



**SCIENCE BY WOMEN
VISITING SENIOR RESEARCH FELLOWSHIPS
8th Edition
Rules and Guidelines**

1. Overview

The Science by Women programme will fund several visiting senior research fellowships for experienced African women researchers in any of the following research centres of excellence based in Spain.

Institute of Photonic Sciences (ICFO, www.icfo.eu) is specialised in the science and technology of harnessing light as a pervasive and universal tool that benefits health, energy, information as well as safety, security and environment

Vall d'Hebron Institut de Recerca (VHIR, <http://en.vhir.org>) is a public-sector institution that promotes and develops the research, innovation and biosanitary teaching of the Vall d'Hebron University Hospital inside Vall d'Hebron Barcelona Hospital Campus. Through the excellence of their research, they identify and apply new solutions to the health problems of society contributing to spread them around the world.

Centre for Genomics Regulation (CRG). The CRG is an international biomedical research institute of excellence whose mission is to discover and advance knowledge for the benefit of society, public health and economic prosperity. The CRG believes that the medicine of the future depends on the groundbreaking science of today. This requires an interdisciplinary scientific team focused on understanding the complexity of life from the genome to the cell to a whole organism and its interaction with the environment, offering an integrated view of genetic diseases.

Spanish National Center of Biotechnology (CNB) (<http://www.cnb.csic.es/index.php/en/>) is located in Madrid and forms part of the Spanish National Research Council (CSIC). The center stands out for its broad and interdisciplinary approach, combining gene-based technologies with frontier research in computational, structural, immunology, oncology, cell and synthetic biology, to discover novel biological entities, decipher their functional interplay in individual organisms and larger communities, ranging from virus and bacteria to plants, animals and humans. As

well as understanding the molecular basis of mammalian gene expression and control of cell processes in normal and pathological conditions.

Biocruces Bizkaia Health Research Institute (<https://www.biocrucesbizkaia.org>) is a Health Research Institute of Bizkaia Region. BBHRI was established in 2008 and it aims to promote, unite and support the research groups to develop a quality translational research and enhance the effective innovation and collaboration with other organizations; all this in order to provide new tools, practices, and knowledge to contribute to the improvement of health care, population health, wealth creation, and economic development. Five important organisations in the Basque Country (Health Department of the Basque Government, Public Health Provider Organization (OSA), Basque Public University and Basque Foundation for Health Innovation and Research (BIOEF) and Foundation BBK.

The legal agreement between BBHRI and the Basque Health System in fact provides the framework for the cooperation between the two institutions, with the goal of translating research results into medical practice. There are close to 900 professionals with complementary basic and clinical profiles divided into more than 60 research groups. BBHRI is taking part in close to 150 clinical trials and offers a long-running close relationship with the University of the Basque Country and other hospitals of the Basque Country.

Deusto Institute of Technology (DeustoTech) (<https://deustotech.deusto.es/>) is the Technology Research Institute at the University of Deusto. It conducts research in areas such as Artificial Intelligence, Internet of Things, Smart Robotics, Advanced Computing Systems, Applied Mechanics, Advanced Materials, Circular Economy, Logistics and HealthTech, applied to different sectors such as Industry, Transport, Energy and Sustainability, Health, Learning and Societal Challenges.

Spanish National Cancer Research Centre (CNIO) (www.cnio.es) is an international cancer research centre of excellence is an international cancer research centre of excellence .

Research is organized into different areas: basic research (Molecular Oncology, and Structural Biology); patient-oriented translational research (Human Cancer Genetics and Clinical Research); and innovation (Biotechnology and Experimental Therapeutics).

Institute of Health Carlos III (ISCIII) (<https://eng.isciii.es/eng.isciii.es/Paginas/Inicio.html>) is one of the implementing agents of the Spanish Science, Technology and Innovation System, either as Research and innovation funder and performer. The performing R&I activities done by ISCIII is carried out through its national centers, institutes and research units by contributing decisively to preserving the health of all citizens. ISCIII's national centers, institutes and units carry out functions, always aimed at improving health and focused on the needs of the citizens as well as offering scientific and technical advisory services that provide a basis for

decision-making by the Spanish National Health System, in particular in the field of public health.

Donostia International Physics Center (dipc.ehu.es) is a research center located in Donostia – San Sebastián (Spain). The mission of DIPC is to perform and catalyze cutting-edge research in physics and related disciplines, as well as to convey scientific culture to society. DIPC was conceived and planned based on the idea that an advanced society needs advanced scientific research.

Institute of Mathematical Sciences (ICMAT) (www.icmat.es) is a joint research center of the [Consejo Superior de Investigaciones Científicas - CSIC](#) (Spanish National Research Council) and three Madrid universities: the [Universidad Autónoma de Madrid \(UAM\)](#), the [Universidad Carlos III de Madrid \(UC3M\)](#), and the [Universidad Complutense de Madrid \(UCM\)](#). The ICMAT is located on the UAM Campus in Madrid, its facilities are exceptional in the field of mathematical research. Its goal is to generate knowledge in all the areas of mathematics, particularly in Algebraic Geometry, Mathematical Physics, Differential Geometry, Geometric Mechanics, Mathematical Analysis, Differential Equations and Applications, Number Theory, Group theory, Statistics, Probability, Operations Research and Mathematics of Quantum Information.

Biomedical and Health Research Institute (<https://www.iuibs.ulpgc.es/>) at the **University of Las Palmas de Gran Canaria** (<https://www.ulpgc.es/>) concentrates the University research in the fields of biomedicine, biotechnology, biomedical technology, hospital systems and public health, with the participation of university and hospital research groups and a wide array of external collaborators. Among its many areas of activity, the Institute hosts the **Medical Technology for Sustainable Development** effort (<http://medtec4susdev.org/>), a multidisciplinary program with collaborators across the World to bring affordable advanced medical technology to all.

