 (2024).

316 Universal symmetry breaking passes the superfluid test
Del Campo A, and Shinn SH.
Nature Physics 20, 1523 (2024).

317 Quantum critical metals and loss of quasiparticles
Hu H, Chen L, and Si Q.
Nature Physics 20, 1863 (2024).

318 Controllable orbital angular momentum monopoles in chiral topological semimetals
Yen Y, Krieger JA, Yao M, Robredo I, Manna K, Yang Q, McFarlane EC, Shekhar C, Borrmann H, Stolz S, et al.
Nature Physics 20, 1912 (2024).

319 Magnetically tunable supercurrent in dilute magnetic topological insulator-based Josephson junctions
Mandal P, Mondal S, Stehno MP, Ilic S, Bergeret FS, Klapwijk TM, Gould C, and Molenkamp LW.
Nature Physics 20, 11223 (2024).

320 Complementary probes for the electrochemical interface
Pastor E, Lian Z, Xia L, Ecija D, Galan-Mascaros JR, Barja S, Gimenez S, Arbiol J, Lopez N, and Garcia de Arquer FP.
Nature Reviews Chemistry 8, 159 (2024).

321 Flat bands, strange metals and the Kondo effect
Checkelsky JG, Bernevig BA, Coleman P, Si Q, and Paschen S.
Nature Reviews Materials 9, 509 (2024).

322 Tip-enhanced Raman scattering
Hoeppener C, Aizpurua J, Chen H, Graefe S, Jorio A, Kupfer S, Zhang Z, and Deckert V.
Nature Reviews Methods Primers 4, 47 (2024).

323 Understanding the bonding and aromaticity of $[Au_3\{C_4H_4(X)_4E\}_3]$- (X = CF_3, CN, BO; E = Si, Ge): trinuclear gold superhalogens
Das S, Sinha S, Roymahapatra G, Orozco-Ic M, Chandra De G, and Giri S.
New Journal of Chemistry 48, 4765 (2024).

324 Activation of metrologically useful genuine multipartite entanglement
Trenyi R, Lukacs A, Horodecki P, Horodecki R, Vertesi T, and Toth G.
New Journal of Physics 26, 023034 (2024).

325 Pseudo-proper two-dimensional electron gas formation
Bennett D, Aguado-Puente P, Artacho E, and Bristowe NC.
New Journal of Physics 26, 102001 (2024).

326 Tailored plasmon polariton landscape in graphene/boron nitride patterned heterostructures
Golenic N, de Gironcoli S, and Despoja V.
npj 2D Materials and Applications 8, 37 (2024).

327 On the dynamical stability of copper-doped lead apatite
Kim SW, Wang K, Chen S, Conway LJ, Pascut GL, Errea I, Pickard CJ, and Monserrat B.
npj Computational Materials 10, 16 (2024).

328 Prediction of ambient pressure conventional superconductivity above 80 K in hydride compounds
Sanna A, Cerqueira TFT, Fang YW, Errea I, Ludwig A, and Marques MAL.
npj Computational Materials 10, 44 (2024).

329 Ultrafast antiferromagnetic switching of Mn_2Au with laser-induced optical torques
JL Ross JL, Gavriloaea PI, Freimuth F, Adamantopoulos T, Mokrousov Y, Evans RFL, Chantrell R, Otxoa RM, and Chubykalo-Fesenko O.
npj Computational Materials 10, 234 (2024).

330 Weyl metallic state induced by helical magnetic order
Soh JR, Sanchez-Ramirez I, Yang X, Sun J, Zivkovic I, Rodriguez-Velamazan JA, Fabelo O, Stunault A, Bombardi A, Balz C, et al.
npj Quantum Materials 9, 7 (2024).

331 Distinct switching of chiral transport in the kagome metals KV_3Sb_5 and CsV_3Sb_5
Guo C, van Delft MR, Gutierrez-Amigo M, Chen D, Putzke C, Wagner G, Fischer MH, Neupert T, Errea I, Vergniory MG, et al.
npj Quantum Materials 9, 20 (2024).

332 Nonlinearity vs nonlocality with emphasis on bandwidth broadening in semiconductor-based 1d metamaterials
Goncharenko V, Silkin VM, and Chang YC.
Optics Express 32, 12551 (2024).

333 Influence of crystal field inhomogeneities on the spontaneous and laser tuning emission of a Nd^{3+} -doped Li_2O-BaO-Al_2O_3-P_2O_5 glass
Garcia-Revilla S, Azkargorta J, Iparraguirre I, Munoz F, Fernandez J, and Balda R.
Optical Materials 157, 116417 (2024).

334 Tutorial 2.0: computing topological invariants in 3D photonic crystals
Devescovi C, Morales-Perez A, Blanco de Paz M, Manes JL, Bradlyn B, Vergniory MG, and Garcia-Etxarri A.
Optical Materials Express 14, 2161 (2024).

335 Dehydration of alcohols catalyzed by copper(II) sulfate: type II dyotropic reactions and stepwise mechanisms
Sanchez-Quesada J, Lopez-Cruz C, de Cozar A, Arrieta A, Arrastia I, and Cossio FP.
Organic & Biomolecular Chemistry 22, 1800 (2024).

336 Comment on "Polycyclic aromatic hydrocarbons containing antiaromatic chalcogenopyrano[3,2-b]-chalcogenopyrans" by Chen W, Zong H, Xie Y, Xu J, Cai J-W, Wang SD and Zhou G. Organic Chemistry Frontiers 11, 390 (2024)
Soriano-Agueda L.
Organic Chemistry Frontiers 11, 6265 (2024).

337 Exploring the antiviral activities of the FDA-approved drug sulfadoxine and its derivatives against Chikungunya virus
Martins DOS, Ruiz UEA, Santos IA, Oliveira IS, Guevara-Vega M, de Paiva REF, Abbehausen C, Sabino-Silva R, Corbi PP, and Jardim ACG.
Pharmacological Reports 76, 1147 (2024).

338 Broadening the bandwidth of epsilon-near-zero metamaterials with embedded square frames
Goncharenko AV, and Silkin VM.
Photonics 11, 1185 (2024).

339 On parametric amplification in discrete Josephson transmission line
Kogan E.
Physica C 616, 1354402 (2024).

340 Enhancing MRI brain tumor classification: a comprehensive approach integrating real-life scenario simulation and augmentation techniques
Abou Ali M, Dornaika F, Arganda-Carreras I, Chmouri R, and Shayeh H.
Physica Medica 127, 104841 (2024).

341 Phase diagrams of the diode effect in superconducting heterostructures
Karabassov T, Bobkova V, Silkin VM, Lvov BG, Golubov AA, and Vasenko AS.
Physica Scripta 99, 015010 (2024).

342 The shocks in Josephson transmission line revisited
Kogan E.
Physica Status Solidi B-Basic Solid State Physics 261, 2300336 (2024).

343 Superconductivity in the doped polymerized fullerite clathrate from first principles
Laranjeira J, Errea I, Dangic D, Marques L, Melle-Franco M, and Strutynski K.
Physica Status Solidi-Rapid Research Letters 18, 2300249 (2024).

344 Room temperature ferromagnetism in graphene/SiC(0001) system intercalated by Fe and Co
Filnov SO, Estyunin DA, Klimovskikh II, Estyunina TP, Golyashov VA, Tarasov AS, Kosyrev NN, Komarov VA, Patrin GS, Rybkina AA, et al.
Physica Status Solidi-Rapid Research Letters 18, 2300336 (2024).

345 Second-order nonlinear optical properties of X-shaped pyrazine derivatives
Postils V, Buresova Z, Casanova D, Champagne B, Bures F, Rodriguez V, and Castet F.
Physical Chemistry Chemical Physics 26, 1709 (2024).

346 Simulating high-pressure surface reactions with molecular beams
Taleb AA, Schiller F, Vyalikh DV, Maria Perez J, Auras SV, Farias D, and Ortega JE.
Physical Chemistry Chemical Physics 26, 1770 (2024).

347 The crucial role of transient tri-coordinated oxygen in the flow of silicate melts
Gao L, Liu X, Bai J, Chen B, Wu M, Kong L, Bai Z, and Li W.
Physical Chemistry Chemical Physics 26, 7920 (2024).

348 Reverse intersystem crossing mechanisms in doped triangulenes
Izu AE, Matxain JM, and Casanova D.
Physical Chemistry Chemical Physics 26, 11459 (2024).

349 Unveiling the quantum secrets of triel metal triangles: a tale of stability, aromaticity, and relativistic effects
Escayola S, Jimenez-Izal E, Matito E, Ugalde JM, Grande-Aztatzi R, and Mercero JM.
Physical Chemistry Chemical Physics 26, 12619 (2024).

350 Dynamic effects on the nonlinear optical properties of donor acceptor stenhouse adducts: insights from combined MD plus QM simulations
Dellai A, Naim C, Cerezo J, Prampolini G, and Castet F.
Physical Chemistry Chemical Physics 26, 13639 (2024).

351 Footprints of atomic-scale features in plasmonic nanoparticles as revealed by electron energy loss spectroscopy
Urbieta M, Barbry M, Koval P, Rivacoba A, Sanchez-Portal D, Aizpurua J, and Zabala N.
Physical Chemistry Chemical Physics 26, 14991 (2024).

352 Lead overlayer dynamics on Ni(111)
Borisova SD, Eremeev SV, Chulkov EV, and Rusina GG.
Physical Chemistry Chemical Physics 26, 16184 (2024).

353 Unique electronic and optical properties of stacking-modulated bilayer graphene under external magnetic fields
Lin C-Y, Weng D-W, Chiu C-W, and Gumbs G.
Physical Chemistry Chemical Physics 26, 19316 (2024).

354 Structural insights into carboxylic-acid based DES across H-bond donor ratios: impact of CL&Pol refinement
Zubeltzu J, and Rezabal E.
Physical Chemistry Chemical Physics 26, 27486 (2024).

355 Single-particle approach to many-body relaxation dynamics
Pelc M, Dams D, Ghosh A, Kosik M, Mueller MM, Bryant G, Rockstuhl C, Ayuela A, and Slowik K.
Physical Review A 109, 022237 (2024).

356 Quantum fidelity kernel with a trapped-ion simulation platform
Martinez-Pena R, Soriano MC, and Zambrini R.
Physical Review A 109, 042612 (2024).

357 Optomechanics with cavity vacuum fluctuations: Self-alignment and collective rotation mediated by Casimir torque
Ilin D, Tokatly V, and Iorsh I.
Physical Review A 109, 043707 (2024).

358 Observing quantum many-body scars in random quantum circuits
Andrade B, Bhattacharya U, Chhajlany RW, Grass T, and Lewenstein M.
Physical Review A 109, 052602 (2024).

359 Comment on "Recovering noise-free quantum observables"
Martinez JE, Larrarte OS, del Moral JO, Dastbasteh R, and Otxoa RM.
Physical Review A 110, 046401 (2024).

360 Xenon photoionization in the vicinity of 4d giant resonance and Cooper minimum using an XUV-NIR pump-probe experiment
Kumar S, Duesterer S, Fruehling U, Alisauskas S, Cirmi G, Czwalinna MK, Grosse-Wortmann U, Kschuev N, Kuschewski F, Lang T, et al.
Physical Review A 110, 063104 (2024).

361 Hysteresis and chaos in anomalous Josephson junctions without capacitance
Mazanik AA, Botha AE, Rahmonov IR, and Shukrinov YM.
Physical Review Applied 22, 014062 (2024).

362 Acoustic lateral recoil force and stable lift of anisotropic particles
Smagin M, Toftul I, Bliokh KY, and Petrov M.
Physical Review Applied 22, 064041 (2024).

363 Chiral spin channels in curved graphene *pn* junctions
Bercioux D, Frustaglia D, and De Martino A.
Physical Review B 108, 115140 (2024).

364 Electronic structure and magnetic and transport properties of antiferromagnetic Weyl semimetal GdAlSi
Laha A, Kundu AK, Aryal N, Bozin ES, Yao J, Paone S, Rajapitamahuni A, Vescovo E, Valla T, Abeykoon M, et al.
Physical Review B 109, 035120 (2024).

365 Electronic structure and lattice dynamics of 1*T*-VSe_2: origin of the three-dimensional charge density wave
Diego J, Subires D, Said AH, Chaney DA, Korshunov A, Garbarino G, Diekmann F, Mahatha SK, Pardo V, Wilkinson JM, et al.
Physical Review B 109, 035133 (2024).

366 $G_0\Delta W$ theory: quasiparticle properties of two-dimensional semiconductors physisorbed on graphene
Barisic LA, and Despoja V.
Physical Review B 109, 035301 (2024).

367 Fractional Chern insulators versus nonmagnetic states in twisted bilayer $MoTe_2$
Yu J, Herzog-Arbeitman J, Wang M, Vafek O, Bernevig BA, and Regnault N.
Physical Review B 109, 045147 (2024).

368 Superconducting skutterudite-like CeP_3
Li X, Bergara A, Zhang X, Ding S, Liu Y, and Yang G.
Physical Review B 109, 054522 (2024).

369 Magnetism, heat capacity, and electronic structure of $EuCd_2P_2$ in view of its colossal magnetoresistance
Usachov DY, Krebber S, Bokai KA, Tarasov AV, Kopp M, Garg C, Virovets A, Mueller J, Mende M, Poelchen G, et al.
Physical Review B 109, 104421 (2024).

370 Phenomenology of Majorana zero modes in full-shell hybrid nanowires
Paya C, Escribano SD, Vezzosi A, Penaranda F, Aguado R, San-Jose P, and Prada E.
Physical Review B 109, 115428 (2024).

371 Atomically precise step grids for the engineering of helical states
Ortega JE, Vasseur G, Schiller F, Piquero-Zulaica I, Weber AP, Rault J, Valbuena MA, Schirone S, Matencio S, Sviatkin LA, et al.
Physical Review B 109, 125427 (2024).

372 Superconductivity in Li_8H_n electrides: the effect of interstitial anionic electrons on electron-phonon coupling
Guo Z, Bergara A, Zhang X, Li X, Ding S, and Yang G.
Physical Review B 109, 134505 (2024).

373 Two-channel Kondo problem in coupled interacting helical liquids
Biswas S, De Martino A, Rao S, and Kundu A.
Physical Review B 109, 155119 (2024).

374 Spectral shifts in tip-induced light from plasmonic nanoparticles in air
Zapata-Herrera M, Rogez B, Marguet S, Dujardin G, Boer-Duchemin E, and Le Moal E.
Physical Review B 109, 155433 (2024).

375 Filling-enforced obstructed atomic insulators
Xu Y, Elcoro L, Song ZD, Vergniory MG, Felser C, Parkin SSP, Regnault N, Manes JL, and Bernevig BA.
Physical Review B 109, 165139 (2024).

376 Purely anharmonic charge density wave in the two-dimensional Dirac semimetal SnP
Gutierrez-Amigo M, Yuan F, Campi D, Schoop LM, Vergniory MG, and Errea I.
Physical Review B 109, 174112 (2024).

377 Topological magnon gap engineering in van der Waals CrI_3 ferromagnets
Brehm V, Sobieszczyk P, Klogetvedt JN, Evans RFL, Santos EJG, and Qaiumzadeh A.
Physical Review B 109, 174425 (2024).

378 Positive magnetoresistance in anapole superconductor junctions
Kokkeler T, Golubov A, and Tanaka Y.
Physical Review B 109, 174513 (2024).

379 Ab initio transport theory for the intrinsic spin Hall effect applied to 5*d* metals
Bajaj A, Gupta R, Tokatly IV, Sanvito S, and Droghetti A.
Physical Review B 109, 195132 (2024).

380 Moiré fractional Chern insulators. I. First-principles calculations and continuum models of twisted bilayer $MoTe_2$
Jia Y, Yu J, Liu J, Herzog-Arbeitman J, Qi Z, Pi H, Regnault N, Weng H, Bernevig A, and Wu Q.
Physical Review B 109, 205121 (2024).

381 Moiré fractional Chern insulators. II. First-principles calculations and continuum models of rhombohedral graphene superlattices
Herzog-Arbeitman J, Wang Y, Liu J, Tam PM, Qi Z, Jia Y, Efetov DK, Vafek O, Regnault N, Weng H, et al.
Physical Review B 109, 205122 (2024).

382 Krylov complexity and dynamical phase transition in the quenched Lipkin-Meshkov-Glick model
Bento PHS, del Campo A, and Celeri LC.
Physical Review B 109, 224304 (2024).

383 Superfluidity of indirect momentum space dark dipolar excitons in a double layer with anisotropic tilted semi-Dirac bands
Arafat AN, Berman OL, and Gumbs G.
Physical Review B 109, 224506 (2024).

384 Shallow core levels, or how to determine the doping and T_c of $Bi_2Sr_2CaCu_2O_{8+\delta}$ and $Bi_2Sr_2CuO_{6+\delta}$ without cooling
Valla T, Kundu AK, Pervan P, Pletikosic I, Drozdov IK, Wu Z, and Gu GD.
Physical Review B 109, 224507 (2024).

385 Competing order in two-band Bose-Hubbard chains with extended-range interactions
Watanabe Y, Bhattacharya U, Chhajlany RW, Arguello-Luengo J, Lewenstein M, and Grass T.
Physical Review B 109, L100507 (2024).

386 Resonant 4f photoelectron diffraction: insight into Yb compounds
Usachov DY, Poelchen G, Tupitsyn II, Bokai KA, Glazkova D, Tarasov AV, Mende M, Fedorov AV, Stolyarov VS, Krellner C, and Vyalikh DV.
Physical Review B 109, L241118 (2024).

387 Unraveling multifractality and mobility edges in quasiperiodic Aubry-André-Harper chains through high-harmonic generation
Dziurawiec M, de Almeida JO, Bera ML, Plodzien M, Maska MM, Lewenstein M, Grass T, and Bhattacharya U.
Physical Review B 110, 014209 (2024).

388 Phonon softening and atomic modulations in $EuAl_4$
Korshunov AN, Sukhanov AS, Gebel S, Pavlovskii MS, Andriushin ND, Gao Y, Moya JM, Morosan E, and Rahn MC.
Physical Review B 110, 045102 (2024).

389 Electron-K-phonon interaction in twisted bilayer graphene
Liu CX, Chen Y, Yazdani A, and Bernevig BA.
Physical Review B 110, 045133 (2024).

390 Probing surface and bulk ground states of lanthanides: 4f moment orientation through 4d x-ray absorption spectroscopy
Usachov DY, Bokai KA, Klimovskikh II, Ali K, Schiller F, Poelchen G, Stolyarov VS, Kliemt K, Krellner C, and Vyalikh DV.
Physical Review B 110, 075157 (2024).

391 Model description of electron transfer between PTCDA molecule and metal surface upon molecular adsorption and STM manipulation
Borisov AG.
Physical Review B 110, 075413 (2024).

392 Quantized Hall current in a topological nodal-line semimetal under electromagnetic waves
Shih PH, Do TN, Gumbs G, Huang D, Lin H, and Chang TR.
Physical Review B 110, 085427 (2024).

393 Exchange kernel $f_x^h(q, \omega)$ of electron liquid from the variational principle of McLachlan
Nazarov VU, and Silkin VM.
Physical Review B 110, 104310 (2024).

394 Fully analytical equation of motion approach for the double quantum dot in the Coulomb blockade regime
Sobrino N, Jacob D, and Kurth S.
Physical Review B 110, 115121 (2024).

395 Exact dynamics of the Tomonaga-Luttinger liquid and shortcuts to adiabaticity
Dupays L, Dora B, and del Campo A.
Physical Review B 110, 155104 (2024).

396 Interplay between strain and size quantization in a class of topological insulators based on inverted-band semiconductors
Khaetskii A, Golovach V, and Kiefer A.
Physical Review B 110, 155301 (2024).

397 Computing Floquet quasienergies in finite and extended systems: role of electromagnetic and quantum-geometric gauges
Puente-Uriona AR, Modugno M, Souza I, and Ibanez-Azpiroz J.
Physical Review B 110, 125203 (2024).

398 Photohole-induced strong σ-π scattering driven by out-of-plane phonons in graphene
Hellsing B, and Frederiksen T.
Physical Review B 110, 155426 (2024).

399 Theoretical model for multiorbital Kondo screening in strongly correlated molecules with several unpaired electrons
Calvo-Fernandez A, Kumar M, Soler-Polo D, Eiguren A, Blanco-Rey M, and Jelinek P.
Physical Review B 110, 165113 (2024).

400 Molecularity: a fast and efficient criterion for probing superconductivity
Di Mauro ME, Braida B, Errea I, Novoa T, and Contreras-Garcia J.
Physical Review B 110, 174515 (2024).

401 Flat bands in chiral multilayer graphene
Makov R, Guinea F, and Stern A.
Physical Review B 110, 195112 (2024).

402 Charge transfer in heterostructures of T and H transition metal dichalcogenides
Sanchez-Ramirez I, Vergniory MG, and de Juan F.
Physical Review B 110, 195138 (2024).

403 Electron states emerging at magnetic domain walls of magnetic semiconductors with strong Rashba effect
Rusinov IP, Men'shov VN, and Chulkov EV.
Physical Review B 110, 195405 (2024).

404 Electron-plasmon scattering in doped graphene
Jakovac J, and Despoja V.
Physical Review B 110, 195425 (2024).

405 Interplay between Dirac and Rashba surface states specific for topologically nontrivial van der Waals superlattices
Shvets IA, Chulkov V, and Eremeev V.
Physical Review B 110, 205113 (2024).

406 In-gap states induced by magnetic impurities on wide-band s-waves superconductors: self-consistent calculations
Jyoti D, Choi DJ, and Lorente N.
Physical Review B 110, 205404 (2024).

407 Theory of phonon spectroscopy with the quantum twisting microscope
Xiao J, Berg E, Glazman LI, Guinea F, Ilani S, and von Oppen F.
Physical Review B 110, 205407 (2024).

408 Influence of dynamical Floquet spectrum on the plasmon excitations and exchange energy of tilted monolayer 1T′-MoS_2
Kandel, Gumbs G, Balassis A, Iurov A, and Roslyak O.
Physical Review B 110, 214301 (2024).

409 Anisotropy of Yu-Shiba-Rusinov states in $NbSe_2$
Uldemolins M, Massee F, Cren T, Mesaros A, and Simon P.
Physical Review B 110, 224519 (2024).

410 Diluted Yu-Shiba-Rusinov arrays on the anisotropic superconductor β-Bi_2Pd
Trivini S, Ortuzar J, Zaldivar J, Herrera E, Guillamon I, Suderow H, Bergeret FS, and Pascual JI.
Physical Review B 110, 235405 (2024).

411 Insights into the laser-assisted photoelectric effect from solid-state surfaces
Wenthaus L, Kabachnik NM, Borgwardt M, Palutke S, Kutnyakhov D, Pressacco F, Scholz M, Potorochin D, Wind N, Duesterer S, et al.
Physical Review B 110, 235406 (2024).

412 Going beyond Landauer scattering theory to describe spatially resolved nonlocal heating and cooling in quantum thermoelectrics
Leumer NG, Basko DM, Jalabert RA, Weinmann D, and Whitney RS.
Physical Review B 110, 245402 (2024).

413 Predicted multiple Walker breakdowns for current-driven domain wall motion in antiferromagnets
Lee MK, Otxoa RM, and Mochizuki M.
Physical Review B 110, L020408 (2024).

414 Atomic-level precision creation and manipulation of interfacial Se chemisorbates in graphene/WSe_2 heterostructures
Zhang MH, Gao F, Lorentzen AB, Ren YN, Zhang RH, Zhou XF, Dong R, Gao SW, Brandbyge M, and He L.
Physical Review B 110, L041405 (2024).

415 Mirror-protected Majorana zero modes in f -wave multilayer graphene superconductors
Phong VT, Sainz-Cruz H, Mele EJ, and Guinea F.
Physical Review B 110, L100501 (2024).

416 Superconducting diode effect in diffusive superconductors and Josephson junctions with Rashba spin-orbit coupling
Ilic S, Virtanen P, Crawford D, Heikkila TT, and Bergeret FS.
Physical Review B 110, L140501 (2024).

417 Dwarf galaxies united by dark bosons
Pozo A, Broadhurst T, Smoot GF, Chiueh T, Luu HN, Vogelsberger M, and Mocz P.
Physical Review D 109, 083532 (2024).

418 Review of particle physics
Navas S, Amsler C, Gutsche T, Hanhart C, Hernandez-Rey JJ, Lourenco C, Masoni A, Mikhasenko M, Mitchell RE, Patrignani C, et al.
Physical Review D 110, 030001 (2024).

419 Detection of a universal core-halo transition in dwarf galaxies as predicted by Bose-Einstein dark matter
Pozo A, Broadhurst T, de Martino I, Chiueh T, Smoot GF, Bonoli S, and Angulo R.
Physical Review D 110, 043534 (2024).

420 Boosting neutrino mass ordering sensitivity with inelasticity for atmospheric neutrino oscillation measurement
Olavarrieta SG, Jin M, Argueelles CA, Fernandez P, and Martinez-Soler I.
Physical Review D 110, L051101 (2024).

421 Unusual low-temperature behavior in the half-filled band of the one-dimensional extended Hubbard model in atomic limit
Rojas O, de Souza SM, Torrico J, Verissimo LM, Pereira MSS, Lyra ML, and Derzhko O.
Physical Review E 110, 024130 (2024).

422 Odd nonlinear conductivity under spatial inversion in chiral tellurium
Suarez-Rodriguez M, Martin-Garcia B, Skowronski W, Calavalle F, Tsirkin SS, Souza I, De Juan F, Chuvilin A, Fert A, Gobbi M, Casanova F, and Hueso LE.
Physical Review Letters 132, 046303 (2024).

