Activity REPORT 2023

CIC biomaGUNE

MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

Activity REPORT 2023

Picture Credits: Fluor Bloom by Agustín Blachman (Soft Matter Nanotechnology Lab), Winner of the 1st Prize of the 2023 CIC biomaGUNE Scientific Photo Contest.

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SUMMARY

This report highlights the accomplishments of **CIC biomaGUNE** in terms of research activity and scientific leadership during 2023.
We are proud to show excellent output, in terms of research, technological development, resources, and capacities, which reflect the great enthusiasm and skills of our researchers, as well as support and management teams, positioning **CIC biomaGUNE** as a consolidated research center in biomaterials with high international recognition.

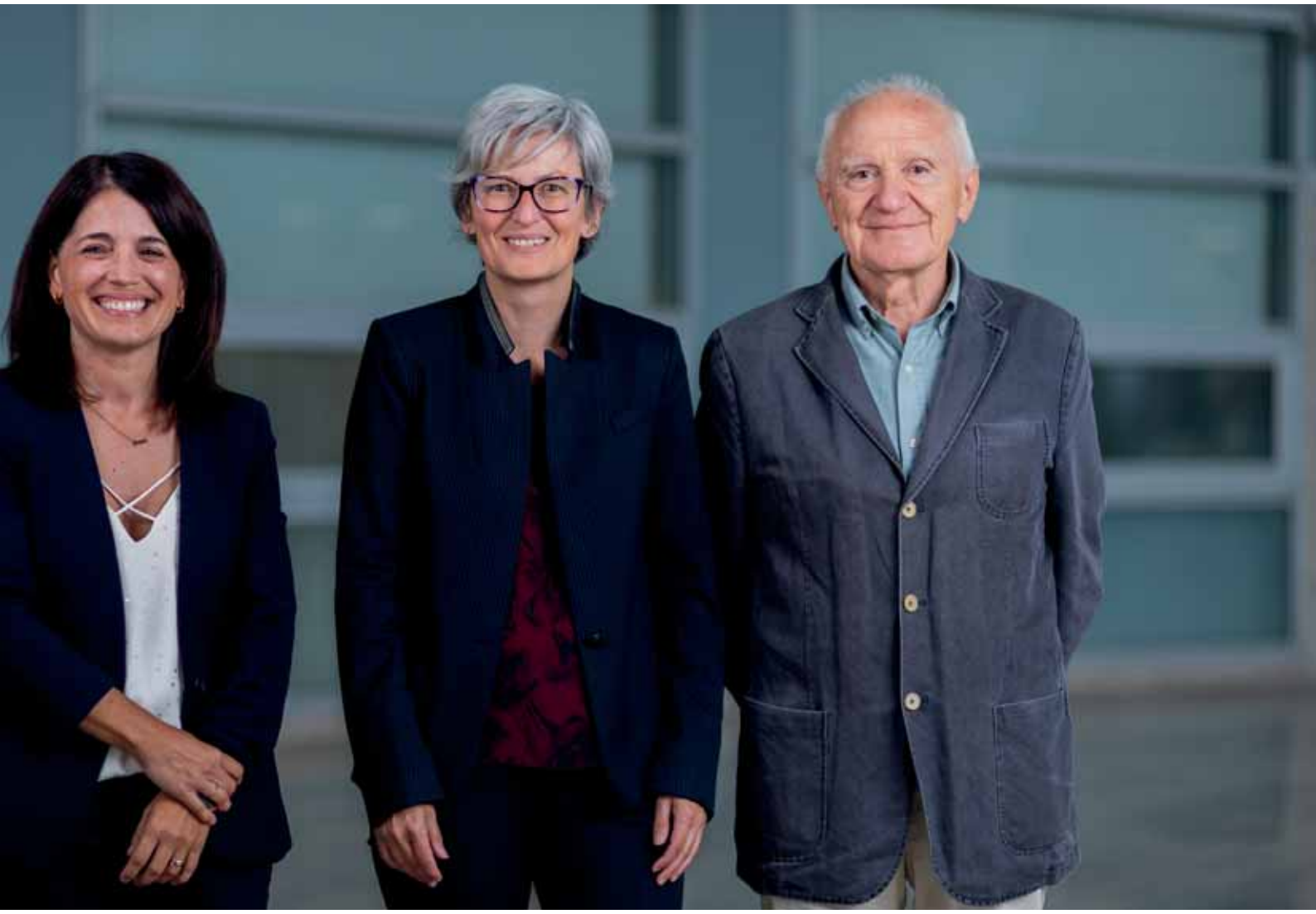
Anna Llanes Pallàs, General Manager (left)
Aitziber L. Cortajarena, Scientific Director (middle)
José M. Mato, Director General (right)

During 2023, CIC biomaGUNE scientific project has been reinforced through the recruitment of Dorleta Jiménez de Aberasturi leading the Hybrid Biofunctional Materials Laboratory.

The volume of R&D activity at CIC biomaGUNE has shown continous growth, as evidenced by the number of grants and industrial contracts awarded (65 new projects: 9 M€ granted in total).

In terms of Resources and Infrastructure, we made significant efforts toward the consolidation and reinforcement of the Center's Technological Platforms and Preclinical Facilites, developing a coherent investment plan for the maintenance, renewal, and acquisition of equipment, to maintain competitiveness at an international level. In this sense in 2023 we received support from the Basque Government to upgrade the MRI 11.7 Tesla, as well as support from the Provincial Council of Gipuzkoa to expand the radiochemistry, nuclear imaging and animal house platforms.

The scientific production of CIC biomaGUNE researchers reflects remarkable quality and impact, with over 140 publications in high-profile journals, and reaching over 11,085 citations. From these articles, 57% involved international, 58% national, and 24% internal collaboration. More importantly, scientific papers tackle important global health challenges, by deciphering fundamental



issues of diseases such as cancer, Parkinson's, Alzheimer's, cerebral ischemia, cardiac disseases, or spinal cord injuries. To achieve these goals, CIC biomaGUNE researchers have tightly collaborated with researchers from renowned international universities or research centers, hospitals, and companies.

CIC biomaGUNE has also achieved significant progress in technology transfer and innovation, as reflected in the increase level of funding from private sources reaching 2.4M€ in 2023. Through our strategic program, we implemented various initiatives aiming at fostering collaboration with the private and clinical sectors, amplifying technology transfer efforts, and attracting industrial funding. Additionally, we promoted the validation of 5 technologies, some of which are currently seeding the creation of spin-offs.

During this period, 5 priority patent applications were filed, 1 patent granted, and 2 trade secrets and 1 software registered. Moreover, 2 additional trade secrets were licensed, 11 technology transfer agreements and 26 services & research contracts were signed with companies and other institutions, and 5 valorisation projects were executed.

CIC biomaGUNE has gradually built up a network of partnerships with leading research centers and universities around the world, aiming at high-quality research and outstanding academic programs.

This endevour has been supported by our successful participation in European and other International Programs. Within the competitive framework of Horizon Europe, we highlight 1 ERC-PoC, 3 MSCA actions, 1 HORIZON CLUSTER4 and 3 EIC Pathfinder projects launched in 2023.

International recognition of academic excellence is also reflected by prestigious awards (ChinaNano Award and Lourenço-Medinaveitia—Liz-Marzán, EMRS 5 Year Materials Impact Prize—Prato), honorary doctorate from U. Antwerp (Liz-Marzán), business idea award (finalist of the Toribio Echeverría Award to Cortajarena).

Our researchers served as Editors and Editorial Board Members for over 25 prominent international Journals, 32 Scientific Advisory Boards of different organizations, and were appointed members of Scientific Societies and Academies (Corresponding academician of the Royal Academy of Sciences – Cortajarena, Vice President of the European Society for Molecular Imaging – Llop).

Additionally, they have gained global recognition, being invited as plenary/keynote speakers at renowned international forums (over 30) and playing key roles as organizers or co-organizers in 10 conferences and workshops in 2023.

CIC biomaGUNE has an average workforce of 157 people, with a balanced gender distribution — 60% of our staff being women— as well as an international profile with over 32% of the staff being foreigners. We maintained a balanced gender distribution among PhDs, Postdocs, and Research Fellows, as well in management positions, including the General Manager and the Scientific Director.

In terms of training, we had a yearly average of 45 postdoctoral researchers and 91 predoctoral researchers, with 11 successfully completed theses.

CIC biomaGUNE's visibility has been increased through fruitful efforts on social media and public communication, with our work featured in 479 media impacts.

In line with our commitment to scientific outreach and responsible research and innovation (RRI), 26 outreach activities were organized including visits by high-school and university students, 24 of these activities aimed to promote STEAM careers in young girls and improve visibility of women in science.

As part of our commitment to achieve excellence in the management of human resources and equality, we developed a harassment prevention protocol, an inclusive language guide, and obtained the HR Excellence in Research seal from the European Commission. Our RD&I management system has renewed the accreditation according to the UNE 166002 standard and we have also renewed our AAALAC accreditation for high quality animal care and use for research.

Aligned with our commitment to sustainable development, the CIC biomaGUNE Strategic Plan encompasses 10 out of the 17 United Nations Sustainable Development Goals (SDGs) and foresees the implementation of sustainability measures to ensure ethics, transparency, compliance, and respect for the environment.

These achievements would not have been possible without the enthusiasm and outstanding performance of our staff and partners. We are confident that this report will offer a clear view of CIC biomaGUNE scientific objectives, accomplishments, and future plans.

Aitziber L. Cortajarena, Scientific Director
Anna Llanes Pallàs, General Manager
José M. Mato, Director General

PRESENTATION

The Center for Cooperative Research in Biomaterials- CIC biomaGUNE, member of the **Basque Research and Technology Alliance (BRTA)**, is a non-profit research organization created to promote scientific research and technological innovation at the highest levels in the Basque Country following the BioBasque policy, to help create a new business sector based on biosciences.

Located in the Science and Technology Park of Gipuzkoa (Donostia-San Sebastián), the activity of CIC biomaGUNE is conducted by an average of 12 international and dynamic research groups, which develop high-level research at the interface between chemistry, physics, and biology, with a particular emphasis on the design of nanostructures and biomaterials with defined properties, and their applications in biomedicine.

The scientific strategy of the Center for the 2021-2024 period has been structured around three main research priorities: Biofunctional Nanomaterials, Tissue Engineering & Regenerative Medicine, and Molecular and Functional Imaging. Since 2022 the area of Tissue Engineering & Regenerative Medicine has been redefined to better suit the new Strategic Program and enhance the current capacities of the Center. In this respect, we renamed this area as Synthetic Bioengineering, which is envisioned to create a stronger connection between the previously established priority areas, with an approach that will bridge the gap between in vitro and in vivo studies.

The main research lines focus on the design, preparation, and characterization of biofunctional nanostructures and custom biomaterials and their evaluation in in vitro and in vivo settings, to understand biological processes and develop biomedical tools. These applications include diagnostic, therapeutic, theranostic, or multimodal imaging, to better understand diseases,

CIC biomaGUNE building

and ultimately apply them in clinical diagnosis and therapy.

To carry out this ambitious program of research, the Center counts with a unique research infrastructure, equipped with advanced nanoscience, chemistry, biochemistry, cell biology, and molecular imaging facilities, including fully equipped research laboratories, Technological Platforms and the Molecular Imaging Facility, selected as a Singular Scientific and Technical Infrastructure (ICTS) by the Spanish Government and one of the most complete preclinical imaging research infrastructures in Europe.

CIC biomaGUNE started its activity in December 2006. In the course of eighteen years, with an average critical mass of 157 people, the Center has obtained national and international recognition as a scientific leader and knowledge builder in the field of biomaterials. Among other achievements, our activity has resulted in the generation of knowledge (publications, patents, PhD theses) the internationalization of research through collaboration with international bodies and institutions, as well as opening our facilities to the scientific community and the industrial sector.

The Center counts with additional certifications and recognitions such as the Seal of Excellence in Human Resources "HR Excellence in Research", UNE 166002 for RD&I Management, and the AAALAC accreditation for the care and use of animals in science.

AT A **GLANCE**

CURRENT ORGANIZATION

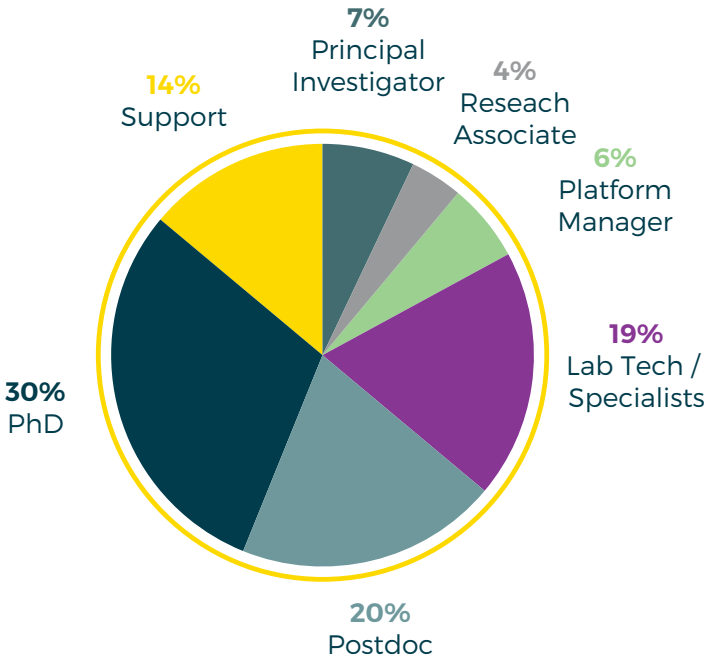
Staff Distribution

157.16

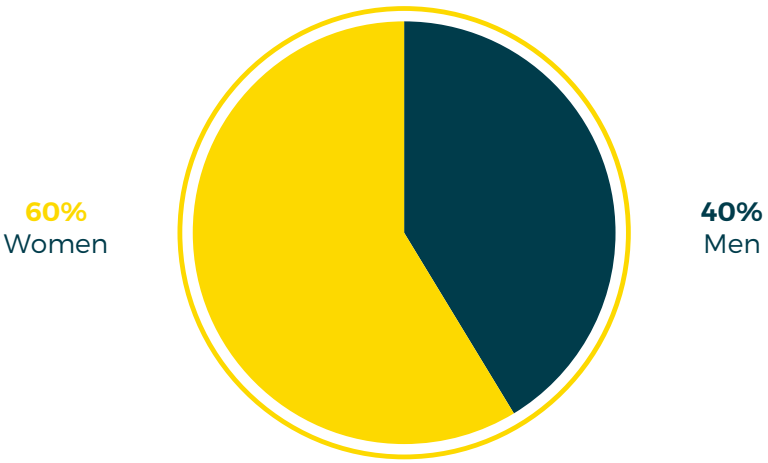
AVERAGE STAFF
(60% women, 40% men)

27

NATIONALITIES REPRESENTED
(32% of staff born outside Spain)



Gender Distribution



FUNDING

15,150,168 €

2023 Budget

17%
Basque Government

15.4%
Spanish Government

25.2%
European Commission

26.4%
Base Funding

16%
Private Funding

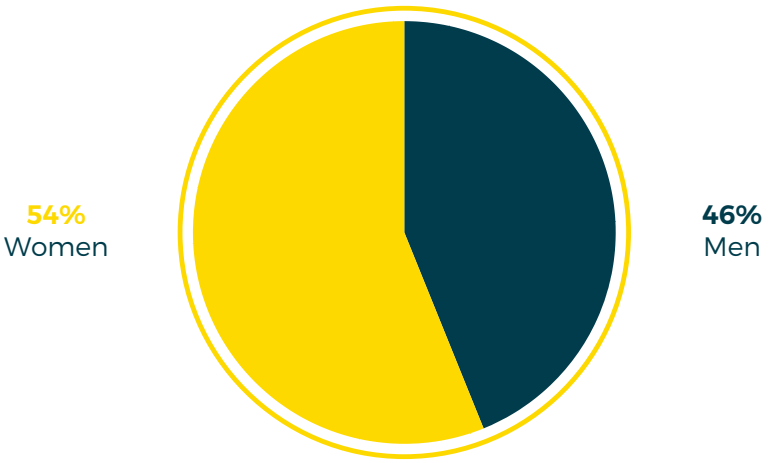
SCIENTIFIC OUTPUT

140	11,085	10.7
Scientific Publications	Citations	Average Impact Factor

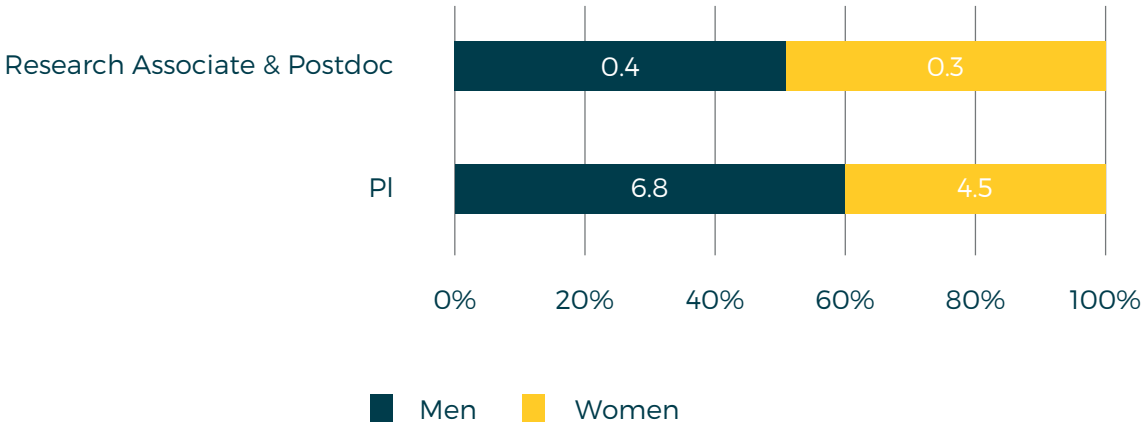
74%	40%	125	80%
1st Quartile	1st Decile	H-Index	Open Access

46%	57%	58%	24%
Publications led by CIC biomaGUNE Researchers	Publications involve International Collaboration	Publications involve National Collaboration	Publications involve Internal Collaboration

Publications 1st autorship



Average articles corresponding authorship per category



AWARDS & RECOGNITIONS

9	6	3	4
Awards, Academy Memberships & Honorary Degrees	Best PhD Theses Awards	Best Talk/Poster Awards	EMBO Fellowships

TECHNOLOGY TRANSFER

5	1	3	2	11
New Patent Families	Granted Patents	Trade Secrets & Software	Licensed Patents & Other IP Rights	Technology Transfer Agreements

26	5
Services & Research Contracts	Ongoing Valorisation Projects

TRAINING & CAREER DEVELOPMENT

11	99	115
Completed PhD Theses (82% women, 18% men)	Ongoing PhD Theses (67% women, 34% men)	Incoming Research Stays (50% women, 50% men)