The **Instituto de Astrofísica de Canarias (IAC)** (<https://www.iac.es/en/>) is a science and technology center dedicated to research in astronomy and astrophysics. It is a public consortium made up of the Central Administration (Ministry of Science, Innovation and Universities), the Canary Islands Autonomous Community, the University of La Laguna and the Higher Council for Scientific Research. The IAC's mission is to perform excellent research and technological developments in astrophysics, securing the appropriate training of graduate students, young researchers and engineers, promoting outreach and technology transfer in many different areas and fostering a fruitful and stable environment of international collaboration. IAC aims to achieve major advances in the understanding of the laws that govern the origin and evolution of the various forms of matter/energy in the Universe. The center aims to use a large variety of cutting edge ground/space facilities and attract new very talented young/senior researchers to develop advances and breakthroughs in physical modelling, computer simulations and technology. The IAC hosts and operates two astrophysical observatories on Tenerife and La Palma islands, where more than 40 telescopes and telescopic installations are run by institutions from a

large number of countries, including the world largest optical and infrared telescope currently in operation

PLOCAN (Oceanic Platform of the Canary Islands) is a Unique Scientific-Technical Infrastructure (ICTS) whose mission is to promote the development of knowledge and technologies for the responsible and sustainable use of the ocean. PLOCAN offers offshore and on land infrastructures to test new technologies, materials, concepts or methodologies, providing services to users in the public and private sectors. It comprises a fixed offshore platform with a net area of 2,500 m² located near the coast at a depth of 30 m; a testsite with an area of 23 Km² that offers progressive depths from the coast to 600 meters, and constitutes an optimal ecosystem in terms of data, operational models, logistics, compatible infrastructures and connection to the electricity grid; an electrical and communications infrastructure for evacuation of the energy produced during the experimental tests; a base of autonomous underwater vehicles; an observatory aimed at monitoring global change processes, ocean health, exploration and environmental monitoring of the marine environment and biodiversity; and an onshore headquarters with workshops and laboratories.

The Basque Center for Applied Mathematics - BCAM (www.bcamath.org) is an international research center in the field of Applied Mathematics that was founded in 2008 by the Basque Government, the UVP/EHU and Ikerbasque. It is also supported by the Provincial Council of Bizkaia and Innobasque. One of its main objectives is to put mathematics at the service of society through the transfer of knowledge, making the results of its research available to sectors such as biosciences, health, energy or advanced manufacturing, and working together with local and international institutions and companies.

Basque Center for Macromolecular Design and Engineering POLYMAT Fundazioa (www.polymat.eu) is a research center of international excellence located in Donostia-San Sebastián linked to the University of the Basque Country UPV/EHU. It is a multidisciplinary research center which includes a wide variety of research teams working in the fields of polymer synthesis, polymerization reaction engineering, membranes, polymers for electronics, energy storage, biomedical applications, rheology and polymer processing. The main objective is to contribute to societal challenges of the 21st century such as energy, sustainability and health. Specifically, it works on the development of polymers to respond to these challenges.

Institut de Ciència de Materials de Barcelona, ICMAB (www.icmab.es) is an institute of the Spanish National Research Council (CSIC), the largest public institution dedicated to research in Spain and the third largest in Europe, whose main objective is to develop and promote basic and applied research. ICMAB focuses on generating new knowledge in Materials Science and transferring it to the society. Cutting edge activities in materials science are now deeply rooted in the nanoscience revolution and ICMAB's research is strongly related to new developments in this area. ICMAB is one of the top research institutions named as a "Severo Ochoa Research Centre", a distinction that recognizes

excellence at the highest international level in terms of research, training, human resources, outreach and technology transfer

Spanish National Center for Cardiovascular Research (CNIC) is a biomedical research center funded through a pioneering public-private partnership between the Spanish Government and the ProCNIC Foundation (composed of twelve Spanish companies unrelated to the biomedical sector). Cardiovascular disease (CVD) is the principal cause of death worldwide, and the exponential increase in the cost of treating CVD in its symptomatic phase places an insurmountable burden on patients, families, and health systems. In response to this challenge, the CNIC has defined three major goals: to increase the understanding of cardiovascular health, to improve disease prevention, and to generate treatment advances for the prevalent manifestations of CVD. These goals require mechanistic studies to gain insight into the molecular and cellular processes underlying disease, coupled to the translation of these findings into improvements in health promotion, diagnosis, and disease management.

Material Physics Center - (MPC-CFM, <http://cfm.ehu.es/>) is a centre created to foster international excellence in advanced materials nanoscience fundamental research. MPC-CFM research activity covers electronic, magnetic, optical and dielectric properties of condensed and soft matter systems, as well as surfaces and nanostructured architectures. Physical and chemical properties of materials and molecular assemblies are addressed by analysing their properties at the nanoscale. This is carried out by following a two-fold strategy, which consists of theoretical and experimental research methods that target the study of nanoscale properties of matter.

Institute for Neuroscience (IN, <http://in.umh.es/>). IN's mission is to achieve a fundamental understanding of the development, structure and function of the nervous system under normal and pathological conditions. Our research will contribute to a society with fewer mental and neurological disorders, healthier aging and fulfilling lives.

The Institute of Environmental Science and Technology at the Universitat Autònoma de Barcelona (ICTA-UAB) aims to undertake cutting-edge research and training on interactions between humans and Earth systems, to build integrative and applied knowledge for a sustainable future. ICTA-UAB develops first-class, socially-relevant, international research in the environmental change-society nexus and strives to extend its contribution as a world-renowned research institute in environmental sciences. The Institute also provides excellent doctoral and post-doctoral training, guided by transparent and effective governance and strong ethical principles.