423 Indistinguishability of identical bosons from a quantum information theory perspective
Englbrecht M, Kraft T, Dittel C, Buchleitner A, Giedke G, and Kraus B.
Physical Review Letters 132, 050201 (2024).

424 Water-wave vortices and skyrmions
Smirnova DA, Nori F, and Bliokh KY.
Physical Review Letters 132, 054003 (2024).

425 Universal features of entanglement entropy in the honeycomb Hubbard model
D'Emidio J, Orus R, Laflorencie N, and de Juan F.
Physical Review Letters 132, 076502 (2024).

426 Twofold facet of kinetics of glass aging
Di Lisio V, Rocchi LA, and Cangialosi D.
Physical Review Letters 133, 048201 (2024).

427 Collective randomized measurements in quantum information processing
Imai S, Toth G, and Guhne O.
Physical Review Letters 133, 060203 (2024).

428 Dispersion-selective band engineering in an artificial kagome superlattice
Wang S, Zhan Z, Fan X, Li Y, Pantaleon PA, Ye C, He Z, Wei L, Li L, Guinea F, Yuan S, and Zeng C.
Physical Review Letters 133, 066302 (2024).

429 Unconventional thermophotonic charge density wave
Zhou CL, Torbatian Z, Yang SH, Zhang Y, Yi HL, Antezza M, Novko D, and Qiu CW.
Physical Review Letters 133, 066902 (2024).

430 Large orbital moment and dynamical Jahn-Teller effect of AlCl-phthalocyanine on Cu(100)
Li C, Bocquet ML, Lu Y, Lorente N, Gruber M, Berndt R, and Weismann A.
Physical Review Letters 133, 126201 (2024).

431 Entanglement entropy and deconfined criticality: emergent SO(5) symmetry and proper lattice bipartition
D'Emidio J, and Sandvik AW.
Physical Review Letters 133, 166702 (2024).

432 Geometrical theory of the shift current in presence of disorder and interaction
Resta R.
Physical Review Letters 133, 206903 (2024).

433 Intrinsic and extrinsic photogalvanic effects in twisted bilayer graphene
Penaranda F, Ochoa H, and de Juan F.
Physical Review Letters 133, 256603 (2024).

434 Multiple localized-itinerant dualities in magnetism of 5f electron systems: the case of UPt_2Si_2
Sandratskii LM, Silkin VM, and Havela L.
Physical Review Materials 8, 034401 (2024).

435 Direct evidence of induced magnetic moment in Se and the role of misplaced Mn in $MnBi_2Se_4$-based intrinsic magnetic topological insulator heterostructures
Fukushima R, Antonov VN, Otrokov MM, Sasaki TT, Akiyama R, Sumida K, Ishihara K, Ichinokura S, Tanaka K, Takeda Y, et al.
Physical Review Materials 8, 084202 (2024).

436 Capturing near-field circular dichroism enhancements from far-field measurements
Olmos-Trigo J, Lasa-Alonso J, Gomez-Viloria I, Molina-Terriza G, and Garcia-Etxarri A.
Physical Review Research 6, 013151 (2024).

437 Extended magic phase in twisted graphene multilayers
Foo DCW, Zhan Z, Al Ezzi MM, Peng L, Adam S, and Guinea F.
Physical Review Research 6, 013165 (2024).

438 Efficient tensor network simulation of IBM's largest quantum processors
Patra S, Jahromi SS, Singh S, and Orus R.
Physical Review Research 6, 013326 (2024).

439 Improving gradient methods via coordinate transformations: applications to quantum machine learning
Bermejo P, Aizpurua B, and Orus R.
Physical Review Research 6, 023069 (2024).

440 Weak localization at arbitrary disorder strength in systems with generic spin-dependent fields
Hijano A, Ilic S, and Bergeret FS.
Physical Review Research 6, 023100 (2024).

441 Designing moiré patterns by strain
Escudero F, Sinner A, Zhan Z, Pantaleon PA, and Guinea F.
Physical Review Research 6, 023203 (2024).

442 Tailoring the statistics of light emitted from two interacting quantum emitters
Juan-Delgado A, Esteban R, Nodar A, Trebbia JB, Lounis B, and Aizpurua J.
Physical Review Research 6, 023207 (2024).

443 Decoherence rate in random Lindblad dynamics
Yang Y, Xu Z, and del Campo A.
Physical Review Research 6, 023229 (2024).

444 Ce_3 Bi_4 Ni_3 - A large hybridization-gap variant of Ce_3 Bi_4 Pt_3
Kirschbaum DM, Yan X, Waas M, Svagera R, Prokofiev A, Stoger B, Giester G, Rogl P, Oprea DG, Felser C, et al.
Physical Review Research 6, 023242 (2024).

445 Probing magnetic and triplet correlations in spin-split superconductors with magnetic impurities
Huang CH, Skurativska A, Bergeret FS, and Cazalilla MA.
Physical Review Research 6, 033022 (2024).

446 Periodic quantum Rabi model with cold atoms at deep strong coupling
Hunanyan G, Koch J, Moll S, Rico E, Solano E, and Weitz M.
Physical Review Research 6, 033023 (2024).

447 Universal vortex statistics and stochastic geometry of Bose-Einstein condensation
Thudiyangal M, and del Campo A.
Physical Review Research 6, 033152 (2024).

448 Topology of SmB_6 revisited by means of topological quantum chemistry
Iraola M, Robredo I, Neupert T, Manes JL, Valenti R, and Vergniory MG.
Physical Review Research 6, 033195 (2024).

449 Electronic properties, correlated topology, and Green's function zeros
Setty C, Xie F, Sur S, Chen L, Vergniory MG, and Si Q.
Physical Review Research 6, 033235 (2024).

450 Spheres of maximum electromagnetic chirality
Olmos-Trigo J, Nieto-Vesperinas M, and Molina-Terriza G.
Physical Review Research 6, 043192 (2024).

451 Large topological Hall effect in a chiral antiferromagnet in hopping transport regime
Yi C, Peshcherenko N, Zhou Y, Samanta K, Yang Q, Roychowdhury S, Yanda P, Borrmann H, Vergniory MG, Zhang Y, et al.
Physical Review Research 6, 043295 (2024).

452 Controlling 4f antiferromagnetic dynamics via itinerant electronic susceptibility
Lee SE, Windsor YW, Zahn D, Kraiker A, Kummer K, Kliemt K, Krellner C, Schuessler-Langeheine C, Pontius N, Staub U, et al.
Physical Review Research 6, 043019 (2024).

453 Origin of the Kerker phenomena
Lasa-Alonso J, Devescovi C, Maciel-Escudero C, Garcia-Etxarri A, and Molina-Terriza G.
Physical Review Research 6, 043311 (2024).

454 Symmetry constraints and spectral crossing in a Mott insulator with Green's function zeros
Setty C, Sur S, Chen L, Xie F, Hu H, Paschen S, Cano J, and Si Q.
Physical Review Research 6, L032018 (2024).

455 Shortcuts to adiabaticity in Krylov space
Takahashi K, and del Campo A.
Physical Review X 14, 011032 (2024).

456 Unified treatment of light emission by inelastic tunneling: interaction of electrons and photons beyond the gap
Muniain U, Esteban R, Aizpurua J, and Greffet JJ.
Physical Review X 14, 021017 (2024).

457 Orbital ingredients and persistent Dirac surface state for the topological band structure in $FeTe_{0.55}Se_{0.45}$
Li YF, Chen SD, Garcia-Diez M, Iraola MI, Pfau H, Zhu YL, Mao ZQ, Chen T, Yi M, Dai PC, et al.
Physical Review X 14, 021043 (2024).

458 Enumeration of spin-space groups: toward a complete description of symmetries of magnetic orders
Jiang Y, Song Z, Zhu T, Fang Z, Weng H, Liu ZX, Yang J, and Fang C.
Physical Review X 14, 031039 (2024).

459 Dynamical correlations and order in magic-angle twisted bilayer graphene
Rai G, Crippa L, Calugaru D, Hu H, Paoletti F, de'Medici L, Georges A, Bernevig BA, Valenti R, Sangiovanni G, and Wehling T.
Physical Review X 14, 031045 (2024).

460 "Quantum geometric nesting" and solvable model flat-band systems
Han Z, Herzog-Arbeitman J, Bernevig BA, and Kivelson SA.
Physical Review X 14, 041004 (2024).

461 Semi-Dirac fermions in a topological metal
Shao Y, Moon S, Rudenko AN, Wang J, Herzog-Arbeitman J, Ozerov M, Graf D, Sun Z, Queiroz R, Lee SH, et al.
Physical Review X 14, 041057 (2024).

462 Poly(alditol sebacate)-PLA copolymers: enhanced degradability and tunable surface properties
Gazzotti S, Hakkarainen M, Pagnacco CA, Manenti M, Silvani A, Farina H, Arnaboldi L, and Ortenzi MA.
Polymer Chemistry 15, 2081 (2024).

463 Connecting dynamics and thermodynamics in polymer-resin cured systems
Miccio LA, Sill C, Wehlack C, and Schwartz GA.
Polymers 16, 3508 (2024).

464 Learning gaze-aware compositional GAN from limited annotations
Aranjuelo N, Huang S, Arganda-Carreras I, Unzueta L, Otaegui O, Pfister H, and Wei D.
Proceedings of the ACM on Computer Graphics and Interactive Techniques 7, 28 (2024).

465 Enhancement of the anomalous Hall effect by distorting the Kagome lattice in an antiferromagnetic material
Roychowdhury S, Samanta K, Singh S, Schnelle W, Zhang Y, Noky J, Vergniory MG, Shekhar C, and Felser C.
Proceedings of the National Academy of Sciences of the United States of America 121, e2401970121 (2024).

466 Breaking the size limitation of nonadiabatic molecular dynamics in condensed matter systems with local descriptor machine learning
Liu D, Wang B, Wu Y, Vasenko AS, and Prezhdo V.
Proceedings of the National Academy of Sciences of the United States of America 121, e2403497121 (2024).

467 Evolution of superconductivity in twisted graphene multilayers
Long M, Jimeno-Pozo A, Sainz-Cruz H, Pantaleon PA, and Guinea F.
Proceedings of the National Academy of Sciences of the United States of America 121, e2405259121 (2024).

468 Complexity of confined water vitrification and its glass transition temperature
Melillo JH, Cangialosi D, Lisio VD, Steinruecken E, Vogel M, and Cerveny S.
Proceedings of the National Academy of Sciences of the United States of America 121, e2407030121 (2024).

469 Development of textile printing ink using expanded polystyrene waste as a binder
Obele CM, Ugwu SC, and Chukwuneke JL.
Progress in Rubber, Plastics and Recycling Technologies 40, 48 (2024).

470 The strongest protein binder is surprisingly labile
Fernandez-Calvo A, Reifs A, Saa L, Cortajarena AL, De Sancho D, and Perez-Jimenez R.
Protein Science 33, e5030 (2024).

471 Atomistic molecular simulations of Aβ-Zn conformational ensembles
Aduriz-Arrizabalaga J, Lopez X, and De Sancho D.
Proteins 92, 134 (2024).

472 Noise-aware variational eigensolvers: a dissipative route for lattice gauge theories
Cobos J, Locher DF, Bermudez A, Mueller M, and Rico E.
PRX Quantum 5, 030340 (2024).

473 Quantum computing for high-energy physics: state of the art and challenges
Di Meglio A, Jansen K, Tavernelli I, Alexandrou C, Arunachalam S, Bauer CW, Borras K, Carrazza S, Crippa M, Croft V, et al.
PRX Quantum 5, 037001 (2024).

474 Quantum chaos and coherence: random parametric quantum channels
Matsoukas-Roubeas AS, Prosen T, and del Campo A.
Quantum 8, 1446 (2024).

475 Decoding algorithms for surface codes
DeMarrti iOlius A, Fuentes P, Orus R, Crespo PM, and Martinez JE.
Quantum 8, 1498 (2024).

476 Error estimation in current noisy quantum computers
Aseguinolaza U, Sobrino N, Sobrino G, Jornet-Somoza J, and Borge J.
Quantum Information Processing 23, 181 (2024).

477 Computing exact moments of local random quantum circuits via tensor networks
Braccia P, Bermejo P, Cincio L, and Cerezo M.
Quantum Machine Intelligence 6, 54 (2024).

478 Enhancing the thermal transfer properties of phase change material for thermal energy storage by impregnating hybrid nanoparticles within copper foams
Nassar A, Nassar E, Rivilla I, Labidi J, Fernandez AG, Sarasini F, Abu El Fadl A, and Younis M.
Results in Engineering 21, 101885 (2024).

479 Enhancing the thermal conductivity and shape stability of phase-change composites using diatomite and graphene nanoplates for thermal energy storage
Nassar A, Nassar E, Rivilla I, Labidi J, Fernandez AG, and Sarasini F.
Results in Engineering 22, 102184 (2024).

480 Electrical control of magnetism by electric field and current-induced torques
Fert A, Ramesh R, Garcia V, Casanova F, and Bibes M.
Reviews of Modern Physics 96, 015005 (2024).

481 Catalog of topological phonon materials
Xu Y, Vergniory MG, Ma DS, Mañes JL, Song ZD, Bernevig BA, Regnault N, and Elcoro L.
Science 384, eadf8458 (2024).

482 Photonic axion insulator
Liu GG, Mandal S, Xi X, Wang Q, Devescovi C, Morales-Pérez A, Wang Z, Yang L, Banerjee R, Long Y, et al.
Science 387, (2024).

483 Accessing bands with extended quantum metric in kagome $Cs_2Ni_3S_4$ through soft chemical processing
Villalpando G, Jovanovic M, Hoff B, Jiang Y, Singha R, Yuan F, Hu H, Calugaru D, Mathur N, Khoury JF, et al.
Science Advances 10, eadl1103 (2024).

484 Low density phases of TiO_2 by cluster self-assembly
Aguilera-Granja F, and Ayuela A.
Scientific Reports 14, 12491 (2024).

485 Variational tensor neural networks for deep learning
Jahromi SS, and Orus R.
Scientific Reports 14, 19017 (2024).

486 Quantum-inspired clustering with light
Varga M, Bermejo P, Pellicer-Guridi R, Orus R, and Molina-Terriza G.
Scientific Reports 14, 21726 (2024).

487 Nonreciprocal superconducting transport and the spin Hall effect in gyrotropic structures
Kokkeler T, Tokatly I, and Bergeret FS.
SciPost Physics 16, 055 (2024).

488 Implantation of gallium into layered WS_2 nanostructures is facilitated by hydrogenation
Martinez JI, Laikhtman A, Zak A, Sezen M, and Alonso JA.
Small 20, 2312235 (2024).

489 The role of rare-earth atoms in the anisotropy and antiferromagnetic exchange coupling at a hybrid metal-organic interface
Blanco-Rey M, Castrillo R, Ali K, Gargiani P, Ilyn M, Gastaldo M, Paradinas M, Valbuena MA, Mugarza A, Ortega JE, Schiller F, and Fernandez L.
Small 20, 2402328 (2024).

490 Thermoplasmonic effect enables indirect ON-OFF control over the Z-E isomerization of azobenzene-based photoswitch
Tarnowicz-Staniak N, Staniak M, Dudek M, Grzelczak M, and Matczyszyn K.
Small 20, 2404755 (2024).

491 Expanding chemical space in the synthesis of gold bipyramids
Sanchez-Iglesias A, and Grzelczak M.
Small 21, 2407735 (2024).

492 Amplifying sensing capabilities: combining plasmonic resonances and Fresnel reflections through multivariate analysis
Etxebarria-Elezgarai J, Bergamini L, Lopez E, Morant-Minana MC, Adam J, Zabala N, Aizpurua J, and Seifert A.
Small Methods 8, 2301445 (2024).

493 Morphological sensitivity to pH of silica and chalk nanocrystalline self-organized biomorphs
Menichetti A, Manzi J, Otálora F, Montalti M, and García-Ruiz JM.
Small Science 4, 2400090 (2024).

494 A lens finder map to check claimed high-z galaxies behind SMACS J0723.3-7327
Chow A, Li SK, Lim J, Broadhurst T, Li MCA, Nianias J, Summers J, and Windhorst R.
The Astrophysical Journal 962, 30 (2024).

495 EPOCHS. II. The ultraviolet luminosity function from 7.5 < z < 13.5 using 180 arcmin^2 of deep, blank fields from the PEARLS survey and public JWST data
Adams NJ, Conselice CJ, Austin D, Harvey T, Ferreira L, Trussler J, Juodzbalis I, Li Q, Windhorst R, Cohen SH, et al.
The Astrophysical Journal 965, 169 (2024).

496 PEARLS: NuSTAR and XMM-Newton extragalactic survey of the JWST north ecliptic pole time-domain field II
Zhao X, Civano F, Willmer C, Bonoli S, Chen CT, Creech S, Dupke R, Fornasini F, Jansen R, Kikuta S, et al.
The Astrophysical Journal 965, 188 (2024).

497 Searching for evidence of subchromospheric magnetic reconnection on the Sun
Baker D, van Driel-Gesztelyi L, James AW, Demoulin P, To ASH, Murabito M, Long DM, Brooks DH, McKevitt J, Laming JM, et al.
The Astrophysical Journal 970, 39 (2024).

498 JWST NIRSpec spectroscopy of the triply lensed z = 10.17 galaxy MACS0647-JD
Hsiao TYY, Abdurrro'uf D, Coe D, Larson RL, Jung I, Mingozzi M, Dayal P, Kumari N, Kokorev V, Vikaeus A, et al.
The Astrophysical Journal 973, 8 (2024).

499 J-PLUS: Beyond spectroscopy. III. Stellar parameters and elemental-abundance ratios for five million stars from DR3
Huang Y, Beers TC, Xiao K, Yuan H, Lee YS, Gu H, Hong J, Liu J, Fan Z, Coelho P, et al.
The Astrophysical Journal 974, 192 (2024).

500 Sigmoid eruption associated with the X9.3 flare from AR 12673 drives the gradual solar energetic particle event on 2017 September 6
Yardley SL, and Brooks DH.
The Astrophysical Journal 976, 152 (2024).

501 An elemental abundance diagnostic for coordinated solar orbiter/SPICE and Hinode/EIS observations
Brooks DH, Warren HP, Baker D, Matthews SA, and Yardley SL.
The Astrophysical Journal 976, 188 (2024).

502 Stochastic wave dark matter with Fermi-LAT γ-ray pulsar timing array
Luu HN, Liu T, Ren J, Broadhurst T, Yang T, Wang JS, and Xie Z.
The Astrophysical Journal Letters 963, L46 (2024).

503 TREASUREHUNT: transients and variability discovered with HST in the JWST north eliptic pole time-domain field
O'Brien R, Jansen RA, Grogin NA, Cohen SH, Smith BM, Silver RM, Maksym III WP, Windhorst RA, Carleton T, Koekemoer AM, et al.
The Astrophysical Journal Supplement Series 272, 19 (2024).

504 Time evolution of natural orbitals in ab initio molecular dynamics
Rivero Santamaria A, and Piris M.
The Journal of Chemical Physics 160, 071102 (2024).

505 Activation volume and quantum tunneling in the hydrogen transfer reaction between methyl radical and methane: a first computational study
Cammi R, and Chen B.
The Journal of Chemical Physics 160, 104103 (2024).

506 APOST-3D: chemical concepts from wavefunction analysis
Salvador P, Ramos-Cordoba E, Montilla M, Pujal L, and Gimferrer M.
The Journal of Chemical Physics 160, 172502 (2024).

507 Intramolecular singlet fission: quantum dynamical simulations including the effect of the laser field
Reddy SR, Coto PB, and Thoss M.
The Journal of Chemical Physics 160, 194306 (2024).

508 Assessing the global natural orbital functional approximation on model systems with strong correlation
Mitxelena I, and Piris M.
The Journal of Chemical Physics 160, 204106 (2024).

509 Alternative CNDOL Fockians for fast and accurate description of molecular exciton properties
Montero-Cabrera LA, Montero-Alejo AL, Aspuru-Guzik A, de la Vega JMG, Piris M, Diaz-Fernandez LA, Perez-Badell Y, Guerra-Barroso A, Alfonso-Ramos JE, Rodriguez J, Fuentes ME, and de Armas CM.
The Journal of Chemical Physics 160, 214108 (2024).

510 Softmax parameterization of the occupation numbers for natural orbital functionals based on electron pairing approaches
Franco L, Bonfil-Rivera IA, Lew-Yee JFH, Piris M, del Campo JM, and Vargas-Hernandez RA.
The Journal of Chemical Physics 160, 244107 (2024).

511 Non-adiabatic electronic relaxation of tetracene from its brightest singlet excited state
Scognamiglio A, Thalmann KS, Hartweg S, Rendler N, Bruder L, Coto PB, Thoss M, and Stienkemeier F.
The Journal of Chemical Physics 161, 024302 (2024).

512 Influence of atomistic features in plasmon-exciton coupling and charge transfer driven by a single molecule in a metallic nanocavity
Candelas B, Zabala N, Koval P, Babaze A, Sanchez-Portal D, and Aizpurua J.
The Journal of Chemical Physics 161, 044707 (2024).

513 Decoherence ensures convergence of non-adiabatic molecular dynamics with number of states
Liu D, Wang B, Vasenko AS, and Prezhdo OV.
The Journal of Chemical Physics 161, 064104 (2024).

514 The origin of broadband blue emission in zero-dimensional organic lead iodine perovskites: A first-principles study
Tan J, Jiang X, Liu D, Moghaddam AO, Stolyarov VS, Xiao S, and Vasenko AS.
The Journal of Chemical Physics 161, 144307 (2024).

515 Planar tetracoordinate beryllium in σ-aromatic Li_4Be and Na_4Be clusters: a missing member in first-octal row planar tetracoordinate family
Miao LH, Cui LJ, Zhang H, Orozco-Ic M, Yang YF, Pan S, and Cui ZH.
The Journal of Chemical Physics 161, 244303 (2024).

516 Demonstration of event position reconstruction based on diffusion in the NEXT-white detector
Haefner J, Navarro KE, Guenette R, Jones BJP, Tripathi A, Adams C, Almazan H, Alvarez V, Aparicio B, Aranburu AI, et al.
The European Physical Journal C 84, 518 (2024).

517 Towards a realistic setup for a dynamical measurement of deviations from Newton's $1/r^2$ law: the impact of air viscosity
Baeza-Ballesteros J, Donini A, Molina-Terriza G, Monrabal F, and Simon A.
The European Physical Journal C 84, 596 (2024).

518 The n,π^* states of heteroaromatics: when are they the lowest excited states and in what way can they be aromatic or antiaromatic?
Vedin NP, Escayola S, Radenkovic S, Sola M, and Ottosson H.
The Journal of Physical Chemistry A 128, 4493 (2024).

519 Role of the radical character in singlet fission: An Ab Initio and Quantum Chemical Topology analysis
Thalmann KS, Ismail KM, Kathir RK, Rodrigues DJL, Thoss M, Pendas AM, and Coto PB.
The Journal of Physical Chemistry A 129, 94 (2024).

520 Indium-doped crystals of $SnSe_2$
Ni D, Xu X, Zhu Z, Ozbek Y, Trontl VM, Yang C, Yang X, Louat A, Cacho C, Ong NP, et al.
The Journal of Physical Chemistry C 128, 11054 (2024).

521 Nonlinear response of nanostructured graphene to circularly polarized light
Aguillon F, and Borisov AG.
The Journal of Physical Chemistry C 128, 16576 (2024).

522 Theoretical procedure for precise evaluation of chemical enhancement in molecular surface-enhanced Raman scattering
Boto RA, Esteban R, Candelas B, and Aizpurua J.
The Journal of Physical Chemistry C 128, 18293 (2024).

523 Scattering of CO from vacant-$MoSe_2$ with O adsorbates: is CO_2 formed?
Bombin R, Muino RD, Juaristi JI, and Alducin M.
The Journal of Physical Chemistry C 128, 19661 (2024).

524 Stained glass effect in anodic aluminum oxide formed in selenic acid
Kushnir SE, Devyanina NP, Roslyakov IV, Lyskov NV, Stolyarov VS, and Napolskii KS.
The Journal of Physical Chemistry Letters 15, 298 (2024).

525 Length scale of molecular motions governing glass equilibration in hyperquenched and slow-cooled polystyrene
Luo J, Wang X, Tong B, Li Z, Rocchi LA, Di Lisio V, Cangialosi D, and Zuo B.
The Journal of Physical Chemistry Letters 15, 357 (2024).

526 Enhanced charge separation in single atom cobalt based graphitic carbon nitride: time domain Ab Initio analysis
Agrawal S, Casanova D, Trivedi DJ, and Prezhdo OV.
The Journal of Physical Chemistry Letters 15, 2202 (2024).

527 Pressure-induced amidine formation via side-chain polymerization in a charge-transfer cocrystal
Dunning SG, Tang WS, Chen B, Zhu L, Cody GD, Chariton S, Prakapenka VB, and Strobel TA.
The Journal of Physical Chemistry Letters 15, 2344 (2024).

528 Multicoverage study of femtosecond laser-induced desorption of CO from Pd(111)
Muzas AS, Jimenez AS, Zhang Y, Jiang B, Juaristi JI, and Alducin M.
The Journal of Physical Chemistry Letters 15, 2587 (2024).

529 Improved carrier separation and recombination by ferroelectric polarization in the $CuBiP_2Se_6/C_2N$ heterostructure: a nonadiabatic molecular dynamics study
Jiang X, Tan J, Liu D, Feng Y, Chen KQ, Long R, and Vasenko AS.
The Journal of Physical Chemistry Letters 15, 2867 (2024).

530 The emergence of the hexagonal lattice in two-dimensional Wigner fragments
Azor ME, Alrakik A, de Bentzmann L, Telleria-Allika X, de Meras AS, Evangelisti S, and Berger JA.
The Journal of Physical Chemistry Letters 15, 3571 (2024).