37	52	348
Outgoing Research Stays (38% women, 62% men)	Seminars (40% women speakers, 60% men speakers)	Internal Scientific & Technology Trainings (64% women participants, 36% men participants)

3	13	210
Organised Conferences	Co-organized Workshops & Conferences	CIC biomaGUNE employees attended to Workshops & Conferences (57% women, 43% men)

158
CIC biomaGUNE employees delivered oral & poster contributions to Workshops & Conferences (59% women, 41% men)

DISSEMINATION & PUBLIC ENGAGEMENT

26	479	48,529
Outreach Activities (24 of which aimed to promote STEAM careers in young girls and improve visibility of women in science)	Media Appearences	Web Visits

3,769	5,533	384
X Followers	LinkedIn Followers	Instagram Followers

SUSTAINABILITY, COMPLIANCE & SOLIDARITY

Energy Consumption

- **Electricity**: 2,452,606 Kwh, which represents 469,441 Kwh less than in 2021. Equivalent to 117 tCO_2eq
- **Gas**: 223,696.00 Kwh, which represents 305,418 Kwh less than in 2021. Equivalent to 76 tCO_2eq

Committed to the Sustainable Development Goals

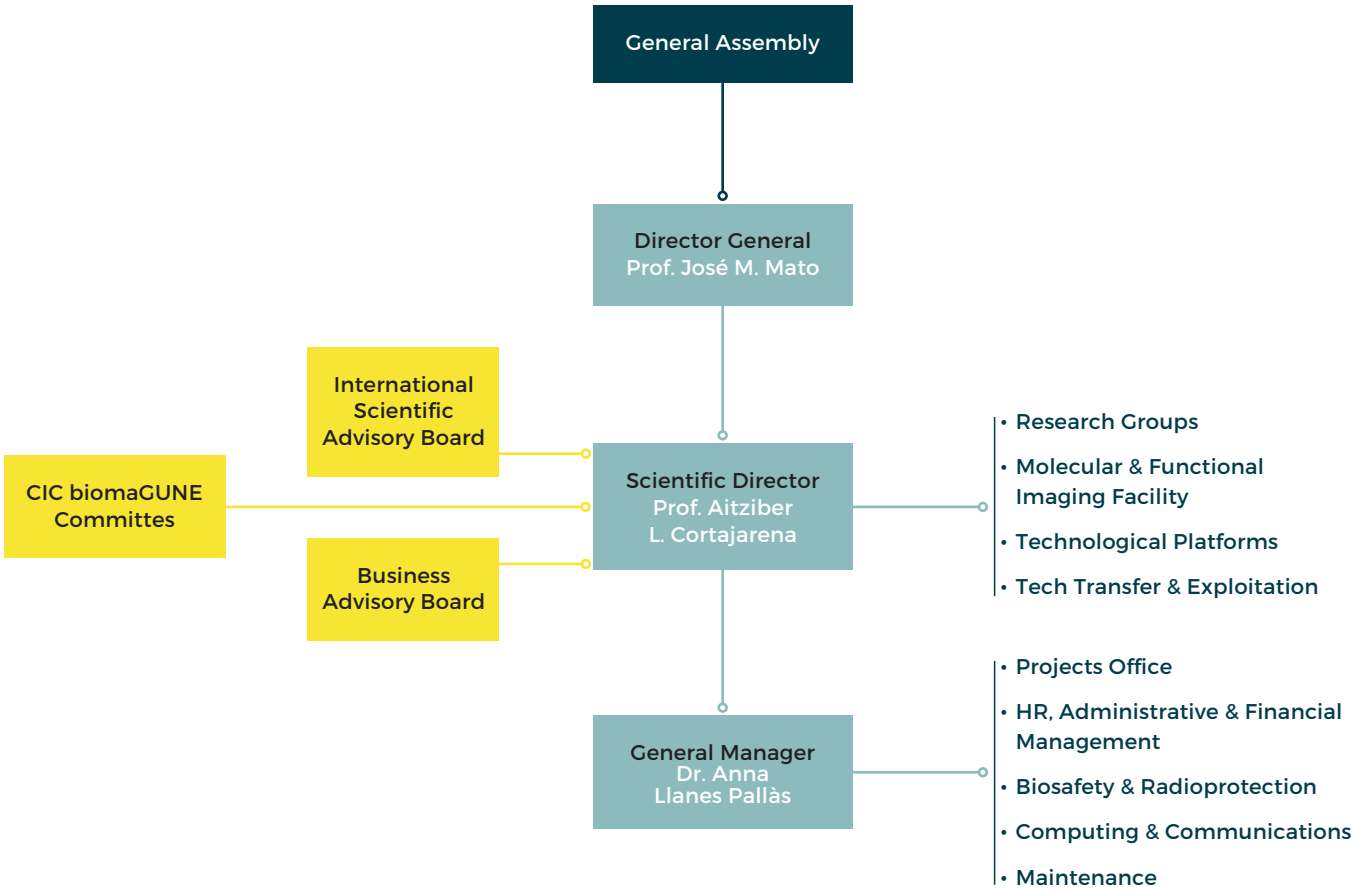
At CIC biomaGUNE, we have incorporated 10 of the 17 Sustainable Development Goals (SDGs) approved by the UN in September 2015 into our strategic programme.

ORGANIZATION

CIC biomaGUNE building

ORGANIZATION

The management structure comprises the following boards: General Assembly, International Scientific Advisory Board (ISAB), and Board of Directors.



GENERAL ASSEMBLY

The GENERAL ASSEMBLY meets 3 times per year to follow up the scientific and financial activities of CIC biomaGUNE. It comprises 5 public administrations and 5 companies.

Public Administration

Companies

INTERNATIONAL ADVISORY BOARD (ISAB)

The **ISAB** assesses CIC biomaGUNE's scientific activity every 3 years, providing the Board of Directors with policy-level and technical advice on the strategic direction of the Center. ISAB members provide support with evaluation of internal calls and strategic decisions.

Prof. Monica Olvera de la Cruz
Department of Chemistry Northwestern University, USA

Prof. Itamar Willner
Institute of Chemistry The Hebrew University of Jerusalem, Israel

Prof. Peter Seeberger
Max-Planck Institute of Colloids and Interfaces, Germany

Prof. Aránzazu del Campo
INM - Leibniz Institute for New Materials, Germany

Prof. Samuel I. Stupp
Institute for BioNanotechnology in Medicine Northwestern University, USA

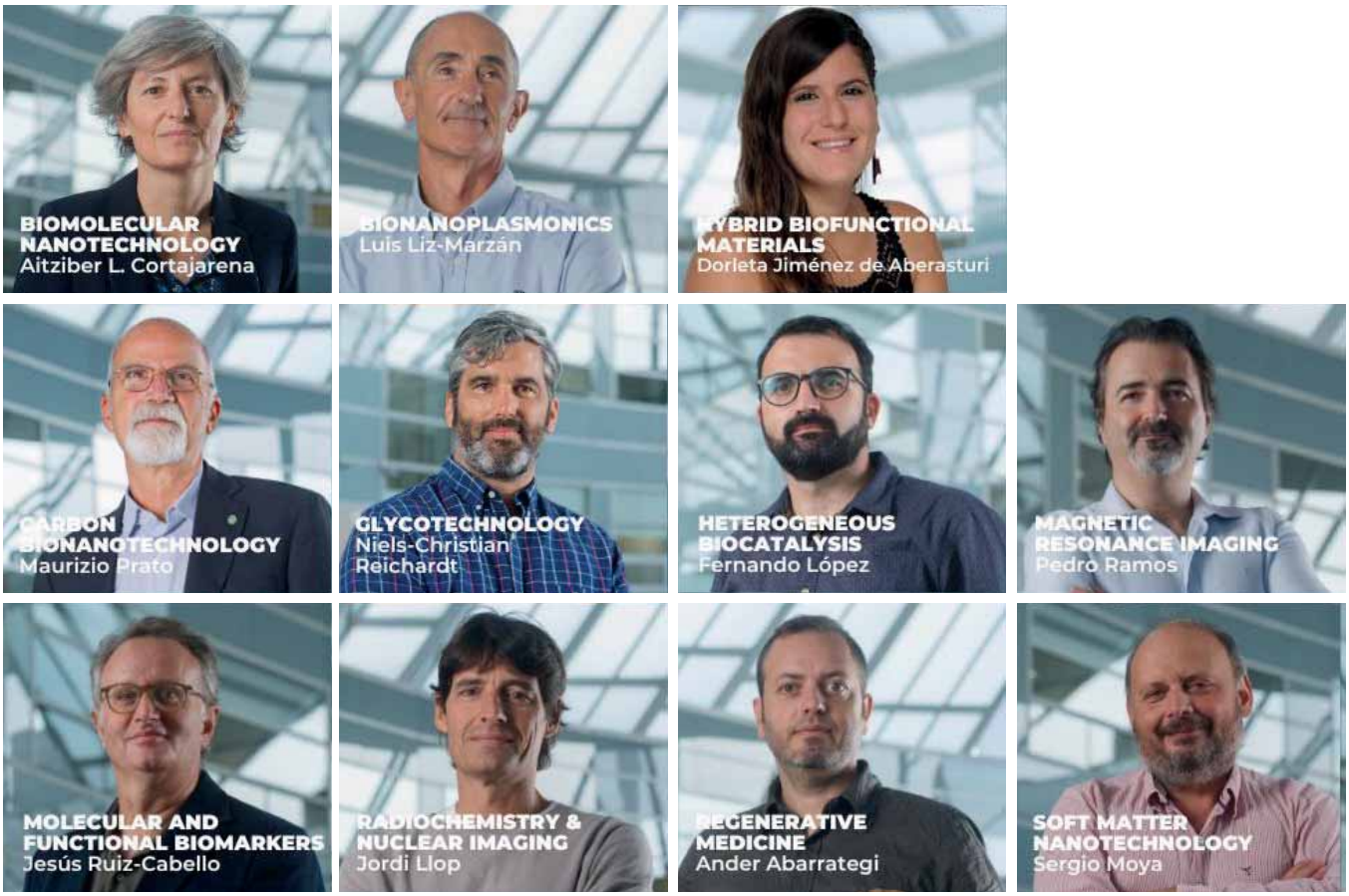
Prof. Patrick Couvreur
Université Paris-Sud, France

Prof. Michal Neemen
Weizmann Institute of Science, Israel

RESEARCH GROUPS

The scientific strategy, divided in 3 main areas, is coherent and highly complementary, fostering numerous synergies among research groups toward the common aim of developing fundamental research at the frontier of the biomaterials field to find biomaterials-based solutions in health and life sciences.

While each laboratory develops its research program (as outlined below), all of them operate within a unified framework aimed at integrating newly developed materials into diagnostic and therapeutic tools. Collaborative projects leveraging complementary expertise have yielded outstanding results.



GLYCOTECHNOLOGY

Niels Reichardt – Principal Investigator
Sonia Serna – Research Associate

The Glycotechnology Laboratory carries out projects in basic and applied glycoscience, focusing on carbohydrates, with untapped potential to provide innovative solutions to important social challenges, such as personalized medicine, pharmaceutical products, food, and biomaterials. The group applies carbohydrate synthesis, materials science, and molecular biology to the design of tools, probes, and devices to elucidate the role and to exploit the potential of sugars and glycomimetics for cancer immunotherapy and diagnostics, immune lectin targeting, vaccine development, and improved vector design for gene therapy.

BIOMOLECULAR NANOTECHNOLOGY

Aitziber L. Cortajarena – Principal Investigator (Ikerbasque Professor)
Valery Pavlov – Associated Principal Investigator
Aitor Manteca– Research Associate (Fellow Gipuzkoa)

The group is at the forefront in engineering biomolecule-based functional nanostructures and bioinspired materials for biotechnology and biomedicine (ERC CoG). Using a combination of protein and nanomaterial engineering, the group creates versatile platforms for constructing protein-based hybrid functional nanostructures and self-assembled biomaterials via bottom-up approaches, from nano- to macro-scale. By combining biomolecular engineering and bioconjugation, molecular hybrids are produced with nanoparticles, nanoclusters, or organic compounds, endowing biomolecules with novel functions. This work includes the development of functional nanostructures and biomaterials for applications in biological therapies, sensing, bioelectronics, catalysis, lighting, and data storage, among others.

SOFT MATTER NANOTECHNOLOGY

Sergio Moya - Principal Investigator

The Soft Matter Nanotechnology Laboratory makes use of elements of soft matter, mainly polyelectrolytes, hybrid materials for biomedical applications are developed. Recent interests include the design of carriers for gene therapy based on engineered polyamines and supramolecular interactions, for applications in cancer therapy. Carriers are also developed to facilitate transport of oxygen for photodynamic therapy of cancer. The study of the physicochemical properties of the fabricated materials and their biological fate is a key aspect of the group's research strategy, using advanced spectroscopic and imaging tools to understand how materials functionality is affected by biological environments.

BIONANOPLASMONICS

Luis M. Liz-Marzán - Principal Investigator (Ikerbasque Professor)
Isabel García - Research Associate (CIBER-BBN)
Malou Henriksen-Lacey – Research Associate

The group focuses on the biomedical applications of plasmonic nanomaterials, including chemical methods for the synthesis of colloidal metal nanoparticles with tailored morphology, surface chemistry, and optical response, as well as their directed self-assembly and applications in biosensing, diagnostics and therapy, mainly based on plasmonic effects.
One of the current central topics of the group (ERC AdG) is the development of realistic three-dimensional cell/tissue models, supported by 3D-printed hydrogel scaffolds with embedded plasmonic nanoparticles, which allow the real-time detection of disease biomarkers by optical methods, including SERS. Such hybrid materials have been recently patented as platforms for the evaluation of drug efficacy in realistic in vitro models, toward applications in personalized medicine.

CARBON BIONANOTECHNOLOGY

Maurizio Prato - Principal Investigator (Ikerbasque Professor & AXA Chair)

Focuses on the design and synthesis of tailored carbon nanostructures (fullerenes, carbon nanotubes, graphene, and carbon nanodots) for the development of functional interfaces with enhanced performance in medicine, energy, biosensing, and diagnostics (ERC AdG). The group seeks to transfer the properties of these new materials into applications, including spinal cord repair, innovative immunotherapies, selective biosensors, MRI contrast agents, water splitting, and reduction of carbon dioxide into useful chemicals.

HETEROGENEOUS BIOCATALYSIS

Fernando López Gallego - Principal Investigator (Ikerbasque Professor)

The Laboratory of Heterogeneous Biocatalysis applies multi-enzyme systems to synthetic, environmental, medical, and analytical chemistries, by harnessing the exquisite selectivity of enzymes, to develop sustainable and efficient chemical processes. The group aims to open new paths toward cell-free synthetic biology and in vitro metabolic engineering (ERC CoG). The main inspiration driving this research is the spatial organization found in living organisms, which are mimicked to fabricate ex vivo systems supported on solid materials. To address this goal, the group interfaces chemistry and biology utilizing multidisciplinary tools that involve molecular biology, enzymology, and materials chemistry.

REGENERATIVE MEDICINE & DISEASE MODELS

Ander Abarrategi – Junior Group Leader (Ikerbasque and Ramón y Cajal Fellow)

The Regenerative Medicine Laboratory uses biomaterial-based approaches to boost knowledge in stem-cell biology, both in physiological and pathological contexts. For this aim, we generate bioactive and cell-laden 3D structures potentially useful for regenerative medicine and disease modelling studies. The understanding of bone tissue is the core of our research. Briefly, we design, characterize and test different kinds of implantable devices to gain insight into specific tissue formation processes. From this information we define and modulate relevant mechanisms in the context of tissue regeneration and tissue pathology.

RADIOCHEMISTRY & NUCLEAR IMAGING

Jordi Llop - Principal Investigator

The group focuses on the development of innovative radiochemistry and application of positron emission tomography (PET) and single photon emission computed tomography (SPECT) tracers, toward understanding biological, physiological, and pathological processes in oncology, neurology, pneumology, infection and cardiovascular diseases. Specifically: (i) innovative radiochemical strategies to obtain positron emitter-labeled tracers, covering various molecular modalities (small molecules, peptides, proteins, antibodies/antibody fragments and nanoparticles) and radionuclides (^{11}C, ^{13}N, ^{18}F, ^{64}Cu, ^{89}Zr, ^{124}I); (ii) investigate the mechanism underlying high-incidence diseases, by combined imaging modalities; (iii) develop and evaluate new theranostic agents.

MAGNETIC RESONANCE IMAGING

Pedro Ramos - Principal Investigator (Ikerbasque Professor)

The Magnetic Resonance Imaging (MRI) Laboratory works on the development of MRI-based methods for the definition of early imaging biomarkers of disease, aiming at advanced diagnosis and treatment of vascular and neurodegenerative disorders of the central nervous system. Using animal models, longitudinal imaging approaches and image analytics, genetically induced or disease-related changes on the phenotype, metabolism, function and connectivity of the brain are studied. Focus is also given to the design of theranostic nanomaterials that reach disease targets across the Blood Brain Barrier for effective treatment of neurological diseases.

MOLECULAR & FUNCTIONAL BIOMARKERS

Jesús Ruiz Cabello - Principal Investigator (Ikerbasque Professor)
Susana Carregal - Research Associate (Ikerbasque and Ramon y Cajal Fellow)
Ermal Ismalaj - Research Associate (Fellow Gipuzkoa)

The group focuses on cardio-pulmonary and vascular diseases, such as atherosclerosis and pulmonary hypertension, using functional and molecular imaging and systems biology approaches. Particular interest is put into nanotechnology-based applications for early diagnosis and monitoring new therapeutic approaches in vascular diseases. We investigate metabolic changes associated with vascular cell growth and proliferation, the structure and function of the right ventricle, and cardiovascular coupling signals. Current activity focuses on developing new biomarkers for flow imaging and participating in a clinical trial with pulmonary hypertension patients.

HYBRID BIOFUNCTIONAL MATERIALS *(Since January 2023)*

Dorleta Jiménez de Aberasturi – Junior Group Leader (Ikerbasque and Ramón y Cajal Fellow)

The group focuses on the design of hybrid biomaterials responsive to specific stimuli, to gain a better understanding of cell-material interactions, propose advances in tissue engineering techniques, and seek solutions in the field of translational medicine. One of the current central topics of the group is the development of hybrid functional bioinks for the fabrication of in vitro 3D printed models that can be used as ideal platforms to better understand the causes behind different diseases and to perform drug screening studies.

RESEARCH FACILITIES

The Center counts with a unique research infrastructure of almost 5,000 m^2, equipped with advanced nanoscience, (bio)chemistry, bioprinting, and cell biology, including Technological Platforms, and the Molecular Imaging Facility, a Singular Scientific and Technical Infrastructure and one of the most complete preclinical imaging infrastructures in Europe.