Each centre will host 1 researcher ¹

¹ Carlos III Health Institute will host 2 researchers

The preferred areas of research include:

1. Health and Bio-medicine
2. Energy, Water and Climate Change
3. Sustainable Agriculture and Food Safety

Mathematics, information and communication technologies, as well as physics, astrophysics and materials physics and all STEM disciplines are instrumental to research in the above areas.

2. Eligibility requirements

- Being a woman
- Nationality of an African country.
- PhD with at least 3 years of post-doctoral professional experience
- Contractual relationship with a university or a public or private organization based in Africa dedicated to significant scientific research in the areas indicated
- Excellent academic record and proven track of relevant research experience
- Solid working knowledge of English
- Proven experience leading a research group

Beneficiaries of previous editions are not eligible.

Candidates must have already identified the principal Investigador in the prospective host centre to confirm that the research proposal can be carried out in collaboration with those research groups and their laboratories.

3. General Conditions

In general, the duration of the research stays will be of six continuous months to be completed within two years from the publication of final selection of beneficiaries. Exceptionally, some centers admit to split the six-month fellowship in two periods to be completed within two years from the publication of final selection of beneficiaries. However, some centers apply special conditions²

Successful candidates will have access to the following benefits:

- Return flight from their centre of origin to the host institution
- Living allowance of 2.400 Euros gross per month to cover accommodation, personal expense and health and occupational accident insurance coverage. Beneficiaries must devote themselves entirely to research at the assigned research

² Check conditions in the application form for each associated center

centre and may not be beneficiaries of any other fellowship, grant, stipend or regular income during their research stay.

Beneficiaries might be asked to formalise their relationship with the research centre in writing. In compliance with the local laws, the Woman for Africa Foundation or the research centre (as the case may be) will, if so required in each particular circumstance by the tax and/or social security regime, retain or withhold the compulsory amounts from the living allowances.

Women for Africa Foundation, in collaboration with the research centre, will help beneficiaries with the compulsory formalities in order to obtain the visa with Spanish Embassies and Consulates.

The Women for Africa Foundation strongly discourages final beneficiaries to take along their families, since we cannot assure any financial, logistic or administrative support for families.

4. Deadline for applications

Deadline for applications is September 30, 2022.

Only applications submitted in English via the Science by Women microsite at www.mujiresporafrica.es will be accepted. They must include the following documents:

- Letter of Interest (max. 1 page)
- Full curriculum vitae (Europass format is recommended)
- Fully filled form
- Passport or NID
- PhD Diploma
- Research proposal (Brief and clear description of the project to be developed in the Spanish host centre (max. 2 pages))

5. Selection process

Applications will be subjected to a highly competitive selection process by the Women for Africa Foundation's Scientific Committee. The jury will evaluate the following criteria:

- The candidate's research career, curriculum vitae and experience as independent research group leader.
- The project's scientific -technical quality and innovative potential.
- The expected and measurable economic or social impact of the research project.
- The candidate's plan to communicate and disseminate the project's results.
- The proper consideration of ethical issues where appropriate.

Successful applicants will present innovative research projects that respond to the needs of African populations and that are likely to be transferred into products or patents for commercial exploitation, or services and public policies which have a social impact in terms of people's welfare and quality of life, as well as an economic impact in terms of companies' productivity and competitiveness.

6. Research proposals

Research proposals shall cover the following lines:

Institute of Photonic Sciences (ICFO)

- Light for Health: medical devices for diagnosis, healthy food, advanced imaging
- Light for Environment: solar energy, new materials, carbon capture, environmental sensors
- Light for Information: telecommunications, quantum information, laser technologies
- Light-based technologies for industrial processes

Vall d'Hebron Institut de Recerca (Dr. Ibane Abasolo)

The Drug Delivery & Targeting (DDT) group works on the development, testing and validation of new therapeutic and diagnostic strategies based on nanotechnology, with which to provide solutions to clinical needs not covered in the fields of oncology and some rare diseases. In short, it is about generating new scientific / biomedical knowledge that can be translated efficiently into clinical practice. In addition, the group has a technological platform included within the ICTS Nanbiosis, one of the Singular Scientific Technological Infrastructures of the Spanish Council for Science Policy, Technology and Innovation (MINECO), receiving FEDER funds. As such, FVPR offers through Nanbiosis' Unit 18 (Nanotoxicology Unit) and Unit 20 (In vivo experimentation Unit) specialized preclinical in vitro and in vivo assays for research groups and biotech companies, testing new biomedical applications based on nanotechnology.

Translational Research in Child and Adolescent Cancer (Dr. Yeste y Dr. Lucas Moreno)

The Group for Translational Research into Childhood and Adolescent Cancer is focused on research for new treatment targets or molecule targets (the place in the organism a drug acts on), based on the most advanced knowledge available on the biology of paediatric cancers. The Group has identified and will continue to work on new molecular targets for sarcomas (cancer that originates in connective tissue cells) and tumours of the

nervous system. The group applies the knowledge acquired from basic research to the prevention and treatment of clinical cases in childhood cancer and haematological diseases, which contributes to better diagnosis, prognosis, treatment and control of such diseases

· **Cardiac Surgery and Pediatric Cardiology Service (Dr. Rosés)**

The Cardiac Surgery and Pediatric Cardiology Service of Vall d'Hebron has participated in more than one hundred research projects. Among the research carried out are the study of the neurological repercussions of fetuses and newborns with congenital heart disease; new cardiac surgery techniques; the program in interventional and pediatric hemodynamics with the use of new devices for percutaneous treatment; the development of new drugs for heart failure and severe pulmonary arterial hypertension and of new ventricular assist devices for treatment bridging cardiac transplantation; the creation of a home monitoring system for children with heart disease and the development of new imaging techniques with cardiac echocardiography. In addition, in the field of genetic studies, the service participate in international research on hereditary diseases of the aorta and hereditary heart diseases with risk of sudden death.