531 Ferroelectric polarization and single-atom catalyst synergistically promoting CO_2 photoreduction of $CuBiP_2Se_6$
Jiang X, Tan J, Liu D, Feng Y, Chen KQ, Kazakova EA, Vasenko AS, and Chulkov EV.
The Journal of Physical Chemistry Letters 15, 3611 (2024).

532 Quantifying shape transition in anisotropic plasmonic nanoparticles through geometric inversion. Application to gold bipyramids
Montano-Priede JL, Sanchez-Iglesias A, Mezzasalma SA, Sancho-Parramon J, and Grzelczak M.
The Journal of Physical Chemistry Letters 15, 3914 (2024).

533 Three-dimensional photonic crystals based on porous anodic aluminum oxide
Roslyakov IV, Kushnir SE, Novikov VB, Dotsenko AA, Tsymbarenko DM, Sapoletova NA, Murzina TV, Stolyarov VS, and Napolskii KS.
The Journal of Physical Chemistry Letters 15, 4319 (2024).

534 Plasmon excitations across the charge-density-wave transition in single-layer $TiSe_2$
Torbatian Z, and Novko D.
The Journal of Physical Chemistry Letters 15, 6045 (2024).

535 Origin of the improved photoelectrochemical and photocatalytic activity in a ZnO-TiO_2 nanohybrid revealed by experimental and density functional theory studies
Das A, Liu D, Wu Y, Abzakh BA, Madhumitha R, Preethi M, Kazakova EA, Vasenko AS, and Prezhdo OV.
The Journal of Physical Chemistry Letters 15, 7524 (2024).

536 Predictive guidelines for electrocyclization of dithienylethenes
Climent C, Xu Z, Wolf MO, and Casanova D.
The Journal of Physical Chemistry Letters 15, 8042 (2024).

537 Formation and recombination dynamics of polarons in goethite: a time-domain ab initio study
Li H, Zhou Z, Vasenko AS, Chulkov EV, Fang Q, and Long R.
The Journal of Physical Chemistry Letters 15, 10018 (2024).

538 Ab initio study of the influence of spin and orbital magnetic moments on the stability of magnetic and charge distribution in Co:ZnO monolayer
Prokhorenko AV, Chibisov AN, Gnidenko AA, Chibisova MA, Obrazcov KV, Vasenko AS, and Srivastava A.
The Journal of Physical Chemistry Letters 15, 10295 (2024).

539 Identifying rare events in quantum molecular dynamics of nanomaterials with outlier detection indices
Wang B, Liu D, Wu Y, Vasenko AS, and Prezhdo OV.
The Journal of Physical Chemistry Letters 15, 10384 (2024).

540 Dynamics of vortex matter in 2D gapless superconducting materials with impurities
Pashkovskaia VD, Duarte ECS, Zadorosny R, Sardella E, Abrameshin DA, Vasenko AS, and Saraiva TT.
The Journal of Physical Chemistry Letters 15, 10742 (2024).

541 Spin mixing in intramolecular singlet fission: a first-principles-based quantum dynamical study
Kathir RK, Coto PB, and Thoss M.
The Journal of Physical Chemistry Letters 15, 11517 (2024).

542 Time-resolved chemical bonding structure evolution by direct-dynamics chemical simulations
Piris M, Lopez X, and Ugalde JM.
The Journal of Physical Chemistry Letters 15, 12138 (2024).

543 Ion migration at metal halide perovskite grain boundaries elucidated with a machine learning force field
Samatov MR, Liu D, Zhao L, Kazakova EA, Abrameshin DA, Das A, Vasenko AS, and Prezhdo OV.
The Journal of Physical Chemistry Letters 15, 12362 (2024).

544 Methylammonium lead iodide across physical space: phase boundaries and structural collapse
Marin-Villa P, Gaboardi M, Joseph B, Alabarse F, Armstrong J, Druzbicki K, and Fernandez-Alonso F.
The Journal of Physical Chemistry Letters 16, 184 (2024).

545 Schottky defects suppress nonradiative recombination in $CH_3NH_3PbI_3$ through charge localization
Qiao L, Vasenko AS, Chulkov EV, and Long R.
The Journal of Physical Chemistry Letters 16, 215 (2024).

546 On the parallelization of multipacting simulation codes for the design of particle accelerator components
Navaridas J, Pascual JA, Galarza J, Romero T, Munoz JL, and Bustinduy I.
The Journal of Supercomputing 80, 12021 (2024).

547 Targeting specific brain districts for advanced nanotherapies: a review from the perspective of precision nanomedicine
Sierri G, Patrucco M, Ferrario D, Renda A, Comi S, Ciprandi M, Fontanini V, Sica FS, Sesana S, Costa Verdugo M, et al.
WIREs Nanomedicine and Nanobiotechnology 16, e1991 (2024).

DIPC Community

Pictured here is the DIPC Community
outside the headquarters in Donostia/San Sebastián.

Researchers

DIPC Associates

Maite Alducin Ochoa CSIC
Ignacio Arganda-Carreras UPV/EHU
Andrés Arnau Pino UPV/EHU
Emilio Artacho Cortés CIC nanoGUNE
Andrés Ayuela Fernández CSIC
Rolindes Balda de la Cruz UPV/EHU
Sara Barja Martínez UPV/EHU
Aitor Bergara Jauregi UPV/EHU
Sebastian Bergeret CSIC
María Blanco Rey UPV/EHU
Pedro Braña Coto CSIC
Tom J. Broadhurst UPV/EHU
Igor Campillo Santos Euskampus
Daniele Cangialosi CSIC
Silvina Cerveny CSIC
Aurelia Chenu UNI.LU
Deung-Jang Choi MPC
Martina Corso CSIC
Fernando Cossio Mora UPV/EHU
David De Sancho Sánchez UPV/EHU
Nuno De Sousa Teixeira Simia Technologies
Adolfo Del Campo Echevarría UNI.LU
Asier Eiguren Goyenetxea UPV/EHU
Ion Errea López UPV/EHU
Rubén Esteban Llorente CSIC
Francesca Ferlaino LFUI
Joaquín Fernández Rossier UPV/EHU
Felix Fernández Alonso CFM
Elena Formoso Estensoro UPV/EHU
Daniel Franco Barranco University of Cambridge
Idoia García de Gurtubay Gálligo UPV/EHU
Dimas García de Oteyza Felderman CINN-CSIC-UNIOVI-PA
Vitaly Golovach CFM
Elton Gomes Dos Santos UoE
Miguel Ángel Gosálvez Ayuso UPV/EHU
Marek Grzelczak CSIC
Julen Ibáñez Azpiroz CFM
Elisa Jiménez-Izal UPV/EHU
Iñaki Juaristi Oliden UPV/EHU
Stefan Kurth UPV/EHU
Aritz Leonardo Lizeranzu UPV/EHU
Xabier López Pestaña UPV/EHU
Nicolás Lorente Palacios CSIC
Jon Mattin Matxain Beraza UPV/EHU
José María Mercero Larraza UPV/EHU
Salvador Miret Artés IFF-CSIC
Gabriel Molina Terriza MPC
Álvaro Moreno Bergareche UPV/EHU
Ángel Moreno Segurado CSIC
Enrique Ortega Conejero UPV/EHU
Mikhail Otrokov CFM
José Ignacio Pascual Chico CIC nanoGUNE
Juan Ignacio Pérez Iglesias UPV/EHU
José María Pitarke De la Torre UPV/EHU
Yuri Rakovich UPV/EHU
Daniel Reta Mañeru UPV/EHU
Elixabete Rezabal Astigarraga UPV/EHU
Enrique Rico Ortega UPV/EHU
Alberto Rivacoba Otxoa UPV/EHU
Celia Rogero Blanco CSIC
Jorge Sánchez Dolado CSIC
Daniel Sánchez Portal CSIC
Ane Sarasola Iñiguez UPV/EHU
Frederik Schiller CSIC
Gustavo Schwartz CSIC
Ivo Souza UPV/EHU
Eugene Tchulkov Savkin UPV/EHU
Ilya Tokatly UPV/EHU
Miquel Torrent Sucarrat UPV/EHU
Geza Toth UPV/EHU
Jesús Ugalde Uribe-Etxebarria UPV/EHU
Lucía Vitali UPV/EHU
Nerea Zabala Unzalu UPV/EHU

Ikerbasque Research Professors

Slawomir Grabowski
01/01/2012–Present
Hydrogen bonds in gas phase and crystals; quantum theory of atoms in molecules and natural bond orbitals approaches; intermolecular interactions as preliminary stages of chemical reactions.

Andreas Heidenreich
01/01/2012–Present
Computer simulations of nanoplasma formation, Coulomb explosions and nuclear fusion induced by ultraintense and ultrashort laser pulses. Computer simulations of pump-probe signals.

Eugene Krasovskii
01/01/2012–Present
Electronic structure of surfaces and interfaces and computational spectroscopy: electron diffraction, angle and time-resolved photoemission, and dielectric response from first principles.

Mario Piris Silvera
01/01/2012–Present
Energy functional method development. Computational modelling of semiconductor nanocluster and molecular solid phases and polymorfism.

Vyacheslav Silkin
01/01/2012–Present
Ultrafast dynamics of the one-particle and collective electronic excitations in metals and their surfaces. The study of electronic excitations at adsorbates on metal surfaces.

Thomas Frederiksen
15/08/2012–Present
Nanoelectronics - theory and simulation.

Geza Giedke
01/09/2014–Present
Quantum systems and technologies.

Fabienne Barroso Bujans
01/02/2016–Present
Novel complex-shaped cyclic polymers, from synthesis to plysical properties. Devices and nanodevices based on cyclic polymers/graphene hybrid materials.

Luca Salassa
01/01/2017–Present
Development of photoactivatable anticancer metal complexes and nanomaterials. Experimental and computational inorganic photochemistry.

Denis Vyalikh
01/01/2017–Present
Photoemission measurements of magnetic surface states.

Juan José Gómez Cadenas
14/03/2018–Present
Experimental particle physics.

Román Orús Lacort
01/09/2018–Present
Quantum systems and technologies.

Miguel Ángel Cazalilla Gutiérrez
01/09/2020–Present
Investigation of the load and spin transport properties in low dimensional systems, highly correlated systems and superconductors. Quantum dissipation and non-balance effects.

Nathan John Bastian
01/03/2021–Present
Stellar population studies.

Juan Ignacio Collar Colmenero
23/11/2022–Present
Neutrino physics at the European Spallation Source.

Distinguished Researchers

Ronen Zangi
01/02/2023–Present
Computer simulations of biological and chemical systems. Statistical mechanics of finite systems.

Miguel Moreno Ugeda
15/06/2023–Present
Low-temperature scanning tunneling microscopy and spectroscopy of two-dimensional materials and nanostructures.

Javier Aizpurua Iriazabal
01/12/2023–Present
Theory of nanophotonics.

Paola Ferrario
01/01–15/09/2024
Neutrino physics.

Arantzazu García Lekue
01/01/2024–Present
Modeling electron transport at the nanoscale. Theoretical investigation of electron processes at nanostructured surface.

Juan Manuel García Ruiz
01/01/2024–Present
Crystallography and crystal growth.

Eduard Matito Gras
01/01/2024–Present
Development of electronic structure methods and real-space descriptors of chemical bonding and aromaticity.

Konstantin Bliokh
01/05/2024–Present
Complex classical and quantum waves.

Irina Sklyadneva
01/05/2003–Present
Electron-phonon coupling in the 3D topological isolators and Weil semiconductors as well as and in ultrathin lead and indium films on the Si substrate (superconductivity).

Albert Fert
01/01/2020–Present
Conversion between spin and charge currents at room temperature by Rashba or topological insulator interfaces, 2D magnets and perspective for low power spintronic devices.

George Fitzgerald Smoot
01/11/2020–Present
Measuring the sum of neutrino masses and properties, interpreting LIGO/Virgo events and testing the nature of Dark Matter.

Roman Kuzian
01/07/2022–Present
Time-resolved photoemission from solids.

Anatolii V. Goncharenko
01/09/2022–Present
Plasmonics and nanooptics.

Francisco Guinea López
01/09/2022–Present
Two dimensional materials.

Tonica Valla
01/10/2022–Present
Condensed matter physics – Emergent phenomena at quantum interfaces.

Maia García Vergniory
01/01/2023–Present
Prediction of new topological phases and materials.

Daniel Rubén Zerzión
01/03/2023–Present
Development and construction of the XeESS detector. Neutrino physics at the ESS.

Francesca Ferlaino
01/10/2024–Present
Quantum Science Lab.

Ikerbasque Research Associates

Alexey Nikitin
01/01/2018–31/12/2024
Nanophotonics of 2D materials.

Raúl Esteban Angulo de la Fuente
01/06/2018–31/12/2024
Numerical simulations in cosmology.

David Casanova Casas
01/07/2018–31/12/2024
Electronic structure of molecular excited states and photophysical process: theory and applications.

Dario Bercioux
01/10/2019–Present
Quantum transport in nanostructures.

Santiago Blanco Canosa
01/10/2019–Present
Synchrotron research in high Tc superconductors and low dimensional ferromagnets.

Iván Rivilla De la Cruz
01/02/2021–Present
Field of molecular indicators for single atom detection in dry media, with major applications to neutrino physics and a clear potential for biomedical.

Francesc Monrabal Capilla
01/02/2022–Present
Development of xenon detectors for basic and applied physics.

Silvia Bonoli
01/09/2023–Present
Formation and evolution of supermassive black holes in a cosmological context, combining theoretical models and observational data.

Fernando de Juan Sanz
01/09/2023–Present
Topology and electronic correlations in quantum materials.

Aitzol García Etxarri
01/11/2024–Present
Nanophotonics theory.

Ikerbasque Research Fellows

Aitzol García Etxarri
01/11/2019–31/10/2024
Nanophotonics theory.

Bo Chen
18/02/2020–Present
Nanothread chemistry and physics; high-pressure chemistry; carbene and diradical chemistry.

Carlos Sánchez Cano
01/09/2021–Present
Controlling the metabolism of cells using metal-based intracellular catalysts.

Tobias Daniel Grass
01/10/2022–Present
Quantum simulation and synthetic quantum matter.

Claire Tonnelé
01/09/2023–Present
Electronic structure in molecular photophysics and optoelectronics.

Stefano Roberto Soleti
01/09/2024–Present
Neutrinoless double beta decay with the NEXT experiment.

Fellows

María Navarro Gastiasoro
01/01/2023–Present
Exotic superconductivity and correlation in quantum materials.

Helena Almazán Molina
15/09/2024–Present
Neutrino physics in NEXT and WCTE experiments.

Postdoctoral Positions

Jens Oliver Stücker
02/09/2019–31/08/2024
Cosmology.

Tao Wang
07/10/2019–31/01/2024
On-surface synthesis of functional molecular materials.

Rubén Rodríguez Ferradás
01/05/2020–20/08/2024
Development of new density functional approximations.

Jonathan D'Emidio
05/10/2020–28/08/2024
Quantum Monte Carlo calculations and networks of tensors.

Rafael Ramis Cortés
08/02/2021–29/02/2024
Molecular dynamics of potassium channels.

María Jesús Morán Plata
20/09/2021–30/11/2024
Catalysis toward platinum substrates for drug delivery.

Pablo Fernández Menéndez
01/10/2021–Present
Development of water Cherenkov test beam experiment.

Ricardo Ortiz Cano
16/10/2021–29/02/2024
Quantum correlations in graphene-based nanostructures.

Valerio Di Lisio
15/11/2021–14/11/2024
Non-equilibrium dynamics of amorphous polymers and other materials.

Rodrigo Voivodic
06/12/2021–Present
Cosmology – Large scale structure.

Iñigo Robredo Magro
01/02/2022–30/06/2024
Topological quantum materials as platforms for quantum computers.

Jorge Humberto Melillo
07/02/2022–06/02/2024
Supercooled water – polymeric and biological aqueous solutions.

Roberto Álvarez Boto
01/03/2022–Present
Quantum technologies – Optical properties of doped nanographenes.

María Blanco De Paz
01/03/2022–28/10/2024
Quantum technologies – Quantum metasurfaces.

Beatriz Robles Hernández
01/03/2022–29/02/2024
Polymers and soft matter.

Ander Simón Estévez
01/03/2022–Present
Coherent neutrino-nucleus scattering at ESS.

Alexey Brodoline
08/03/2022–Present
Optics, fluorescence.

Luis Alejandro Miccio Stefancik
01/04/2022–14/01/2024
Chain dynamics in crosslinked filled polymer systems with high plasticizer content.

María Isabel Ardaya Franco
04/04/2022–Present
Neurobioscience – Nanoneuro: optically manipulating neuronal activity with nanoparticles.

Anastasiia Skurativska
11/07/2022–10/07/2024
Quantum technologies – Quantum annealing hardware-based on non-conventional superconducting circuitsand new quantum materials.

Haoyu Hu
22/09/2022–18/11/2024
Development of flat band theory methods for search of new materials.

Stefano Roberto Soleti
26/09/2022–31/08/2024
Neutrinoless double beta decay with the NEXT experiment.

Raphael Enoque De Paiva
30/09/2022–Present
Development of photoactivatable anticancer metal complexes and nanomaterials.

Siddhartha Patra
18/11/2022–Present
Tensor networks and artificial intelligence for quantum matter.

Douglas Nakahata
21/11/2022–Present
Metal catalysis for the chemical modification of proteins.

Ana Cristina Carrasco Gento
01/01/2023–Present
Bioorthogonal photocatalysis towards metal substrates.

Ricardo Rama Eiroa
16/01/2023–Present
Designing the next generation of hard-drives using two-dimensional materials.

Jose Eduardo Barcelon
23/01/2023–Present
On-surface trapping of Ba ions by functionalized surfaces.

Fei Gao
23/01/2023–Present
Hybrid graphene nanoarchitectures for electrochemical sensing.

Raúl Guerrero Avilés
01/04/2023–14/06/2024
Adsorbing atoms and molecules on van der Waals heterostructures.

Charles Mark Lewis
01/04/2023–Present
Neutrino physics as part of ESSCEvNS.

Mesías Agustín Orozco Ic
05/04/2023–30/09/2024
Theoretical physical chemistry.

Óscar Rodríguez Ballesteros
10/04/2023–Present
Computational design of proteins.

Mikel Iraola Iñurrieta
11/04/2023–Present
Topological phases in interacting-electron systems.

Fernando Peñaranda del Río
01/05/2023–Present
Multiscale modelling of moiré materials.

Mihovil Bosnar
10/05/2023–06/10/2024
Condensed matter physics.

Ane Izaskun Aranburu Leiva
01/06/2023–30/09/2024
Development of luminiscent chemical sensors for the selective detection of Ba++.

Galder Llorente Conde
01/06/2023–Present
Organic chemistry, neuroscience.

Álvaro Pozo Larrocha
01/06/2023–Present
Wave dark matter.

Shayan Edalatmanesh
05/06/2023–31/12/2024
Spin physics in graphene-based nanostructures.

Ilya Klimovskikh
19/06/2023–Present
Electronic properties of quantum interfaces studied in ARPES.

Sourav Biswas
01/07/2023–Present
Quantum technologies.

Haojie Guo
01/07/2023–Present
Condensed matter physics and strong electron correlations in moiré quantum matter.

Yi Jiang
01/07/2023–Present
HPC&IA – Magnetic properties of flat band kagome lattices studied by Inelastic neutron scattering.

Arunava Kar
01/07/2023–Present
Electronic properties of flat band kagome lattices studied by ARPES.

Nico Leumer
01/07/2023–Present
Spin physics in driven graphene nanostructures.

Luan Felipe Santos Martins Veríssimo
01/07/2023–30/12/2024
Computational condensed matter.

Rubén Pellicer Guridi
01/07/2023–31/12/2024
Vacancy centers in diamond for advanced quantum sensing.

Germán Eduardo Pieslinger
01/07/2023–Present
Green H_2 generation.

Mario Zapata Herrera
06/07/2023–Present
Nanophotonics.

Shivaprasad Achary Balahoju
01/09/2023–Present
Organic donor-acceptor π-conjugated molecular systems.

Tamara Richardson
01/09/2023–Present
Cosmology.

Benjamin Shirt-Ediss
14/09/2023–31/07/2024
Minimal agency and evolution.

Rodrigo Martínez Peña
01/10/2023–Present
Hybrid quantum algorithms for time series analysis.

Kate Storey-Fisher
11/10/2023–25/08/2024
Cosmological structure formation.

Constance Mahony
01/11/2023–30/09/2024
Weak gravitational lensing.

Hoang Nhan Luu
20/11/2023–Present
Exploring the nature of the standard cosmological model.

Moritz Frankerl
01/12/2023–Present
Theory of light emission from current-driven plasmonic nanocavities.

Antoine Patt
01/12/2023–Present
Theory and modelling, clathrate hydrates, porous materials.

Safa Hamreras
11/12/2023–Present
Hybrid quantum algorithms for pattern recognition.

Mateo Uldemolins Nivela
01/01–31/12/2024
Theory of quantum transport in superconducting and magnetic materials.

Pablo Ezequiel Dietz
02/01/2024–Present
Neutrino physics (CEvNS) at the European Spallation Source.

Chan Young Lim
05/01/2024–Present
Electronic properties of flat band kagome lattices studied by ARPES and scattering.

Ngoc Duc Le
15/01/2024–Present
Nano-optics, nano-photonics and nano-plasmonics.

Juan Felipe Huan Lew Yee
15/01/2024–Present
Solving the EoM for the 1RDM on quantum computing devices.

Manuel José Sánchez del Castillo
22/01/2024–Present
ECC - Experimental chemistry clusterX-rays for Inorganic biochemistry lab.

Andrei Mazanik
01/04–14/09/2024
Non-equilibrium properties of unconventional Josephson junctions.

Artem Korshunov
08/04/2024–Present
Uniaxial strain control of competing order parameters in complex quantum materials.

José Aarón Rodríguez Jiménez
11/04/2024–Present
Quantum Lanczos methods for quantum chemistry.

Emre Bölen
15/04–31/08/2024
Diffusion of ions into polymers and calcium silicates.

Jorge Diogo Marques Laranjeira
01/05/2024–Present
High-pressure computational organic chemistry.

Sabine Veronika Auras
01/06–30/11/2024
Activation of COP2 on metal surfaces.

Amanda Ribeiro Guimaraes
12/06–11/12/2024
In silico design and assessment of novel polyelectrophylic chemistry agents.

Kaycee Underwood
15/06/2024–Present
Novel forms of superconductivity and magnetism in two-dimensional materials.

Samuele Torelli
18/06/2024–Present
Search for neutrinoless double beta decay with high pressure xenon time projection chambers.

Hanqi Pi
01/07/2024–Present
Electronic structure of twisted 2 TMDs.

Nicholus Bhattacharjee
01/09/2024–Present
Computational mechanistic studies of the biological function of deprotonated diradicals.

Heqiu Li
01/09/2024–Present
Interactions, superconductivity, catalysis and topology in flat bands.

Tamar Meshveliani
01/09/2024–Present
Massive black holes and galaxy evolution.

Christian Jenewein
02/09/2024–Present
Patterns on the rocks.

Aleksander Bach Lorentzen
09/09/2024–Present
Theory and simulation of time-dependent nanoelectronics.

Rafael Ramis Cortés
16/09/2024–Present
AI-powered interpretation of missense variants in actionable genes.

Dulce Consuelo Guzmán Ocampo
01/10/2024–Present
Molecular dynamics simulation of proteins.

Stephen Ross McMillan
01/11/2024–Present
Spin qubits and graphene-based nanostructures.

Borja Aparicio Gil
18/11/2024–Present
Prebiotic chemistry and origin of life.

Irene Casademont Reig
01/12/2024–Present
Molecular optical properties and aromaticity.

Gonzalo Martínez Lema
06/12/2024–Present
Development of the GanESS detector.

Research Collaborators

Yetli Rosas Guevara
01/12/2020–30/11/2024
Theory and observation of galaxy formation.

Luis Antonio Soriano Águeda
01/02/2021–30/11/2024
Design of interchange and correlation functionalities for the correct description of dynamic and non-dynamic correlation.

Jorge Pelegrín Mosquera
08/09/2021–Present
Development of gas handling system for NEXT experiment.

Sergio Contreras Hantke
01/12/2021–Present
Modelling of galaxy formation physics and its impact on clustering and cosmological parameters.

PhD Students

Sara Lois Cerdeira
07/01/2020–06/01/2024
Tuning the chemical properties of graphene nanostructures.

Daniel López Cano
01/09/2020–31/08/2024
Computational cosmology.

Miryam Martínez Vara
01/09/2020–31/08/2024
Search for double beta decay without neutrinos with the NEXT-100 detector.

Nischal Acharya
28/09/2020–27/09/2024
The environment of quasars & evolution of galaxies.

Nathaniel Capote Robayna
01/10/2020–30/09/2024
Polaritons in anisotropic van der Waals crystals.

Antonio David Subires Santana
01/02/2021–Present
Electronic and magnetic ordering in low dimensional systems.

Irián Sánchez Ramírez
01/07/2021–Present
Modeling of strongly correlated electronic systems.

Aitor Díaz Andrés
01/08/2021–Present
Photophysical processes in molecules, molecular aggregates and molecular solids.

Juan Sánchez-Camacho Sánchez
01/08/2021–Present
Development of new biorthogonal photocatalytic catalysts for cancer therapy.

Antonio Cebreiro Gallardo
01/09/2021–Present
Quantum computational chemistry.

Kateryna Domina
01/09/2021–Present
Anomalous wave phenomena in 2D materials.

Divya Jyoti
02/09/2021–Present
Impurities on superconductor.