Each platform is managed by highly trained personnel who not only maintain the facilities and provide training, but also actively participate in the research when advanced operation and data analysis are required.

CIC biomaGUNE covers salaries of specialized Platform Managers and technicians, maintenance and purchase of new equipment. In this sense, in 2023 we received support from the Basque Government to upgrade the MRI 11.7 Tesla, as well as support from the Provincial Council of Gipuzkoa to expand the radiochemistry, nuclear imaging and animal house platforms.

Ane Miren Rebollo, Maider Garbizu, Mariana Matos and María Gómez, working in the Radiochemistry Lab. New equipment funded by Provincial Council of Gipuzkoa under the grants 2022-CIEN-000085-01, 2023-CIEN-000003-01 and the Basque Government under the EC_2022_1_0031 grant.

MOLECULAR & FUNCTIONAL IMAGING FACILITY

Designed, built and equipped to tackle longitudinal and multimodal pre-clinical projects and to develop applications in the areas of Preclinical Molecular and Functional Imaging and Nanomedicine.

The research-oriented preclinical imaging facility offers state-of-the-art imaging resources in: (i) radiochemistry (dual particle-high current cyclotron capable to routinely produce ^{18}F, ^{11}C, and ^{13}N; versatile synthesis boxes housed in shielded hot cells; and state-of-the-art analytical equipment including radio-HPLC, radio-GC, radio-TLC, and gamma spectrometry); and (ii) small-animal imaging including PET and SPECT (both as hybrid systems with CT) and a trimodal PET-SPECT-CT, optical imaging and high field Magnetic Resonance Imaging (MRI, 7.0 and 11.7 T). The MRI unit and the Nuclear Imaging unit sandwich a dedicated animal housing area, which holds since 2015 accreditation by the Association for Assessment and Accreditation of Laboratory Animal Care International (AAALAC) and is prepared to house up to 800 mice and 400 rats in individually ventilated cages, with an experimental area specifically devoted to performing longitudinal studies. The animal house is complemented with microsurgery areas for animal preparation. Four workstations and a data storage system in the Terabyte scale enable image reconstruction, processing, quantification and archiving.

Personnel with extensive scientific background and experience in handling and operating specific equipment, technologies, methodologies or experimental animals complete the scientific-technical staff.

The Facility is currently integrated in the “Distributed Biomedical Imaging Network” (ReDIB, www. redib.net), recognized by the Spanish Government as a Singular Scientific and Technical Infrastructure (ICTS).

RADIOCHEMISTRY PLATFORM

Vanessa Gómez-Vallejo - Platform Manager

The platform is equipped with an IBA Cyclone 18/9 cyclotron able to accelerate protons (18 MeV) and deuterons (9 MeV) and is equipped with 7 targets for the routine production of [^{18}F] F-, [^{18}F]-F_2, [^{13}N]-NH_4+-, [^{15}O]-O_2 [^{11}C]-CO_2 and [^{11}C]-CH_4. It also has a solid target to produce ^{89}Zr and ^{64}Cu.
The radiochemistry laboratory equipped with 5 shielded hot cells housing versatile automatic synthesis, suitable for the production (synthesis, purification and quality control) of PET and SPECT radiotracers. The facility has specially designed modules for:

- Synthesis of [^{11}C] CH_3I / [^{11}C] CH_3OTf from [^{11}C] CO_2 / [^{11}C] CH_4, and subsequent methylation reaction
- ^{18}F-fluorination by nucleophilic and electrophilic substitution
- Radiotracer synthesis using microfluidics technology
- Chelation reactions using radiometals (^{68}Ga, ^{67}Ga, ^{64}Cu, ^{89}Zr, etc.)

The quality control lab, sited in the production lab, is equipped with state of art equipment to perform the complete quality control of the synthesized radiotracers, including radio-HPLC, radio-GC, radio-TLC, and gamma spectrometry.

NUCLEAR IMAGING

Unai Cossío - Platform Manager

Equipped with autoradiography, PET and SPECT (both as hybrid systems with CT) and a trimodal PET-SPECT-CT. Four workstations and a data storage system in the Terabyte scale enable image reconstruction, processing, quantification and archiving.

MAGNETIC RESONANCE IMAGING (MRI)

Daniel Padró - Platform Manager

Equipped with instrumentation to conduct advanced imaging and spectroscopic experiments applied to biological samples including small rodents, samples or tissue extracts and cell cultures is available. CIC biomaGUNE provides the instrumentation and the expertise to carry out a wide range of MRI and MRS experiments and is equipped with surgery rooms for animal preparation and implementation of surgical models. Ancillary equipment is also available: anesthesia systems, MRI-compatible physiological monitoring systems, infusion pumps, and temperature regulation systems. Equipment available: MRI 7T/30 cm (70/30 USR), MRI 11.7T/16 cm (117/16 USR).

PRE-CLINICAL IMAGE ANALYTICS

Unai Cossío - Platform Manager

The Image Analytics service takes care of processing all the outcoming multimodal images obtained within the Molecular Imaging Unit (PET, SPECT, CT, and MRI).
Working on different operating systems, we carry out co-registration, segmentation, and quantification of multimodal images. The combination of all multimodal imaging techniques confined in the Imaging Unit with a reliable image analysis process offers a complete and powerful Imaging facility to researchers. Four workstations and a data storage system in the Terabyte scale enable image reconstruction, processing, quantification and archiving.

ANIMAL FACILITY

Ainhoa Cano - Platform Manager

The MRI Unit and the Nuclear Imaging Unit sandwich a dedicated animal housing area, which holds accreditation of the Association for Assessment and Accreditation of Laboratory **Animal Care International (AAALAC) since 2015** and is prepared to house up to 960 mice and 234 rats in individually ventilated cages, with an experimental area specifically devoted to performing longitudinal studies. The animal house is complemented with microsurgery areas for animal preparation.

CIC biomaGUNE Molecular and Functional Imaging

TECHNOLOGICAL PLATFORMS

Managed by specialized Platform Managers, provide technical and scientific support to the research activities conducted at CIC biomaGUNE. They include the following state-of-the-art research infrastructures.

NUCLEAR MAGNETIC RESONANCE (NMR)

Daniel Padró – Platform Manager

Equipped with a **500 MHz NMR** spectrometer, it provides essential service for the characterization of molecules with biological activity, from complex glycans to molecules used in the design of nanostructures for biomedical applications.

ELECTRON MICROSCOPY

Marco Möller – Platform Manager

Equipped with **SEM-EDX, TEM – 120 keV and 200 keV**, it offers techniques to study nanoparticles and biological or soft polymer materials (cryo-TEM) at the micrometer and nanometer scale to determine the materials dimensions, shape and composition.

MASS SPECTROMETRY

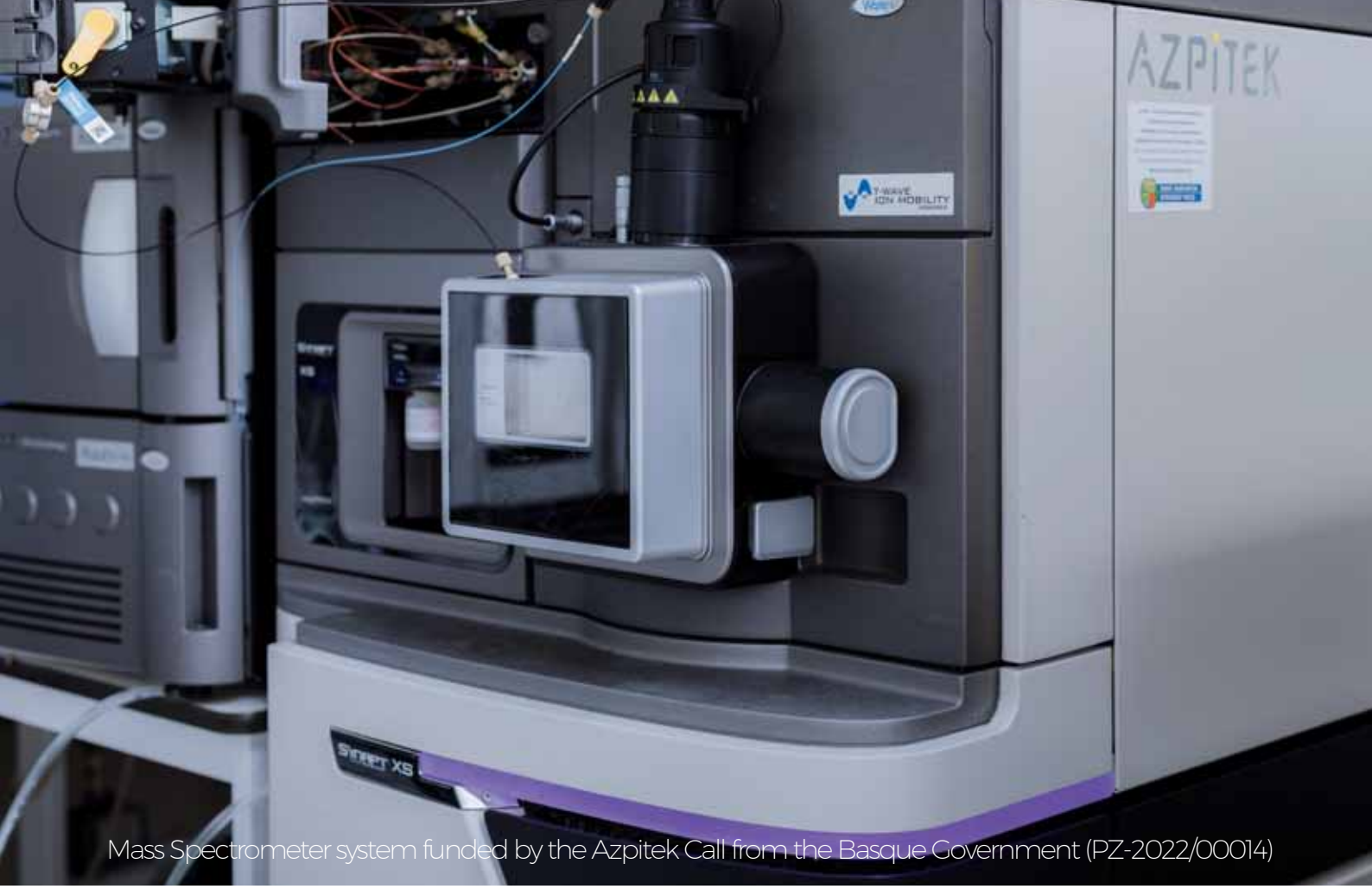
Javier Calvo – Platform Manager

The platform is equipped with state-of-the-art mass spectrometers of different ionization sources such as **electrospray**, **ICP**, and **MALDI**. These instruments, equipped with high-resolution analyzers (**QTOF** & **TOF**), allow for structural analysis and characterization ranging from small organic molecules to complex biomolecules and nanomaterials, as well as elemental absolute quantification by **ICP/MS**. Additionally, high-resolution liquid and gas chromatography systems (**UHPLC** and **GC/MS**) are available in order to improve the analysis of complex samples.
Furthermore, the platform is equipped with advanced technologies for molecular imaging, including MALDI imaging and DESI, allowing spatially-resolved molecular and chemical profiling directly from sample surfaces.

SURFACE ANALYSIS & FABRICATION

Desiré Di Silvio – Platform Manager

Equipped with **XPS, 3 x AFM, sputtering system**, it focuses on the analysis of materials at the surface level, including spectroscopic and microscopic techniques especially suited to surfaces. The platform offers also service for the deposition of thin layers with controlled manufacture at the nanoscale.



Mass Spectrometer system funded by the Azpitek Call from the Basque Government (PZ-2022/00014)

COLLOIDAL NANOFABRICATION (until April 2023)

Ana Sánchez-Iglesias – Platform Manager

Within the priority area of biofunctional nanomaterials and nanomedicine, colloidal synthesis plays an essential role. This platform provides knowledge, training and service for the manufacture of nanoparticles with a wide variety of compositions and morphologies.

OPTICAL SPECTROSCOPY & IMAGING

Irantzu Llarena – Platform Manager
Judith Langer – Platform Manager

Equipped with **2 x Fluorescence Confocal** microscopes (1 of them equipped with **multiphoton laser**), Epifluorescence microscope for live cell imaging, **2 x Confocal-Raman** microscopes, Dark field microscope, **UV-VIS-NIR**, **FT-IR** and **Raman** spectrometers, UV-NIR **Fluorimeter, Flow Cytometer**, Spectropolarimeter (**CD**), Dynamic Lyght Scattering (**DLS**), Differential Scanning Calorimeter (DSC), Monolith MST this platform offers a wide variety of techniques for the spectroscopic characterization of biomaterials and biosurfaces. Also included are optical microscopy techniques (confocal fluorescence, Raman, etc.), to investigate biofunctional materials and the interaction of nanomaterials with cellular systems of diverse complexity.manufacture of nanoparticles with a wide variety of compositions and morphologies.

Mantas Liutkus using the newly adquired FE-SEM funded by MCIN/AEI/10.13039/501100011033 and by the "European Union NextGenerationEU/PRTR"Grant EQC2021-006811-P / EQC2021-000949-C

DIRECTORATE & MANAGEMENT

BOARD OF DIRECTORS

The **BOARD OF DIRECTORS**: Composed by the Director General, the Scientific Director, and the General Manager.

José M. Mato - Director General
Aitziber L. Cortajarena - Scientific Director
Anna Llanes Pallàs - General Manager

Their roles are key to the Center and must ensure excellence in research and management at all levels. They are in charge of defining the structure of CIC biomaGUNE, coordinating the scientific strategy, supervising the organizational units, managing the available space and human resources, and prioritizing infrastructure acquisition and renewal and ensuring adequate use of available economic resources.

HR & ADMINISTRATION

Sheyla García Medel - HR & Administration Manager
Elizabeth Noguera Olaechea - Finance & Control Manager

This department is responsible for the management of finances, accounting, administration, and the human resources of the Center.

PROJECTS OFFICE

Cristina Díez García - Project Manager

A dedicated office to support and strengthen the capacities of the Center, in terms of attracting funding from various Research Programs, in particular, international ones, strengthening links between academic and industrial environments, and promoting the transfer of research results to society and industry, especially to the biotechnology sector.

TECHNOLOGY TRANSFER & INNOVATION

Marcos Simón Soria - Technology Transfer Manager

The technology transfer office manages the intellectual property facilitating the flow of knowledge from the Center to society and driving business development. It is dedicated to identifying and safeguarding intellectual property, negotiating licensing agreements, and catalyzing the commercialization of research outcomes.

BIOSAFETY & RADIOPROTECTION

Paola Ferreira Cabeza - Biosafety & Radioprotection Manager

Dedicated to establishing safe working conditions for all CIC biomaGUNE's personnel by promoting good laboratory practices. The service is also in charge of the appropriate operation of the Center´s Radioactive Facility.

COMPUTING & COMMUNICATIONS

Mikel Gonzalez Lacunza - IT Manager

The IT department is responsible for setting up and maintaining computer-related equipment, software, data storage, email servers, the website and social media.

MAINTENANCE

Álvaro Ruiz Fernández - Maintenance Manager

This department takes care of the preventive, predictive and corrective maintenance of all facilities at CIC biomaGUNE.

ATTRACTION & TRAINING OF **SCIENTIFIC TALENT**

Beatriz del Campo Herrero

TALENT ATTRACTION

CIC biomaGUNE has an average workforce of 157 people, with a balanced gender distribution — 60% of our staff being women— as well as an international profile with over 32% of the staff being foreigners. We maintained a balanced gender distribution among PhDs, Postdocs, and Research Fellows, as well in management positions, including the General Manager and the Scientific Director.

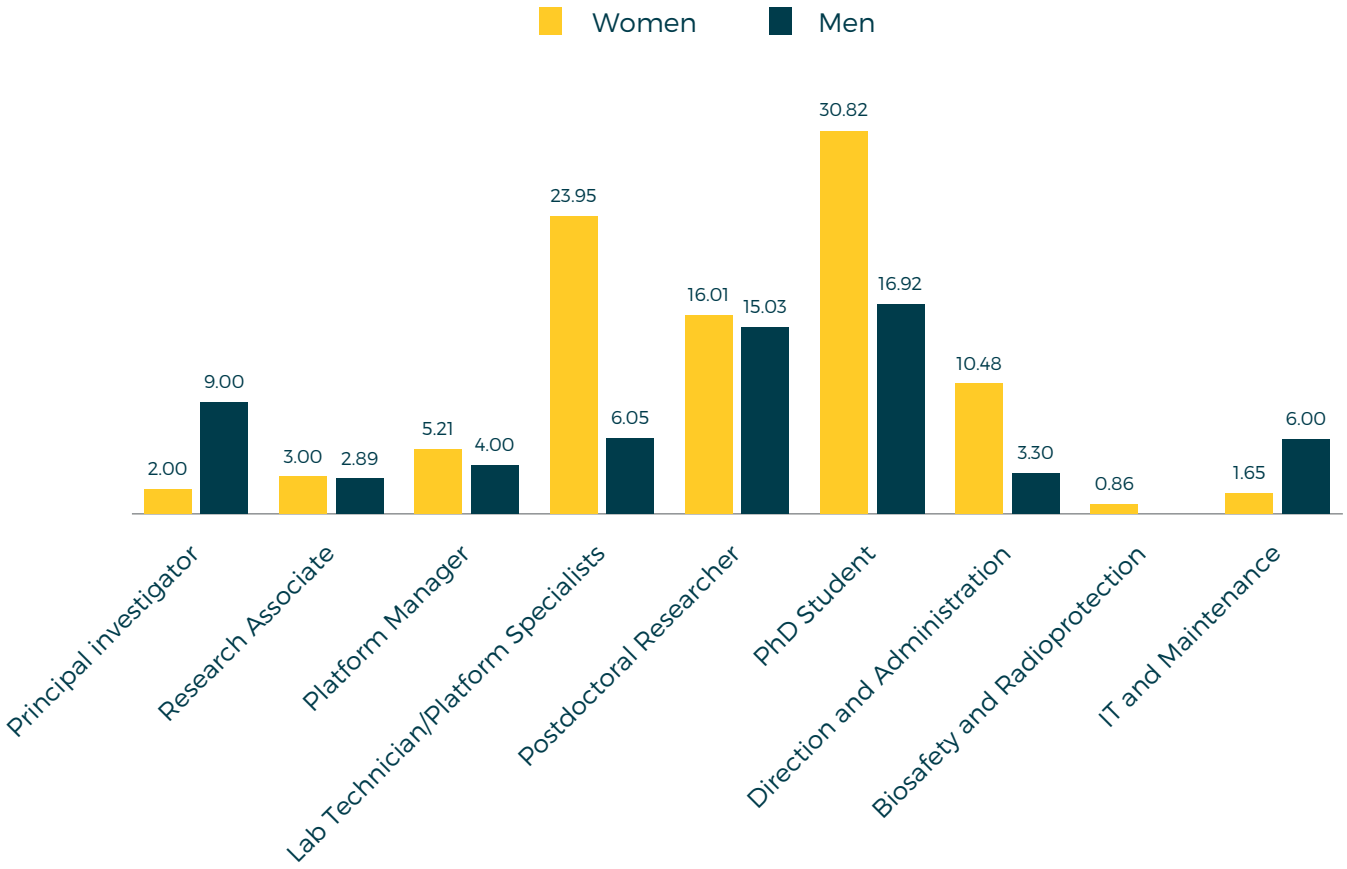
Our strategic scientific project has been reinforced through the recruitment of Dorleta Jiménez de Aberasturi in January 2023 leading the Hybrid Biofunctional Materials Laboratory.