· **HIV Translational Laboratory (Dra Buzón)**

The HIV Translational Laboratory is focused on the characterization of the latent HIV reservoir and the development of new therapeutic strategies directed to deplete this latent reservoir with the ultimate goal of curing HIV. The lab is located within the Infectious Disease unit of the Vall d'Hebrón Hospital, and has access to clinical samples of more than 2100 HIV-infected patients. The priority research lines are: i) Understanding the viral mechanisms involved in the long-term maintenance of viral latency, ii) Assessing the impact of new drugs to purge the latent reservoir, iii) Exploring new synergistic approaches to deplete the latent reservoir with bi-specific nanoparticles, and iv) Targeting specific sites of viral replication. Moreover, we are working with samples from SARS-CoV-2 infected patients in two different lines of research: i) identification of repurposing drugs using lung tissue models, and ii) predicting long-term immunity.

Center for Genomic Regulation

The CRG will offer the successful candidates training and learning of specific skills and competencies in one or more of the research areas outlined below.

- **Medical Genomics:** dissecting human genome variation and its role in human rare and common diseases; applying genomics and disease models to define causal mechanisms and new therapies.
- **Bioinformatics and Genomics:** computational biology of RNA processing; comparative bioinformatics and genomics; gene function and evolution; genomic and epigenomic variation in disease; genomics and biodiversity.
- **Cell and Developmental Biology:** cell trafficking and secretion; microtubules function and cell division; cell and tissue dynamics; intra-cellular cell organization; oocyte biology and cellular dormancy.

- **Gene Regulation Stem Cells and Cancer:** mechanisms of gene expression and epigenetic regulation (from chromatin organization, alternative splicing, RNA modifications to mRNA translation); molecular basis of cellular decisions involved in tissue homeostasis and diseases, such as cancer; cell reprogramming and tissue regeneration.
- **Systems Biology:** dynamic gene regulatory networks; development and evolution (genomics, single cell approaches); systems neuroscience; combining systematic and quantitative data collection with computational models, to reach a deeper dynamic understanding of complex biological processes.
- **Core Technologies Programme:** offering services and training in advanced technologies such as light microscopy (including super-resolution microscopy), proteomics, genomics, tissue engineering, FACS, biomolecular screening and protein technologies.
- **Synthetic biology.** Engineering of organism to introduce new properties for health and biotechnology

Carlos III Health Institute (ISCIII)

<u>Knowledge Area</u>	<u>Centre involved</u>	<u>Persons in charge at the Centre</u>	<u>e-mail for contact*</u>
<u>Basic and preclinical research:</u> A better knowledge of the disease by SARS-COVI-2 prevention. Diagnosis and treatment.	Microbiology National Centre CNM	Dra. Isabel Jado Garcia Director/Directora	ijado@isciii.es
<u>Epidemiological research:</u> COVID-19 surveillance of risk factors and health determinants: Monitoring behavioral insights related to COVID-19: a population survey”.	Epidemiological National Centre CNE	Dra. Marina Pollan Directora	mpollan@isciii.es

<p><u>Research capacity:</u> building, evidence analysis, implementation research, new diagnostics development on Research on Neglected Tropical and Poverty Related Diseases.</p>	<p>National School of Public Health ENS</p>	<p>Dr. Israel Cruz Mata Head of International Health Department</p>	<p>cruzi@isciii.es</p>
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- In copy tlpena@isciii.es ISCII focal point for the program

BioCruces Bizkaia Health Research Institute

Biocruces HRI is constituted by different research groups integrated in 7 research scientific areas. Each research group and area are supervised by a coordinator, being Dr. Mar Mendibe Bilbao, the Scientific Director of Biocruces, the scientific areas are the following:

- **Covid 19** : Research on the molecular/genetic aspects, both of the virus itself and of genetic polymorphisms associated with clinical evolution. The approach is epidemiological, but also diagnostic and therapeutic.
- **Primary Health Care, Prevention and Chronic Diseases:** Primary healthcare provides a unique opportunity for clinical research at the population level focused on the promotion of health and primary, secondary and tertiary prevention of the chronic illnesses that are most common and which have the most effect on health, including cancer, cardiovascular diseases and mental disorders. The research groups work as well in **Regenerative therapies, osteoarticular and tendon pathology.**
- **Autoimmune, Inflammatory and Infectious Diseases:** we focus on tend to have aninflammatory basis and an environmental, infectious, metabolic, or autoimmune cause, and be chronic in nature. Translation of our results to clinical practice should be immediate, the main objective being to improve the prognosis and quality of life of our patients. Further, clinical research in this area should contribute to ameliorating the growing social and economic impact of these medical conditions.
- **Maternal Child Healthcare and Assisted Reproduction:** The objective is to innovate and provide answers to the fertility problems, to improve the health of pregnant women and to increase the safety of the mother and child at birth. We

focus our efforts on caring for foetal health, the analysis of congenital, and improving the diagnosis of certain genetic disorders, especially in relation to intellectual disability and diseases linked to the X chromosome. We aim to improve our understanding of paediatric cancer, especially brain tumours and genetic predisposition to cancer, and some rare diseases to develop better diagnostic methods and new treatments. Health problems of children and adolescents, in particular conditions related to prematurity and those associated with severe conditions or requiring urgent intervention.