Mohammed Loukili
15/09/2021–Present
Exploring organic chemistry under pressure with computations.

Francisco Germano Maion
27/09/2021–Present
Cosmological large-scale structure.

Lurdes Ondaro Mallea
01/10/2021–Present
Research in computational cosmology.

Markos Polkas
15/10/2021–Present
Supermassive black holes and galaxy evolution.

Xabier Díaz de Cerio Palacio
01/11/2021–Present
Electronic properties of carbon-based nanostructures.

Adam Roselló Sánchez
01/11/2021–Present
Light-matter interactions in molecular systems on surfaces.

Carlo Andrea Pagnacco
15/11/2021–Present
Synthesis of cyclic polymers for biomedical applications.

Kirill Voronin
13/12/2021–Present
Nanophotonics with van der Waals crystals.

Sara Ortega Martínez
01/01/2022–Present
Cosmos: computational cosmology.

Andrei Paulau
12/01/2022–Present
Theoretical chemistry.

Leire Larizgoitia Arcocha
17/01/2022–Present
Development of gaseous detectors for the ESS.

Tim Kokkeler
07/02/2022–06/02/2024
Transport properties of non-conventional superconducting structures.

Amitayush Jha Takur
11/04/2022–31/12/2024
Condensed matter physics.

Chen-How Huang
03/05/2022–Present
Low dimensional system, quantum systems in non-equilibrium.

Andrés Felipe Bejarano Sánchez
06/05/2022–Present
Quantum transport.

Julen Aduriz Arrizabalaga
13/05/2022–Present
Theoretical simulation of metal-Aβ complexes.

Teresa Itziar Celaya Garmendia
17/05/2022–Present
Nanoneuro: optically manipulating neuronal activity with nanoparticles.

Nerea Salor Iguíñiz
01/08/2022–Present
Medical physics.

Nils Hoyer
01/09/2022–29/02/2024
The cosmological evolution of Nuclear Star Clusters.

Duy Hoang Minh Nguyen
01/09/2022–Present
Twisted 2D materials.

Sandra Sajan
01/09/2022–Present
Unconventional superconductivity in 2D materials.

María de los Ángeles Del Barrio Torregrosa
01/10/2022–Present
Neutrinoless double beta decay with the NEXT experiment.

Eric Gómez Urreizti
01/10/2022–Present
Synthesis of cyclic polymers for biomedical applications.

Josianne Imbola Owona
01/10/2022–Present
Theoretical chemistry and computational modelling.

Martin Irizar Landa
01/10/2022–Present
Towards spin-qubits in 2.

Antonio Morales Pérez
01/10/2022–Present
Artificial Intelligence algorithms for the topological control of quantum emitters.

Pablo Manuel Bermejo Navas
01/12/2022–Present
Hybrid quantum machine learning for NISQ devices. Analysis of QML methods, tensor networks and neuromorphic computing.

Marta Costa Verdugo
15/12/2022–Present
Development of new photocatalytic materials for drug delivery.

Javier Domínguez Calvo
19/12/2022–Present
Development of new density functional approximations.

Esteban Zingales
09/01/2023–Present
Metal modulation of glucose metabolism.

Francesco Di Marcantonio
16/01/2023–15/01/2024
Simulation of quantum matter and gauge theories with tensor networks.

Mikel Elorza Romera
23/01/2023–Present
Development of slow control system for the GaP detector.

Aitor González Marfil
06/03/2023–Present
Deep self-supervised learning methods for bioimage analysis.

Daniel García Pina
15/03/2023–Present
Magnetism in graphene nanostructures: spin chains with tunable interactions.

Paschalis Agapitos
01/04/2023–Present
Complex networks methods applied to cultural analytics.

Nonia Vaquero Sabater
01/04/2023–Present
Quantum algorithms for quantum chemistry.

Mikel Olano Aranburu
01/06/2023–Present
Moving quantum dots.

Elena Ramos Cascón
12/06/2023–Present
Development, data collection and physical analysis in the WCTE and Hyper-Kamiokande experiments.

Hanae Boulehjour
01/07/2023–Present
Quantum technologies – Asymmetric dilanthanide clusters as platforms for addressable qubits.

Hussen Oumer Mohammed
01/07/2023–Present
Computational design of draw solutes for forward–osmosis seawater desalination.

Shah Jee Rahman
01/07/2023–Present
Optical trapping and levitation.

Andoni Agirre Arabolaza
01/10/2023–Present
Tensor network methods for interacting electrons in quasi-1D graphene nanostructures.

Guillermo Santamaría Fernández
01/10/2023–30/09/2024
Study of phonons and charge and heat transport in molecular crystals.

Francisco Manuel Ballester Macià
16/10/2023–Present
Study and application of topological phonons.

Ramón María Bergua López
16/10/2023–Present
Study of fluxionality and environment effects on Pt nanoclusters for applications in catalysis.

Pablo Ramón García Valle
16/10/2023–Present
Development of luminiscent chemical sensors for the selective selection of Ba++.

Carolina Adriana Iacovone
23/10/2023–Present
Polymers and Soft Matter.

Marc Justin Seemann
27/10/2023–Present
Experimental particle physics: towards next-generation high pressure xenon time projection chambers for neutrinoless double beta decay.

Irene Valderrama Flores
01/11/2023–Present
Galaxies.

Alfonso Yubero Navarro
01/11/2023–Present
Neutrino physics, surface physics.

Victor Sierka
03/11/2023–Present
Design of quantum materials for channeling light and electrons.

Unai Pereira Castelo
01/12/2023–09/02/2024
Uniaxial strain tuning of the ground state of quantum materials.

Yongsong Wang
13/12/2023–Present
Electronic characterization of real- and momentum-space topology of ultra flat bands.

Joan Grèbol Tomás
01/01/2024–Present
Aromaticity in large conjugated circuits.

Alaitz Lecuona Isasa
01/01/2024–Present
Chiral multicolor quantum dots for monitoring biologically relevant phenomena.

Alfredo Manuel Rotundo
01/01/2024–Present
Photoactive anticancer drugs.

Nitin Kumar
01/02/2024–Present
Catalysis and photocatalysis.

Guilherme Henrique De Oliveira
02/02/2024–Present
Correlative X-ray and non-linear optical microscopy to characterise protein aggregates.

Vladyslav Chernenko
14/02–31/05/2024
Theoretical study of spin-orbit effects in scattering of electrons by surfaces.

Jehyeok Ryu
29/02/2024–Present
Plasmon-exciton quantum emitters for applications in quantum technologies.

Ainhoa Villoria Bárcena
01/05/2024–Present
New biomolecules with Huisgenase activity: metalloproteins as biocatalysts for (3 + 2) cycloadditions.

Javier Antonio Vélez Simanca
06/05/2024–Present
Chaos, magnetic materials and antiferromagnetics.

Aymeric Saunot
25/09/2024–Present
Topological magnetic moiré heterostructures.

Santiago Villodre Martínez
01/10/2024–Present
Condensed matter models implemented in quantum computers.

Markel García Ibarluzea
15/10/2024–Present
Biophysics of potassium channels: from atomistic protein folding, to clinical testing and drug design.

Carolina Martínez Strasser
01/11/2024–Present
Physics of nanostructures and advanced materials.

Alicia Omist Gálvez
16/11/2024–Present
Quantum technologies.

Ludovic Donneger
01/12/2024–Present
Gaseous detectors for neutrino physics.

Research Assistants

Carlos Alberto Maciel Escudero
01/07/2022–31/05/2024

Ainhoa Villoria Bárcena
01/10/2022–30/04/2024

Carolina Martínez Strasser
13/10/2022–31/10/2024

Miguel Ángel Jiménez Herrera
17/10/2022–31/03/2024

Jehyeok Ryu
01/03/2023–28/02/2024

Alicia Omist Gálvez
15/07/2023–15/11/2024

Alfredo Serrano Jiménez
18/09/2023–30/09/2024

Markel García Ibarluzea
01/10/2023–14/10/2024

Irati Lizaso Berrueta
23/10/2023–Present

Martín Molezuelas Ferreras
13/11/2023–27/08/2024

Martín Gutiérrez Amigo
04/12/2023–31/08/2024

José Aarón Rodríguez Jiménez
10/12/2023–10/04/2024

Bruno Candelas Peñalba
01/01/2024–Present

David Silva Brea
01/01/2024–Present

Sara Lois Cerdeira
07/01/2024–Present

Janaarthana Babu Perumal Marisami
22/01/2024–Present

Benjamin Tirado Heras
01/06–19/12/2024

Diego Herrero Carrión
14/10/2024–Present

Laura Navarro Cozcolluela
14/10/2024–Present

Shiyue Zhang
16/12/2024–Present

Engineers

Jordi Torrent Collell
16/06/2018–Present

Eva Oblak
14/09/2020–Present

José María Benlloch Rodríguez
22/01/2022–Present

Asier Castillo Litago
02/02/2022–Present

Alejandro Taboada Fernández
11/09/2022–Present

Oier Peñasco Escandell
23/12/2024–Present

Technical Assistants

Francisco López Gejo
01/01/2021–Present

Carlos Echeverría Lizarraga
01/03/2022–Present

Bruno López-Gómez Saldaña
11/09/2022–13/08/2024

José Luis López Gómez
10/02/2023–24/11/2024

Andrés Blanco Galán
03/09/2024–Present

Internships

Aitor Echeverría Ibarbia
Escuela Universitaria de Ingeniería Dual, Spain
01/09/2023–12/07/2024
Infrastructure monitoring.

Irene Plazaola Iguaran
UPV/EHU, Spain
01/09/2023–01/07/2024
Chemigenetic probes based on synthetic chelators.

Gorka Acuña Pérez
Zubiri Manteo, Spain
21/09/2023–18/03/2024
Administration of networked computer systems.

Alejandro Pérez Casas
UPV/EHU, Spain
30/10/2023–30/01/2024
Computer engineering.

Matt Hugget
Collège Sciences et Technologies - Université de Bordeaux, France
22/01–14/06/2024
Electronic structure characterization of electronic spin states in molecules.

Guillem Pey Costa
Universitat de Girona, Spain
26/02–26/04/2024
Theoretical evaluation of molecular and spectroscopic properties.

Élodie Boutou
Polytech Clermont-Ferrand, France
04/03–03/08/2024
Donostia natural orbital functional software.

Rebeka Rita Reszegi
Universität Hamburg, Germany
18/03–30/06/2024
Chelating nanoparticles to reach metal pools in cellular environments.
01/07–01/09/2024
Nanoparticle systems for intrabacterial metal sensing.

Alejandro Martín Quevedo
UPV/EHU, Spain
15/04–15/07/2024
Refinement of supercomputing use cases.

Pablo Serrano Molinero
Universidad Internacional de la Rioja (UNIR), Spain
02/05–27/06/2024
Quantum computing application to Bayesian learning.

Urko Arosa Elcoroiribe
UPV/EHU, Spain
01/06–31/07/2024
Estimation of NLOP in ionic liquids.

Idoia Cámara Garmendia
UPV/EHU, Spain
01/06–31/07/2024
Theoretical design of PtGe catalyst for HOR in alkaline.

Laura Hernández Fernández
Universidad de Vigo, Spain
01/06–31/07/2024
Solvent effects of biocompatible ionic liquids.

Lore Oregi Lauzirika
UPV/EHU, Spain
01/06–31/07/2024
Android app development for exploring nanographenes.

Irene Plazaola Iguaran
UPV/EHU, Spain
01/06–31/07/2024
Preparation of cellulose-based colorimetric sensor for heavy metal ion detection.

Cristina Sobrino Fernández
Universidad Autónoma de Madrid (UAM), Spain
01/06–31/07/2024
Rhodium-catalyzed isomerization of alkenes.

Martín Zapata Ferguson
Universidad Complutense de Madrid (UCM), Spain
01/06–31/07/2024
Controlling light at the nanoscale.

Iker Valle Gallegos
UPV/EHU, Spain
05/06–04/08/2024
Electric circuits for the investigation of non-Hermitian lattice physics.

Patxi Moreno Estebánez
UPV/EHU, Spain
10/06–09/08/2024
Photoemission experiments with quantum materials.

Ane Paniagua González de Chavarri
UPV/EHU, Spain
10/06–09/08/2024
Development of open-source deep learning tools for bioimage analysis.

Asier Adrián Díaz Valdivieso
UPV/EHU, Spain
12/06–11/08/2024
Machine learning methods applied to the mutagenesis of ion channels.

Ander Aleson Gurruchaga
UPV/EHU, Spain
19/06–18/08/2024
Aromaticity in large macrocylces.

Léa Serrano Giménez
Vrije Universiteit Brussel, Belgium
26/06–26/08/2024
Rationalization of linear and non-linear optical properties.

Alejandro Blanco Peces
Universidad Autónoma de Madrid (UAM), Spain
01/07–31/08/2024
Unconventional superconductivity in transition metal dichalcogenides.

Cristina Domínguez Escobar
UPV/EHU, Spain
01/07–31/08/2024
Computational study of the effect of pressure on organocatalysis.

Sergio Fernández Expósito
Universidad Complutense de Madrid (UCM), Spain
01/07–31/08/2024
Exploring noise impact on variational quantum eigensolvers.

Guillermo Pascua Ramón
Universidad de Zaragoza, Spain
02/07–31/08/2024
Gaseous detectors for neutrino physics at the ESS.

Clara Clemente Marcuello
Universidad de Zaragoza, Spain
08/07–07/09/2024
Nanophotonics in 2D materials.

Itsaso Hontoria Indart
UPV/EHU, Spain
08/07–11/08/2024
Gaseous detectors for neutrino physics at the ESS.

Laura Navarro Cozcolluela
Universidad de Valencia, Spain
08/07–31/08/2024
Positron-emission tomography with cryogenic crystals.

María Pérez Garrote
Universidad Complutense de Madrid (UCM), Spain
08/07–31/08/2024
Gaseous detectors for neutrino physics at the ESS.

Raúl Lago Saavedra
Universidad de Vigo, Spain
15/07–31/08/2024
Molecular dynamic simulations of intrinsically disordered proteins.

Alejandro Martín Rodríguez
Instituto de Ciencias Fotónicas (ICFO), Spain
01/08–31/08/2024
Unconventional superconductivity in two-dimensions.

Kamil Dutkiewicz
University of Warsaw, Poland
01/09–01/11/2024
Superconductivity in fractal lattices.

Carla García Gazulla
Universitat de Barcelona, Spain
30/09–30/12/2024
Study on rare processes in particle physics: research on dark matter and neutrinos.

Noa Andueza Arín
Zubiri Manteo, Spain
02/12/2024–Present
Supercomputing Center.

Undergraduate Candidates

Patxi Moreno Estebánez
UPV/EHU, Spain
02/10/2023–30/06/2024
Introduction to synchrotron radiation and its use in photoemission studies.

Katy Andrea Domínguez Farinango
UPV/EHU, Spain
11/10/2023–28/06/2024
Crosslinked polymers with reversible enamine-type bands.

Xabier Arrue Díaz
UPV/EHU, Spain
30/09/2024–Present
Experimental physics - particle physics.

Unai Miranda Redondo
UPV/EHU, Spain
01/10/2024–Present
Synchrotron radiation.

Master's Degree Student

Katy Andrea Domínguez Farinango
UPV/EHU, Spain
03/10/2024–Present
Cyclic polymers.

Special Assignments

Fabienne Barroso Bujans
DIPC Summer Internships

Aitzol García Etxarri
DIPC Transferable Skills Courses

Arantzazu García Lekue
DIPC Calls for Young Researchers

Geza Giedke and Thomas Frederiksen
DIPC Colloquia

David de Sancho Sánchez
DIPC Seminars

Deung-Jang Choi and Nicolás Lorente Palacios
DIPC Courses

Luca Salassa
DIPC Workshops and DIPC Schools

Carlos Sánchez Cano
PhD Seminars

Gustavo Schwartz
Mestizajes program
and DIPC Transdisciplinary Skills Courses

Andrés Arnau Pino, Claire Tonnelé, Francesc Monrabal Capilla and María Navarro Gastiasoro
Scientific newsletter

Gender Equality Committee

Amaia Arregi Buldain

Silvia Bonoli

Ricardo Díez Muiño

Luz Fernández Vicente

Aitzol García Etxarri

Maia García Vergniory

Elisa Jiménez Izal

Olatz Leis Esnaola

Irián Sánchez Ramírez

Beatriz Suescun Rodríguez

Visiting Researchers

Long visits

Talat Shahnaz Rahman
University of Central Florida, Orlando, FL, USA
01/12/2023–31/03/2024
01/12–31/12/2024
Theoretical and computational investigations of transport, magnetic and optical properties of functional nanomaterials.

Julio Alonso Martín
Universidad de Valladolid, Spain
01/12/2023–31/01/2024
01/10–30/11/2024
Interaction of small molecules with layered materials.

Pablo Herrero Gómez
Hebrew University of Jerusalem, Israel
01/10/2023–30/04/2024
Development of hardware an analysis for SABBAT project.

Ángel Rodríguez Alcaráz
Universidad Complutense de Madrid (UCM), Spain
02/10/2023–31/01/2024
Developing new tools for the BASQ-IBM quantum computer.

Chioma Ibiam Aja
Federal University of Technology Owerri, Nigeria
17/10/2023–16/09/2024
Introducing sulphons to amino acids to create super conducting capacitors.

Laura Barros Silva
Instituto de Química - Unicamp, Campinas, Brazil
10/12/2023–11/03/2024
Synthesis, characterization and antiviral studies of novel Pd(II) complexes with aminoadamantanes.

Juan Faustino Aguilera Granja
Instituto de Física, Universidad Autónoma de San Luis Potosí, México
10/12/2023–09/01/2024
16/03–12/04, 04/06–31/07/2024
Nanostructures made of new components.

Maxim Kagan
Higher School of Economics, Moscow, Russia
15/12/2023–15/01/2024
Acoustic plasmons in novel superconducting materials.

Antonio Zelaquett Khoury
Instituto de Física, Universidade Federal Fluminense, Rio de Janeiro, Brazil
18/12/2023–17/03/2024
Quantum nanophotonics.

Vladimir Nazarov
The Hebrew University of Jerusalem, Israel
01/01–31/01/2024
Optics of semiconductors and insulators beyond adiabatic local density approximation.

Dumitru Calugaru
Princeton University, NJ, USA
11/01–30/03, 07/05–15/06/2024
SuperFlat.

Rubén Miguel Otxoa de Zuazola
Hitachi-Cambridge Laboratory, UK
15/01–15/06/2024
Antiferromagnetism & quantum error correction.

Andrew Weber
University of Missouri-Kansas City, MO, USA
01/02–30/04/2024
Thin film plasmonics.

Joshua Renner
IGFAE - Universidade de Santiago de Compostela, Spain
01/02–31/05/2024
HyperK / WCTE radioactive source development.

Joseph Richard Manson
Clemson University, SC, USA
01/02–28/03, 01/09–31/10/2024
Electron-phonon interactions at surfaces.

Tyann Dumerchat
Centre de Physique des Particules de Marseille, Aix-Marseille Université, France
12/02–15/03/2024
Cosmology with peculiar velocity clustering.

Sergi Danés Pibernat
Universitat de Girona, Spain
15/02–15/05/2024
Theoretical evaluation of molecular and spectroscopic properties.

Zenan Dai
Shanghai Jiao Tong University, China
15/02–15/09/2024
Topological insulators.

Pau Besalú Sala
Institut de Química Computacional i Catàlisi, Facultat de Ciències, Girona, Spain
26/02–08/04/2024
Theoretical evaluation of molecular and spectroscopic properties.

Andrey Borissov
Institut des Sciences Moléculaires d'Orsay - CNRS - Université Paris-Saclay, France
01/03–30/04, 15/10–15/12/2024
Quantum plasmonics, strong field emission, electron transport in plasmonic gaps.

Simon White
Max Planck Institute for Astrophysics, Garching bei München, Germany
03/03–30/03/2024
Cosmological structure formation.

Matteo Santini
Università di Bologna, Italy
11/03–09/07/2024
Angular redshift fluctuations in extragalactic mappings.

João Pedro Vieira de Mendonça Santos
Faculty of Physics, University of Warsaw, Poland
20/03–22/06/2024
Non Fermi liquid behavior in Hubbard ladders.

Heba Kandil
National Research Center, Dokki, Egypt
21/03–14/09/2024
Exploring polysaccharide materials: innovating wound healing patches for optimal recovery.

Seok Gyeong Yoon
The University of Chicago, IL, USA
29/03–29/08/2024
ERC-ESSCEvNS.

Petru Milev
Wrocław University of Science and Technology, Poland
30/03–28/06/2024
Efficient methodologies for computing response propreties of molecules and materials.

José Ángel Hernando Morata
Instituto Galego de Física de Altas Enerxías (IGFAE) - Universidade de Santiago de Compostela (USC), Spain
01/04–30/06/2024
Neutrinos.

Gernot Frenking
Philipps-Universität Marburg, Germany
01/04–30/05/2024
Quantum chemical analysis of the chemical bond.

Oleg Dolgov
Lebedev Physical Institute of the Russian Academy of Sciences, Moscow, Russia
01/04–30/06/2024
Electronic excitations and superconducting instability in solids.

Agustín Rodríguez Medrano
Instituto de Astronomía Teórica y Experimental (IATE - Conicet), Córdoba, Argentina
01/05–30/07/2024
BACCO simulations.

Bárbara Andrade dos Santos
ICFO – The Institute of Photonic Sciences, Castelldefels, Spain
01/05/2024–01/05/2025
Real-time evolution of lattice gauge theories using modern quantum devices.

Paula Natalia Abufager
Instituto de Física Rosario, Argentina
01/05–01/07/2024
Electronic, magnetic and transport properties at the nanoscale.

Eric Switzer
University of Central Florida, Orlando, FL, USA
05/05–28/06/2024
Developing new tools for the BASQ-IBM quantum computer.

Karol Angélica Chim Ramirez
Institute of Radio Astronomy and Astrophysics (IRyA), UNAM, Morelia, México
06/05–01/07/2024
Parametric and environmental study of the formation and evolution of stellar bars in a cosmological context.

Peter Saalfrank
University of Potsdam, Germany
11/05–22/06/2024
Hot-electron mediated chemistry at metal nanoparticles.

In-Sang Yang
Ewha Womans University, Seoul, South Korea
13/05–13/08/2024
Spin rotational excitations in hexagonal $R\mathrm{MnO_3}$ (R=Y, rare-earths).

Oleg Prezhdo
University of Southern California, Los Angeles, CA, USA
25/05–25/08/2024
Excited state dynamics in novel nanoscale materials for optoelectronic applications.

Stephanie Louise Yardley
Northumbria University, Newcastle, UK
01/06–01/09/2024
Solar Physics/ Space weather.

Christian Jenewein
Instituto Andaluz de Ciencias de la Tierra (IACT), Armilla, Granada, Spain
01/06–31/08/2024
Patterns on the rocks.

Godfrey Gumbs
Hunter College, City University of New York, USA
01/06–30/06/2024
Thermoelectric response of magic-angle twisted bilayer graphene in external fields.

Elton Gomes Dos Santos
James Clerk Maxwell Building, The University of Edinburgh, UK
01/06–01/09/2024
Correlated properties based quantum technologies.

Francisco José García Vidal
Facultad de Ciencias, Universidad Autónoma de Madrid (UAM), Spain
01/06–31/07/2024
Quantum light-matter interaction.

Juan Pablo Echeverry Enciso
Universidad de Ibagué, Colombia
01/06–30/07/2024
Electron-plasmon coupling in $TiSe_2$ monolayers and bilayers.

Blanca del Rosal Rabes
RMIT University, Melbourne, Australia
01/06–30/06/2024
Nanoneuro.

Edgar Martín Salazar Canizales
University of Arizona, Tucson, AZ, USA
03/06–28/06/2024
Large scale structure modeling.

Eduardo Rozo
University of Arizona, Tucson, AZ, USA
03/06–28/06/2024
Modeling of large scale structure.

Mads Brandbyge
Technical University of Denmark (DTU), Kongens Lyngby, Denmark
03/06–07/07/2024
Electron transport in carbon nanostructures.

Dmitri Efremov
Institute for Solid State Physics and Material Research (IFW), Dresden, Germany
07/06–06/07/2024
Charge excitations in superconducting materials.

Haozhe Tong
Nanyang Technological University (NTU), Singapore
09/06–09/08/2024
Hyperbolic nanooptics.

Pavel Jelinek
Institute of Physics of the Czech Academy of Sciences, Prague, Czech Republic
17/06–17/07/2024
Magnetism at surfaces.

Rafael Yuste Rojas
Columbia University, New York, NY, USA
01/07–20/08/2024
Neurophysics.

Andrey Vasenko
HSE University, Moscow, Russia
01/07–30/09/2024
Photo-excitation dynamics in nanoscale systems.

Alejandro Martín Rodríguez
ICFO, Castelldefels, Spain
01/07–31/07/2024
STM/STS measurements on 2D materials.

Luis Martín Moreno
Instituto de Nanociencia y Materiales de Aragón, Zaragoza, Spain
01/07–31/07/2024
Theory on nanophotonics.

Nikolay Kabachnik
European XFEEL GmbH, Schenefeld, Germany
01/07–30/09/2024
Theoretical description of time-delay in photoemission from solid surfaces.

María Ángeles Hernández Vozmediano
Instituto de Ciencia de Materiales de Madrid, Spain
01/07–31/07/2024
Topological semimetals. Semimetal topologikoak.

Gabriel Alejandro Cwilich
Yeshiva University, New York, NY, USA
01/07–31/12/2024
Modeling of networks applied to vehicular traffic and similar problems.

Ivano Sarra
Istituto Nazionale di Fisica Nucleare, Laboratori Nazionali di Frascati, Italy
02/07–29/08/2024
Detectors for neutrino physics.