In terms of training, we had a yearly average of 45 postdoctoral researchers and 91 predoctoral researchers, with 11 successfully completed theses.

Personnel Overview

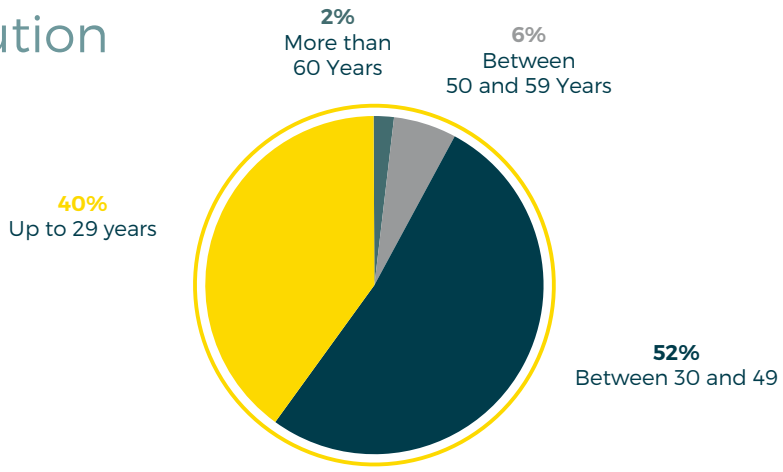
The table below provides the distribution of CIC biomaGUNE's personnel during 2023 in Full Time-Equivalent (FTE):

Staff Distribution by Position

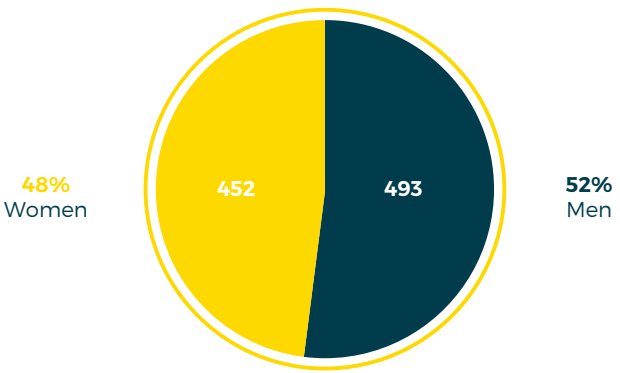


POSITION	WOMEN	%	MEN	%	TOTAL	%
Principal Investigator	2.00	18%	9.00	82%	11.00	7%
Research Associate	3.00	51%	2.89	49%	5.89	4%
Platform Manager	5.21	57%	4.00	43%	9.21	6%
Lab Technician/Platform Specialists	23.95	80%	6.05	20%	30.00	19%
Postdoctoral Researcher	16.01	52%	15.03	48%	31.04	20%
PhD Student	30.82	65%	16.92	35%	47.74	30%
Direction and Administration	10.48	76%	3.30	24%	13.78	9%
Biosafety and Radioprotection	0.86	100%		0%	0.86	1%
IT and Maintenance	1.65	22%	6.00	78%	7.65	5%
	93.97	**60%**	**63.19**	**40%**	**157.16**	

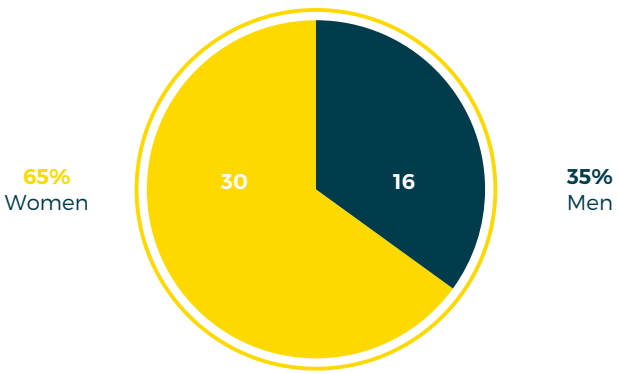
Age Distribution



Applicants to Selection Process



Selected/Hired Candidates



International Representation

CIC biomaGUNE is a **multicultural organization**. people from 27 different countries work at CIC biomaGUNE and 32% of the research staff were born outside Spain.

27

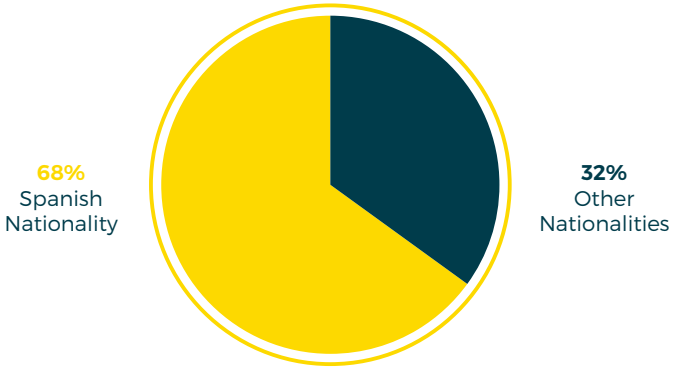
Different countries

68%

Spanish Nationality

32%

Other Nationalities



COUNTRY	TOTAL	COUNTRY	TOTAL	COUNTRY	TOTAL	COUNTRY	TOTAL
Albania	1	Denmark	1	Libanon	1	Rusia	2
Argentina	4	France	5	Lithuania	1	South Africa	1
Australia	1	Germany	4	Mexico	5	Spain	140
Austria	1	Greece	1	Peru-Italy	1	Uruguay	1
China	2	India	6	Philippines	1	USA	2
Colombia	1	Iran	1	Poland	1	Yemen	1
Cuba	2	Italy	18	Portugal	4		

Equality

CIC biomaGUNE formalized in 2020 a commitment to equality that has been developing since the beginning of the activity and that it intends to maintain over time. Our commitment stems not only from legal compliance but also from the opportunity represented by being able to generate a consensus that allows us to deepen and improve our culture, based on shared values and made explicit through our RD&I Policy and other directives that we have been adopting over the years.

The Equality Committee, established in 2018, together with the Direction, work on the equality plan of CIC biomaGUNE. This plan aims at **ensuring equality, equal recruitment policies, and work-life balance**. The Committee also engages in organizing multiple outreach activities and actions aimed at **promoting scientific-technological vocation among girls** and the **role of women in science**.

Since 2020 CIC biomaGUNE has implemented specific measures to **support labor flexibility which have favored the work-life balance**. This has resulted in a decrease in requests for both childcare leave and reductions of working hours for legal guardianships, avoiding the consequent loss of income. In 2021, we approved the **protocol of prevention and action against workplace, sexual or gender-based harassment**. In 2022, we developed an **inclusive language guide** and in 2023 a **lactation room** was allocated in the Center. This innitiative supports the efforts of breastfeeding mothers and help prevent those mothers who want to continue breastfeeding from discontinuing it due to the workplace challenges. In 2023, we actively participated in the organization of the **Internation Congress on Equality, science and technology. For a paradigm shift**, promoted by the Emakunde, the Basque Institute for Women: **https://www.berdintasunazientzian.eus/**

CIC biomaGUNE community celebrating the 8th of March, the International Women's Day

FUNDING **MODEL**

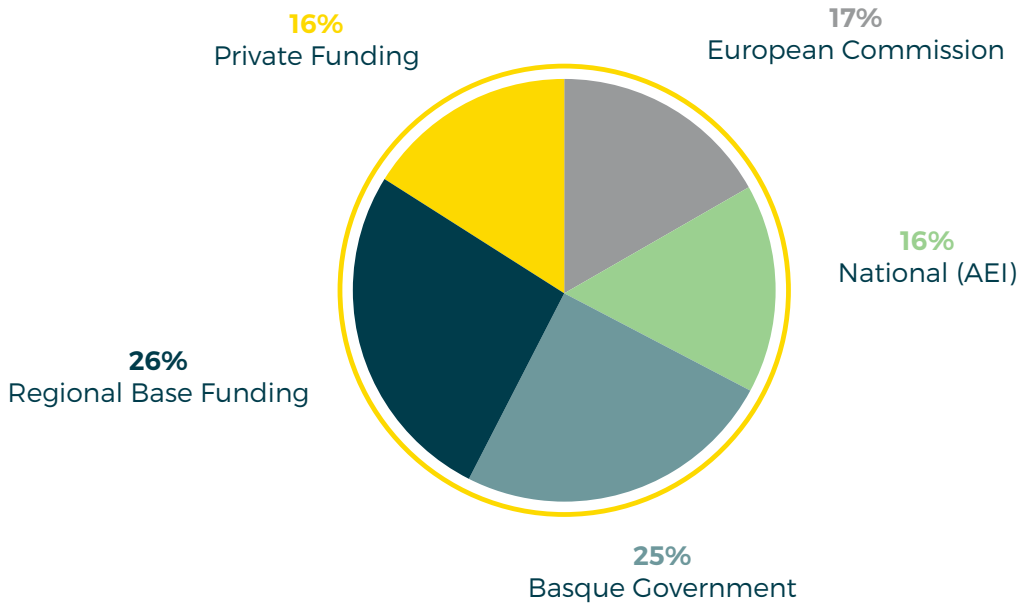
FUNDING MODEL

The total budget for 2023 has amounted 15,676,654 €, 84% of which came from public sources and 16% from private sources.

15,676,654 €	84%	16%
Total budget	Public Funding	Private Funding

25%	16%	17%
Basque Government	Spanish Government	European Commission

26%	16%
Base Funding	Private Funding



LAUNCHED PROJECTS

65 new projects (from competitive funding sources) have been launched in 2023 with a **total contribution** of **9,013,815 €**.

From the new launched projects, we highlight 1 **ERC-PoC, 3 MSCA actions, 1 HORIZON CLUSTER4** and **3 EIC Pathfinder** projects funded under Horizon Europe.

FUNDING AGENCY	TOTAL PROJECTS	TOTAL GRANTED
European Commission - Horizon Europe	8	2,701,773.12 €
European Research Council (ERC) - Horizon Europe	1	130,000.00 €
Basque Government	22	3,137,966.53 €
Spanish Research Agency - AEI	17	2,003,541.72 €
Gipuzkoa Provincial Council	9	637,996.50 €
Basque Foundation for Health Innovation and Research (BIOEF)	1	22,000.00 €
Ministry of Universities of Spain	2	76,869.26 €
Fundacion Ramon Areces	1	116,800.00 €
BBVA Foundation	1	10,118.00 €
Fundacio La Marato	1	99,750.00 €
La Caixa Foundation	1	50,000.00 €
EGTC Euroregion Nouvelle-Aquitaine Euskadi Navarra	1	27,000.00 €
	65	**9,013,815.13 €**

LIST OF FUNDED PROJECTS STARTING IN 2023

CALL	PL (FELLOW)	FULL TITLE	PERIOD	AMOUNT (€)
ERC-2022-PoC Proof of Concept Grant	Fernando López Gallego	NIBIOX– Heterogeneous biocatalysts for oxygen-independent oxidations using inorganic salts	2023 - 2025	130,000.00

CALL	PL (FELLOW)	FULL TITLE	PERIOD	AMOUNT (€)
HORIZON-TMA-MSCA-DN 2021 Doctoral Networks (former H2020-MSCA-ITN)	Fernando López Gallego	BioCatCodeExpander: Genetic code expansion for biocatalysis and enzyme engineering training network	2023-2026	251,971.20
HORIZON-TMA-MSCA-PF 2021 Postdoctoral Fellowships	Aitziber L. Cortajarena	ProteNano-MAG: Eco-friendly and bioinspired protein-based synthesis of magnetic nanomaterials for advanced cancer theranostics	2023-2025	181,152.96

CALL	PL (FELLOW)	FULL TITLE	PERIOD	AMOUNT (€)
HORIZON-CL4-202-RESILIENCE-01-10: Innovative materials for advanced (nano)electronic components and systems (RIA) (Cluster 4 - DIGITAL, INDUSTRY and SPACE)	Aitziber L. Cortajarena / Valery Pavlov	GREENER: Single Photon source and detector based on novel materials for the detection of endocrine disruptors	2023 - 2025	429,707.50
EIC Pathfinder OPEN 2022	Maurizio Prato	PLANKT-ON: Plankton-like Protocells for Artificial Photosynthesis Targeting Carbon-neutral Energy Vectors	2023 - 2026	450,000.00
HORIZON-CL4-2022-DIGITAL-EMERGING-01-35: Advanced characterisation methodologies to assess and predict the health and environmental risks of nanomaterials (RIA) (Cluster 4 - DIGITAL, INDUSTRY and SPACE)	Sergio Moya	POTENTIAL: Platform Optimisation To Enable NanomaTerIAL safety assessment for rapid commercialisation	2023 - 2026	338,687.50
EIC Pathfinder OPEN 2022	Fernando López Gallego	BMRex: Biocatalytic membranes for micro/nano plastic degradation within waste water effluents	2023 - 2026	305,591.00
EIC Pathfinder OPEN 2022	Sergio Moya	BRAINSTORM: Wirelessly deep BRAIN Stimulation Treatment using multifunctiOnal nanomateRial with engineered Magnetic properties	2023 - 2027	579,350.00
HORIZON-MSCA-PF-2022-01 MSCA Postdoctoral Fellowships 2022	Luis M. Liz-Marzán	ChirPlasBiosensing: Self-assembled 2D Chiral Plasmene Nanosheets for Biomarker Detection Based on Surface-Enhanced Raman Scattering	2023 - 2025	165,312.96

CALL	PL (FELLOW)	FULL TITLE	PERIOD	AMOUNT (€)
Consolidación investigadora (CNS 2022)	Dorleta Jiménez de Aberasturi	BREATHin3D: Diseño de modelos pulmonares dinámicos 3D in vitro: Plataformas organotípicas para estudiar la progresión de enfermedades pulmonares y nuevos tratamientos	2023-2025	199,395.00
Proyectos de Generación de Conocimiento (PID 2022) y actuaciones encaminadas a la formación de personal investigador predoctoral (former "Retos", "FPI")	Aitziber L. Cortajarena	PROTHER: Protein based tools and functional biomaterials for biomedical applications	2023-2026	193,750.00
Proyectos de Generación de Conocimiento (PID 2022) y actuaciones encaminadas a la formación de personal investigador predoctoral (former "Retos", "FPI")	Susana Carregal Romero	BiomTher: Biomimetic nanoparticles to improve therapies for lung diseases	2023-2026	150,000.00
Proyectos de Generación de Conocimiento (PID 2022) y actuaciones encaminadas a la formación de personal investigador predoctoral (former "Retos", "FPI")	Dorleta Jiménez de Aberasturi	PhotoCardiModel: Photoactivable Cardiovascular in vitro disease Models	2023-2026	150,000.00

CALL	PL (FELLOW)	FULL TITLE	PERIOD	AMOUNT (€)
Proyectos de Generación de Conocimiento (PID 2022) y actuaciones encaminadas a la formación de personal investigador predoctoral (former "Retos", "FPI")	Maurizio Prato	NEUROGEL: Desarrollo de hidrogeles con alto contenido de nanotubos de carbono para regeneración neuronal	2023-2026	268,750.00
Preparación y Gestión de Proyectos Europeos 2022 (former "Europa Redes y Gestores")	Cristina Díez García	BoostUGIDI: Impulso de la Unidad de Gestión de la I+D+i de CIC biomaGUNE	2023-2024	205,438.72
Redes de Investigación 2022	Jordi Llop / Pedro Ramos Cabrer / Jesús Ruiz-Cabello	DIAMOND: Diagnosis by molecular imaging: basic research and translational development	2023-2025	0.00
Redes de Investigación 2022	Fernando López Gallego	Red Temática de Biocatálisis: Estrategia Sostenible para una Bioeconomía Circular	2023-2025	0.00
Redes de Investigación 2022	Jesús Ruiz-Cabello / Jordi Llop / Pedro Ramos Cabrer	ImBio4Net: Imagen biomédica distribuida en red	2023-2025	0.00
Ayudas para contratos predoctorales para la formación de doctores (FPI 2021)	Sergio Moya	PhD Fellow: Alejandro Fabrega Puentes	2023-2026	100,860.00
Ayudas para contratos Juan de la Cierva - Formación (JDC-F 2021)	Fernando López Gallego	Postdoctoral fellow: Rut Fernández Marín	2023-2025	64,800.00
Ayudas para contratos predoctorales para la formación de doctores 2022 (former FPI)	Aitziber L. Cortajarena / Fernando López Gallego	PhD Fellow: Paula Isla Gangoiti	2023-2027	111,758.00
Ayudas para contratos predoctorales para la formación de doctores 2022 (former FPI)	Jordi Llop / Pedro Ramos Cabrer	PhD Fellow: Mariana M. Coimbrade Almeida	2023-2027	111,758.00
Ayudas para contratos predoctorales para la formación de doctores 2022 (former FPI)	Jesús Ruiz-Cabello / Dorleta Jiménez de Aberasturi	PhD Fellow: Adrián Lluveras Sirés	2023-2027	111,758.00
Ayudas para contratos predoctorales para la formación de doctores 2022 (former FPI)	Sergio Moya	PhD Fellow: Sofia Zuffi	2023-2026	111,758.00
Ayudas para contratos predoctorales para la formación de doctores 2022 (former FPI)	Fernando López Gallego	PhD Fellow: Maialen Iturralde Adarraga	2023-2026	111,758.00
Ayudas para contratos predoctorales para la formación de doctores 2022 (former FPI)	Ander Abarrategi López	PhD Fellow: Pablo Martín Abad	2023-2027	111,758.00
Ayudas para la formación de profesorado universitario (FPU 2021)	Luis M. Liz-Marzán	PhD Fellow: Lara Troncoso	2023-2026	

CALL	PL (FELLOW)	FULL TITLE	PERIOD	AMOUNT (€)
Ayudas a la movilidad para estancias breves y traslados temporales de beneficiarios FPU 2022	Luis M. Liz-Marzán	Research Stay granted to Paula Piñeiro Varela	2023-2023	3,480.00