Deusto Institute of Technology (DeustoTech)

DeustoTech is structured in different research groups specialized in the areas of:

- Artificial Intelligence: Machine Learning, Deep Learning, Reinforcement Learning, Data Science, Predictive Analytics, Optimization, Natural Language Processing, ...
- Pervasive Computing: Internet of Things/People, Human Computer Interaction, Collaborative Robotics, ...
- Advanced Computer Systems: Quantum Computing, Blockchain, Edge Computing, High-Performance Computing, ...
- Circular economy strategies and digitalization, quantification of environmental impact, human behaviour modeling of the energy and social transition
- Applied Mechanics: Advanced Industrial Manufacturing and Advanced Materials.
- Health technologies and well-being, ultrasonic technologies.
- Logistics and Industry 4.0.
- Design Research.

DeustoTech carries our research project in collaboration with industrial and social partners in the following sectors:

Energy & Environment:

This application area aims to design ITC-based solutions that will allow to move towards more sustainable and efficient environments and cities, working collaborately with companies and public administrations. Our scientific-technological capabilities include: environment, smart grids for the supply and management of urban services, and advanced maintenance and operation systems.

Mobility and transport:

This application area focuses on ICT research applied to transport, mobility of people and logistics. Our transfer activity related to the development ITS Intelligent Transport Systems and Smart Mobility Platforms, contributes to making the mobility of individuals and objects more sustainable, smarter and more comfortable. Our scientific-technological

capabilities include: soft computing applied to ITS, smart mobility and seamless positioning systems.

Industry 4.0 and Logistics:

This application area is focused on transformation into a digital, smart and safe industry. We question the state of the art in order to meet the challenges faced by industry in its transformation towards a more sustainable and competitive model. Our scientific-technological capabilities include: industrial data analytics, cyberphysical systems, industrial design, advanced manufacturing, advanced materials and digitalized supply chain management.

Societal Challenges, Health and Learning:

This application area aims at using basic and applied research to make ICTs available to society and citizens, and contribute to building a better world. Our scientific/technological capabilities are: heterogeneous data management, IoP (Internet of People) and artificial intelligence for health and well-being.

Spanish National Cancer Research Centre (CNIO)

Research proposals should be focused on basic research, generating knowledge and discoveries that can advance the fields of molecular oncology, structural biology and biocomputing.

Donostia International Physics Center

1-Title: Electronic structure in optoelectronics (Dr David Casanova)

Description:

The characterization of electronic states is crucial for the deep understanding and rationalization of molecular photophysics. While electronic structure methods are currently able to disentangle the ground state properties of molecular materials, the computation and characterization of electronic excitations involved in photophysical process is much complicated and computationally costly.

The present project aims to explore and apply new methods to obtain and analyze electronic excited state wave functions and their characteristics linked to interesting photophysical and optoelectronic properties for the absorption, usage and conversion of visible light.

More information: <https://molecular-electronic-structure-group.github.io>

2- Computational high-pressure organic chemistry, nanothread chemistry and physics, and diradicals and carbenes (Dr Bo Chen)

Description: The research in the Chen group focuses on applying creative computational chemistry methods/models to interdisciplinary research at the interface of organic chemistry, materials science, and high-pressure science. We strive to understand

structures (molecular and extended) and reaction mechanisms using a variety of computational tools. The knowledge obtained is used to rationally design useful molecules/materials and propose realistic synthetic routes, including those in untypical, new environments. Current research topics in the group include computational high-pressure organic chemistry, nanoscale chemistry and physics, and diradicals and carbenes.

3-Understanding the interaction of thermal and hyperthermal atoms and molecules with surfaces and nanostructures is one of the forefronts of modern surface science.

Elementary processes arising in gas/solid interfaces are ever-present in our daily life as well as in many industrial applications. We are mainly interested in the theoretical description of these processes. We use first-principles electronic structure calculations to describe the details of the interaction between gas-phase atoms and molecules and the surface. We then simulate the dynamical evolution of the system through different computational methods. This project will be developed within the Transborder Joint Laboratory QuantumChemPhys (<http://www.quantumchemphys.org/>), which is an international initiative that includes research groups from Donostia - San Sebastián and Bordeaux

Institute of Mathematical Sciences (ICMAT) (www.icmat.es)

Algebra and Geometry. The group conducts research in a broad variety of topics, in the areas of abstract algebra (group theory, commutative algebra), algebraic geometry (arithmetic geometry, number theory, moduli spaces of bundles), differential geometry (geometric analysis, geometric mechanics, dynamical systems and the geometry of PDEs) and topology (topological fluid dynamics, symplectic and contact topology, low-dimensional topology). As such, the research is naturally interdisciplinary, fostering an important level of cross-fertilization between the different areas. In addition, a number of the themes finds their motivation in ideas stemming from physics, such as special metrics, gauge theories and their algebro-geometric counterparts.

Mathematical Analysis and Differential equations. These are very active, deeply interrelated fields of research with a preponderant position within the mathematical sciences. This line deals with fundamental problems in the fields of harmonic analysis, partial differential equations, geometric group theory, functional analysis, geometric measure theory, operator algebra, differential geometry and probability, and has been awarded with a total of 7 ERC grants. The topics of interest in this line are classical problems around the Kakeya conjecture and Bochner-Riesz multipliers, the Schrödinger and wave equations, elliptic PDE in rough domains and connections with geometric measure theory, harmonic analysis and geometric group theory for nonamenable groups, classical and abstract Calderón-Zygmund theory and problems around the invariant subspace problem, operator theory, geometry of Banach spaces, complex analysis, quantum probability, and analytic number theory. Also, this group considers differential equations arising in fluid mechanics, spectral theory, mathematical physics and

mathematical biology. This is an interdisciplinary subject, with significant applications to engineering, biology and physics.