Sergio Ceravolo
Istituto Nazionale di Fisica Nucleare, Laboratori Nazionali di Frascati, Italy
02/07–29/08/2024
Detectors for neutrino physics.

Rodrigo Humberto Aguilera del Toro
Universidad de Valladolid, Facultad de Ciencias, Spain
04/07–01/08/2024
12/12/2024–12/01/2025
On the quest of new magnetic 2D materials.

Felix von Oppen
Dahlem Center for Complex Quantum Systems and Freie Universität Berlin, Germany
06/07–04/08/2024
Theory of the quantum twisting microscope.

Leonid Glazman
Yale University, New Haven, CT, USA
13/07–11/08/2024
Phonon spectroscopy with the quantum twisting microscope.

Alejandro González Tudela
Instituto de Física Fundamental, Madrid, Spain
14/07–15/08/2024
Topological quantum optics.

Yuval Oreg
Weizmann Institute of Science, Rehovot, Israel
19/07–05/08/2024
Novel properties of van der Waals layered systems.

Victor Oluwapemi Adebayo
Paul Sabatier University, Toulouse, France
29/07–22/09/2024
Mechanism of doublet-triplet energy transfer for photon upconversion.

Mohammad Monir
KU Leuven, Belgium
01/08–01/10/2024
Magnetic anisotropy in organic polyradicals.

Igor Karnaukhov
GV Kurdyumov Institute for Metal Physics of the NAS of Ukraine, Kyiv, Ukraine
01/08–30/10/2024
Topological insulators and superconductors.

Tairzhan Karabassov
HSE University, Moscow, Russia
01/08–31/08/2024
Superconductivity in topologically nontrivial materials.

Sergio Carbajo García
UCLA, Los Angeles, CA, USA
01/08–31/08/2024
Topological nanophotonics.

Guillermo Pedro Acuña
University of Fribourg, Faculty of Science and Medicine, Switzerland
01/08–31/10/2024
Chiral light matter interactions at the nanoscale.

Pablo Ares García
Facultad de Ciencias, Universidad Autónoma de Madrid (UAM), Spain
15/08–15/09/2024
AFM polarization in moiré materials.

Ziya Aliyev
Baku State University, Azerbaijan
25/08–25/09/2024
Materials physics of magnetic topological insulators.

Alexander Yaresko
Max Planck Institute for Solid State Research, Stuttgart, Germany
01/09–30/09/2024
Spin-polarized photoemission from the surface of antiferromagnet.

Leonid Sandratskii
Institute of Physics of the Czech Academy of Sciences, Prague, Czech Republic
01/09–30/11/2024
Magnons in altermagnets: symmetry aspects and first-principles calculations.

Ceferino López Fernández
ICMM (CSIC), Madrid, Spain
01/09–30/09/2024
Disorder photonics.

Stephen Ross McMillan
Universität Konstanz, Germany
12/09–31/10/2024
Spin dynamics in nanographenes.

Kurt Walsen Bluee-Blatter
Universidad Diego Portales (UDP), Santiago, Chile
16/09–07/12/2024
Cosmological simulations.

Giorgio Benedek
Università di Milano-Bicocca, Italy
16/09–23/10/2024
Surface dynamics and electron phonon interaction.

Valeria Aylen Cristiani
Instituto de Astronomía Teórica y Experimental (IATE), Córdoba, Argentina
19/09–17/12/2024
Properties of disks and spheroids in galaxies belonging to hydrodynamic simulations.

Nischal Acharya
DIPC, Donostia/San Sebastián, Spain
28/09/2024–28/09/2025
Connecting active galactic nuclei to host galaxy properties.

Julio Navarro
University of Victoria, Canada
01/10/2024–31/03/2025
Dark matter clues from the faintest galaxies in the universe.

Anabel Lam Barandela
Universidad de La Habana, Cuba
01/10–31/10/2024
Cyclic polymers.

Nathaniel Capote Robayna
DIPC, Donostia/San Sebastián, Spain
01/10–30/10/2024
Polaritons in anisotropic van der Waals crystals.

Matyas Nachtigall
University of Luxembourg, Luxembourg
07/10–31/12/2024
Quantum treatments of nanophotonic systems.

Roberto José Javier Assef Trebilcock
Facultad de Ingeniería y Ciencias,
Universidad Diego Portales (UDP), Santiago, Chile
15/10–15/11/2024
GN and galaxy evolution.

Luis Alberto Montero Cabrera
Universidad de La Habana,
Facultad de Química, Cuba
01/11–30/11/2024
Photophysics of molecular photovoltaic devices.

Amaia Elizaran Mendarte
UPV/EHU, Leioa, Spain
15/11/2024–28/02/2025
Neural networks optimisation in data scarcity scenarios.

Junze Deng
Aalto University, Espoo, Finland
30/11/2024–30/06/2025
Study on kagome flat band materials.

Haoyu Hu
Princeton University, NJ, USA
01/12/2024–01/10/2025
SuperFlat.

An Wei
University of Science and Technology Beijing, China
11/12/2024–10/12/2025
Quantum treatments of molecule-nanoresonator coupling.

Maxim Kagan
Higher School of Economics, Moscow, Russia
16/12/2024–14/01/2025
Investigation of doping dependence and plasmon poles of the dielectric function of cuprate high-T-c superconductors.

Short Visits

Rene Christian Urbina Jimenez
SPEC (CNRS-CEA) Université Paris-Saclay, Gif-sur-Yvette, France
08/01–11/01/2024
The exciting life of quasiparticles trapped between superconductors.

Marcelo Goffman
SPEC (CNRS-CEA) Université Paris-Saclay, Gif-sur-Yvette, France
08/01–11/01/2024
The exciting life of quasiparticles trapped between superconductors.

Anya Paopiamsap
University of Oxford, UK
09/01–13/01/2024
Large scale structure of the universe.

David Izquierdo Villalba
Università degli Studi di Milano-Bicocca, Italy
14/01–26/01/2024
Black hole growth and spin evolution.

Carolina Cuesta Lázaro
MIT, Cambridge, MA, USA
15/01–18/01/2024
Cosmological constraints from galaxy surveys.

Diego Herrero Carrión
Universidad Complutense de Madrid (UCM), Spain
21/01–25/01/2024
L-Galaxies.

Mohammadreza Ayromlou
Heidelberg University, Germany
21/01–26/01/2024
L-Galaxies.

Fabian Schmidt
Max Planck Institute for Astrophysics, Garching, Germany
28/01–02/02/2024
Forward models for large-scale structure.

Wei Xiong
University of California, San Diego, CA, USA
29/01–02/02/2024
Energy redistribution among vibrational degrees of freedom in molecular layers.

Jorge Iván Cárdenas Gamboa
Max Planck Institute for Chemical Physics of Solids, Dresden, Germany
03/02–24/02/2024
Non-collinear magnetism / Phonon calculation.

Christian Jenewein
Instituto Andaluz de Ciencias de la Tierra (IACT), Armilla, Granada, Spain
04/02–07/02/2024
Mineral self-organization and origin of life.

Jorge Olmos Trigo
Facultad de Ciencias,
Universidad de La Laguna, Spain
06/02–18/02/2024
Optical torques at the nano-and-microscale.

Samuele Torelli
Gran Sasso Science Institute, L'Aquila, Italy
07/02–10/02/2024
Search for neutrinoless double beta decay with high pressure xenon time projection chambers.

Arzhang Ardavan
The Clarendon Laboratory, University of Oxford, UK
15/02–15/02/2024
Experimental implementation of quantum error detection using hyperfine-coupled nuclear qudits.

Tim Kokkeler
University of Twente, Enschede, Netherlands
18/02–25/02, 12/10–22/10/2024
Nonlinear sigma model for materials with magnetic sublattices.

Alexander Golubov
University of Twente, Enschede, Netherlands
21/02–25/02/2024
Superconductor, topological insulator hybrid structures.

Fabio Donati
Center for Quantum Nanoscience, Ewha Womans University, Seoul, South Korea
21/02–24/02/2024
Lanthanide atoms on superconducting surfaces.

Magdalena Marganska-Lyzniak
Institute for Theoretical Physics, University of Regensburg, Germany
02/03–10/03/2024
Gipuzkoa Quantum.

Norhan Omar
Institut des Sciences Moléculaires, Talence, France
03/03–08/03/2024
DALTON - how hydrogen desorption and adsorption are influenced on tungsten by oxygen and nitrogen?

Guinevere Kauffmann
Max Planck Institute for Astrophysics, Garching, Germany
04/03–31/03/2024
Physical properties of galaxies in DESI bright galaxy survey; stellar halos of low mass galaxies.

Iván Fernandez-Corbatón
Karlsruhe Institute of Technology, Germany
07/03–08/03/2024
Light-matter interactions.

Rein Ulijn
Advanced Science Research Center CUNY, NY, USA
10/03–11/03/2024
Materials discovery through exploration of biomolecular space.

Martin Tomterud
University of Bergen, Norway
11/03–15/03/2024
Temperature dependent properties of two dimensional materials.

Roberto Cammi
Università di Parma, Italy
12/03–14/03/2024
Effect of pressure on tunneling in organic reactions.

Mu-Kun Li
Waseda University, Tokyo, Japan
16/03–27/03/2024
Evindence of time-dilation in topologically protected antiferromagnetic textures.

Mikhail Otrokov
Instituto de Nanociencia y Materiales de Aragón, Zaragoza, Spain
18/03–21/03, 13/05–16/05, 16/12–20/12/2024
Magnetic topological insulators.

Philippe Roncin
Université Paris-Saclay, Orsay, France
25/03–04/04/2024
Inelastic diffraction of atoms on surfaces.

Julia Contreras García
Sorbonne Université, Paris, France
04/04–04/05, 11/12–20/12/2024
Non covalent interactions and electron delocalization.

Antonio Hernando Grande
Universidad Complutens, Madrid, Spain
08/04–12/04/2024
Magnetism in neurons.

Fernando Aguilar-Galindo Rodríguez
Universidad Autónoma de Madrid (UAM), Spain
08/04–12/04/2024
Electron dynamics under the effect of strong laser pulses.

Jacopo Dosso
Università degli Studi di Trieste, Italy
10/04–12/04/2024
Reinventing dihydrophenazine systems: from smart materials to catalysis.

Ewa Lokas
Nicolaus Copernicus Astronomical Center (CAMK PAN), Warsaw, Poland
11/04–13/04/2024
Tidally induced bars in galaxies.

Thales Gutcke
Institute for Astronomy University of Hawaii, Hilo, HI, USA
14/04–20/04/2024
Dwarf galaxy simulations.

Guillem Aromi Bedmar
Universitat de Barcelona, Spain
17/04–18/04/2024
Spin qubit molecules.

Mahammad Babanli
Institute of Catalysis and Inorganic Chemistry named after Academician M. Nagiyev, Baku, Azerbaijan
21/04–27/04/2024
Development of new magnetic topological insulators.

Cyril Aymonier
Institute for Condensed Matter Chemistry of Bordeaux (ICMCB), Pessac, France
22/04–26/04/2024
LTC green concrete.

Jacek Styszynski
Institute of Physics, University of Szczecin, Poland
26/04–04/05/2024
Relativistic effects in chemical bonding analysis.

Beñat Martínez de Aguirre Jokisch
Technical University of Denmark (DTU), Lyngby, Denmark
28/04–05/05/2024
Nano-optics, nano-photonics and nano-plasmonics.

José Manuel Caridad Hernández
Universidad de Salamanca, Spain
28/04–30/04/2024
Graphene-based heterostructures for Terahetz detection technology.

Kasper Moth-Poulsen
Universitat Politècnica de Catalunya (UPC), Barcelona, Spain
29/04–30/04/2024
Synthetic chemistry for energy storage, solar energy, sensors and molecular electronics.

Zhiyu Hu
Zhangjiang Institute for Advanced Study, Shanghai Jiao Tong University, China
29/04–30/04/2024
Nano-fire technology and nanocatalysts.

Anastasia Vyalikh
Technical University Dresden, Germany
01/05–04/05/2024
Low dimensional functional materials.

Eloy Ramos Córdoba
Instituto de Química Avanzada de Cataluña - CSIC, Barcelona, Spain
10/05–19/05/2024
Development of new density functional approximations.

Karolina Slowik
Nicolaus Copernicus University in Toruń, Poland
15/05–29/05/2024
Optical properties of grahene nanostructures.

Marta Pelc
Nicolaus Copernicus University in Toruń, Poland
15/05–29/05/2024
Investigating electro-optical properties of graphene nanoflakes with adatoms.

Anna Seiler
ETH Zürich, Switzerland
20/05–25/05/2024
Optics, electronics and magnetism in 2D materials.

Giovanni Aricò
University of Zurich, Switzerland
20/05–31/05/2024
Cosmological implications of dark energy.

Garnett Bryant
National Institute of Standards and Technology, Gaithersburg, MD, USA
27/05–31/05/2024
Quantum plasmonics.

María del Valle Palomo Ruíz
IMDEA Nanociencia, Madrid, Spain
31/05–31/05/2024
Quantum dots and peptide-based sensors to develop and improve drug selection in neurodegenerative diseases.

Gorm Ole Steffensen
Instituto de Ciencia de Materiales de Madrid (ICMM), Spain
06/06–08/06/2024
Non equilibrium transport in proximitized InAs-Al nanowires.

Rodney Dewayne Priestley
Princeton University, NJ, USA
10/06–13/06/2024
Glass transition in polymers.

Zoltán Haiman
Pupin Laboratories, Columbia University, New York, NY, USA
10/06–16/06/2024
Massive black holes.

Latha Venkataraman
Columbia University, New York, NY, USA
13/06–16/06/2024
Electroluminescence at the nanoscale.

Sebastian Kozuch
Ben-Gurion University of the Negev, Be'er Sheva, Israel
21/06–27/06/2024
Tunneling in organic reaction under pressure.

Simon Mun
Gwangju Institute of Science and Technology, South Korea
25/06–27/06/2024
Surface science with ambient pressure XPS.

Joaquín González Nuevo Gónzalez
Universidad de Oviedo, ICTEA, Oviedo, Spain
27/06–27/06/2024
Cosmology with magnification bias.

Adrian Feiguin
Northeastern University, Boston, MA, USA
30/06–03/07/2024
Software ecosystem.

Juan Pablo Ortega
School of Physical and Mathematical Sciences, Nanyang Technological University, Singapore
01/07–06/07/2024
Quantum reservoir systems for machine learning.

Lyudmila Grigoryeva
Faculty of Mathematics and Statistics University of St. Gallen, Switzerland
01/07–06/07/2024
Quantum reservoir systems for machine learning.

Michael Edward Flatté
University of Iowa, IA, USA
03/07–07/07/2024
Spintonics and superconductors.

Adiel Stern
Weizmann Institute of Science, Rehovot, Israel
07/07–27/07/2024
Flat bands in multi-layer systems.

Stephan Roche
Catalan Institute of Nanoscience and Nanotechnology (ICN2), Bellaterra, Spain
08/07–19/07/2024
Spintronics, quantum technologies and advanced electronics.

Charles Marcus
University of Washington, Seattle, WA, USA
10/07–17/07/2024
Experimental research on quantum materials.

Javier García de Abajo
ICFO - Institut de Ciències Fotòniques, Castelldefels, Spain
13/07–19/07, 21/09–27/09/2024
Plasmonics in atomically thin crystalline silver films.

Chen Fang
Institute of Physics, Chinese Academy of Sciences, Beijing, China
13/07–20/07/2024
Many-body scar dynamics and open quantum systems.

Elia Strambini
Istituto Nanoscienze (CNR-NANO), Pisa, Italy
15/07–27/07/2024
Magnetic Josephson junctions and superconducting diodes.

Javier Aguilar Sánchez
Università degli Studi di Padova, Padua, Italy
15/07–18/07/2024
Binomial quantum trajectories.

Mitchell Luskin
University of Minnesota, Minneapolis, MN, USA
21/07–31/07/2024
Two-dimensional materials.

Lisa Randall
Harvard University, Cambridge, MA, USA
22/07–26/07/2024
Warped five-dimensional geometry in particle physics, cosmology, and more formal theory.

Alfredo Levy Yeyati
Universidad Autónoma de Madrid (UAM), Spain
22/07–29/07/2024
Towards a new Shiba Qubit based on superconductor-semiconductor hybrid quantum dots.

Zhipeng Wang
Tohoku University, Sendai, Japan
23/07–25/07/2024
Magnetic molecules on superconductors.

Daniel Cooke
University of Texas at Austin, TX, USA
27/07–30/07/2024
Nanoneuro.

Christoph Strunk
University of Regensburg, Germany
28/07–31/07/2024
Superconducting diode effect.

Yao Zhang
University of Science and Technology of China, Hefei, Anhui, China
03/08–07/08/2024
Atomistic description of surface enhanced raman spectroscopy.

José Francisco Toledo Alarcón
Universitat Politècnica de València, Gandia, Spain
19/08–21/08/2024
Experimental particle physics.

Joaquín Armijo
Kavli Institute for the Physics and Mathematics of the Universe (IPMU), Kashiwa, Japan
19/08–23/08/2024
Modelling of the large-scale structure of the universe.

Matteo Zennaro
University of Oxford, UK
28/08–06/09/2024
Cosmological structure formation.

Raúl Lago Saavedra
Universidad de Vigo, Spain
01/09–15/09/2024
Molecular dynamic simulations of intrinsically disordered proteins.

Julio Gómez Herrero
Universidad Autónoma de Madrid (UAM), Spain
03/09–05/09/2024
Proximity microscopy: the eyes of nanotechnology.

Thomas Eckl
Robert Bosch, Renningen, Germany
17/09–19/09/2024
Achieving quantum utility for industrial applications in materials simulation.

Claudio Savarese
The University of Manchester, UK
18/09–20/09/2024
Development of dark matter detectors.

Marco Montalti
Università di Bologna, Italy
23/09–28/09/2024
Mineral self-organisation.

Michele Parrinello
Fondazione Istituto Italiano di Tecnologia, Genoa, Italy
25/09–27/09/2024
Do we really understand catalysis?

José Luís Lado Villanueva
Aalto University, Espoo, Finland
29/09–01/10/2024
Hamiltonian learning, triplons, and high-order topological order in engineered nanoscale quantum magnets.

Lexin Ding
Ludwig-Maximilians-Universität München, Germany
29/09–05/10/2024
Quantum information theory for studying chemical bonding.

Nelson David Padilla
Instituto de Astronomía Teórica y Experimental (IATE), Córdoba, Argentina
30/09–04/10/2024
Warm dark matter simulations.

Manfred Mark
Universität Innsbruck,
Institut für Experimentalphysik, Austria
01/10–05/10/2024
Novel quantum phases in ultracold dipolar gases.

Steen Rasmussen
University of Southern Denmark, Odense, Denmark
05/10–25/10/2024
Physics of living materials.

Salvador Miret Artés
Instituto de Física Fundamental, Madrid, Spain
07/10–11/10/2024
Fundamentals of quantum mechanics and stochastic processes.

Jens Oliver Stücker
University of Vienna, Austria
13/10–20/10/2024
Warm dark matter simulations.

Rik Broekhoven
Delft University of Technology, The Netherlands
13/10–16/10/2024
Efficient algorithm for dispersion of Yu-Shiba-Rusinov chains on a superconducting surface.

Martin Tomterud
University of Bergen, Norway
20/10–24/10/2024
Temperature dependent properties of two dimensional materials.

Azadeh Moradinezhad
Laboratoire d'Annecy de Physique Théorique (LAPTh), Annecy, France
20/10–23/10/2024
Primordial non-gaussianity in the universe.

Marcin Bartosz Semczuk
Institut de Ciències del Cosmos (ICCUB), Universitat de Barcelona, Spain
24/10–25/10/2024
Theory and observation of galaxy formation.

Sara Capponi
IBM Almaden Research Center, San Jose, CA, USA
26/10–03/11/2024
Nanoneuro.

Shalitha Shrimantha Bandara Pathiranage
Queen Mary University of London, UK
03/11–15/11/2024
Near-field microscopy with epitaxially-grown h-BN.

Yang Hao
Queen Mary University of London, UK
07/11–09/11/2024
Near-field microscopy with epitaxially-grown h-BN.

Valentina De Romeri
Instituto de Física Corpuscular (IFIC), Paterna, Spain
11/11–15/11/2024
Coherent elastic neutrino-nucleus scattering in the standard model and beyond.

James De Yoreo
Pacific Northwest National Laboratory, Richland, WA, USA
20/11–23/11/2024
In situ studies of hierarchical nucleation pathways in silicate and carbonate systems.

Chunli Huang
University of Kentucky, Lexington, KY, USA
03/12–05/12/2024
Superconductivity and spin-transport in two dimensional materials.

Juan Faustino Aguilera Granja
Universidad Autónoma de San Luis Potosí, México
06/12–18/12/2024
Nanostructures made of new components.

Abhishek Ghosh
Nicolaus Copernicus University in Toruń, Poland
08/12–22/12/2024
Graphene mediated adatom interaction.

Abel Rojo Francàs
Universitat de Barcelona, Spain
09/12–13/12/2024
Few quantum particles on a fractal lattice.

Diego Martín Cano
IFIMAC, Universidad Autónoma de Madrid (UAM), Spain
09/12–11/12/2024
Theory of interactions between light and molecules in nanoenvironments.

Yann Fichou
CBMN/CNRS, Pessac, France
12/12–13/12/2024
Understanding the modulators of tau amyloid aggregation pathways.

Aurelia Chenu
University of Luxembourg, Luxembourg
18/12–21/12/2024
Control of open quantum systems.

Administration and Services

General Management

Ricardo Díez Muiño
Director

Management

Nora González Lakunza
Head of Outreach & Communication

Olatz Leis Esnaola
Head of Finance & Accounting
and R+D+i Project Management

Txomin Romero Asturiano
Head of Supercomputing Center

Beatriz Suescun Rodríguez
Head of Administration,
Human Resources and Legal Area

Administration

Karmela Alonso Arreche
Organization of Scientific Events
and Administration

María del Mar Álvarez San Martín
Human Resources and Administration

Xabier De la Torre Arostegui
Public Procurements and Administration
As of 25/11/2024

Amaia Etxaburu Munduate
President's Assistant

Nerea Fariñas Conde
Public Procurements and Administration
End of contract: 05/05/2024

Leire Herranz Erquicia
Finance & Accounting and Administration

Irati Jauregi Unanue
Public Procurements and Administration
End of contract: 08/05/2024

Natasha Nedashkivska
Finance & Accounting and Administration

Yannick Sáenz Augusto
Finance & Accounting and Administration

Laura Sancho Ortega
Human Resources and Administration

María Tarazona Lorente
Public Procurements and Administration

Ainara Vélez Ara
Public Procurements and Administration
As of 09/09/2024

Jon Viedma García
Public Procurements and Administration
As of 08/05/2024

Maintenance

Juan Burgos Jiménez
End of contract: 31/10/2024

Ekain Ugalde Goldarazena

Jarvin Baca Sánchez
As of 04/11/2024

Outreach and Communication

Amaia Arregui Buldain

Itxaso Azcune Tolosa

Valentina Rodríguez Castro

Marta Vega de Seoane López de Goicoechea

R+D+i Projects Management

Mikel Abadía Gutiérrez

Iñigo Díez García
As of 15/01/2024

Marina Santos Ovejero

Jone Zabaleta Llorens

Supercomputing Center

José Caballero Tobajas
HPC Resources Administration

Aitor Echeverría Ibarbia
HPC Infrastructure Maintenance

Luz Fernández Vicente
Help Desk & Microinformatics

Daniel Franco Barranco
HPC Resources Administration
End of contract: 31/10/2024

Belén Isla Rodríguez
HPC Services Design

Diego Lasa Goicuria
HPC Software & Applications
End of contract: 12/03/2024

Carmen Martín Pulpón
Security, Web & Networks

Iker Ortiz de Luzuriaga
HPC Resources Administration

Carlos Pérez Miguel
HPC Software and Applications
As of 11/06/2024

Youssef Raoudi Zakir
Help Desk & Microinformatics

Unai Sainz de la Maza Gamboa
Computing System Management

Julen Suárez Ventosa
HPC Resources Administration
End of contract: 26/11/2024

Seminars

1 The exciting life of quasiparticles trapped between superconductors
10/01/2024
Cristian Urbina
SPEC (CNRS-CEA) Université Paris-Saclay, Gif-sur-Yvette, France

2 The mathematics of the periodic table of the elements
26/01/2024
Jan Philip Solovej
University of Copenhagen, Denmark

3 Ultrafast dynamics of molecular polaritons
31/01/2024
Wei Xiong
University of California, San Diego, CA, USA

4 Scientific misconduct in current materials research: aspects, conditions and perspectives
08/02/2024
Johannes Gierschner
IMDEA Nanociencia, Madrid, Spain

5 Feasibility of a directional solar neutrino measurement with the CYGNO/INITIUM experiment
09/02/2024
Samuele Torelli
Gran Sasso Science Institute, L'Aquila, Italy

6 Orbitronics: orbital currents induced by currents in interfacial orbital textures or by light for TeraHz emission
13/02/2024
Albert Fert
Université Paris-Saclay, Orsay, France

7 Experimental implementation of quantum error detection using hyperfine-coupled nuclear qudits
15/02/2024
Arzhang Ardavan
The Clarendon Laboratory, University of Oxford, UK

8 Structured quantum optics (part 1)
21/02/2024
Antonio Zelaquett Khoury
Universidade Federal Fluminense, Rio de Janeiro, Brazil

9 Addressing sub-meV interactions and multi-orbital configurations with X-ray absorption spectroscopy
23/02/2024
Fabio Donati
Institute for Basic Science (IBS), Ewha Womans University, Seoul, South Korea