CALL	PL (FELLOW)	FULL TITLE	PERIOD	AMOUNT (€)
Elkartek 2022 - Fase II	Niels Reichardt	bmG22-2: Terapias avanzadas basadas en Glicobiología para el tratamiento de cáncer y enfermedades infecciosas	2023-2032	873,607.64
Elkartek 2023 - Fase II	Fernando López Gallego	bmG23-1: DESARROLLO DE MATERIALES BIOCATÁLITICOS PARA SU APLICACIÓN EN BIOECONOMÍA Y BIOMEDICINA	2023-2024	849,050.15
Azpitek 2023	Jesús Ruiz-Cabello / Pedro Ramos Cabrer / Jordi Llop	MRI 11.7 Tesla: Actualización del equipo de imagen por resonancia magnética (MRI) 11 Teslas preclínico	2023-2025	955,110.00
BIKAINTEK 2023 - Ayudas para la contratación de personas investigadoras doctoradas y la realización de doctorados industriales en el País Vasco	Fernando López Gallego	HETDERAC: Fabricación de biocatalizadores heterogéneos para la desracemización de oxido-reductiva de monoéteres de glicerol	2023-2025	59,792.62
PREDOC - Ayudas nuevas y renovaciones para el Programa Predoctoral de formación de personal investigador no doctor curso 2022-2023	Dorleta Jiménez de Aberasturi / Malou Henriksen	PhD Fellow: Uxue Aizarna Lopetegui	2023	22,465.17
PREDOC - Ayudas nuevas y renovaciones para el Programa Predoctoral de formación de personal investigador no doctor curso 2022-2023	Fernando López Gallego	PhD Fellow: Daniel Andrés Sanz	2023	22,465.17
PREDOC - Ayudas nuevas y renovaciones para el Programa Predoctoral de formación de personal investigador no doctor curso 2022-2023	Aitziber L. Cortajarena	PhD Fellow: Laura Pérez Fernández	2023	22,465.17
Estrategia IKUR 2022 (QUANTUM, HPC-IA): Convocatoria 2022-2024	Aitziber L. Cortajarena	IKUR HPC-IA: Computational design of novel protein-based catalysts	2023-2024	0.00
Estrategia IKUR 2022 (NEURO, NEUTRIÓNICA): Convocatoria 2022-2024	Pedro Ramos Cabrer	IA-GEMI (IKUR-NEURO C): Optimization of genetic MRI technology	2023-2025	15,500.00
Estrategia IKUR 2022 (NEURO, NEUTRIÓNICA): Convocatoria 2022-2024	Pedro Ramos Cabrer	IKUR (NEURO-B): Avanzando los protocolos de diagnóstico y terapia cognitiva humana	2023-2026	0.00

CALL	PL (FELLOW)	FULL TITLE	PERIOD	AMOUNT (€)
Estrategia IKUR 2022 (NEURO, NEUTRIÓNICA): Convocatoria 2022-2024	Pedro Ramos Cabrer / Aitziber L. Cortajarena / Jesús Ruiz-Cabello / LuisM. Liz-Marzán	NEURODEGENPROT (IKUR-NEURO A): Multidisciplinary approach for the study of CNS proteinopathies (synuclein and TDP-43) due to Basque ancestral mutations in LRRK2 (R1441G) and progranulin genes linked to familial Parkinson and frontotemporal dementia/als complexes	2023-2027	0.00
Estrategia IKUR 2022 (NEURO, NEUTRIÓNICA): Convocatoria 2022-2024	Pedro Ramos Cabrer / Jesús Ruiz-Cabello	MemoryFTO (IKUR-NEURO B): Potenciadores cognitivos. The molecular mechanisms by which Ab controls epitranscriptomics to modulate memory formation	2023-2028	0.00
Estrategia IKUR 2022 (QUANTUM, HPC-IA): Convocatoria 2022-2024	Jesús Ruiz-Cabello	IKUR HPC-IA: Novel applications of medical image and analysis techniques.	2023-2029	38,059.00
Estrategia IKUR 2022 (QUANTUM, HPC-IA): Convocatoria 2022-2024	Maurizio Prato	ReUSED (HPC-IA): UltrA-wide ScrEening of anti-viral Drugs	2023-2030	70,757.00
Estrategia IKUR 2022 (NEURO, NEUTRIÓNICA): Convocatoria 2022-2024	Jordi Llop	ExoPsyCog (IKUR NEURO-B): Brain-derived plasma extracellular vesicles as biomarkers of psychotic disorders: Prediction of cognitive decline and antipsychotic activity	2023-2031	66,013.00
Ayudas a proyectos de cooperación técnica con la Región Estratégica de Quebec, para 2023-2024	Luis M. Liz-Marzán	Gold Conference 2025 (Quebec): The Gold International Conference 2025	2023-2033	5,000.00
Ayudas a proyectos de investigación y desarrollo en salud (RIS3) 2023	Aitziber L. Cortajarena	Glioblastoma (2): Nueva estrategia terapeútica en glioblastoma a través del silenciamiento de la vía de TGF-β	2023	17,833.14
Ayudas a proyectos de investigación y desarrollo en salud (RIS3) 2023	Jordi Llop	Theragac-2: Identificación y caracterización funcional y clínica de nuevos genes implicados en la progresión y la quimiorresistencia del cáncer gástrico	2023	11,675.50
Ayudas a proyectos de investigación y desarrollo en salud (RIS3) 2023	Jesús Ruiz-Cabello	FIBROTERA (2): Enfoque teranóstico integral para la fibrosis basado en nanobiotecnología	2023	44,707.31
Ayudas a proyectos de investigación y desarrollo en salud (RIS3) 2023	Sergio Moya	CART (2): Aplicación de nano-compuestos como sistema de entrega no viral para el desarrollo de terapias CAR-T	2023	28,763.01
Ayudas a proyectos de investigación y desarrollo en salud (RIS3) 2023	Niels Reichardt	BIOCART: Enfoque multiómico y espectroscópico integrado para la identificación de nuevos biomarcadores CAR-T en sangre mediante análisis de aprendizaje automático	2023	20,372.40
Ayudas a proyectos de investigación y desarrollo en salud (RIS3) 2023	Pedro Ramos Cabrer	Papel del proceso de nedilación en el deteriorocognitivo asociado a la edad	2023	14,330.25

CALL	PL (FELLOW)	FULL TITLE	PERIOD	AMOUNT (€)
Ayudas 2023 a proyectos de investigación en ESCLEROSIS MÚLTIPLE de la Fundación Vasca de Innovación e Investigación Sanitarias, BIOEF	Jordi Llop / Pedro Ramos-Cabrer	STOP-MS: Novel therapies to limit demyelination and promote remyelination in progressive multiple sclerosis	2023-2026	22,000.00

Gipuzkoako Foru Aldundia
Diputación Foral de Gipuzkoa

CALL	PL (FELLOW)	FULL TITLE	PERIOD	AMOUNT (€)
Línea I+D: Programa de Red guipuzcoana de Ciencia, Tecnología e Innovación 2023	Jesús Ruiz-Cabello / Jordi Llop / Pedro Ramos Cabrer	PULMOPET: Ventilación pulmonar mediante tomografía por emisión de positrones	2023-2024	92,941.00
Línea Inversión: Programa de Red guipuzcoana de Ciencia, Tecnología e Innovación 2023	Jesús Ruiz-Cabello / Jordi Llop / Pedro Ramos Cabrer	UIM_II_BMG: Proyecto de Ampliación de la Infraestructura de la Unidad de Imagen Molecular en CIC biomaGUNE (Fase II)	2023-2024	100,000.00
Línea GIPUZKOA NEXT: Programa de Red guipuzcoana de Ciencia, Tecnología e Innovación 2023	Fernando López Gallego	REPLAS: Reciclado y valorización enzimático de plásticos	2023-2024	140,061.00
Gipuzkoa QUANTUM 2023	Aitziber L. Cortajarena	QUANTUM: Computación Quántica para diseñar interacciones de Epítopo-Anticuerpo	2023-2024	120,000.00
Proyectos Estratégicos GANTT	Aitziber L. Cortajarena	MOHS-10: Los nanodiamantes como vectores no virales teranósticos en terapias Mirna avanzadas	2023-2024	55,993.75
Proyectos Estratégicos GANTT	Aitor Manteca González / Aitziber L. Cortajarena	QUANCAP: Ingeniería de la Cápside del Virus Adenoasociado mediante Algoritmos de Inspiración Quántica para Terapia Génica	2023-2024	54,000.75
Programa Fellows Gipuzkoa de atracción y retención de talento 2023	Jesús Ruiz-Cabello	MIMA (2): Agentes de Imagen Molecular para el estudio de Enfermedades Cardiacas	2023-2024	40,000.00
Programa Fellows Gipuzkoa de atracción y retención de talento 2023	Aitziber L. Cortajarena	FLUIDEVOPRO (3): Sistemas de cribado y selección microfluídica para evolución dirigida de proteínas	2023-2024	35,000.00
Valorización de Cartera Biotecnológica 2022	Luis M. Liz-Marzán	Desarrollo de modelos complejos de tumores mediante tecnología de bioimpresión en 3D	2023	0.00

FUNDACIÓN RAMÓN ARECES

CALL	PL (FELLOW)	FULL TITLE	PERIOD	AMOUNT (€)
XXI Concurso Nacional para la adjudicación de Ayudas a la Investigación en Ciencias de la Vida y de la Materia 2022	Susana Carregal Romero	NanoSurf: Nanomedicinas basadas en surfactante pulmonar para tratamientos dirigidos al pulmón	2023-2026	116,800.00

La Marató 3

CALL	PL (FELLOW)	FULL TITLE		
Ayudas a la Investigacion biomedica 2021 - enfermedades mentales	Jordi Llop	Imaging glutamatergic transmission and its brain structural and functional correlates during the neurodevelopmental pathway leading to schizophrenia: from rodents to humans	2023-2026	99,750.00

Fundación BBVA

CALL	PL (FELLOW)	FULL TITLE		
Becas Leonardo a Investigadores y Creadores Culturales 2022	Lourdes Marcano	Nano-roBIOts: Uso de nano-robots multifuncionales de origen biológico como agentes terapéuticos	2023-2025	10,118.28

Obra Social Fundació "la Caixa"

CALL	PL (FELLOW)	FULL TITLE		
CaixaImpulse Innovación Convocatoria Salud 2023	Maurizio Prato	RECONNECT: Therapeutic Rewiring of Spinal Injuries using Carbon Nanotubes	2023-2025	50,000.00

EUROREGIÓN EUSKADI NAVARRA EUROREGIÓN

CALL	PL (FELLOW)	FULL TITLE		
EURORREGIÓN Nueva-Aquitania Euskadi Navarra 2022 - Convocatoria de proyectos «Innovación eurorregional»	Aitziber L. Cortajarena / Aitor Manteca	EPINPOC: Ingeniería de epítopos para dispositivos point of care	2023-2024	27,000.00

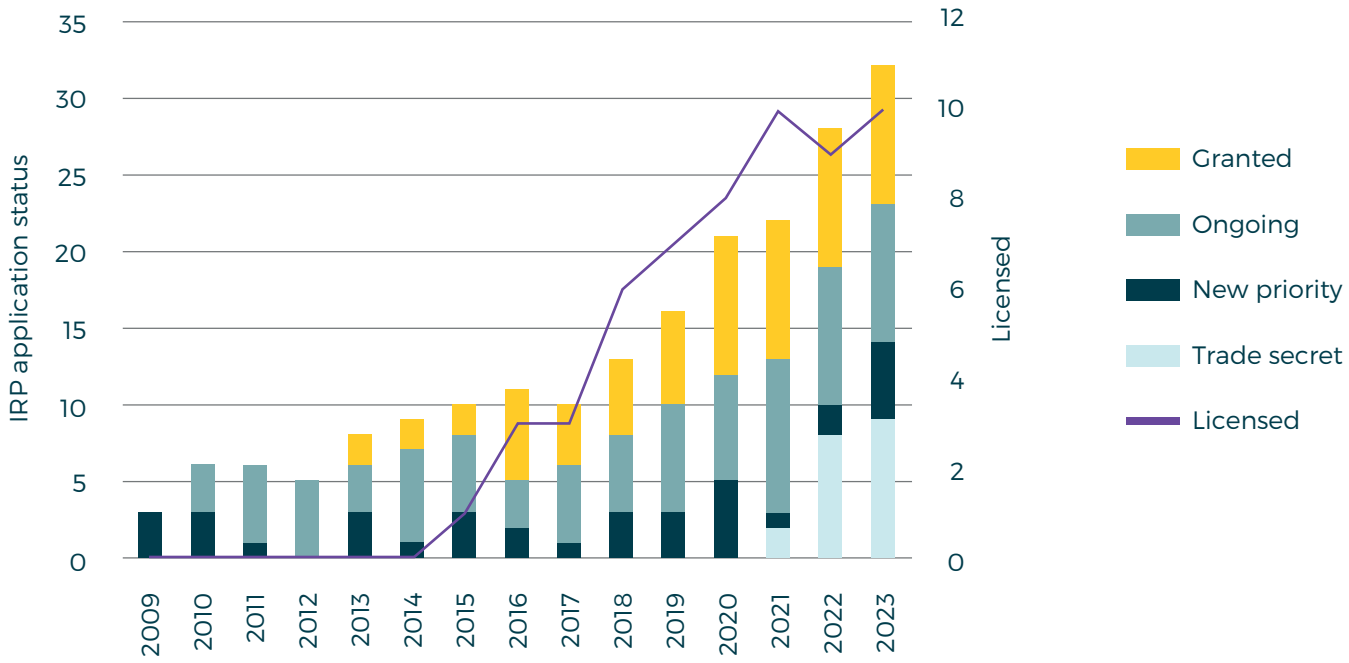
TECHNOLOGY TRANSFER & **INNOVATION**

Irati Aiestaran Zelaia using the PET system funded by AZPITEK - Basque Government (PZ-2021/00006)

The Knowledge and Technology Transfer Unit (TTU) oversees the identification and development of technologies with a clear market potential. The TTU ensures the proper protection of the technologies and results, and promotes their transfer by encouraging their exploitation. Efforts devoted by our researchers with the support of the Technology Transfer Unit in 2023 resulted in **5 priority patent applications, 1 granted patents, 2 trade secrets and 1 software registries**. Moreover, **26 service and research agreements** and **11 technology transfer agreements** were signed with companies and other institutions.

PATENT PRIORITY APPLICATIONS & OTHER IP

The generation of patents is one of the instruments that indicates the transfer of knowledge from the Center to society. The figure below shows the evolution of the IP portfolio over the years:



Patent & Utility Model Applications

Bioprinted three-diensional Tumor model
L. M. Liz-Marzán. A. Izeta. M. Henriksen. D. Jimenez de Aberasturi. P. Vázquez. C. García. P. González Callejo
EP23382142.0 (15/02/2023)

Self-standing hydrogels based on poly(vinyl alcohol) and carbon nanostructures
M. Prato. N. Alegret. B. Daou
EP23382781.5 (27/07/2023)

Method for estimating the ventricular stroke volume from the pulmonary artery pressure.
J.M. Ruiz-Cabello. A. de J. Santos Oviedo
EP23382143.8 (15/02/2023)

Hybrid composite for tuning local nanoactuation over enzyme activity, without tuning MNP anisotropy
F. López Gallego. J. Cejudo Sanches. L. Trobo Maseda. J. Rocha Martín. J. M. Guisán. J. Ovejero. M. del P. Morales. F. Bussolari. L. Armenia. J. Martínez de la Fuente. V. Grazú
EP23382002.6 (03/01/2023)

Array con forma volumétrica para Imagen de Resonancia Magnética [Array with volumetric shape for magnetic resonance imaging]
J. M. Ruiz-Cabello. P. Villa Valverde. A. Santos Lleó
U202330363 (06/03/2023)

Granted Patents

Method and apparatus for the cardiovascular assessment of a subject in need thereof
J. M. Ruiz Cabello. A. de J. Santos Oviedo
EP3752047 (06/12/2023)

Licensed Patents & Other IP Rights

Procedure for the immobilization of biomolecules on latex particles
A. L. Cortajarena. J. Leon. L. Saa
Trade Secret (18/01/2023)

Know-how of Magnetic Resonance Imaging Lab
Magnetic Resonance Imaging Lab
Trade Secret (18/07/2023)

INDUSTRIAL & CLINICAL COLLABORATIONS

Collaboration with companies and health institutes has significantly increased and several technical services by our technological platforms, contributing to transfer of knowledge to industry with a total private funding amounting to 2.4 M€. This activity has a sharp focus on innovation to which CIC biomaGUNE contributes with scientific knowledge. Joint projects under development include privately funded research activities as well as research contracts and consultancy services.

During 2023, besides several technical services provided by our Technological Platforms, the following agreements and services with public and private partners were signed:

26 Service and Research Agreements

11 Technology Transfer Agreements

SPIN-OFFS

Hylezitek, a new CRO spin-off specializing in preclinical molecular imaging services for drug development, was launched in 2022, reaching a turnover of 771 k€ in 2023. We continued supporting our spin-off Asparia Glycomics, founded in 2016, which markets leading technology from the Glycotechnology Lab, with a turnover of 1M€ in 2023.

Asparia Glycomics

www. aspariaglycomics.com

In 2016, CIC biomaGUNE researchers and private investors joined efforts to set up **Asparia Glycomics**, a spin-off company specialized in the production and marketing of reagents, reference standards, kits and software, intended for glycan analysis in clinical diagnosis and for quality control of biopharmaceuticals.

The business initiative markets the leading technology developed by CIC biomaGUNE's Glycotechnology Laboratory, directed by Niels C. Reichardt, to quantify and identify glycans more accurately and faster than existing solutions on the market. Asparia Glycomics offers unique, stable, isotope labeled glycans as internal standards, custom made quantification software and reagents for glycan analysis by mass spectrometry.

Asparia Glycomics' line of work is based on the development of its own technology that can be useful for the diagnosis and prognosis of cancer, diabetes or autoimmune diseases such as rheumatoid arthritis, among others.

The products and technology developed by the Glycotechnology Laboratory, reviewed and validated by the CIC biomaGUNE Development Unit are aimed at researchers, academia and pharmaceutical companies around the world.

Since 2020, after a change in management, the company has broken even and has established itself as a reliable provider of cutting-edge glycan analysis and synthesis projects for leading biotech companies and academic researchers worldwide.