Applied Mathematics. This research group works to develop the mathematical foundations and models needed to deal with the main new societal challenges, with a focus on Data Science, Machine Learning and Quantum Technologies. In particular they consider a wide variety of mathematical problems which are motivated by quantum technologies, such as condense matter and many body systems, quantum control, foundational aspects of quantum mechanics and the theory of operator algebras. In the field of Machine Learning and Data science, they consider Bayesian approaches to treat adversarial risk analysis and adversarial machine learning, and work in the areas of security and cybersecurity, and the tracking of fake news. Finally, other topics of interest are mathematical modelling, simulation, and numerical computation with applications in microfluidics modelling and technological applications, geophysical fluid dynamics, etc.

Spanish National Center of Biotechnology (CNB)

Microbial Biotechnology. Microbiologists at the CNB aim at gaining knowledge on key aspects of microbial biology with environmental, clinical or biotechnological relevance through approaches that include molecular genetics, genomics, proteomics, metagenomics and synthetic biology. The subjects studied include environmental microbiology, microbial responses to hostile environments, microbial pathogens, microbial engineering, microbial resistance to antibiotics and search for new antimicrobials.

Plant Molecular Genetics. Research in this area aims at elucidating signaling pathways in growth and adaptive responses of plants to environmental changes and pathogenic diseases. Besides the intrinsic fundamental interest in understanding key biological processes in plants, the ultimate goal is to develop new tools and methods to improve crop production and quality. Biotechnological applications such as the use of plants as biopharmaceutical factories or as tools to fight environmental problems arising from pillages and the accumulation of toxic substances are also being studied.

Systems Biology. A more recent focus of research at the CNB is on the application of emerging concepts and tools in the fields of systems biology, evolutionary biology, computational biology and synthetic biology to biologically relevant questions. The biotechnological side of this approach includes novel strategies to re-program bacteria for the efficient production of chemicals, biodegradation of toxic pollutants or as biosensors to monitor the presence of given chemicals. Metagenomics, metatranscriptomics and mathematic modeling techniques are used to evaluate changes in composition, function and activity of bacteria in response to environmental perturbations, as well as to determine the conditions that favor combinations of species for specific tasks in biotechnological, clinical and ecological scenarios.

Structural Biology. The CNB stands out for its critical mass of research in 3D-electron and X-Ray microscopy, ranging from cryo-electron microscopy to 3D single particle reconstruction, tomography and correlative methods, together with in-house development of imaging software. Groups focusing on X-Ray crystallography, functional proteomics and biophysics complete the coverage of key areas in structural biology. Research in this area is transversal and connects with biochemists and cell biologists who apply leading-edge biophysical approaches to resolve biological questions, such as the molecular mechanisms of virus assembly, DNA repair, cell division or protein homeostasis.

Cellular and Molecular Biology. Research groups in this area cover two broad, but closely interwoven topics. The first topic is molecular virology and comprises multidisciplinary efforts to dissect viral replication mechanisms and structural studies of key viral proteins, as well as virus-host interactions of relevant human and veterinary pathogens. The second topic is regulation of gene expression, with a focus on the networks that control the function of mammalian genes with critical roles in normal and pathological processes, including developmental defects, cognitive disorders, neurodegeneration and rare diseases.

Immunology and Oncology. Biomedical research groups in this area address various key aspects of innate and adaptive immunity, as well as immunotherapy, with special emphasis on characterizing the molecular mechanisms that underlie inflammation, the processes that drive tissue-specific tumor development, as well as tumor immunology and the relationships among stem cells, inflammation and cancer. A broad and multidisciplinary approach to study these diseases integrates knowledge ranging from cell biology and immunology to nanomedicine and stem cell biology, as well as input from clinical research through a network of collaborations with hospitals and pharmaceutical companies.

Biomedical and Health Research Institute (IUIBS) at the University of Las Palmas de Gran Canaria (ULPGC)

- Medical image computing for COVID-19 screening and diagnosis. Possible topics include but are not limited to multimodal (eg. Computed Tomography, X-Ray, Ultrasound,...) chest image analysis using artificial intelligence, data annotation for algorithm training, infrared thermal imaging, etc. Computer vision for social-distancing monitoring.
- Construction of digital anatomy atlases for patient information, medical education and therapy planning. Advanced visualization. Use of the digital atlases in remote training and telemedicine applications.
- Affordable image guided therapy (IGT) systems based on point-of-care ultrasound (POCUS). Percutaneous procedures. Deployment of training systems. Virtual surgical simulation for minimally invasive surgery.

- Digital content creation for medical and biomedical engineering remote education and training. Management of remote education technology platforms.

IAC (Instituto de Astrofísica de Canarias)

Research program addresses key problems on:

- The magnetism and dynamics of the Sun.
- Exploring the diversity of Planetary Systems.
- Physics of Stars and the Interstellar Medium.
- Milky Way and Local Group galaxies
- Evolution of galaxies across cosmic times
- Very High Energy Astrophysics and Cosmology.

PLOCAN (Oceanic Platform of the Canary Islands)

- Acoustics thematic area: "To process, document and prepare acoustic data for noise and bioacoustic measurements" (Matlab or python language very good skills required)
- Ocean sensor thematic area: "To optimise real-time embedded processing algorithm for event detection on an ocean sensor" (very good C language expertise required)
- Ocean data management thematic area: "To develop algorithms in Python for the preparation and formatting of oceanographic data and metadata" (python language skills required)

Basque Center for Applied Mathematics (BCAM)

- **Computational Mathematics (CM):** We analyse modern numerical methods such as advanced Finite Element (AFE) and Finite Volume (FV) techniques applied to stationary and time-dependent problems. In addition, we develop new meshless multi- scale methods such as Smoothed Particle Hydrodynamics (SPH) or Dissipative Particle Dynamics (DPD) applied to complex fluids and mesoscopic flow problems.
- **Mathematical Modelling with Multidisciplinary Applications (M3A):** We push the boundaries of mathematics and develop analytical frameworks, multiscale parsimonious models, advanced algorithms and novel measuring techniques to extract invariant patterns hidden within the multi-spatial-temporal scales involved in biological and physical systems. A closed loop between

hypothesis testing, HPC, high throughput data and data management, enable quantitative and qualitative knowledge discovery.