10 Structured quantum optics (part 2)
28/02/2024
Antonio Zelaquett Khoury
Universidade Federal Fluminense, Rio de Janeiro, Brazil

11 Algebraic tools for light-matter interaction
07/03/2024
Ivan Fernandez-Corbaton
Karlsruhe Institute of Technology, Germany

12 Electronic interactions and superconductivity with fragmented Fermi surface
08/03/2024
Magdalena Marganska
Institute for Theoretical Physics, University of Regensburg, Germany

13 Materials discovery through exploration of biomolecular space
11/03/2024
Rein Ulijn
Advanced Science Research Center CUNY, NY, USA

14 Spins in mesoscopic and topological systems for quantum computing and spintronics
21/03/2024
Vitaly Golovach
CFM UPV/EHU-CSIC and DIPC, Donostia/San Sebastián, Spain

15 Diversity Matters - some strategies that could broaden participation
22/03/2024
Talat S Rahman
University of Central Florida, Orlando, FL, USA

16 Reinventing dihydrophenazine systems: from smart materials to catalysis
12/04/2024
Jacopo Dosso
Università degli Studi di Trieste, Italy

17 Constructing new models to predict superconductivity
15/04/2024
Julia Contreras García
CNRS-Sorbonne Université, France

18 Heterometallic lanthanide coordination complexes for quantum technologies
17/04/2024
Guillem Aromí
Universitat de Barcelona, Spain

19 Open science with Springer Nature (policies and tools)
18/04/2024
Asja Prohic
Head of Academic Affairs, Springer Nature, France

20 Utility-scale quantum computing in your own quantum computational workflows
23/04/2024
Pedro Rivero
IBM Quantum, NY, USA

21 Temporal aspects of electron scattering: superluminality, negative transit time, and attosecond chronoscopy
25/04/2024
Eugene Krasovskii
UPV-EHU, DIPC and IKERBASQUE, Donostia/San Sebastián, Spain

22 From nanofire to micro-TEG chip power generation technology
30/04/2024
Zhiyu Hu
Shanghai Jiao Tong University, China

23 Graphene-based heterostructures for Terahetz detection technology
30/04/2024
José Caridad
University of Salamanca, Spain

24 Exploring the role of nuclear magnetic resonance (NMR) spectroscopy in the study of biorelevant nanocomposites and electrochemical reactions
03/05/2024
Anastasia Vyalikh
Technical University Dresden, Germany

25 From data analysis to machine learning, the mathematical connection that makes scientists so valuable in tech companies
10/05/2024
Roberto Sanchís Ojeda
Spotify, Spain

26 Quantum interference effects in molecular nanoelectronics: theory and applications
13/05/2024
Angelo Valli
Budapest University of Technology and Economics, Hungary

27 A personal perspective on simulations of biomolecules: challenges and opportunities
23/05/2024
Xabier López
UPV/EHU and DIPC, Donostia/San Sebastián, Spain

28 Magnetic molecules: structure, spectroscopy, and dynamics
24/05/2024
Jon Kragskow
Univerty of Bath, UK

29 Topological properties of altermagnets
27/05/2024
Rafael Fernandes
University of Minnesota, Minneapolis, MN, USA

30 Hybrid halide perovskites: Taking advantage of ion migration and stability
27/05/2024
Pablo Docampo
University of Glasgow, UK

31 Resonance Raman study of spin rotational excitations in hexagonal $RMnO_3$ (R = rare earths, Y)
29/05/2024
In-Sang Yang
Ewha Womans University, Seoul, South Korea

32 Neutron beams for irradiation applications at the Rutherford Appleton Laboratory
30/05/2024
Carlo Cazzaniga
UKRI-STFC, UK

33 Quantum dots and peptide-based sensors to develop and improve drug selection in neurodegenerative diseases
31/05/2024
Valle Palomo
IMDEA Nanociencia, Madrid, Spain

34 Quantum computing cosmology. Computing the universe
06/06/2024
George F. Smoot
Hong Kong University of Science and Technology, DIPC, Hong Kong and Spain

35 The formation and growth of massive black holes
12/06/2024
Zoltan Haiman
Columbia University, New York, NY, USA

36 Photochemistry without light: molecules in cavities
12/06/2024
Peter Saalfrank
Department of Chemistry, University of Potsdam, Germany

37 Conductance and electroluminescence in single-molecule devices
14/06/2024
Latha Venkataraman
Columbia University, New York, NY, USA

38 Development of quantum algorithms for electronic structure calculations
17/06/2024
Matthieu Saubanere
LOMA, Bordeaux, France

39 Heavy atom tunneling: when molecules disobey the reactivity textbook
24/06/2024
Sebastian Kozuch
Ben-Gurion University of the Negev, Be'er Sheva, Israel

40 A study of surface oxides on $Pt_3Ni(111)$ and $Pt_3Co(111)$ using ambient pressure STM and XPS
26/06/2024
Bongjin Simon Mun
Gwangju Institute of Science and Technology, South Korea

41 From femtoseconds to nanometers: an overview of ultrafast laser spectroscopy and atomic force microscopy at boise state university
27/06/2024
Paul Davis
Boise State University, Boise, ID, USA

42 Time dependent approach to non-equilibrium spectroscopies
01/07/2024
Adrian Feiguin
Northeastern University, Boston, MA, USA

43 Quantum metrology in the ultra-strong coupling limit
08/07/2024
Karol Gietka
University of Innsbruck, Austria

44 Engineering quantum properties of molecular circuits with chemistry
09/07/2024
Masha Kamenetska
Boston University, Boston, MA, USA

45 Enumeration of spin-space groups: toward a complete description of symmetries of magnetic orders
15/07/2024
Chen Fang
Institute of Physics, Chinese Academy of Sciences, Beijing, China

46 Universal cold RNA phase transitions
17/07/2024
Felix Ritort
Universitat de Barcelona, Spain

47 Pillar[5]arene scaffolds for the preparation of advanced materials and bioactive compounds
22/07/2024
Jean-François Nierengarten
CNRS and University of Strasbourg, France

48 The role of 4f spin in single molecule magnets (SMMs) in generating Kondo states and Yu-Shiba-Rusinov states: insights from bis(phthalocyaninato)terbium(III) ($TbPc_2$) adsorbed on superconductor Pb(111) surface
24/07/2024
Zhipeng Wang
Tohoku University, Sendai, Japan

49 Non-reciprocity in superconductors - Josephson diode effect and beyond
29/07/2024
Christoph Strunk
University of Regensburg, Germany

50 Seminar-I of internship students at DIPC
30/07/2024
Internship Students
DIPC, Donostia/San Sebastián, Spain

51 Seminar-II of internship students at DIPC
30/08/2024
Internship Students
DIPC, Donostia/San Sebastián, Spain

52 Achieving quantum utility for industrial applications in materials simulation
18/09/2024
Thomas Eckl
Bosch Corporate Research, Germany

53 Flavin photocatalysis for the activation and delivery of metallodrugs
26/09/2024
Luca Salassa
DIPC, Donostia/San Sebastián, Spain

54 Hamiltonian learning, triplons, and high-order topological order in engineered nanoscale quantum magnets
30/09/2024
José Luis Lado Villanueva
Aalto University, Espoo, Finland

55 RIKEN Accelerator-driven compact neutron systems, RANS project, and their capabilities
14/10/2024
Yoshie Otake
RIKEN, Wako, Japan

56 Efficient algorithm for dispersion of Yu-Shiba-Rusinov chains on a superconducting surface
15/10/2024
Rik Broekhoven
Delft University of Technology, The Netherlands

57 Multistability in quantum systems and related cavity QED experiments
18/10/2024
Peter Domokos
HUN-REN Wigner Research Centre for Physics, Budapest, Hungary

58 Molecular assembly and reactivity triggered by Br-functional groups
24/10/2024
Lucia Vitali
CFM, Donostia-San Sebastián, Spain

59 Rydberg atom arrays for quantum simulation, computation, and metrology
25/10/2024
Daniel Barredo
Institut d'Optique-CNRS, CINN-CSIC, France and Spain

60 Leveraging machine learning for advanced materials discovery and electromagnetic applications
08/11/2024
Yang Hao
Queen Mary University of London, UK

61 Coherent elastic neutrino-nucleus scattering in the standard model and beyond
14/11/2024
Valentina de Romeri
Instituto de Física Corpuscular (IFIC), Paterna, Spain

62 Long-range entangling gates in constant depth using dynamic circuits
20/11/2024
Elisa Bäumer
IBM, Germany

63 In situ studies of hierarchical nucleation pathways in silicate and carbonate systems
22/11/2024
Jim De Yoreo
Pacific Northwest National Laboratory (PNNL), Richland, WA and University of Washington, Seattle, WA, USA

64 Gravitational waves: the theorist's Swiss knife
27/11/2024
Mairi Sakellariadou
King's College London, UK

65 Landau-level mixing and SU(4) symmetry breaking in graphene
04/12/2024
Chunli Huang
University of Kentucky, Lexington, KY, USA

66 Quantum optics with organic molecules
10/12/2024
Diego Martín Cano
IFIMAC, Universidad Autónoma de Madrid (UAM), Spain

67 Anomalous quantum transport in fractal lattices
11/12/2024
Abel Rojo-Francàs
Universitat de Barcelona, Spain

68 Understanding the modulators of tau amyloid aggregation pathways
12/12/2024
Yann Fichou
Université Bordeaux/CNRS/Institut Européen de Chimie et Biologie, France

69 Novel collective electronic phenomena in engineered 2D quantum materials
12/12/2024
Miguel Moreno Ugeda
DIPC, Donostia/San Sebastán, Spain

Colloquia

1 Novel quantum dynamics with superconducting qubits
11/01/2024
Pedram Roushan
Google Quantum AI, Santa Barbara, CA, USA

2 Bell inequalities: from curiosity to security
07/03/2024
Artur Ekert
Merton College, University of Oxford, UK

3 Thinking outside the hypercube: RS and its implications
24/07/2024
Lisa Randall
Harvard University, Cambridge, MA, USA

4 Do we really understand catalysis?
26/09/2024
Michele Parrinello
Istituto Italiano di Tecnologia, Genoa, Italy

5 From inorganic photochemistry to molecular machines
27/11/2024
Jean-Pierre Sauvage
ISIS, University of Strasbourg and CNRS, France

Workshops

Other Workshops

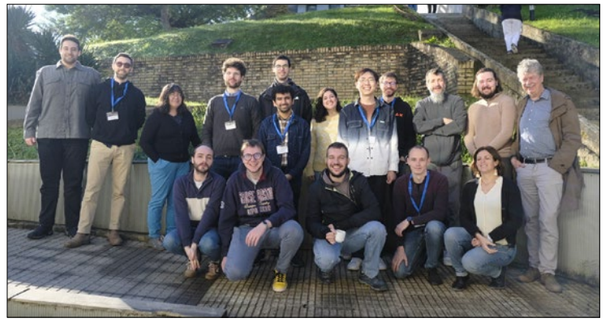
Scientific Meetings

L-Galaxies Workshop 2024

January 22-24, 2024
Live streamed and in-person
DIPC, Donostia/San Sebastián
https://lgalaxiespublicrelease.github.io/workshop2024.html

Organizing Committee
Silvia Bonoli (DIPC, Ikerbasque)
Rob Yates (University of Hertfordshire)

This meeting was aimed at discussing recent advancements and projects carried out with the galaxy evolution modeling code "L-Galaxies".



Invited Speakers
Nils Hoyer (DIPC, Spain)
Rob Yates (University of Hertfordshire, UK)
Markos Polkas (DIPC, Spain)
Peter Thomas (Sussex, UK)
David Izquierdo-Villalba (Universitá degli studi di Milano-Bicocca, Italy)
Mohammadreza Ayromlou (Heidelberg University, Germany)
Will Roper (Astronomy Centre, University of Sussex, UK)
Akash Vani (MPA, Germany)
Qingbo Ma (Guizhou Normal University, China)
Qi Guo (NAOC, China)
Daniele Spinoso (Department of Astronomy - Tsinghua University, China)
Massimiliano Parente (SISSA, Italy)
Jimi Harrold (University of Nottingham, UK)
Matteo Bonetti (University of Milano-Bicocca, Italy)
Julen Untzaga San Vicente (Institute of Space Sciences (ICE), Spain)
Tong Su (National Astronomical Observatories, Chinese Academy of Sciences, China)
Wenxiang Pei (NAOC, China)
Jian Fu (Shanghai Astronomical Observatory, China)

14th European Symposium on Computing π-Conjugated Compounds (CπC-14)

February 8-9, 2024
Faculty of Education, Philosophy and Anthropology (HEFA I), Donostia/San Sebastián
cpic14.dipc.org

Organizing Committee
Claire Tonnelé (DIPC, Ikerbasque)

Since its beginning in 2010 in Valencia, the CπC symposium series has kept its original spirit of a convivial gathering that offers an informal platform for the discussion of the latest research findings in the domain of π-conjugated systems. Topics encompass the fields of functional materials, photochemistry, biochemistry, theory and computation. In essence, it is a youthful, affordable, short and *intimate* event that aims to foster open and stimulating friendly discussions.

This year, the CπC symposium remained faithful to its spirit once again, promoting young scientists, local researchers, and rich and intense scientific exchange within this vibrant community.

This edition was sponsored by InSilibio and Springer Nature Group (Theoretical Chemistry Accounts journal) who awarded prizes for the best oral and poster contributions.

Invited Speakers
Elixabete Rezabal (UPV/EHU, Spain)
Aran Garcia-Lekue (DIPC, Ikerbasque, Spain)
Aurelio Mateo-Alonso (Polymat & UPV/EHU, Ikerbasque, Spain)

BioNEXT: 1st AEBIN Young Researchers Symposium

March 14-15, 2024
Live streamed and in-person
DIPC, Donostia/San Sebastián
https://bionext.dipc.org

Organizing Committee
Raphael de Paiva (DIPC, La Caixa)
Ana C. Carrasco (DIPC)
Douglas Hideki Nakahata (DIPC)
María Jesús Morán (DIPC)

BioNEXT is a new initiative by Spanish Association for Bioinorganic Chemistry (AEBIN), complementing the "Bio" series of biannual in-person events organized by the society. The main purpose of BioNEXT was to serve as a venue to foment interaction between Spanish and international young researchers working in the field of bioinorganic and medicinal inorganic chemistry.

We organized three thematic sessions, including six invited talks and 13 talks from young researchers selected among the abstracts we received, covering the following themes:

- Frontiers in medicinal inorganic chemistry
- Biomolecular targets and mechanism of action of metallodrugs
- Intracellular catalysis

We also hosted eight flash presentations and a poster session with 79 posters.

Together with our collaborator, ChemBioChem, we hosted a training session delivered by Dr. Ruben Ragg, editor-in-chief of the journal, and offered three prizes: one for the best oral communication by a young researcher, and two for the best posters.

BioNEXT received 264 attendees and presenters from 23 countries across Europe, the Americas, Africa, Asia and Oceania.

Invited Speakers
Andrew Kellett (Dublin City University, Ireland)
Caterina Ramogida (Simon Fraser University, Canada)
Ramon Vilar (Imperial College London, UK)
Jessica Rodríguez Villar (University of Santiago de Compostela)
Gerard Roelfes (University of Groningen, Netherlands)
James Coverdale (University of Birmingham, UK)

Anticancer Metal Drugs: New Developments and Future Perspectives 2nd Edition (MDRUGMET)

May 15-17, 2024
DIPC, Donostia/San Sebastián

Organizing Committee
Luca Salassa (DIPC, Ikerbasque)
Carlos Sanchez-Cano (DIPC, Ikerbasque)
Raphael de Paiva (DIPC)

MDRUGMEET is an international scientific meeting, the first edition of which was held in Jerusalem (Israel) two years ago. In this second edition of the workshop, 25 prominent researchers from various European and Asian centers gathered to present unpublished results and discuss advancement in the field of medicinal inorganic chemistry. The unique format of the meeting helped to maximize interaction among researchers, thereby opening opportunities to consolidate existing collaborations and create new ones.

Invited Speakers
Angela Casini (Technical University of Munich, Germany)
Emilia Sicilia (University of Calabria, Italy)
Vanesa Fernandez Moreira (University of Zaragoza, Spain)
Luisa Ronga (University of Pau et des Pays de l'Adour, France)
Ana Pizarro (IMDEA Nanociencia, Spain)
Petra Heffeter (Medical University of Wien, Austria)
Giorgia Pastorin (National University of Singapore, Singapore)
Dan Gibson (Hebrew University of Jerusalem, Israel)
Luigi Messori (University of Florence, Italy)
Ingo Ott (University of Braunschweig, Germany)
Nicola Margiotta (University of Bari, Italy)
José Ruiz (University of Murcia, Spain)
Gustavo Espino (University of Burgos, Spain)
Giampaolo Barone (University of Palermo, Italy)
Wee Han Ang (National University of Singapore, Singapore)
Patrick Gamez (University of Barcelona, Spain)
Samuel Meier-Menches (University of Wien, Austria)
Walter Berger (Medical University of Wien, Austria)
Christian Kowol (University of Wien, Austria)
Alessio Terenzi (University of Palermo, Italy)

Optics, Electronics and Magnetism in 2D Materials (OEM2D)

May 21-24, 2024
Faculty of Education, Philosophy and Anthropology (HEFA I), Donostia/San Sebastián
https://oem2d.dipc.org

Organizing Committee
Garnett Bryant (Joint Quantum Institute, National Institute of Standards and Technology, University of Maryland)
Thomas Weitz (Georg-August University Göttingen)
Anna Seiler (Georg-August Univesity Göttingen)
Marta Pelc (Nicolaus Copernicus University in Toruń)
Karolina Słowik (Nicolaus Copernicus University in Toruń)
Andrés Ayuela (CSIC-UPV/EHU-MPC, DIPC)
Mikel Arruabarrena (CFM-MPC, CSIC-UPV/EHU)
Piotr Gładysz (Nicolaus Copernicus University in Toruń)

The OEM-2D International Conference aimed to establish and enhance collaborations between experts in the field, facilitating the exchange of ideas and research across several disciplines and serving as a platform for sharing perspectives and initiating collaborative projects.

By promoting a synergy of knowledge, the conference sought to accelerate progress and achieve significant advances in the areas of optics, electronics and magnetism, with special emphasis on graphene and other interesting 2D materials and nanostructures.

Supporting the next generation
The conference aimed to connect PhD students and postdoctoral researchers with the latest developments at the cutting edge of these fields. In this way it sought to bridge the gap between established researchers and emerging talent. It provided a valuable educational experience for young researchers through a combination of exhibition sessions and networking opportunities.

Invited Speakers
Eva Andrei (Rutgers University, USA)
Jaroslav Fabian (University of Regensburg, Germany)
Andrea Ferrari (Cambridge Graphene Center GC, UK)
Gregory A. Fiete (Northeastern University of Boston, USA)
Frank Koppens (ICFO, Spain)
Stevan Nadj-Perge (Caltech, USA)
Rick Silver (NIST, USA)
Fan Zhang (UT Dallas, USA)
Dario Bercioux (DIPC, Spain)
Erez Berg (Weizmann Institute, Israel)
Andres Castellanos (ICMM, Spain)
Leonor Chico (Universidad Complutense, Spain)
Joel Cox (University of Southern Denmark SDU, Denmark)
Xiaodong Cui (University of Hong Kong, Hong Kong)
Thomas Frederiksen (DIPC, Spain)
Stephan Hofmann (Cambridge Graphene Centre GC, UK)
Alexander Högele (Ludwig-Maximilians University of Munich, Germany)
Shahal Ilani (Weizmann Institute, Israel)
Włodzimierz Jaskólski (Nicolaus Copernicus University, Poland)
Nicolas Lorente (CFM-CSIC, Spain)
Paweł Machnikowski (Politechnika Wrocławska, Poland)
Alejandro Manjavacas (Instituto de Óptica "Daza de Valdés" (IO-CSIC), Spain)
Magdalena Margańska (University of Regensburg, Germany)
Alexey Nikitin (DIPC, Ikerbasque, Spain)
Hryhoriy Polshyn (Institute of Science and Technology Austria IST-A, Austria)
Paweł Potasz (Nicolaus Copernicus University NCU, Poland)
Lorenzo Del Re (Max Plank Institute for Solid State Research, Germany)
Carsten Rockstuhl (Karlsruher Institut of Technology, Germany)
Eli Zeldov (Weizmann Institute, Israel)
Michał Zieliński (Nicolaus Copernicus University NCU, Poland)

European South Atlantic Biophysics Congress – Young Scientist Seminar (ESAB-YSS)

June 4-5, 2024
DIPC, Donostia/San Sebastián
https://www.biophysicssansebastian2024.com/satellite-workshop

Organizing Committee
Aitziber L. Cortajarena (CIC biomaGUNE)
David de Sancho (DIPC, UPV/EHU)
Gabriel Ortega (CIC bioGUNE)
Edurne Rujas (Biofisika, UPV/EHU)
Aitor Manteca (CIC biomaGUNE)

The Young Scientist Seminar (ESAB-YSS) took place on June 4-5 at Donostia International Physics Center as a Satellite Workshop of the European South Atlantic Biophysics Congress. This workshop, designed to support early-stage researchers, brought together a vibrant community of 60 graduate students, postdoctoral researchers, and early-career scientists from various fields of biophysics.

The workshop sessions showcased the outstanding scientific work being conducted by the youngest members of the Spanish, Portuguese, and French biophysics communities. Each presentation was followed by lively discussions that encouraged the exchange of ideas and the exploration of new research directions.

Many attendees expressed their appreciation for the supportive environment and the chance to engage with leaders in the field. The organizing committee received positive feedback, particularly regarding the workshop's focus on young scientists.

Invited Speakers
Nunilo Cremades (Universidad de Zaragoza, Spain)
Javier Fernández Martínez (Institute of Biofísika, Spain)

XXI International Workshop on Quantum Atomic and Molecular Tunneling Systems (QAMTS2024)

June 16-21, 2024
Miramar Palace, Donostia/San Sebastián
https://qamts2024.dipc.org

Organizing Committee
Ricardo Díez Muiño (DIPC, Ikerbasque)
Antonio Fernández Ramos (Universidade de Santiago de Compostela)
Salvador Miret Artés (Instituto de Física Fundamental CSIC)

Tunneling phenomena are of importance in a wide range of fields in the physical, chemical, biological and computational sciences. The series of Workshops on Quantum Atomic and Molecular Tunneling Systems has always been highly cross-disciplinary. It encompasses work on tunneling of protons and heavier species in gas and condensed phases, in general, including biological systems, chemical reactions, transport phenomena in solids and liquids and in systems of lower dimensionality.

The scientific program of QAMTS2024 included invited lectures as well as contributed talks and posters. There were scientific contributions on phenomena where atomic, molecular, or magnetic tunneling plays an important role, including not only processes in solids and matrices, but also organic and organometallic reactions in liquids, tunneling processes in clusters and nanoparticles, enzyme-catalyzed reactions, and some nontraditional emerging areas, this list being exemplary and non-exhaustive.

Invited Speakers
Octavio Roncero Villa (IFF, CSIC, Spain)
Marta I. Hernández (IFF, CSIC, Spain)
Alejandro González-Tudela (IFF, CSIC, Spain)
John Ellis (Cavendish Lab., UK)
Marco Sacchi (University of Surrey, UK)
Jian Liu (University of Beijing, China)
Chiara Aieta (University of Milano, Italy)
Michele Ceotto (University of Milano, Italy)
Jianshu Cao (MIT, USA)
Sebastian Kozuck (University Ben-Gurion, Israel)
Jeremy O. Richardson (ETH Zurich, Switzerland)
Gunter Wichmann (ETH Zurich, Switzerland)
Sotiris Xantheas (University of Washington, USA)
Jon M. Matxain (UPV/EHU, Spain)
Bo Chen (DIPC, Spain)
Pavel Jelinek (Institut of Physics, Czech Republic)
Karina Morgenstern (University of Bochum, Germany)
Ion Errea (CFM- CSIC, Spain)
Emilio Martínez-Núñez (Universidade de Santiago de Compostela, Spain)
Katarzyna Swiderek (University Jaume I, Spain)
Claudio M. Nunes (University of Coimbra, Portugal)
Elena Jimenez (University of Castilla La Mancha, Spain)
Robert McMahon (University of Wisconsin, USA)
Franceso Paesani (University of California, USA)
Zlatko Bacic (University of New York, USA)
Ad van der Avoird (University of Nijmegen, Netherlands)
Roberto Marquard (University of Strasbourg, France)
Peter Saalfrank (University of Potsdam, Germany)
Steven D. Schwartz (University of Arizona, USA)
Wolfram Sander (University of Bochum, Germany)
Sophya Garashchuk (University of South Carolina, USA)
Alberto Lesarri (University of Valladolid, Spain)
Micheline B. Sorey (University of Wisconsin, USA)

III International Conference on Novel 2D Materials Explored via Scanning Probe Microscopy & Spectroscopy (2DSPM)

June 24-28, 2024
Miramar Palace, Donostia/San Sebastián
https://2dspm.dipc.org

Organizing Committee
Miguel Moreno Ugeda (DIPC, Ikerbasque)
Iván Brihuega (UAM, IFIMAC)

The III International Conference on Novel 2D Materials Explored via Scanning Probe Microscopy & Spectroscopy (2DSPM) aimed to bring together the scientific elite in the field of 2D materials to present and discuss the latest advancements in the field, offering innovative ideas as well as new methods to study the fundamental properties of these new materials at the atomic scale.