HYLEZITEK

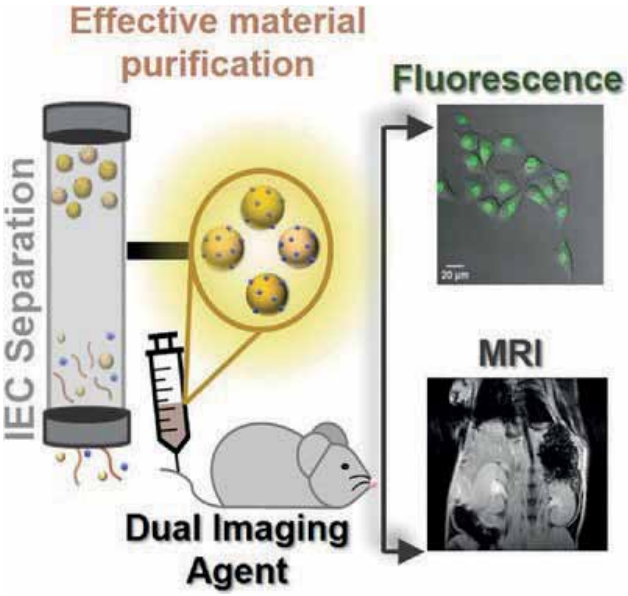
www.hylezitek.es

Incorporated in September 2022, HYLEZITEK is a company 100% owned by CIC biomaGUNE specialized in the provision of services related to research, innovation and development in biomaterials including the development of longitudinal and multimodal studies in the preclinical field, as well as the development applications in the areas of Preclinical Molecular and Functional Imaging and Nanomedicine.

INTERNATIONAL LEADERSHIP: **SCIENTIFIC EXCELLENCE**

The scientific production of our 11 research groups maintained a remarkable quality and impact. We published over **140 articles** in high profile journals, 46% articles were led by CIC biomaGUNE researchers, 57% include international collaboration, 58% national collaboration and 24% internal collaboration. The **Impact factor** of the overall production continues increasing reaching **10,7** in 2023 and **11,085 citations**.

HIGHLIGHTS



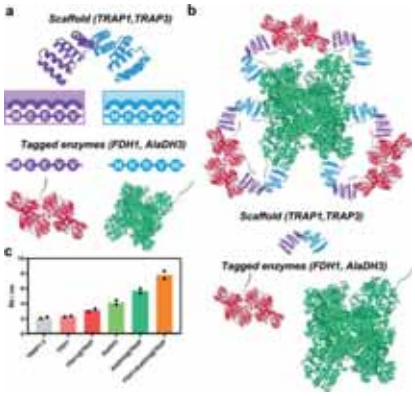
Luminescent Carbon Nanodots Doped with Gadolinium (III): Purification Criteria, Chemical and Biological Characterization of a New Dual Fluorescence/MR Imaging Agent

Cardo, L; Martínez-Parra, L; Cesco, M; Echeverría-Beistegui, BM; Martínez-Moro, M; Herrero-Álvarez, N; Cabrerizo, M; Carregal-Romero, S; Ramos-Cabrer, P; Ruiz-Cabello, J; Prato, M.

Small, **2023**, *19*, 2206442

DOI: **10.1002/smll.202206442**

Carbon Dots (CDs) are luminescent quasi-spherical nanoparticles, possessing water solubility, high biocompatibility, and tunable chemical and physical properties for a wide range of applications, including nanomedicine and theranostics. The evaluation of new purification criteria, useful to achieve more reliable CDs, free from the interference of artifacts, is currently an object of debate in the field. Here, new CDs doped with gadolinium (Gd (III)), named Gd@CNDs, are presented as multifunctional probes for Magnetic Resonance Imaging (MRI). This new system is a case of study, to evaluate and/or combine different purification strategies, as a crucial approach to generate CDs with a better performance. Indeed, these new amorphous Gd@CNDs display good homogeneity, and they are free from emissive side products. Gd@CNDs (7–10 nm) contain 7% of Gd (III) w/w, display suitable and stable longitudinal relaxivity (r_1) and with emissive behavior, therefore potentially useful for both MR and fluorescence imaging. They show good biocompatibility in both cellular and in vivo studies, cell permeability, and the ability to generate contrast in cellular pellets. Finally, MRI recording T1-weighted images on mice after intravenous injection of Gd@CNDs, show signal enhancement in the liver, spleen, and kidney 30 min postinjection.

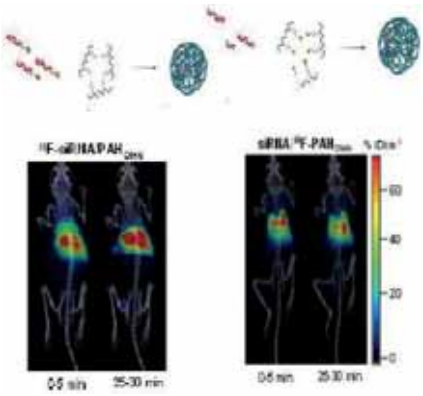


Engineered repeat proteins as scaffolds to assemble multi-enzyme systems for efficient cell-free biosynthesis

Ledesma-Fernandez, A; Velasco-Lozano, S; Santiago-Arcos, J; López-Gallego, F; Cortajarena, AL.

Nature Commun. **2023**, *14*, 2587
DOI: **10.1038/s41467-023-38304-z**

Multi-enzymatic cascades with enzymes arranged in close-proximity through a protein scaffold can trigger a substrate channeling effect, allowing for efficient cofactor reuse with industrial potential. However, precise nanometric organization of enzymes challenges the design of scaffolds. In this study, we create a nanometrically organized multi-enzymatic system exploiting engineered Tetrapeptide Repeat Affinity Proteins (TRAPs) as scaffolding for biocatalysis. We genetically fuse TRAP domains and program them to selectively and orthogonally recognize peptide-tags fused to enzymes, which upon binding form spatially organized metabolomes. In addition, the scaffold encodes binding sites to selectively and reversibly sequester reaction intermediates like cofactors via electrostatic interactions, increasing their local concentration and, consequently, the catalytic efficiency. This concept is demonstrated for the biosynthesis of amino acids and amines using up to three enzymes. Scaffolded multi-enzyme systems present up to 5-fold higher specific productivity than the non-scaffolded ones. In-depth analysis suggests that channeling of NADH cofactor between the assembled enzymes enhances the overall cascade throughput and the product yield. Moreover, we immobilize this biomolecular scaffold on solid supports, creating reusable heterogeneous multi-functional biocatalysts for consecutive operational batch cycles. Our results demonstrate the potential of TRAP-scaffolding systems as spatial-organizing tools to increase the efficiency of cell-free biosynthetic pathways.

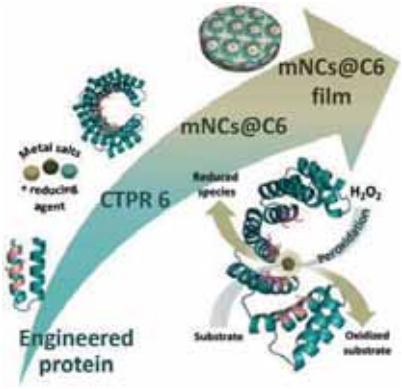


Positron Emission Tomography Studies of the Biodistribution, Translocation, and Fate of Poly Allyl Amine-Based Carriers for Sirna Delivery by Systemic and Intratumoral Administration

Simo, C; Salvador, C; Andreozzi, P; Gomez-Vallejo, V; Romero, G; Dupin, D; Llop, J; Moya, SE.

Small, **2023**, *19*, 2304326
DOI: **10.1002/smll.202304326**

Polyamine-based vectors offer many advantages for gene therapy, but they are hampered by a limited knowledge on their biological fate and efficacy for nucleic acid delivery. The ^{18}F radiolabeled siRNA is complexed with poly(allyl amine) hydrochloride (PAH), PEGylated PAH (PAH_{PEG}), or oleic acid-modified PAH (PAH_{Oleic}) to form polyplexes, and injected them intravenously into healthy rodents. The biodistribution patterns obtained by positron emission tomography (PET) imaging vary according to the polymer used for complexation. Free siRNA is quickly eliminated through the bladder. PAH and oleic acid modify PAH polyplexes accumulate in the lungs and liver. No elimination through the bladder is observed for PAH and PAH_{Oleic} within 2 h after administration. PAH_{PEG} polyplexes accumulate in kidneys and are eliminated through the bladder. Polyplexes prepared with ^{18}F-labeled oleic acid-modified PAH and non-labeled siRNA show similar biodistribution to those prepared with labeled siRNA, but with more accumulation in the lungs due to the presence of non-complexed polymer. Intravenous administration of PAH_{Oleic} polyplexes in tumor models results in a limited availability of siRNA. When PAH_{Oleic} polyplexes are administered intratumorally in tumor bearing rodents, ≈40% of the radioactivity is retained in the tumor after 180 min while free siRNA is completely eliminated.



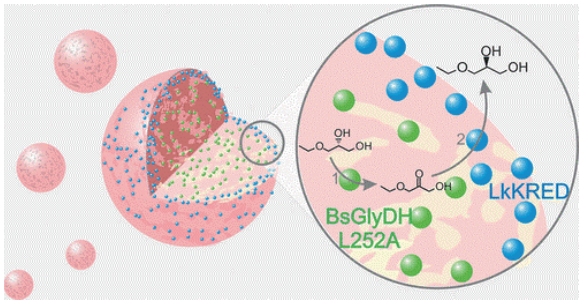
An Emerging Nanozyme Class for à la carte Enzymatic-Like Activities based on Protein-Metal Nanocluster Hybrids

López-Domene, R; Vázquez-Díaz, S; Modin, E; Beloqui, A; Cortajarena, AL.

Adv. Funct. Mater. **2023**, *33*, 2301131

DOI: **10.1002/adfm.202301131**

In this study, the goal is to fabricate robust and highly efficient peroxidase-like nanozymes that can ultimately be assembled into films for their easy reuse in catalytic cycles. Nanozymes are designed by mimicking the strategy adopted by metalloproteins to accommodate metal cofactors within their protein structure. The engineered consensus tetratricopeptide repeat (CTPR) protein module is selected as the scaffold to guide the growth and the stabilization of a library of in situ synthesized metal nanoclusters. A deep investigation of the interplay between the composition and function of the nanozymes reveals the impact of the protein templates and nanocluster composition on the peroxidase-like activity of the hybrids. Moreover, among a total of 24 hybrids, a top-performing nanozyme results from the growth of Au/Pt bimetallic nanoclusters on a CTPR protein with engineered histidine coordination sites. These nanozymes exhibit improved thermostability and resistance to hydrogen peroxide compared to natural peroxidases like horseradish peroxidase. Finally, it shows the easy fabrication of nanozyme composite films guided throughout the intrinsic self-assembling properties of the CTPR scaffold. These heterogeneous solid materials are reused in several reaction cycles without significant loss of the catalytic performance, proving these protein-templated nanozymes as an advantageous alternative to natural enzymes.



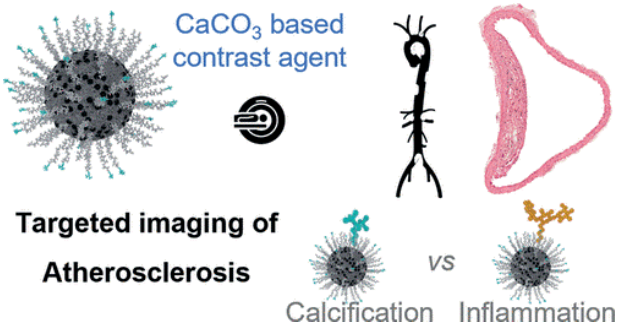
Spatial Organization of Immobilized Multienzyme Systems Improves the Deracemization of Alkyl Glyceryl Ethers

Grajales-Hernández, DA; Diamanti, E; Moro, R; Velasco-Lozano, S; Pires, E; López-Gallego, F.

ACS Catalysis, **2023**, *13*, 15620

DOI: **10.1021/acscatal.3c02615**

Production of enantiomerically pure molecules is of utmost importance in the pharma industry. In this context, biocatalysis emerges as an alternative to conventional chemical methods due to the exquisite selectivity and specificity underlying the enzymes. In this work, we design a multienzymatic system to perform the deracemization of alkyl glyceryl ethers as potential building blocks for the synthesis of drugs. The key to success in this route is controlling the spatial organization of the enzymes involved in the cascade through their immobilization on porous carriers. By fine tuning the intraparticle organization of an enzymatic cascade comprising an (S)-selective glycerol dehydrogenase from Bacillus stearothermophilus and an (R)-selective ketoreductase from Lactobacillus kefir, we performed the oxidoreductive deracemization of rac-alkyl/aryl glyceryl ethers with a yield up to 100% and enantiomeric excess e.e. > 99%, otherwise impossible using a soluble system. Remarkably, we find that optimal spatial assembly of the biocatalyst ameliorates the inhibition phenomena experimented by the system and increases the deracemization rate by 4-fold. Finally, integrating an enzymatic nicotinamide adenine dinucleotide oxidized disodium salt (NAD^+) regeneration system to the heterogeneous biocatalyst, we intensified the process by reusing it in discontinuous and consecutive batch cycles and scaling the reaction up to 250 mM substrate, achieving 100% yield and e.e. > 99%

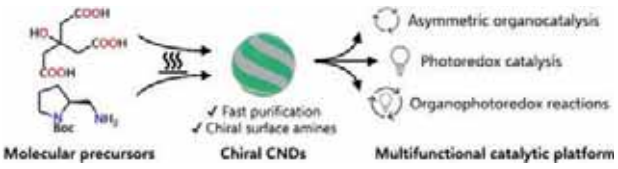


A Comparative Study of Ultrasmall Calcium Carbonate Nanoparticles for Targeting and Imaging Atherosclerotic Plaque

Martínez-Parra, L; Piñol-Cancer, M; Sanchez-Cano, C; Miguel-Coello, AB; Di Silvio, D; Gomez, AM; Uriel, C; Plaza-García, S; Gallego, M; Pazos, R; Groult, H; Jeannin, M; Geraki, K; Fernández-Méndez, L; Urkola-Arsuaga, A; Sánchez-Guisado, MJ; Carrillo-Romero, J; Parak, WJ; Prato, M; Herranz, F; Ruiz-Cabello, J; Carregal-Romero, S.

ACS Nano **2023**, *17*, 13811–13825
DOI: **10.1021/acsnano.3c03523**

Atherosclerosis is a complex disease that can lead to life-threatening events, such as myocardial infarction and ischemic stroke. Despite the severity of this disease, diagnosing plaque vulnerability remains challenging due to the lack of effective diagnostic tools. Conventional diagnostic protocols lack specificity and fail to predict the type of atherosclerotic lesion and the risk of plaque rupture. To address this issue, technologies are emerging, such as noninvasive medical imaging of atherosclerotic plaque with customized nanotechnological solutions. Modulating the biological interactions and contrast of nanoparticles in various imaging techniques, including magnetic resonance imaging, is possible through the careful design of their physicochemical properties. However, few examples of comparative studies between nanoparticles targeting different hallmarks of atherosclerosis exist to provide information about the plaque development stage. Our work demonstrates that Gd (III)-doped amorphous calcium carbonate nanoparticles are an effective tool for these comparative studies due to their high magnetic resonance contrast and physicochemical properties. In an animal model of atherosclerosis, we compare the imaging performance of three types of nanoparticles: bare amorphous calcium carbonate and those functionalized with the ligands alendronate (for microcalcification targeting) and trimannose (for inflammation targeting). Our study provides useful insights into ligand-mediated targeted imaging of atherosclerosis through a combination of in vivo imaging, ex vivo tissue analysis, and in vitro targeting experiments.

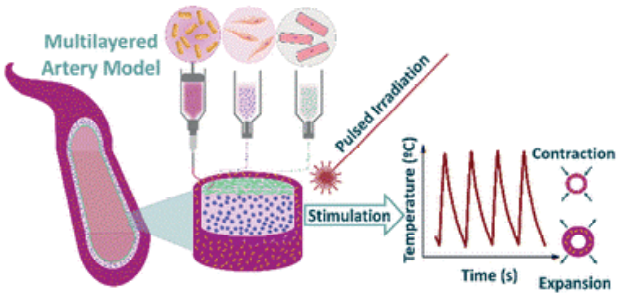


Chiral Carbon Nanodots Can Act as Molecular Catalysts in Chemical and Photochemical Reactions

Bartolomei, B; Corti, V; Prato, M.

Angew. Chem. Int. Ed, **2023**, *62*, e202305460
DOI: **10.1002/anie.202305460**

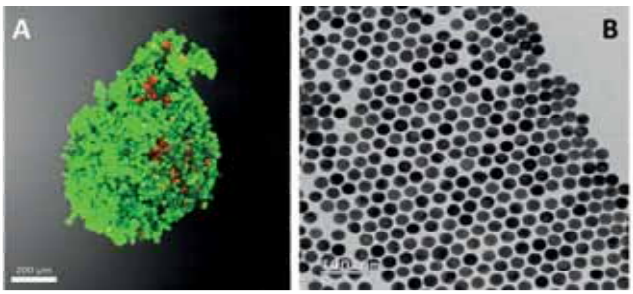
A new type of chiral carbon nanodots (CNDs) is synthesized through a hydrothermal treatment of molecular precursors. The surface amino functionalities along with the photophysical and redox properties of the material allowed its exploitation as a multifunctional catalytic platform. The CNDs promote enantioselective organocatalytic reactions, photochemical processes and organophotoredox transformations.



Remodeling arteries: studying the mechanical properties of 3D-bioprinted hybrid photoresponsive materials

Aizarna-Lopetegui, U; García-Astrain, C; Renero-Lecuna, C; González-Callejo, P; Villaluenga, I; del Pozo, MA; Sánchez-Álvarez, M; Henriksen-Lacey, M; Jimenez de Aberasturi, D.
J. Mater. Chem. B, **2023**, *11*, 9431
DOI: **10.1039/D3TB01480K**

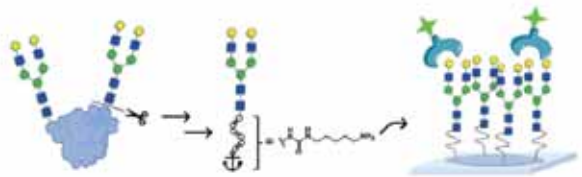
3D-printed cell models are currently in the spotlight of medical research. Whilst significant advances have been made, there are still aspects that require attention to achieve more realistic models which faithfully represent the in vivo environment. In this work we describe the production of an artery model with cyclic expansive properties, capable of mimicking the different physical forces and stress factors that cells experience in physiological conditions. The artery wall components are reproduced using 3D printing of thermoresponsive polymers with inorganic nanoparticles (NPs) representing the outer tunica adventitia, smooth muscle cells embedded in extracellular matrix representing the tunica media, and finally a monolayer of endothelial cells as the tunica intima. Cyclic expansion can be induced thanks to the inclusion of photo-responsive plasmonic NPs embedded within the thermoresponsive ink composition, resulting in changes in the thermoresponsive polymer hydration state and hence volume, in a stimulated on–off manner. By changing the thermoresponsive polymer composition, the transition temperature and pulsatility can be efficiently tuned. We show the direct effect of cyclic expansion and contraction on the overlying cell layers by analyzing transcriptional changes in mechanoresponsive mesenchymal genes associated with such microenvironmental physical cues. The technique described herein involving stimuli-responsive 3D printed tissue constructs, also described as four- dimensional (4D) printing, offers a novel approach for the production of dynamic biomodels.