- **Mathematical Physics (MP):** We study several questions of classical physics that although long known, are still not understood from the mathematical perspective, microscopic origin of macroscopic laws (like in electricity) and natural phenomena of front motion embedded into random environments. More theoretically, we study the geometry of Singularities appearing in Algebraic Geometry.
- **Analysis of Partial Differential Equations (APDE):** The attempt to efficiently describe real-life phenomena leads to mathematical models, often expressed in terms of PDEs, capturing the essential features of the phenomena. Solving these equations implies the use and development of sophisticated techniques of analysis together with the realisation of numerical simulations to eventually determine the validity of the models.
- **Data Science (DS):** In the applied statistics field, the main topics of our research are semi-parametric regression, multidimensional smoothing, (Bayesian) hierarchical models, computational statistics... Regarding Machine learning, we work on supervised and unsupervised classification of massive data, probabilistic graphical models, time series, Bayesian optimisation, etc. In optimisation we pursue the developments of efficient metaheuristics methods.
- **Model building and data analysis for COVID:** prediction-evolution models, analysis of RX images, pronostic prediction, traceability analysis.

POLYMAT is a multidisciplinary research center with different research lines that include:

- **Polymer synthesis.** Research groups in this area cover different activities such as organic catalysis, polymer hybrids and robust, efficient and orthogonal synthesis of polymers. They study the most distinctive characteristics of the polymers: the chemical composition distribution (functionality) and the architecture of the polymer chain.
- **Assembly and processing.** Assembly has played a key role in the development of the polymer industry. Thus, high impact polystyrene and semicrystalline polyolefins are based on the assembly of in-situ produced graft copolymers and that of polymer chains by dispersed forces, respectively. Nature shows that more complex interactions (dispersive, polar and charged) can be used to produce hierarchical structures. Biological systems serve as example to extract the basic principles and then develop other materials with functionalities that cannot be achieved otherwise and that are not attainable by the current polymers.
- **Theory and simulations.** Theory and simulations are used to provide understanding of the observed phenomena and to guide the activities in polymer synthesis and assembly. Simulations of polymeric materials and their properties expands over three

scale domains, according to the system size to be modeled and to the time scale of the phenomena sought.

- **Energy.** Generation of energy from renewable and CO₂-neutral sources is one the greatest 21th Century's challenges. The groups involve in this area work in polymer photovoltaics cells and organic batteries
- **Waterborne dispersed polymers.** The current research topics include Knowledge-based processes for high-performance dispersed polymers, structured nanoparticles and bio and smart materials
- **Tuneable and stimuli responsive membranes.** Within this research area, activities are focused on membranes for gas and vapor separations, stimuli-responsive/biomimicking membranes and membranes in water treatment processes.
- **Polymers for biomedical applications.** This line is focusing on the development of biocompatible and biodegradable polymers from natural resources able to replace synthetic polymers based on non-renewable monomers for biomedical applications such as tissue regeneration, polymer drugs, bio—absorbable materials for vascular stents, polymer carriers for drug and gene delivery, etc. In addition, this research area also studies the multifunctional polymer-drug conjugates, self-assembling amphiphiles for the controlled delivery of bioactives, new diagnostic technologies as theranostic approaches, and environment-responsive nanogels.
- **Polymer physics.** This research line is devoted to understanding structure, morphology, functionality and properties of semi-crystalline multiphasic polymers: Effects of confinement on polymer nucleation, crystallization and morphology, How polymer topology affects crystallization, Melt memory effects on the crystallization of homopolymers and copolymers, etc.

Institut de Ciència de Materials de Barcelona, ICMAB (www.icmab.es)

Sustainable Energy Conversion and Storage System. Developing experimental and theoretical tools to increase our understanding on energy materials, replacing critical materials to boost sustainability, developing conversion and storage technologies.

Superconducting Materials for Emerging Technologies. Developing superconducting tapes or Coated Conductors, which are a unique opportunity to enhance the efficiency and reduce environmental impact in electricity transport, distribution, generation and use.

Oxides for New Generation Electronics. Transition metal oxides are considered to be the building blocks for efficient and energy friendly, data storage, advanced computing and energy harvesting devices.

Tuneable and Low Cost Molecular Electronics. The use of molecules in electronic devices is arousing enormous interest due to their unique advantages for designing tailored functional materials, compatibility with low-cost production processes, biocompatibility and biodegradability.

Bioactive Materials for Therapy and Diagnosis. These materials are developed based on the gathered long-term experience in modeling, obtaining, processing and performing in-vitro studies of nanostructured biomaterials of ICMAB researchers.

Spanish National Center for Cardiovascular Research (CNIC) is organized in seven highly focused and integrated programs: (1) novel mechanisms of atherosclerosis, (2) myocardial homeostasis & cardiac injury, (3) cardiovascular regeneration, (4) novel arrhythmogenic mechanisms, (5) CVD, risk factors & cognitive function, (6) cardiovascular health promotion, and (7) technology development. These programs span from basic research to advanced health-changing clinical trials and build on the CNIC's deep-rooted and proven expertise in state-of-the-art technology, cellular and animal models, imaging modalities, and large-scale data gathering and analysis.