The conference program was particularly focused on scientists specializing in 2D materials studied through Scanning Probe Microscopy & Spectroscopy (SPM & SPS) methods. Scanning probe techniques are particularly suitable for the study of two-dimensional materials because, unlike most experimental techniques, they provide information about their atomic, electronic, and magnetic structure in real space with atomic resolution. For this reason, these techniques have recently taken on a fundamental role in the study of these new materials and, in general, in the field of Materials Science.

The conference also aimed to be a gathering point to discuss the current state of research in this area, focused on the search for new functional low-dimensional materials, with the participation of leading national and international researchers in the field as well as to promote and encourage interaction and collaboration between internationally renowned research groups in the field and theoretical and experimental groups working in the Basque Country.

Invited Speakers
Ali Yazdani (Princeton University, USA)
Stevan Nadj-Perge (Caltech, USA)
Jennifer Hofmann (Harvard University, USA)
Stuart Parkin (Max Planck Institute, Germany)
Shalal Alani (Weizmann Institute, Israel)
Abhay Pasupathy (Columbia University, USA)
Katharina J. Franke (Freie University, Germany)
Francisco Guinea (DIPC, Spain)
Eva Andrei (Rutgers University, USA)
José Ignacio Pascual (CIC nanoGUNE, Spain)
Haim Beidenkopf (Weizmann Institute, Israel)
Roland Wiesendanger (University of Hamburg, Germany)
Joseph Stroscio (NIST, USA)
Maia G. Vergniory (Max Planck Institute, Germany)
Joaquín Fernández-Rossier (INL Braga, Portugal)
Peter Liljeroth (Aalto University, Finland)
Roser Valentí (Goethe-University, Germany)
Roman Fasel (EMPA, Switzerland)
Nadine Hauptmann (Radboud University, The Netherlands)
Sivan Refaeli-Abramson (Weizmann Institute, Israel)
Lin He (Beijing Normal University, China)
Feng Wang (UC Berkeley, USA)

Quantum Designer Physics 2024 (QDP2024)

July 15-19, 2024
Miramar Palace, Donostia/San Sebastián
https://qdp2024.dipc.org

Organizing Committee
Vitaly Golovach (CFM-UPV/EHU, DIPC, Ikerbasque)
Francisco Guinea López (DIPC, IMDEA Nanoscience)
Daniel Loss (University of Basel)

The workshop highlighted the advances in material systems designed for studying the most intriguing physical phenomena at the nanoscale. These phenomena are related to spin, topology, and coherence, which make it possible for the materials to display quantum functionalities. While Condensed Matter Physics is rich in material systems in which almost any physics can be readily found and studied, with recent developments of quantum materials, it is possible to purposefully design material systems with a given physical phenomenon in mind. Thus, a 'toy model' which could be conceived to exhibit an interesting behavior can be implemented in quantum materials and be subsequently used for basic research and applications.

This workshop brought together the leading experts working on quantum materials and created a stimulating atmosphere for discussing physics on the marvelous sites of Donostia/San Sebastián. We discussed recent progress in creating ordinary and topological quantum systems in different dimensions, as well as some of the most exotic quantum materials based on graphene and other low dimensional materials. We updated on the progress in topological and spin-based quantum computing with an outlook into the prominent future of quantum technologies. The workshop had all it is required to foster collaborations and inspire its attendants to tackle new problems with great ideas which make a difference for fundamental physics, lead to applications, and advance quantum technologies.

Invited Speakers
Shaffique Adam (National University of Singapore, Singapore)
Yoichi Ando (University of Cologne, Germany)
Christian Back (TU Munich, Germany)
Sebastian Bergeret (CFM-CSIC, Spain)
Andrei Bernevig (Princeton University, USA)
Stefano Bosco (QuTech, The Netherlands)
Sara Catalano (CFM-MPC, Spain)
Silvano De Franceschi (CEA Grenoble, France)
Olesia Dmytruk (CNRS, Institut Polytechnique de Paris, France)
Jérôme Faist (ETH Zurich, Switzerland)
Liang Fu (MIT, USA)
Leonid Glazman (Yale University, USA)
Shahal Ilani (Weizmann Institute of Science, Israel)
Jelena Klinovaja (University of Basel, Switzerland)
Roza Kotlyar (Intel, USA)
Leo Kouwenhoven (TU Delft, The Netherlands)
Henry Legg (University of Basel, Switzerland)
Roman Lutchyn (Microsoft, USA)
Allan MacDonald (University of Texas Austin, USA)
Vladimir Manucharyan (EPFL, Switzerland)
Pierre Pantaleon (IMDEA Madrid, Spain)
Jeong Min (Jane) Park (MIT, USA)
Stuart Parkin (MPI Halle, Germany)
Nacho Pascual (Nanogune, Spain)
Elsa Prada (ICMM-CSIC, Spain)
Patrik Recher (TU Braunschweig, Germany)
Pascal Simon (University Paris Saclay, France)
Ady Stern (Weizman Institute, Israel)
Dominik Zumbuhl (University of Basel, Switzerland)

NanoNeuro 2024

July 20, 2024
Live streamed
https://ntc.columbia.edu/nanoneuro-2024

Organizing Committee
Aitzol Garcia-Etxarri (DIPC, Ikerbasque)
Rafael Yuste (Columbia University)
Teresa Celaya (DIPC, Columbia University)

The conference aimed to help nucleate the emerging field of research at the intersection of Nanoscience and Neuroscience and provide a forum for experts from both areas to interact.

NanoNeuro2024 was an online conference, organized by the NeuroTechnology center at Columbia University and the Donostia International Physics Center (DIPC). The Conference was organized in thematic sessions with keynote and invited talks. This workshop was supported by the Tianqiao and Chrissy Chen Institute.

The conference achieved its scientific objectives and was followed by a total 700 people, making it a great success of public as well.

Invited Speakers
William Shih (Harvard University, USA)
Bryan Roth (UNC, USA)
Blanca del Rosal (RMIT, Australia)
Pau Gorostiza (IBEC, Spain)
José Antonio Garrido (ICN2, Spain)
Katrin Willig (University of Augsburg, USA)

Synthetic Electronic Quantum Matter (SELEQ)

August 28-30, 2024
Miramar Palace, Donostia/San Sebastián
https://seleq24.dipc.org

Organizing Committee
Dario Bercioux (DIPC, Ikerbasque)
François Dubin (CNRS)
Tobias Grass (DIPC, Ikerbasque)
Mohammad Hafezi (JQI, University of Maryland)

The SELEQ workshop brought together international scholars working on the challenge of controlling and manipulating electronic systems for the engineering of quantum correlations and many-body phases of real or synthetic matter. Experimental and theoretical experts presented the state-of-art related in scientific sessions dedicated to:

- Light-matter interactions in strongly correlated systems
- Excitons/exciton-polaritons
- Light-induced quantum phases
- Electronic quantum simulators
- Quantum dots
- Moiré systems

Invited Speakers
Jacqueline Bloch (University of Paris-Saclay, France)
Eugene Demler (ETH Zurich, Switzerland)
Sebastian Diehl (University of Cologne, Germany)
Nathan Goldman (UL Bruxelles, Belgium)
Tom Devereaux (Stanford University, USA)
Ataç Imamoglu (ETH Zurich, Switzerland)
Philip Kim (Harvard University, USA)
Camille Lagoin (CRHEA, CNRS, France)
Cristiane Morais Smith (University of Utrecht, The Netherlands)
Fabio Pistolesi (Université de Bordeaux, France)
Marlou Slot (NIST, USA)
Ingmar Swart (University of Utrecht, The Netherlands)
Lieven Vandersypen (TU Delft, The Netherlands)
Xiadong Xu (University of Washington, USA)
Go Yusa (Tohoku University, Japan)

Quantum Phenomena in Multilayers and Heterostructures (QPMH)

September 2-6, 2024
Miramar Palace, Donostia/San Sebastián
https://qpmh.dipc.org

Organizing Committee
Leni Bascones (ICMM-CSIC)
Maria Gastiasoro (DIPC)
Paula Mellado (Universidad Adolfo Ibañez)
Ali Yazdani (Princeton University)

The aim of the workshop was to explore and discuss the correlated and topological phases of twisted and untwisted graphene and dichalcogenides multilayers, the properties of van der Waals magnets and interface superconductivity. Focus was given to the latest advances in the characterization, theory and ad-hoc engineering of new quantum states, as well as to breakthroughs in sensing and spectroscopic techniques to detect these novel states.

We list below some of the main scientific outcomes and achievements presented and discussed during the workshop:

- Novel evidence and techniques to detect Wigner crystals in graphene multilayers
- New techniques to detect topological edge states and to probe multilayers
- Novel measurements of fractional topological states in twisted dichalcogenides and penta-layer graphene
- Evidence of very strong substrate and capping layer effect on the properties of multilayers from in-situ twisting techniques
- Novel theoretical proposals to detect the correlated states in twisted bilayer and trilayer graphene
- New insights of different mechanisms for exceeding the Pauli limit with spin-orbit coupling of interface superconductors

Another achievement that should be highlighted is the strong interaction and engagement that took place among attendees throughout the entire week, not only with many questions during and after the talks, but also during the lunch and coffee breaks.

Invited Speakers
Kaveh Ahadi (Ohio State University, USA)
Monica Allen (UC San Diego, USA)
Leon Balents (UC Santa Barbara, USA)
Anand Bhattacharya (Argonne National Laboratory, USA)
Silke Buehler-Paschen (Vienna University of Technology, Austria)
María José Calderón (ICMM-CSIC, Spain)
Andrey Chubukov (University of Minnesota, USA)
Laura Classen (MPI-FKF Stuttgart, Germany)
Santiago Grigera (Universidad Nacional de La Plata, Argentina)
Shahal Ilani (Weizmann Institute of Science, Israel)
Long Ju (Massachusetts Institute of Technology, USA)
Raquel Queiroz (Columbia University, USA)
Louk Rademaker (Geneva University, Switzerland)
Rebeca Ribeiro-Palau (CNN-Saclay-CNRS, France)
Carmen Rubio-Verdú (ICFO, Spain)
Lucile Savary (CNRS, École Normale Supérieure de Lyon, France)
Anna Seiler (ETH-Zurich, Switzerland)
Miguel Ugeda (DIPC,Ikerbasque, Spain)
Roser Valentí (Goethe Universität Frankfurt, Germany)
Maia García-Vergniory (DIPC, Spain, MPI-CPfS, Germany)
Xiaodong Xu (University of Washington, USA)

Challenges in Chemical Sensing with Graphene Derivatives and 2D Materials (SENSE)

September 23-25, 2024
Miramar Palace, Donostia/San Sebastián
https://sense.dipc.org

Organizing Committee
Martina Corso (CFM-CSIC)
Aran Garcia-Lekue (DIPC, Ikerbasque)
Aitor Mugarza (ICN2)
Diego Peña (CiQUS)
Dimas G. de Oteyza (CINN, CSIC-UNIOVI-PA)

Chemical sensors are part of modern society, finding broad applications in environmental and indoor monitoring, industrial safety, industrial chemical productions processes, pharmaceutical, food products, healthcare, security, etc. The workshop aimed to gather experts in the field of chemical sensing with two dimensional materials and graphene derivatives seeking for an efficient implementation of such materials in operating sensing devices and architectures. The three-day workshop, the first one of this kind, proved to be successful by creating a stimulating environment for exchange of ideas especially in gas and bio sensing. The workshop facilitated networking and collaboration opportunities among scientists from diverse research fields in experimental and theoretical physics, chemistry, engineering and materials science.

Invited Speakers
Cristina Africh (CNR-IOM, Italy)
Alejandro Criado (Universidade da Coruña, Spain)
Ganna (Anya) Gryn'ova (Heidelberg Institute for Theoretical Studies, Germany)
Martina Lihter (Institute of Physics, Croatia)
Michal Otyepka (CATRIN, Palacký University, Czech Republic)
Celia Rogero (CFM- Spain)
Paolo Samori (University of Strasbourg, France)
Luigi Sangaletti (Università Cattolica del Sacro Cuore, Italy)
Jose Angel Martin Gago (ICMM, Spain)
Tao Wei (Friedrich Alexander University Erlangen-Nürnberg, Germany)
Amaia Zurutuza (Graphenea, Spain)

BasQ Summer Course on Quantum Technologies

September 9-11, 2024
Miramar Palace, Donostia/San Sebastián

Organizing Committee
Javier Aizpurua (BasQ-DIPC, Ikerbasque)
Igor Campillo (Euskampus Foundation)

Promoted by the BasQ initiative, Donostia International Physics Center (DIPC) and Euskampus Foundation, the Summer Course on Quantum Technologies was held as part of the Summer Courses organized by the Universidad del País Vasco / Euskal Herriko Unibertsitatea (UPV/EHU).

The event gathered experts from around the world, offering a unique opportunity to delve into the growing field of quantum technologies, which promises to transform sectors such as computing, telecommunications, and security, among many others.

The course featured a diverse program of lectures by renowned researchers and professionals in the field. Over the course of three days, topics such as quantum computing, quantum communications, quantum cryptography, and quantum sensing were addressed. Each of these areas was presented in an educational manner, demonstrating their real and potential impact on industry and society as a whole. Participants, including undergraduate, master's, and PhD students from various disciplines, as well as researchers and business representatives, were able to explore the disruptive potential of these innovations and their possible applications in the future.

Invited Speakers
Verónica Fernández Marmol (ITEFI-CSIC, Spain)
Joana Fraxanet Morales (IBM Research, Spain)
Yassine Hamoudi (LaBRI-CNRS, Université de Bordeaux, France)
Eduardo Jacob Taquet (UPV/EHU, Spain)
Nicolás Lorente Palacios (CFM-CSIC, Spain)
Brahim Lounis (LP2N-Institut d'Optique, France)
Gabriel Molina Terriza (CFM-MPC, Ikerbasque, Spain)
Roman Orús (DIPC, Ikerbasque, Spain)
Daniel Ramos (ICMM, Spain)
Cristina Sanz (IBM Quantum, Spain)
Martha Johanna Sepúlveda Flórez (Airbus Defence and Space)

7th Basque Quantum Science and Technology Workshop (3rd IKUR Quantum Workshop)

October 4, 2024
Camara de Comercio, Donostia/San Sebastián
https://giedke.dipc.org/eusqutech24.html

Organizing Committee
Géza Giedke (DIPC, Ikerbasque)
Enrique Rico (UPV/EHU, Ikerbasque)

The meeting connected researchers from various research institutions of the Basque Country (BCAM, CFM, DIPC, Mondragon, Nanogune, Tecnun, UPV/EHU) and the Université de Bordeaux that work in the (broadly defined) field of quantum science and technology. It served as a platform to present recent results and enter into scientific exchange with colleagues, especially during the 2.5 hours poster session. In total, 14 talks and almost 40 posters were presented, meaning that almost two-thirds of all participants contributed to the program.

Invited Speakers
Pedro Crespo (Tecnun, Spain)
Thomas Frederiksen (DIPC, Ikerbasque, Spain)
Ruiyang Huang (Université de Bordeaux, France)
Fabio Pistolesi (Université de Bordeaux, France)
Manfred Mark (Universität Innsbruck, Austria)
Géza Toth (UPV/EHU, Ikerbasque, Spain)

Transborder QuantumChemPhys Lab Workshop

November 28-29, 2024
Bayonne, France
https://dipc.ehu.eus/en/scientific-activities/workshops/transborder-quantumchemphys-lab-workshop

Organizing Committee
Pascal Larregaray (ISM, CNRS - Université de Bordeaux)
Ricardo Díez Muiño (DIPC, Ikerbasque)

Theoretical Chemistry and Physics at the Quantum Scale (QuantumChemPhys) is a Transborder Joint Laboratory (LTC - Laboratoire Transfrontelier Conjoint, http://www.quantumchemphys.org) created by Université de Bordeaux (UBx), Universidad del País Vasco / Euskal Herriko Unibertsitatea (UPV/EHU), and Donostia International Physics Center (DIPC). The purpose of the QuantumChemPhys lab is to strengthen the scientific collaboration among researchers from Euskadi and Aquitaine through the creation of a transnational institution focusing on the theoretical aspects of chemistry and physics at the quantum scale, i.e. the quantitative description of the motion of electrons and nuclei (and their coupling) in solids, at gas-solid interfaces, as well as in the interaction with light. Such a challenge requires the developments of theoretical methods and numerical simulations within the framework of quantum/classical/semiclassical mechanics. In this context, on November 28th-29th 2024, the QuantumChemPhys Lab organized a workshop in which recent activity on the topics of interest to the Lab was discussed. Forty-six scientists from the three institutions forming the QuantumChemPhys lab gathered in Bayonne. All PhD students and post-doctoral researchers that are developing their research project under the joint supervision of scientists in Donostia and Bordeaux had the opportunity to present their work in the workshop. Contributions from other junior researchers were included in the program as well. This workshop contributed to the cohesiveness of the QuantumChemPhys lab, as well as building and developing new lines of research, in particular in the field of quantum computing.

Invited Speakers
Alejandro Rivero (Université de Lille, France)
Raúl Bombín (ISM, CNRS - Université de Bordeaux, France)
Juan Felipe Lew Yee (DIPC, Spain)
Markel Ylla (UPV/EHU, Spain)
Joan Grebòl-Tomàs (DIPC, Spain)
Raidel Martín Barrios (ISM, CNRS - Université de Bordeaux, France)
Duy Hoang Minh Nguyen (DIPC, Spain)
Matt Hugget (ISM, CNRS - Université de Bordeaux, France)
Nonia Vaquero (DIPC, Spain)
Laura Viaud (ISM, CNRS - Université de Bordeaux, France)
Angela Dellai (ISM, CNRS - Université de Bordeaux, France)
Alicia Omist (DIPC, Spain)
Antonio Cebreiro-Gallardo (DIPC, Spain)
Janaarthana Babu Perumal Marisami (DIPC, Spain)
Norhan Omar (ISM, CNRS - Université de Bordeaux, France)
Antoine Patt (DIPC, Spain, ISM, CNRS - Université de Bordeaux, France)
Moritz Frankerl (DIPC, Spain, LOMA, CNRS - Université de Bordeaux, France)
Andrés Bejarano (DIPC, Spain, LOMA, CNRS - Université de Bordeaux, France)
Josianne Owona (DIPC, Spain, ISM, CNRS - Université de Bordeaux, France)
Isabella C. D. Merrit (ISM, CNRS - Université de Bordeaux, France)
José Aarón Rodríguez-Jiménez (DIPC, Spain)
Verónica Postils (ISM, CNRS - Université de Bordeaux, France; Catholic University of Louvain, Belgium)
Roberto A. Boto (DIPC, Spain)

On-Surface Synthesis International Workshop (OSS2024)

June 2-7, 2024
Hotel Eden Roc, Sant Feliu de Guixols
https://oss24.dipc.org

Organizing Committee
Dimas G. de Oteyza (CINN, DIPC)
Martina Corso (CFM, DIPC)
Roman Fasel (EMPA)

On-surface synthesis, a surface-supported variation of organic chemistry most commonly performed under vacuum, unites the easy tunability of molecular materials and the promises of self-assembly as a revolutionary production method, with the sturdiness of covalently bonded structures.

Because this approach bridges across the fields of chemistry, physics and materials science, further involving engineering for the integration of these molecular materials in actual devices, the aim of this fifth edition of the "On-Surface Synthesis" international workshop was to bring together researchers working in this field from different perspectives, theory and experiment, as well as with chemical, physical and/or application-oriented viewpoints. It has been a full success, bringing together 110 researchers from 17 different countries spread over various continents. Their respective expertise also spanned the whole range of disciplines involved in this field, overall promoting common approaches and collaborations that will in the end allow for the fastest and best possible advances in this promising research field.

Invited Speakers
Gabriela Borin-Barin (EMPA, Switzerland)
Lifeng Chi (Soochow University, China)
Joaquín Fernández-Rossier (International Iberian Nanotechnology Laboratory, Portugal)
Felix Fischer (University of California at Berkeley, USA)
Szymon Godlewski (Jagiellonian University, Poland)
Pavel Jelinek (The Czech Academy of Sciences, Czech Republic)
Jiong Lu (National University of Singapore, Singapore)
Dolores Pérez (CIQUS, Universidade de Santiago de Compostela, Spain)
Guillaume Schull (Institute of Physics and Chemistry of Materials of Strasbourg, France)
Alexander Sinitskii (University of Nebraska-Lincoln, USA)
Ping Yu (ShanghaiTech University, China)
Junfa Zhu (University of Science and Technology of China, China)

International Quantum Matter Conference & Expo (QUANTUMatter 2024)

May 7-10, 2024
Kursaal Congress Centre-Auditorium, Donostia/San Sebastian
https://www.quantumconf.eu/2024

Organizing Committee
Antonio Correia (Phantoms Foundation)
Ricardo Muiño (DIPC, CFM-CSIC)
Juan Jose Garcia-Ripoll (IFF-CSIC)
Stephan Roche (ICREA / ICN2)
Daniel Sanchez-Portal (CFM, Spain)
Javier Aizpurua (CFM-CSIC, UPV/EHU, DIPC)
Nacho Pascual (CIC nanoGUNE)
Enrique Rico (UPV-EHU, Spain)
Celia Rogero (CFM-CSIC, UPV/EHU)

The fourth edition of the Quantum Matter International Conference – QUANTUMatter 2024 (San Sebastian, Spain) – aimed at gathering the various communities engaged in the science and technologies of quantum information and quantum matter, to foster the incubation of new ideas and collaborations at the forefront of quantum technologies, emerging quantum materials and novel generations of quantum communication protocols, quantum sensing and quantum simulation.

Quantum Information and Quantum Matter are two components of revolutionary treatments of information which are becoming cornerstones for discovering and implementing disruptive paradigms in quantum computation and quantum technologies.

This year, the Topological Matter Conference (TMC2024) joined forces with QUANTUMatter2024 featuring tutorials, specific workshops and speakers on topics such as topological insulators and Weyl semimetals, topological phononics and photonics, skyrmions, quantum metrology and more.

Invited Speakers
Ignacio Cirac (Max Planck Institute of Quantum Optics, Germany)
Claudia Felser (Max Planck Institute for Chemical Physics of Solids, Germany)
Leo Kouwenhoven (Delft University of Technology, The Netherlands)
Michelle Simmons (University of New South Wales, Australia)
Amir Yacoby (Harvard University, USA)
Ana Asenjo-Garcia (Columbia University in the city of New York, USA)
Philippe Bouyer (University of Amsterdam/Quantum Delta NL, The Netherlands)
Deung-Jang Choi (CFM-CSIC, UPV/EHU, Spain)
Jens Eisert (Freie Universität Berlin, Germany)
Francesca Ferlaino (University of Innsbruck & IQOQI, Austria)
Mohammad Hafezi (University of Maryland, USA)
Angela Kou (University of Illinois Urbana-Champaign, USA)
Anatoly Kulikov (ETH Zurich, Switzerland)
Peter Lodahl (University of Copenhagen, Denmark)
Yulia Maximenko (Colorado State Universtity, USA)
Susanne Yelin (Harvard University, USA)
Antonio Acin (ICFO, Spain)
Audrey Bienfait (ENS Lyon, France)
Frédéric Bonell (Spintec, France)
Olivier Boulle (CEA, France)
Jorge Casanova (UPV/EHU, Spain)
Sonia Conesa Boj (TU Delft, The Netherlands)
Joseph Dufouleur (IFW Dresden, Germany)
Dmitri Efetov (LMU, Germany)
Adolfo G. Grushin (Institut Néel / CNRS, France)
Sophie Gueron (Université Paris Saclay - LPS, France)
Matteo Ippoliti (The University of Texas at Austin, USA)

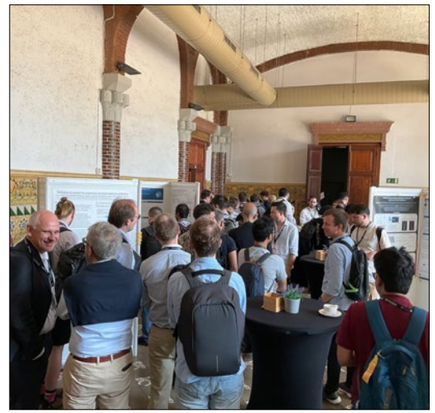
Karl Jansen (Deutsches Elektronen-Synchrotron DESY, Germany)
Barbara Kraus (Technical University of Munich, Germany)
Marie-Blandine Martin (CNRS-Thales, France)
Nicola Poccia (IFW Dresden & University of Naples Federico II, Germany/Italy)
Carmen Rubio Verdú (ICFO, Spain)
Nitin Samarth (Penn State University, USA)
Mikel Sanz (NQUIRE Center - UPV/EHU, Spain)
Javad Shabani (New York University, USA)
Matti Silveri (University of Oulu, Finland)
Jairo Sinova (Johannes Gutenberg University Mainz, Germany)
Magdalena Stobinska (Warsaw University, Poland)
Sofia Vallecorsa (CERN, Switzerland)
Visa Vesterinen (VTT, Finland)
Silvia Zorzetti (Fermilab, USA)
James S. Clarke (Intel, USA)
Yonatan Cohen (Quantum Machines, Israel)
Alexandre Dauphin (PASQAL, France)
Artur Ekert (University of Oxford / Centre for Quantum Technologies, NUS, UK / Singapore)
Jay M. Gambetta (IBM, USA)
Pau Jorba (Kiutra, Germany)
Yemliha Bilal Kalyoncu (Qblox BV, The Netherlands)
Samira Nik (European Innovation Council (EIC), Belgium)
Roman Orus (Multiverse Computing & DIPC, Spain)
Claudius Riek (Zurich Instruments, Switzerland)
Anurag Saha Roy (Qruise, Germany)
Felice Francesco Tafuri (Keysight Technologies, USA)
Jelena Trbovic (QuantrolOx, Finland)
Ramon Aguado (ICMM-CSIC, Spain)
Athanasios Dimoulas (NCSRD, Greece)
Maia García Vergniory (Max Planck for Chemical Physics of Solids, DIPC, Germany/Spain)
Tomas Jungwirth (Czech Academy of Sciences, Czech Republic)

Artificial Intelligence for Advanced Materials (AI4AM2024)

July 2-4, 2024
Casa Convalescència, Barcelona
https://www.ai4am.net/2024/index.php

Organizing Committee
Antonio Correia (Phantoms Foundation, Spain)
Konstantin S. Novoselov (NUS / Institute for Functional Intelligent Materials, Singapore)
Stephan Roche (ICREA/ICN2, Spain)
Andrey Ustyuzhanin (Constructor, Germany)
Ricardo Díez Muiño (DIPC, Ikerbasque, Spain)
Concepción Narros Hernández (Phantoms Foundation, Spain)
Joaquín Gaspar Ramón-Laca Maderal (Phantoms Foundation, Spain)
Jose Luis Roldán (Phantoms Foundation, Spain)

AI4AM2024 was a cross-disciplinary international event that joined top experts from industry and research institutions utilizing Artificial Intelligence, including machine learning, deep learning, and neural networks. The event aimed to enhance discoveries in materials science by refining automated designs for both structural and electronic material models in engineering. It focused on improving interoperability among material databases and reverse material engineering. This platform offers experts an opportunity to delve into the latest innovations, discuss practical challenges, and share solutions in applying AI for groundbreaking advancements in material science and engineering. It covers targeted applications in electronics, composites, energy, (bio) medicine, quantum computing, and related fields. This inaugural edition set the groundwork for a series of conferences dedicated to this theme, fostering networking, collaboration, and industrial partnerships.