SERS analysis of cancer cell-secreted purines reveals a unique paracrine crosstalk in MTAP-deficient tumors

Valera, PS; Plou, J; García, I; Astobiza, I; Viera, C; M. Aransay, A; Martin, JE; Sasselli, IR; Carracedo, A; Liz-Marzán, LM.
Proc. Natl. Acad. Sci. U.S.A., **2023**, *120*, e2311674120
DOI: **10.1073/pnas.2311674120**

The tumor microenvironment (TME) is a dynamic pseudoorgan that shapes the development and progression of cancers. It is a complex ecosystem shaped by interactions between tumor and stromal cells. Although the traditional focus has been on the paracrine communication mediated by protein messengers, recent attention has turned to the metabolic secretome in tumors. Metabolic enzymes, together with exchanged substrates and products, have emerged as potential biomarkers and therapeutic targets. However, traditional techniques for profiling secreted metabolites in complex cellular contexts are limited. Surface-enhanced Raman scattering (SERS) has emerged as a promising alternative due to its nontargeted nature and simplicity of operation. Although SERS has demonstrated its potential for detecting metabolites in biological settings, its application in deciphering metabolic interactions within multicellular systems like the TME remains underexplored. In this study, we introduce a SERS-based strategy to investigate the secreted purine metabolites of tumor cells lacking methylthioadenosine phosphorylase (MTAP), a common genetic event associated with poor prognosis in various cancers. Our SERS analysis reveals that MTAP-deficient cancer cells selectively produce methylthioadenosine (MTA), which is taken up and metabolized by fibroblasts. Fibroblasts exposed to MTA exhibit: i) molecular reprogramming compatible with cancer aggressiveness, ii) a significant production of purine derivatives that could be readily recycled by cancer cells, and iii) the capacity to secrete purine derivatives that induce macrophage polarization. Our study supports the potential of SERS for cancer metabolism research and reveals an unprecedented paracrine crosstalk that explains TME reprogramming in MTAP-deleted cancers.



A Versatile Urea Type Linker For Functionalisation of Natural Glycans and its Validation in Glycan Arrays

Serna, S; Artschwager, R; Pérez-Martínez, D; Lopez, R; Reichardt, N.

Chem. Eur. J. **2023,** *29*, e202301494
DOI: **10.1002/chem.202301494**

The isolation from organisms and readily available glycoproteins has become an increasingly convenient source of N-glycans for multiple applications including glycan microarrays, as reference standards in glycan analysis or as reagents that improve bioavailability of protein and peptide therapeutics through conjugation. A problematic step in the isolation process on a preparative scale can be the attachment of a linker for the improved purification, separation, immobilization and quantification of the glycan structures. Addressing this issue, we firstly aimed for the development of an UV active linker for a fast and reliable attachment to anomeric glycosylamines via urea bond formation. Secondly, we validated the new linker on glycan arrays in a comparative study with a collection of N-glycans which were screened against various lectins. In total, we coupled four structurally varied N-glycans to four different linkers, immobilized all constructs on a microarray and compared their binding affinities to four plant and fungal lectins of widely described specificity. Our study shows that the urea type linker showed an overall superior performance for lectin binding and once more, highlights the often neglected influence of the choice of linker on lectin recognition.

COVER PAGES

Expanding the substrate scope of acyltransferase LovD9 for the biosynthesis of statin analogues.
García-Marquina, G; Núñez-Franco, R; Grajales-Hernández, D; Jiménez-Oses, G; López-Gallego, F.
Chem. Eur. J. **2023**, *29*, e202300911

Remodeling arteries: studying the mechanical properties of 3D-bioprinted hybrid photoresponsive materials.
Aizarna-Lopetegui, U; García-Astrain, C; Renero-Lecuna, C; González-Callejo, P; Villaluenga, I; del Pozo, MA; Sánchez-Álvarez, M; Henriksen-Lacey, M; Jimenez de Aberasturi, D.
J. Mater. Chem. B **2023**, *11*, 9431-9442

Bioinspired chiral inorganic nanomaterials.
Cho, NH; Guerrero-Martínez, A; Ma, J; Bals, S; Kotov, NA; Liz-Marzán, LM; Nam, KT.
Nat. Rev. Bioeng. **2023**, *1*, 88-106

Shining Light on Carbon Dots: New Opportunities in Photocatalysis.
Sbacchi, M; Mamone, M; Morbiato, L; Gobbo, P; Filippini, G; Prato, M.
ChemCatChem **2023**, *15*, e202300667

Transformable Plasmonic Helix with Swinging Gold Nanoparticles.
Peil, A; Zhan, P; Duan, X; Krahne, R; Garoli, D; Liz-Marzán, LM; Liu, N.
Angew. Chem. Int. Ed. **2023**, *62*, e202213992

Predicting the size and morphology of nanoparticle clusters driven by biomolecular recognition.
Palacios-Alonso, P; Sanz-de-Diego, E; Peláez, RP; Cortajarena, AL; Teran, FJ; Delgado-Buscalioni, R
Soft Matter **2023**, *16*, 8929-8944

Direct Bottom-Up In Situ Growth: A Paradigm Shift for Studies in Wet-Chemical Synthesis of Gold Nanoparticles.
Vinnacombe-Willson, GA; Conti, Y; Stefancu, A; Weiss, PS; Cortes, E; Scarabelli, L
Chem. Rev. **2023**, *123*, 8488-8529

Chiral Seeded Growth of Gold Nanorods Into 4-Fold Twisted Nanoparticles with Plasmonic Optical Activity.
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Adv. Mater. **2023**, *35*, 2208299

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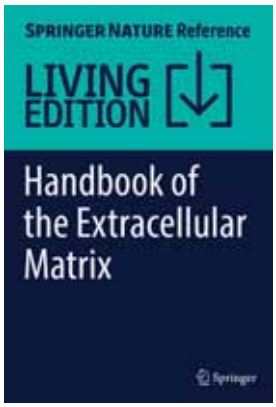

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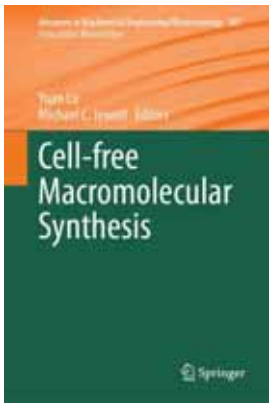

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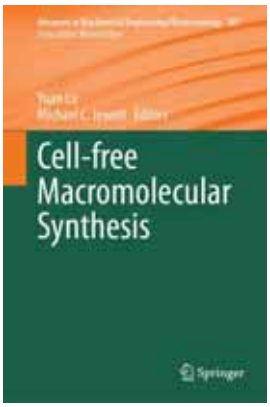

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AWARDS & RECOGNITIONS

International recognition of academic excellence is also reflected by **prestigious awards**.

CIC biomaGUNE Accreditations

AAALAC Accreditation to CIC biomaGUNE's animal facilities
CIC biomaGUNE received the AAALAC accreditation in 2015 for the first time, and the accreditation was renewed in 2018, 2021 and 2024.

The Molecular & Functional Imaging Facility renewed its recognition as **Singular Scientific and Technical Infrastructure** (ICTS in Spanish).

Certification of CIC biomaGUNE RD&I management system according to **UNE 166002:2021** standard.

Seal of Excellence in Human Resources "**HR Excellence in Research**" from the European Commission since 2021.

In 2018 CIC biomaGUNE earned the accreditation as a "**María de Maeztu Unit of Excellence**", the highest recognition of scientific excellence in Spain awarded by the Spanish State Research Agency (AEI).

Awards, Academy Memberships & Honorary Degrees

- **Luis M. Liz-Marzán** received the **2023 ChinaNano Award**. 28/08/2023
- **Aitziber L. Cortajarena**. The Melisa (FastAb) project (led by Aitziber L. Cortajarena) finalist 33rd edition of the **Toribio Echevarria Awards** for innovative entrepreneurship in the Ideas/Business Projects category. 05/06/2023
- **Luis M. Liz-Marzán** awarded the **Materials Science Leader Award**, of the Research.com site. 01/06/2023
- **Maurizio Prato** awarded with the **E-MRS 5-Year Materials Impact Prize**. 30/05/2023
- **Aitziber L. Cortajarena** elected **Corresponding academician of the Royal Academy of Sciences**. 11/05/2023
- **Luis M. Liz-Marzán** received the **Honorary Doctor by the University of Antwerp**. 30/03/2023
- **Jordi Llop** named **Vice President of the European Society for Molecular Imaging**. 20/03/2023
- **Luis M. Liz-Marzán** awarded the **Lourenço-Medinaveitia Award** of the Portuguese Society of Chemistry (SPQ). 28/02/2023
- **Luis M. Liz-Marzán** elected **International Member of the National Academy of Engineering**. 07/02/2023

Best PhD Theses

- **Javier Plou Izquierdo**, received **Best PhD Thesis Award** from the Grupo Especializado de Nanociencia y Materiales Moleculares (GENAM) of the Real Sociedad Española de Química and the Real Sociedad Española de Física. 06/07/2023
- **Javier Plou Izquierdo**, awarded with the **Extraordinary PhD Award** of the UPV/EHU 2021-2022. 10/07/2023
- **Charles Williams** awarded the **Extraordinary PhD Award** of the UPV/EHU 2020-2021. 20/07/2023
- **Elisa Lenzi Best PhD Thesis Award** in Nanomedicine 2022/2023, awarded by Conexión Nanomedicina CSIC & Grupo Especializado de Coloides e Interfases de la RSEQ y RSEF. 20/09/2024
- **Javier Plou Izquierdo,** received an **Honorable Mention of his PhD Thesis** from the Grupo Especializado de Coloides e Interfases (GECI) of the Real Sociedad Española de Química and the Real Sociedad Española de Física. 20/11/2023
- **Javier Plou Izquierdo**, awarded with the **"Handira Jo" Award** for the Best UPV/EHU Doctoral Thesis with Business Potential. 22/12/2023

Best Talk/Poster

- **Gunnar Klös** awarded with the **Best poster Award** at the XVII International Congress of the Spanish Biophysical Society (SBE). 03/07/2023
- **Gabriela Guedes** awarded the **Journal of Material Science: Materials in Medicine Oral Presentation Award**. 11/09/2023
- **Goretti Arias Ferreiro** awared **Best Postdoc Presentation** in the 11th Congress of young researchers in polymers. 10/10/2023

EMBO Fellowships

Gabriela Guedes, PhD student at the Biomolecular Nanotechnology group, granted an EMBO Fellowship in 2023, conducted her research at the Department of Pharmacology, University of Cambridge, in Cambridge, United Kingdom, for 3 months. Her project, "Protein design as a tool towards a customizable theranostic agent," explores innovative approaches in protein engineering for diagnostics and therapy.

Rocío López Domene, PhD student at the Biomolecular Nanotechnology group, received an EMBO Fellowship in 2023, joined the Instituto Lavoisier de Versailles in France for 3 months. Her project on the "Immobilization of nanozymes with Metal-Organic Frameworks"

EMBO Fellows at CIC biomaGUNE. From left to right:
Rocío López Domene, Gabriela Guedes, Laura Pérez-Chirinos Lallana and Irati Aiestaran Zelaia

investigates the potential of nanozymes in catalysis and their immobilization techniques for enhanced functionality.

Laura Pérez-Chirinos Lallana, member of the Biomolecular Nanotechology group, received an EMBO Fellowship in 2023 for research at the University of Groningen in The Netherlands for 3 months. Her project, "Employing molecular dynamic simulations to reveal the molecular-level and supramolecular interactions of peptide-based assemblies," aims to understand the interactions at the molecular level that drive the formation of peptide-based structures.

Peio Azcoaga Azcoaga, PhD student at the Molecular and Functional Biomarkers group, received an EMBO Fellowship in 2023 to spent 5 months at the VIB-KU Leuven Center for Cancer Biology in Leuven, Belgium. His project, "The role of oncostatin M cytokine in cancer metabolism and metastasis," focuses on understanding the contributions of specific cytokines in cancer progression and metastasis.

	2021	2022	2023
Awards, Academy Memberships And Honorary Degrees	7	5	9
Best PhD Theses		2	6
Best Talk/Poster	8	10	3
EMBO Fellowships		3	4
	15	**20**	**22**

TRAINING & **CAREER DEVELOPMENT**

Sefora Alessandra Scibetta

In 2023 there have been **99** active **PhD theses**, **11** of them defended during the year. Our researchers performed **37** secondments at collaborating institutions, and we hosted **115** stays of visiting researchers. The Center has organized **52** seminars, **3** workshops/conferences and our researchers have participated as co-organizers of **10** international conferences.

TRAINING INITIATIVES FOR GRADUATE STUDENTS

Postdoctoral Program

Postdoctoral researchers are hired at CIC biomaGUNE for periods of 1-5 years. During this time, postdoctoral researchers broaden and deepen their research skills and boost their career perspectives so they can become independent research scientists. Researchers gain training-through-research, by means of individual personalized projects under the guidance of a group leader and receive hands-on-training for developing scientific skills and transferrable skills.

PhD Program

The objective of CIC biomaGUNE's PhD Program is to provide PhD students with top quality multidisciplinary training at the interface between biology, chemistry, nanobiotechnology and materials science. The students benefit from international training and are exposed to different research areas. The training program offers weekly lectures by leading scientists, technical training courses on a broad range of scientific techniques and instrumentation, opportunities for short stays at renowned international research institutions, as well as complementary training in soft skills to prepare doctoral candidates to become highly qualified, autonomous and skilled professionals. The joint training of PhD candidates fosters closer ties and cooperation between research groups and researchers of the institutions involved.

In partnership with the **University of the Basque Country (UPV/EHU)**, CIC biomaGUNE participates in the following Doctoral programs:

- **Synthetic & Industrial Chemistry**
- **Applied Chemistry & Polymeric Materials**
- **Molecular Biology & Biomedicine**
- **Medicine & Surgery**
- **Biomedical Research**

Co-supervised PhD Scheme

Since 2016, CIC biomaGUNE is running a program of co-supervised (and co-funded) PhD theses, in collaboration with other research institutions, technology centers and enterprises in the Basque Country. In 2023, 41 PhD theses were co-directed with the following institutions:

- **UPV-EHU – University of the Basque Country**
- **POLYMAT- Basque Center for Macromolecular Design & Engineering**
- **ACHUCARRO - Basque Center for Neuroscience**
- **BIOFISIKA- Basque Center for Biophysics**
- **DIPC – Donostia International Physics Center**
- **CIC bioGUNE**
- **CIC nanoGUNE**
- **IIS BIOBIZKAIA**
- **IIS BIOGIPUZKOA**
- **TECNALIA**
- **GAIKER**
- **CIDETEC**

Industrial PhD Scheme

CIC biomaGUNE has agreements with industrial partners to conduct industrially oriented PhD research projects.

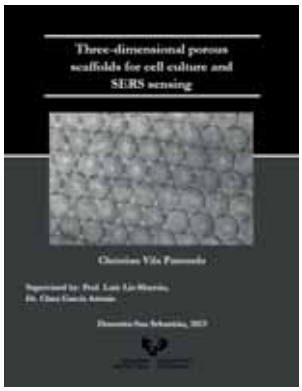
Completed PhD Theses

During 2023, 11 students obtained their PhD at CIC biomaGUNE.

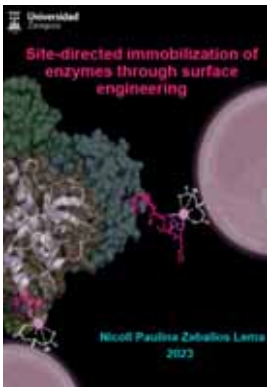
Palmira Villa Valverde
Design of an RF Coil System for Fluorine Magnetic Resonance Imaging Applications
Supervisor: Prof. Jesús Ruiz Cabello (CIC biomaGUNE) & Dr. Andrés Santos Lleó (Polytechnic University of Madrid)
Defense Date: 01/02/2023

Cristina de la Encarnación Bermúdez
Magnetic-plasmonic nanoparticles for multimodal bioimaging and hyperthermia
Supervisors: Prof. Luis M. Liz Marzán (CIC biomaGUNE) & Dr. Dorleta Jiménez de Aberasturi (CIC biomaGUNE)
Defense Date: 01/02/2023

Lucía Fadón
Characterization of environment-related endophenotypes in pulmonary hypertension
Supervisor: Prof. Jesús Ruiz-Cabello (CIC biomaGUNE) & Dr. Edurne Berra (CIC bioGUNE)
Defense Date: 02/03/2023



Christian Vila Parrondo
Three-dimensional porous scaffolds for cell culture and SERS sensing
Supervisors: Prof. Luis M. Liz-Marzán (CIC biomaGUNE) & Dr. Clara García Astrain (CIC biomaGUNE)
Defense Date: 20/03/2023



Nicoll Paulina Zeballos Lema
Site-directed immobilization of enzymes through surface engineering
Supervisor: Prof. Fernando López-Gallego
Defense Date: 17/05/2023

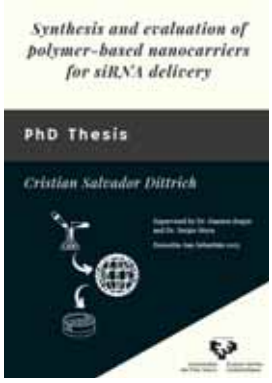
Laura Filomena Mazzei
Engineering hybrid nanostructures for the photocatalytic activation of Pt(IV) prodrugs
Supervisors: Prof. Aitziber L. Cortajarena (CIC biomaGUNE) & Dr. Luca Salassa (Donostia International Physics Center-DIPC)
Defense Date: 09/06/2023

Ana Joya Villanúa
Multimodal imaging of the role of hyperglycemia after experimental aneurysmal subarachnoid haemorrhage
Supervisor: Dr. Jordi Llop (CIC biomaGUNE) & Dr. Abraham Martín (Achucarro Basque Center for Neuroscience)
Defense Date: 20/06/2023

Cecilia Wetzl
Design of tailored carbon nanomaterials for biosensing applications
Supervisors: Prof. Maurizio Prato
Defense Date: 10/07/2023

Alba Ledesma-Fernández
Novel organized multi-enzymatic systems based on protein scaffolding
Supervisor: Prof. Aitziber L. Cortajarena (CIC biomaGUNE) & Prof. Fernando López-Gallego (CIC biomaGUNE)
Defense Date: 29/09/2023

Nicolette Flavia Czarnievicz Rother
Surface engineering of transaminases to tailor protein immobilization on microreactors
Supervisors: Dr. Maciej Skolimowski (University of Groningen) & Prof. Fernando López-Gallego (CIC biomaGUNE)
Defense Date: 30/10/2023



Christian Salvador Dittrich
Synthesis and evaluation of polymer-based nanocarriers for si RNA delivery
Supervisors: Dr. Damien Dupin (CIDETEC) & Dr. Sergio Moya (CIC biomaGUNE)
Defense Date: 30/11/2023

CIC biomaGUNE community celebrating the annual Phd Day

TRAINING INITIATIVES FOR UNDERGRADUATE STUDENTS

Master's Fellowship Program

CIC biomaGUNE has agreements with several universities (which are the degree-grating bodies) in different Master's programs.
Additionally, in partnership with the **University of the Basque Country (UPV/EHU)**, CIC biomaGUNE researchers participate in the following MSc courses by providing lectures and direction of master thesis:

- **Molecular Biology & Biomedicine**
- **Nanoscience**
- **Chemistry & Polymers**

The Master's Fellowship Program aims at offering scholarships to highly qualified master students to carry out their Master's Project. In 2023 4 fellowships have been granted.