Material Physics Center (MPC-CFM)

MPC-CFM research activities are grouped into four (4) main lines, although the organisational structure remains fully horizontal and cross-linked, since multidisciplinary research is actively pursued:

I. CHEMICAL PHYSICS OF COMPLEX MATERIALS

This research line addresses the structural and electronic properties of complex nanostructured materials, particularly in the presence of molecules. Both experimental and theoretical efforts are combined to understand the properties, formation and dynamics of different molecules and nanostructures at surfaces. Within this research line, there is a recent thematic area related to *nanomedicine*. The experimental research group 'Nanophysics Lab' at MPC-CFM is contributing with know-how in surface physics and nanotechnology in the development of optical detectors that allow detecting the presence of molecules that are part of specific viruses, for example the proteins that coat *coronaviruses*.

II. ELECTRONIC PROPERTIES AT THE NANOSCALE

This research line focuses on the theoretical investigation of electronic properties of solids, surfaces, nanostructures, and low-dimensional systems, including spintronics, nanomagnetism, or attosecond dynamics in solids. The activity within this research line covers the study of a wide range of advanced materials at microscopic and mesoscopic scales, such as materials under high pressure or ceramics and cement-based materials. This latter are also studied experimentally, using equipment for synthesizing ceramics and cements.

III. PHOTONICS

This research line deals with the experimental and theoretical study of the interaction of radiation with matter from different and complementary approaches: (i) the interaction of light with metallic and semiconductor nanostructures to confine and engineer electromagnetic fields in the nanoscale, (ii) the optical properties of new materials and elements that provide improved properties in a variety of lasing effects, as well as the design of novel photonic structures that provide laser confinement for bioimaging, and (iii) spectroscopy and photonic applications of nano-scale functional units, including different types of low-dimensional systems. The experimental research groups within

Photonics research line are recently working on a new thematic area related to *biomedicine*. Among other projects, they are contributing with know-how in optics and nanotechnology in the development of optical detectors that allow detecting the presence of molecules that are part of specific viruses, for example the proteins that coat *coronaviruses*.

IV. POLYMERS AND SOFT MATTER

This research line deals with the experimental and theoretical study of polymers and soft condensed matter materials, focusing mainly on the investigation of the structure and dynamics of polymers and glass-forming complex systems (multi-component, nano-structured and biopolymer materials) at different length and time scales (micro, nano, meso, macro). The following specific objectives have been targeted: (i) understanding of the interplay of geometry and topology in polymeric materials, (ii) the characterisation of interfacial features, and (iii) the study of the dynamics at the interfacial level, the new confinement effects and the way local friction arises in crowded environments. The recently created “Quantum Beams and Sustainable Materials” group complements the research line making extensive use of beams of quantum particles like neutrons or photons in tandem with computational materials modelling to interrogate, understand and design novel functional materials for energy applications and sustainability.

Overall, within this scientific structure, the applicant could collaborate with the different MPC-CFM research groups working on the following main strategic topics at MPC-CFM: Nanophotonics; Two-dimensional materials; Topological materials; Soft matter; Ab-initio characterization of nanostructured materials; Surface Nanophysics; Nanodevices; Quantum Technologies; Ceramics and Cement-based materials; and Neutron Techniques in Materials Science.

Institute for Neuroscience (IN)

- Building and adapting circuits into functional neural networks
- Cellular plasticity in brain disease and repair
- Genetic and epigenetic bases of individuality and aging
- Human cognition and behavior
- Neural stem cells regulation and differentiation
- Neurobiology of pain and inflammation
- Synaptic modulation of neural circuits and behavior
- Translational research of neurological and psychiatric disorders

The Institute of Environmental Science and Technology at the Universitat Autònoma de Barcelona (ICTA-UAB)

ICTA-UAB's research is structured around 5 interrelated Societal Challenges: "Oceans" brings together researchers who work on anticipating the impacts of global change on oceanic and coastal systems and developing pathways towards sustainable and equitable interactions with marine environments and their resources; "Land" aims to analyze the combined effects of climate and other drivers of global environmental change on the sustainability of rural landscapes and livelihoods; "Cities" interrogates and advances actions and projects for climate-responsive, equitable, and healthy cities and urban systems; "Consumption and production" examines how processes of production and consumption of goods and services relate to global environmental impacts and affect human wellbeing and technological transitions; and the fifth Challenge, "Cities", analyzes and advocate for effective and equitable cross-scale policies, institutions and social responses to address global environmental change. Each of these challenges brings together researchers from different scientific backgrounds and disciplines, which makes of ICTA-UAB an extraordinary laboratory of interdisciplinarity and innovative applied science.

7. Decision

The jury's final decision, which shall be dictated by the strictest criteria of meticulousness and transparency, will be published by November 20, 2022

Successful candidates are expected to start their research projects at the assigned host institutions not earlier than January 2023.

8. Successful applicants' commitments

The beneficiaries of the visiting research fellowships agree to respect and comply with the internal academic and legal regulations of the host research centre. The award of fellowships does not generate any statutory or labour relation with FMxA, and candidates commit themselves to return to their places of origin in Africa once they have finalized their research stay.

9. Monitoring of the project

Fellowship recipients are obliged to submit within 2 months after finalization of their research stay to the Women for Africa Foundation a final report containing the results of their research projects as well as propositions to deepen collaboration between the host center and the one of origin.

10. Results and dissemination of the research projects

The Intellectual and Industrial Property (IP) generated by the Beneficiaries throughout the term of the stay at the Host Entity will be regulated by the same terms and conditions which apply to the IP generated by the research personnel of the Host entity.

Submission of applications implies that the fellowship recipients grant to FMxA and the host center, in consideration of the benefits set forth in Section 3, the right to publish and disseminate the results of the chosen research projects in all forms (including, but not limited in form of working papers, electronic documents and books) and in all territories, with no detriment to the publications in scientific journals chosen by the researchers, which should in any case mention the support received by FMxA and the collaborating research centre.