Invited Speakers
Kostya Novoselov (NUS, Singapore)
Amanda Barnard (Australian National University, Australia)
Sergei V. Kalinin (UT Knoxville and Pacific Northwest National Laboratory, USA)
Karsten Reuter (Max-Planck-Gesellschaft, Germany)
Marin Soljacic (MIT, USA)
Anatole von Lilienfeld (University of Toronto, Canada)
Maite Alducin (CFM, Spain)
Juan Carrasquilla Alvarez (ETH Zurich, Switzerland)
Bingqing Cheng (UC Berkeley, USA)
Kamal Choudhary (NIST, USA)
Giulia Cisotto (University of Milan-Bicocca, Italy)
Gabor Csanyi (University of Cambridge, UK)
Gianaurelio Cuniberti (TU Dresden, Germany)
Volker Deringer (University of Oxford, UK)
Andrea Ferrari (Cambridge Graphene Centre / University of Cambridge, UK)
Kedar Hippalgaonkar NTU, Singapore)
Boris Kozinsky (Harvard University, USA)
Nicola Marzari (EPFL, Switzerland)
Kostya Novoselov (NUS, Singapore)
Wolfgang Wenzel (Karlsruhe Institute of Technology, Germany)

XXXIX Reunión Bienal de la Real Sociedad Española de Física (RSEF)

July 15-19, 2024
Musikene and School of Engineering of Gipuzkoa, Donostia/San Sebastián
https://bienalfisica.org/en/home

Organizing Committee
Jenaro Guisasola (UPV/EHU)
Ion Errea (CFM-UPV/EHU)
Idoia G. Gurtubay (UPV/EHU)
Josu M. Igartua (UPV/EHU)
Mikel Sanz (UPV/EHU, Ikerbasque)
Mikel Garmendia (UPV/EHU)

The RSEF Biennial served as a platform for the exchange of knowledge, the presentation of new research and the discussion of developments in various fields of physics. It was probably the largest event held in the Spanish state in the field of physics, covering all its fields from particle physics, biomedical physics and solid state physics, to physics education. It offered a unique platform for professionals, researchers, educators and students to participate in scientific discourse and establish new collaboration networks.

The main objectives have been the following:

- Dissemination of Scientific Research. The biennial facilitates the presentation of cutting-edge research findings in various subfields
- Promotion of Collaboration. The event promotes networking and collaboration opportunities between physicists from different institutions and countries, which is essential to develop joint research projects and share resources and knowledge
- Education and Dissemination. The biennial emphasizes the importance of education and public outreach, including sessions designed to improve the teaching of physics and promote public understanding of science
- Recognition of Excellence. During the biennial, prizes and recognitions are awarded, such as the prizes for the best doctoral theses of the RSEF+EPJ, highlighting significant achievements within the community

Invited Speakers
Sayeef Salahuddin (University of California Berkeley, USA)
Clivia, Sotomayor Torres (ICN2, Portugal)
Roberto, Gómez Calvet (European University of Valencia, Spain)
Francisco Savall (IES Veles e Vents, Spain)
José Luis, Sánchez Gómez (University of León, Spain)
Yolanda Prezado (Institut Curie, France)
Ursulla Keller (ETH Zurich, Switzerland)
Olga Smirnova (Max Born Institute, Berlin)
Juan Ignacio Cirac (Max Planck Institute for Quantum Optics, Germany)
Javier Aizpurua (DIPC, Spain)
Ricardo Díez Muiño (DIPC, Spain)
Jorge Mira (University of Santiago de Compostela, Spain)
Alessandra Buonanno (Max Planck Institute for Gravitational Physics, Germany)
Jonathan Home (ETH Zurich, Switzerland)
Jorge Méndez (University of La Laguna Tenerife, Spain)
Irene Abril (University of Cambridge, Spain)
Verónica Sanz (University of Valencia, Spain)
Inmaculada Pérez Pérez (Friedrich Schiller University Jena, Germany)
Pedro Miguel Echenique (UPV/EHU, Spain)
Itziar Otegui (CIC NanoGUNE, Spain)
Jorge Bravo-Abad (Universidad Autónoma de Madrid, Spain)
Claudio Zeni (Cambridge University, UK)

9th International Doctoral Training Session "Frontiers of Condensed Matter"

September 16-27, 2024
École de Physique des Houches, France
https://www.houches-school-physics.com/program/program-2024/frontiers-of-condensed-matter-1305548.kjsp

Organizing Committee
Sebastian Bergeret (DIPC, CFM/CSIC)
Julia Meyer (Université Grenoble Alpes)
Jörg Schmalian (Karlsruhe Institute of Technology)
Christian Schönenberger (Swiss Nanoscience Institute, University of Basel)
Gary Steele (TU Delft)

Frontiers of Condensed Matter offered final year master's students and junior PhD students a high-level training program in the general area of condensed matter physics. The session consisted of a lecture series on topics such as Quantum Transport, Topological Phases, Superconductivity, and Quantum Information – complemented by more specialized pedagogical seminars on timely topics as well as poster sessions and discussion forums. This was the 9th event in a series of doctoral training sessions organized since 2010.

Invited Speakers
Carlo Beenakker (Leiden, The Netherlands)
Vidya Madhavan (Urbana-Champaign, USA)
Sophie Guéron (University of Paris-Saclay, France)
Adolfo Grushin (Institut Néel Grenoble, France)
Anja Metelmann (Institute for Theoretical Condensed Matter Physics Karlsruhe, Germany)
Zaki Leghtas (Mines Paris, France)
Natalia Chepiga (Delft University of Technology, The Netherlands)
Silvano De Francheschi (CEA Grenoble, France)
Maria Gastiasoro (DIPC, Spain)
Yaroslav Herasymenko (Delft University of Technology, The Netherlands)
Christophe Mora (Université de Paris, France)
Silke Paschen (Vienna University of Technology, Austria)
Marta Pita-Vidal (IBM Research Zurich, Switzerland)

2nd SPRING-DIPC Meeting

February 26-28, 2024
Donezteb/Santesteban, Navarra

The second SPRING-DIPC MEETING brought together researchers from diverse disciplines, so as to create a fertile ground for academic exchange, promoting scientific discussion in an overarching atmosphere of open dialogue and collaboration.

Meeting attendants
Thomas Frederiksen (DIPC, Ikerbasque, Spain)
Tobias Grass (DIPC, Ikerbasque, Spain)
Geza Giedke (DIPC, Ikerbasque, Spain)
Natxo Pascual (CIC nanoGUNE, Ikerbasque, Spain)
Nico Leumer (DIPC, Spain)
Roberto Alvarez Boto (DIPC, Spain)
Moritz Frankerl (DIPC, Spain)
Martín Irizar (DIPC, Spain)
Shayan Edalatmanesh (DIPC, Spain)
Talat Rahman (University of Central Florida, Orlando, USA)
Matt Hugget (Collège Sciences et Technologies - Université de Bordeaux, France)
Sourav Biswas (DIPC, Spain)
Alicia Omist Galvez (DIPC, Spain)
Sofía Sanz Wuhl (Materials Physics Center CFM-CSIC, Spain)
Ricardo Ortiz (DIPC, Spain)
Daniel García (DIPC, Spain)
Daniel Sánchez Portal (Materials Physics Center CFM-CSIC, Spain)

PROTOS Kick-off meeting

July 14-16, 2024
Olarain, Donostia/San Sebastián

The first gathering of the ERC-PROTOS synergy project focused on establishing the working profile for the upcoming years. Both scientific and administrative key goals were discussed and stablished.

Meeting attendants
Juan Manuel Garcia (DIPC)
Christian Jenewein (DIPC)
Olatz Leis (DIPC)
Mikel Abadia (DIPC)
Wolfgang Bach (UBremen)
Mark van Zuilen (Naturalis)
Denis Gebauer (LUH)
Stefan Lalonde (CNRS)
Isaac Rodríguez (INPT)
Sebastien Teychene (INPT)
Fermín Otálora (CSIC)

Higher Education

Photo- and Electrocatalysis at the Atomic Scale (PECAS 2024)

May 6-9, 2024
Faculty of Chemistry (UPV/EHU), Donostia/San Sebastián
https://pecas2024.dipc.org

Organizing Committee
CAT&SCALE network
Sara Barja (CFM-UPV/EHU, DIPC, Ikerbasque)
Nuria López (ICIQ)
José Ramón Galán (ICIQ)
Sixto Giménez (INAM-UJI)
Irene Palacio (ESISNA-ICMM)
David Écija (IMDEA Nanoscience)
Jordi Arbiol (ICN2)
Pelayo García de Arquer (ICFO)
Maria Escudero-Escribano (ICN2)
María Giménez (CiQUS)

As in previous editions, PECAS 2024 was aimed at promoting interdisciplinary discussions among scientists in the fields of materials science and photoelectrochemistry, as well as the presentation of new results, ideas, and methods to understand the catalyst-electrolyte interface at the atomic level.

The program began with a two-day school featuring introductory lectures on surface science, electrochemistry, and theoretical methods. These lectures were specifically designed to introduce master's and graduate students in Chemistry and/or Physics to the topics covered in PECAS 2024. After the school, PECAS 2024 continued with a two-day workshop, including postgraduate-level seminars in surface science and electrochemistry. Hands-on experiments in NAP-XPS, STM/nc-AFM, and electrochemistry were also conducted to introduce participants to key surface science tools.

Invited Speakers
Herbert Over (Justus Liebig University, Germany)
Julia Kunze-Liebhäuser (University of Innsbruck, Austria)
Hendrik Bluhm (Fritz Haber Institute of the Max Planck Society, Germany)
Paramarconi Rodriguez (CIC energiGUNE, Spain)
Karoliina Honkala (University of Jyväskylä, Finland)
Nùria López (Institute of Chemical Research of Catalonia ICIQ, Spain)
Andrea Auer (University of Innsbruck, Austria)
Pelayo García de Arquer (ICFO, Spain)
Marko Melander (University of Jyväskylä, Finland)
Juan Jesús Velasco Vélez (Cells ALBA, Spain)
María del Carmen Giménez-López (CiQUS, Spain)

Nanotechnology Meets Quantum Information (NanoQI'24)

July 22-25, 2024
Miramar Palace, Donostia/San Sebastián
http://nanoqi.dipc.org

Organizing Committee
Géza Giedke (DIPC, Ikerbasque)
Alejandro Gonzalez-Tudela (IFF CSIC, Madrid)
Atac Imamoglu (ETH Zurich)

The speakers highlighted various active research directions in the area where quantum information and nanotechnology meet, ranging from the design of naturally protected qubits to quantum enhanced time-keeping and quantum-enabled communication protocols on the theory side to the implementation of coherent quantum dynamics and QIP protocols in diverse platforms (semiconductor quantum dots, quantum emitters in chiral waveguides, atomic spins on insulating or superconduction surfaces, magnons, two-dimensional materials, or cold atoms in optical tweezers. More than two thirds of the students presented a poster and actively discussed their work throughout the poster session and coffee breaks. They were also very active and inquisitive in all the lectures, making this the most successful edition of NanoQI so far. On the other hand, it was the least successful in terms of total attendance.

By their participation, the participants gained a broader and deeper knowledge of the covered fields and the methods used. In addition, they had the opportunity to get to know and network with their colleagues.

Invited Speakers
Jason Alicea (Caltech, USA)
Daniel Barredo (CINN-CSIC, El Entrego, Spain)
Harry Buhrman (QuSoft, The Netherlands and Quantinuum, UK)
Deung-Jang Choi (CFM-CSIC, Ikerbasque, Spain)
Francisco Guinea (IMDEA, DIPC, Spain)
Klemens Hammerer (University of Hannover, Germany)
Atac Imamoglu (ETH Zurich, Switzerland)
Silvia Kusminskiy (RWTH Aachen, Germany)
Hannes Pichler (University of Innsbruck, IQOQI, Austria)
Seigo Tarucha (RIKEN, Japan)

Topological Matter School (TMS2024)

August 19-23, 2024
Miramar Palace, Donostia/San Sebastián
https://tms.dipc.org

Organizing Committee
Maia G. Vergniory (DIPC, Max Planck for Chemical Physics of Solids)
Reyes Calvo (Universidad de Alicante, Spain)
Santiago Blanco-Canosa (DIPC, Ikerbasque)
Adolfo Grushin (Institut NEEL – CNRS)
Alexander Altland (University of Cologne, Germany)
Julen Ibañez-Azpiroz (Materials Physics Center, Ikerbasque)

In this year's edition the topic was topologically correlated flat bands. Flat band materials offer a platform for enhancing correlation effects, rendering them an area of significant current interest. They present exceptional opportunities for exploring topology in correlated settings and correlation physics enriched by topology. Recent experiments on correlated kagome metals and Moiré systems have unveiled evidence of peculiar behaviors, including strange-metal characteristics, charge density waves, nematic orders, and fractional Chern insulators within flat-band materials. Throughout this school, our objective was to delve into the study of flat bands and these systems, as well as the intriguing physical phenomena they manifest, under the guidance of world-leading experts.

Invited Speakers
Andrei Bernevig (Princeton University, USA)
Alexander Altland (University of Cologne, Germany)
Ming Yi (Rice University, USA)
Leni Bascones (CSIC, Spain)
Erez Berg (Weizmann Institute, Israel)
Stephen Wilson (University of Santa Barbara, USA)
Zhida Song (Peking University, China)
Nicolas Regnault (CNRS, France)
Yves Hon Kwan (Princeton University, USA)
Carmen Rubio-Verdú (ICFO, Spain)
Vidya Madhavan (University of Illinois, USA)
Allan MacDonald (University of Austin, USA)
Päivi Törmä (Aalto University, Finland)

Excited State Charge Dynamics and Optical Response of 2D Materials: Interplay Excitons and Phonons

February 29 - March 26, 2024
DIPC Auditorium, Donostia/San Sebastián

Talat S. Rahman
Department of Physics, University of Central Florida, Orlando, Florida

A striking feature of 2D transition metal dichalcogenides (TMDs) is the large exciton binding energy, which together with strong interactions between the electrons, holes, excitons, and phonons, promise the potential for applications in energy harvesting. These strong nonlinearities may be reflected in the characteristics of the resulting photocurrent and the emission spectra, for example, through high harmonic generation. In this talk, after attributing the experimentally observed anomalous optical band gap energy redshift, with increasing isotope mass, in single layer MoS_2, to strong exciton-phonon coupling, we turned to phonon-assisted charge and exciton dynamics and photoluminescence in single layer and bilayer MoS_2 and WSe_2. Shown, through application of time dependent density functional theory (TDDFT) and many-body theory, the (momentum-resolved) intra- and inter-valley dynamics, and photoluminescence in these 2D TMDs is a result of complex collective response involving the free charges, bright and dark excitons, and phonons. Our conclusions are validated by experimental data where available.

Innovations in Spintronics, Quantum Technologies and Advanced Electronics

July 9-18, 2024
DIPC Auditorium, Donostia/San Sebastián

Stephan Roche
Institut Català de Nanociència i Nanotecnologia (ICN2), Barcelona, Spain

This DIPC Course was composed of four lectures:

LECTURE 1 Ten Years of 2D Materials based Spintronics Research: Highlights and Future
Objective: Present an historical perspective of why graphene and other two-dimensional materials have been anticipated as enabling materials to revolutionize the transfer, storage, and processing of spin information in the context of spintronic applications. This bird's-eye view emphasized the various milestones unique capability of these materials for manipulating spin degree of freedom at room temperature and over unprecedented length scales. Beyond the efforts to move from lab to fab and the current state-of-the-art in the research at high technology readiness level, the prospect for spin logics or other spin-dependent technologies were also addressed.

LECTURE 2 Linear scaling quantum transport methodologies applied to Topological Matter
Objective: This lecture introduced linear scaling transport methodologies which are the only possible tool giving access to complex quantum transport physics in realistic models of disordered systems contained up to a billion atoms. By connecting DFT approaches to tight-binding parametrization, the elaborate models can capture both perturbative and nonperturbative effects of a variety of disorder sources, and give access to resonant transport, weak (anti)-localization, strong localization regimes as well as topological phenomena (quantum Hall effects and so on). The combination of bulk with multiterminal transport approaches was also shown key to solve controversial claims of topological physics in nontrivial heterostructures.

LECTURE 3 Topological Spin Transport & Entanglement in Quantum Materials
Objective: This lecture presented spin transport phenomena related with the emergence of nontrivial spin textures in topological materials with low symmetries. It was shown that persistence spin textures result in canted spin Hall and canted Quantum spin Hall effects in monolayer transition metal dichalcogenides (TMDs), offering a novel platform for manipulating spin degree of freedom in topological phases, opening some road to topological spintronics. The spin-orbit torque phenomenon was also discussed in Janus TMDs, with theoretical predictions showing unprecedented performances.

LECTURE 4 Exploring properties and applications of amorphous 2D materials using Artificial Intelligence
Objective: This lecture focused on the presentation of machine-learning based models of amorphous materials, which enable the access to quantitative predictions of their properties. Contrary to initial expectations at first sight, amorphous materials are offering novel types of improvement of a variety of properties for coating applications (anticorrosion, barrier to migration), interconnects (ultralow dielectric coefficient) or neuromorphic computing (memristive devices). Artificial Intelligence was shown to be key for future breakthroughs in these fields.

Transferable Skills Courses

Equipping researchers with skills beyond the purely scientific is a challenge that institutions are beginning to take up in the framework of what is known as the "transferable skills" education programs. Organized by Aitzol García-Etxarri (DIPC, Ikerbasque) and Gustavo A. Schwartz Pomeraniec (DIPC, CFM-CSIC) DIPC develops a full program covering issues like stress management, time and career management or transformative leadership. 40 researchers joined these courses in 2024.

First and Second Edition: Oral Presentation Skills Training

May 14, 21 and 28, June 7, 13 and 21, 2024
DIPC Josebe Olarra Auditorium, Donostia/San Sebastián

Sofía Facal
Skills for Science and Industry

The ability to communicate complex topics in a clear and efficient way is a key skill in the academic field, as the success of bright ideas, great initiatives and promising projects can depend significantly on how they are presented.

In this training the participants further develop their skills in preparing and delivering top quality scientific presentations, as well as in communicating with audiences of different levels of expertise in their field.

SESSION 1 Before the Presentation
- Understanding your audience
- Structuring your message
- Designing effective slides
- Timing your talk
- What do people care most about scientific talks

SESSION 2 During the Presentation
- Body language
- Voice and articulation
- Anti-nervousness program
- Stress management

SESSION 3 After the Presentation
- Delivering the 10 mins talk you have prepared
- Constructive feedback
- Techniques for a Successful Q&A session
- Designing and presenting scientific posters

Generative AI: Useful Tools or Expensive Toys?

June 13, 2024
DIPC Josebe Olarra Auditorium, Donostia/San Sebastián

Tim Smithers

The purpose of this course was to examine the benefits and risks of Generative AI systems, such as ChatGPT, in common research practices.

Generative AI systems now cover text, sound (speech and music), image, and video, generation, and combinations of these. A basic understanding of how these systems work and what they really do is needed to be able to judge well if and how they may be used in professional research practices, such as preparing research publications, funding proposals, presentations and talks, and computer code. Understanding how ChatGPT works and how the so-called Large Language Model (LLM) inside it is built does provide a good basis for deciding how and when good use might be made of any of the Generative AI systems. The important ethical issues and hazards raised by using ChatGPT in research practices are also common across the other kinds of Generative AI systems.

Outline of the course:
A few words on using tools in purposeful activities (and using toys).
Some terminological explanations to get started with.
How to build a Large Language Model (a cartoon sketch).
What does ChatGPT really do (it doesn't do writing!).
A look at what happens when we try to use ChatGPT.
Some ethical issues and hazards of using Generative AI systems.
Discussion and Questions.

Balancing Science and Self: Advanced Soft Skills for PI's

October 16 and 23, 2024
CFM Auditorium, Donostia/San Sebastián

October 30, 2024
DIPC Josebe Olarra Auditorium, Donostia/San Sebastián

Sofía Facal
Skills for Science and Industry

The training program "Balancing Science and Self: Advanced Soft Skills for PIs" was designed to address the need for soft skills development among Principal Investigators (PIs). The role of a PI goes beyond technical expertise, as they are responsible for shaping the direction of their research teams and fostering a good working culture.

Stress management, effective communication, emotional intelligence, and interpersonal skills form the backbone of successful leadership, creating a positive and collaborative environment where team members feel valued and supported. This training recognized the importance of soft skills and provided tools, the necessary self-reflection for each PI to lead, influence, and nurture within their own unique style, their research groups.

This training program was designed for researchers who seek to improve the art of balancing their scientific career with personal well-being. Through interactive sessions, they reflected on advanced soft skills, discovered effective stress management techniques, and explored strategies to achieve a healthy work-life balance. Our goal was to foster resilient, mindful, and highly effective leaders in the research community.

SESSION 1 Mastering Self-Awareness and Mindfulness in Leadership

- Techniques to increase self-awareness and understand its impact on leadership style and team dynamics
- Practical mindfulness exercises for busy schedules to enhance focus, reduce stress, and improve decision-making
- Strategies to manage emotions and understand the emotional needs of team members, fostering a supportive and productive research environment

SESSION 2 Effective Stress Management for Research Leaders

- Tools to recognize and address common stressors
- A toolkit of stress reduction methods, including time management, prioritization, and relaxation techniques
- Strategies to cultivate a research environment that promotes mental health, resilience, and well-being among team members
- Understanding the importance of balance for long-term productivity and personal well-being

SESSION 3 Advanced Communication and Conflict Resolution

- Communication Skills: Advanced strategies for clear, empathetic, and effective communication within diverse research teams
- Conflict Resolution: Approaches to resolving disagreements and conflicts in a way that promotes growth, understanding, and cohesion within the team

Theses

Fundamentals of nano-optics in hyperbolic van der Waals materials.
Gonzalo Álvarez Pérez
24/01/2024
Supervisors: Pablo Alonso González and Alexey Nikitin

Probing nanoscale light-matter interactions with fast electrons and near-field optical probes.
Carlos Alberto Maciel Escudero
09/02/2024
Supervisors: Javier Aizpurua Iriazabal and Rainer Hillenbrand

Quantum simulation of two-dimensional electronic lattices.
Miguel Ángel Jiménez Herrera
07/03/2024
Supervisors: Dario Bercioux and Aitzol García Etxarri

Development, implementation and applications of hybrid quantum chemistry models.
José Aarón Rodríguez Jiménez
15/03/2024
Supervisors: David Casanova Casas and Eduard Matito Gras

Exploring the boundaries of aromaticity through computational analysis of excited states and complex molecular topologies.
Sílvia Escayola Gordils
14/05/2024
Supervisors: Albert Poater Teixidor, Miquel Solà Puig and Eduard Matito Gras

Near- and far-field studies of polariton-enhanced interactions between light and molecules.
Andrei Bylinkin
16/05/2024
Supervisors: Rainer Hillenbrand and Alexey Nikitin

Deep learning for bioimage analysis: novel user- and developper-oriented approaches.
Daniel Franco Barranco
21/06/2024
Supervisors: Ignacio Arganda Carreras and Arrate Muñoz Barrutia

Lattice effects and phase transitions in topological materials.
Martín Gutiérrez Amigo
22/07/2024
Supervisors: Juan Luis Mañes Palacios and Ion Errea Lope

Improving cosmological simulations: semi-analytic models, the internal structure of haloes, and machine learning techniques.
Daniel López Cano
06/09/2024
Supervisors: Raúl Esteban Angulo de la Fuente

Polaritonic phenomena in twisted van der Waals heterostructures.
Nathaniel Andrés Capote Robayna
30/10/2024
Supervisors: Alexey Nikitin and Pablo Alonso González

Credits

CREATIVE DIRECTION AND DESIGN

Lauren Hammond | lhammond@orange.fr

Oleksandr Ursulian | oleksandrursulian@gmail.com

TEXT COORDINATION

Marta Vega de Seoane | marta.vegadeseoane@dipc.org

PRINTING

Editorial MIC | mic@editorialmic.com

https://dipc.ehu.eus

Paseo Manuel de Lardizabal, 4 E-20018 Donostia / San Sebastián