Summer Research Program

During the summer period, undergraduate students with a background in Chemistry, Biology and Materials Science are hosted at CIC biomaGUNE's laboratories. The undergraduates work alongside pre- and post-doctoral researchers and receive high level training while working on aresearch project, but also by attending weekly group meetings and seminars. At the end of the traineeship, the students are required to prepare a short report and a presentation summarizing their research and results.
The **Summer Research Program** aims at offering scholarships to highly qualified students in their second and third years of study, to carry out research stays at CIC biomaGUNE during summer. In 2023 4 fellowships have been granted.

Vocational Training Program

CIC biomaGUNE has agreements with **CPES**, **CESA**, **BHIP**, **Don Bosco**, **CEBANC** and **Colegio Inmakulada Ikastetxea**, Centers for Intermediate and Superior level vocational training in the fields of Chemistry or Biosciences to host training internships of students.
Several training placements take place every year at different laboratories of the Center.
Selected undergraduates are mentored and supervised by postdoctoral researchers or PhD students and receive hands-on training.

RESEARCH SECONDMENTS

In the framework of different national and international projects, CIC biomaGUNE has established collaborations with international institutions to **second** and **host research stays of PhD students and postdoctoral researchers**. During 2023, our researchers performed **37** secondments at collaborating partners and we hosted **115** stays of visiting researchers.

	2018	2019	2020	2021	2022	2023
Research stays from CIC biomaGUNE	11	23	16	12	38	37
Research stays to CIC biomaGUNE	84	110	86*	97	111	115
Experiencied ResearchersVisiting Professors	2	12	10	7	21	13
Erasmus placements	2	8	1	6	4	6
Summer placements	6	15		17	7	4
Vocational Training	3	5	8	6	6	7

* Many of the visits in 2020 were interrupted due to the pandemic situation

SEMINARS & INTERNAL TRAINING

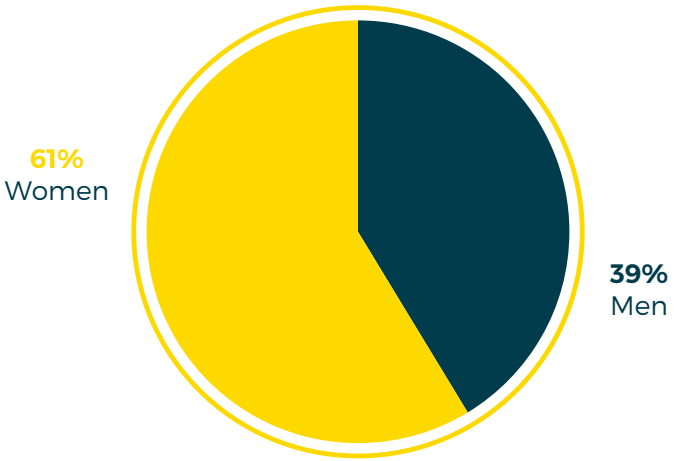
CIC biomaGUNE runs an annual program of scientific seminars, which includes:

- **International seminars** delivered by internationally recognized researchers of varying scientific backgrounds and fields.
- **Postdoctoral seminars** delivered by selected postdoctoral fellows to share progress in each of our laboratories to the rest of the Center.
- **PhD seminars** delivered by PhD students of the Center.
- **Training seminars** delivered by CIC biomaGUNE's PIs or Platform Managers, aimed at strengthening the technical training program and soft skills training.

These actions aim at discussing recent developments, fostering internal and external interactions and paving the way toward future collaborations and contributing to the career development of our researchers. Altogether, these programs contribute to the career development of our researchers. During 2023, **52** Seminars and **348** Internal Scientific & Technology Trainings have been delivered with a total of **1175** participants reached.

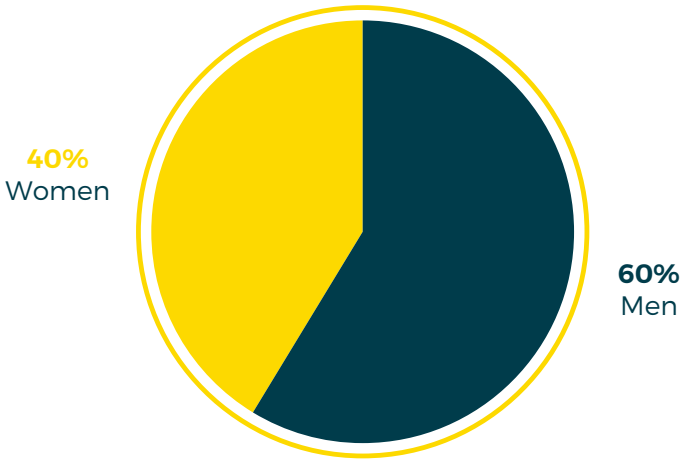
1175

Training Participants
(61% women, 39% men)



52

Invited Speakers
(40% women, 60% men)



TRAINING TYPE	NUMBER OF EVENTS
CIC biomaGUNE Seminar	22
Open Group Seminar	4
Postdoctoral Seminar	9
Soft Skills Seminar	16
Christmas Lecture	1
Internal Scientific & Technology Trainings	348

SEMINARS

17/01/2023
Spin-offs launch program at CIC biomaGUNE
Dr. Marcos Simón - CIC biomaGUNE

24/01/2023
Nano in 3D: Carbon Nanotubes used to Reconnect the Nervous and Cardiac systems
Dr. Núria Alegret - CIC biomaGUNE

25/01/2023
Engineering of a gene therapy viral vector surface as plataform to generate chimeric vectors with new properties
Dr. Rafael Aldabe Arregui - CIMA, University of Navarra

26/01/2023
Magnetic-plasmonic nanoparticles for multimodal bioimaging and hyperthermia
Cristina de la Encarnación Bermúdez - CIC biomaGUNE

15/02/2023
Reconstitution biology – what we gain by rebuilding cellular processes from bottom-up
Dr. Natalia Baranova - University of Vienna

21/02/2023
Cell Therapy for Spinal Cord Injury Regeneration
Dr. Victoria Moreno Manzano - Centro de Investigación Príncipe Felipe

14/03/2023
Practical aspects of Electron Microscopy in CIC biomaGUNE
Dr. Marco Möller - CIC biomaGUNE

17/03/2023
Optical Activity at the Nanoscale: From Chiral Light Absorbing to Chiral Light Emitting Nanomaterials
Dr. Jatish Kumar - Indian Institute of Science Education and Research (IISER)

28/03/2023
Cell-free artificial cascades for ?-hydroxy acids biosynthesis
Dr. Alejandro Herrera Orrego - CIC biomaGUNE

03/04/2023
Microfluidics for the physical assembly of life-like microsystems
Prof. Jean-Christophe Baret - CNRS

25/04/2023
Moral dilemmas in scientific research
Prof. Jorge Alegre-Cebollada - CNIC

26/04/2023
Protein mechanobiology in cell and tissue physiology
Prof. Jorge Alegre-Cebollada - CNIC

08/05/2023
Metal complexes for biomedical imaging
Dr. Eva Jakab Toth - Centre de Biophysique Moléculaire, CNRS Orléans

09/05/2023
Surface Analysis and Fabrication Platform: techniques and possibilities at CICbiomaGUNE
Dr. Desirè di Silvio - CIC biomaGUNE

11/05/2023
The elephant in the room - integrative approaches to structural biology
Dr. Sam Hoff - Institut Pasteur

16/05/2023
Bone and cartilage tissue engineering approaches at CIC biomaGUNE
Dr. Ander Abarrategi - CIC biomaGUNE

17/05/2023
Functional Protein-Based Materials from Opaquness to Transparency
Dr. Luai R. Khoury - Technion Israel Institute of Technology

19/05/2023
Designing Advanced Materials for Advanced Manufacturing: Striving for Sustainability
Prof. Timothy E. Long - Biodesign Center for Sustainable Macromolecular Materials and Manufacturing, Arizona State University

24/05/2023
Synthetic tools to interact with antigen presenting cells (APCs)
Prof. Javier Rojo - IIQ, CSIC

29/05/2023
Chiral nanomaterials templated by liquid crystals - from chiral plasmonics to circularly polarized luminescence
Dr. Wiktor Lewandowski - University of Warsaw

30/05/2023
Nanogels for gene delivery
Bruno Espuche - CIC biomaGUNE

31/05/2023
Bioinspired Processing of Complex Coacervates for Advanced Materials
Dr. Julien Es Sayed - University of Groningen

13/06/2023
The Art of Storytelling: What We Can Learn from Fraudsters
Kyle Van Gordon - CIC biomaGUNE

14/06/2023
Nanobiocatalysis: opportunities for remote enzymatic control by nanoactuation
Dr. Valeria Grazu - Instituto de Nanociencia y Materiales de Aragón (INM,) CSIC-UNIZAR

27/06/2023
Advanced Biomaterials for Brain Repair and Imaging Following Ischemic Stroke
Maria Eduarda Oliveira - CIC biomaGUNE

27/06/2023
Advanced Biomaterials for Brain Repair and Imaging Following Ischemic Stroke
Maria Eduarda Oliveira - CIC biomaGUNE

11/07/2023
The Alzheimer's disease pathophysiology: a longitudinal multi-tracer PET imaging study in a rat model of AD
Oscar Moreno - CIC biomaGUNE

18/07/2023
Synthesis and surface modification of multifunctional nanoparticles for applications in Oncology
Dr. Megi Bejko - Institut de Chimie de la matière condensée de Bordeaux

19/07/2023
Engineered Nanoparticles as a toolkit to probe biomimetic and Biogenic Lipid Assemblies
Prof. Debora Berti - University of Florence

26/07/2023
Designer Microorganisms for Sustainable Chemical Synthesis
Prof. Stephen Wallace - University of Edinburgh

08/09/2023
Synthetic gene circuits & their applications: Programming cells in space, time, and more
Dr. Javier Santos Moreno - (University Pompeu Fabra, Spain)

22/09/2023
Plasmonic nanoplatforms: an asset in molecular chemistry.
Dr. Clémence Queffelec - University of Nantes

26/09/2023
Travelling in Time with Proteins: Directed Evolution vs. Ancestral Reconstruction
Dr. Aitor Manteca - CIC biomaGUNE

27/09/2023
Simultaneous quantitative imaging of two PET radiotracers
Prof. Joaquín López-Herraiz - Complutense University of Madrid

28/09/2023
Covalent inhibitors of proteases. Towards the computer-assisted design
Dr. Katarzyna Patrycja Swiderek - University Jaume I

04/10/2023
Design of biomaterials to modulate cellular signalling and control cell behaviour
Prof. Núria Oliva-Jorge - IQS School of Engineering

10/10/2023
Light-matter interaction for material characterization: from UV-vis to IR range
Dr. Judith Langer - CIC biomaGUNE

11/10/2023
Unveiling the placenta: Structural & Functional MRI as a path towards fixing a neglected organ
Prof. Michal Neeman - Weizmann Institute of Science

24/10/2023
Chiral Plasmonic Nanoparticles in Biological Applications
Benjamin Tadgell - CIC biomaGUNE

07/11/2023
MRI platform at biomaGUNE: how can we help you?
Dr. Daniel Padró - CIC biomaGUNE

15/11/2023
Translational Supramolecular Chemistry: From Systems Catalysis to Cellular Uptake".
Prof. Stefan Matile - University of Geneva

22/11/2023
Carbon Nanodots: Versatile Structures for Diverse Applications
Dr. Silvia Collavini - CIC biomaGUNE

23/11/2023
Curso sobre los conceptos básicos del uso de OneDrive, Teams y Sharepoint
Jorge del Álamo - CIC biomaGUNE

29/11/2023
Curso sobre los conceptos básicos del uso de OneDrive, Teams y Sharepoint
Jorge del Álamo - CIC biomaGUNE

30/11/2023
Automated Glycan Assembly Enables the Glycosciences
Prof. Dr. Peter Seeberger - Max Planck Institute of Colloids and Interfaces

11/12/2023
Cross-Linked Gold Nanoparticle Networks for Advanced Resistive Sensing Applications
Dr. Sophia C. Bittinger - Universität Hamburg

12/12/2023
Nanotechnology in the context of Molecular and Functional Biomarkers
Dr. Susana Carregal - CIC biomaGUNE

20/12/2023
Christmas Lecture 2023 - Incoming genomics, updating our framework towards precision medicine
Dr. Urko M.Marigorta - CIC bioGUNE

SCIENTIFIC CONFERENCES & WORKSHOPS

CIC biomaGUNE seeks to enhance its national and international visibility and reputation by organizing conferences, workshops and seminars that share knowledge about the latest research and advances in the field of biomaterials. The following events have been organized during 2023.

- **6th Glycobasque Meeting**, Organizer: **Niels Reichardt** (CIC biomaGUNE), Bilbao, November 23-24, 2023
- **5th CIC biomaGUNE PhD Day**, Organizer: **CIC biomaGUNE Research Associates**, Donostia-San Sebastián, November 16, 2023
- **Open workshop on nanomedicine approaches in gene delivery**, Organizer: **Sergio Moya** (CIC biomaGUNE), Donostia-San Sebastián, July 13, 2023

Additionally, our researchers have also chaired or co-organized 10 other international conferencesas listed below:

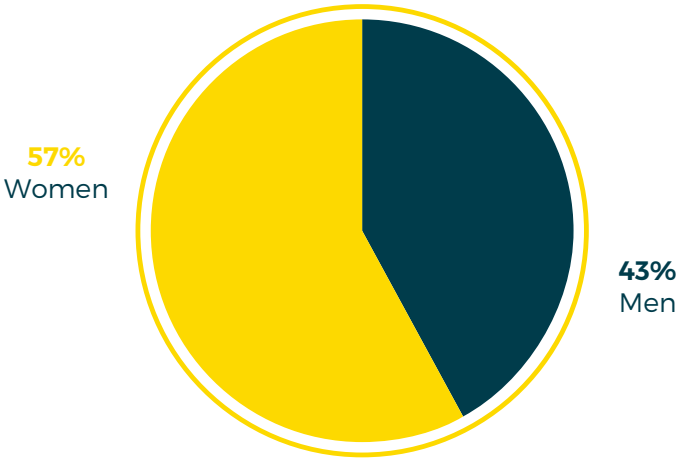
- **European Winter School on Physical Organic Chemistry (E-WISPOC 23)**, co-organizer: Maurizio Prato. Bressanone, Italy, 5-10 February 2023
- **7th meeting of Research in Pulmonary Hypertension**, Organizer and Co-chair: **Jesús Ruiz-Cabello**. Barcelona, 3 March
- **2D Nanomaterials for Sustainable Energy (MATSUS23)**, NanoGE Series. Co-organizer: **Maurizio Prato**. Valencia, Spain, 6-10 March 2023
- **18th European Molecular Imaging Meeting (EMIM)**, Category Chair and co-chair: **Jesús Ruiz-Cabello**. Salzburg, Austria. 14-17 March
- **International Winterschool on Electronic Properties of Novel Materials**, Program Committee member: **Maurizio Prato**, Kirchberg, Austria, 18-24 March 2023
- **The Thinking Institute of the University of Vigo II**, Chair: **Luis M. Liz-Marzán**, Vigo, Spain, 7-9 June
  XVII international Congress of the Spanish Biophysical Society, The Protein Society representative, Coordinator of 4 Protein Society sponsored scientific sessions and Co-Chair of Protein Design session: **Aitziber L. Cortajarena**, Castelldefels, Spain, 27-30 June

- **14th European Biophysical Societies' Association (EBSA)-2023 Congress**, Co-organizer: **Aitziber L. Cortajarena**, Stockholm, Sweden. 31 July-4 August
- **International Materials Research Congress**, Co-Chair in the New Trends in Nanoscience and Nanotechnology: Innovative Synthesis, Novel Properties, Theory and Challenges Symposium: **Luis M. Liz-Marzán**, Cancún, México, 20-25 August
- **Biomaterials and Bioelectronics Workshop**, Co-organizer: **Aitziber L. Cortajarena**, University of Alicante, Spain, 22 September

The participation of CIC biomaGUNE personnel to events is summarized below:

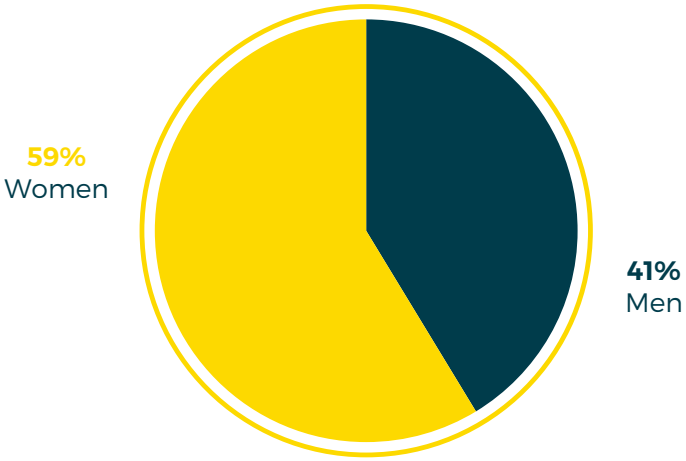
210

Attendance to Conferences
(57% women, 43% men)



158

Oral & Poster contributions
(59% women, 41% men)



DISSEMINATION & **PUBLIC ENGAGEMENT**

CIC biomaGUNE Outreach team in charge of the organisation of Pint of Science

OUTREACH ACTIVITIES

In addition to our dissemination efforts within the scientific community, CIC biomaGUNE undertakes significant outreach initiatives aimed at the general public. These initiatives, either organized by us or in collaboration with third parties, are essential for making our research accessible and understandable to society. It is our responsibility to demonstrate the positive impact of our work on daily life. Consequently, we have strengthened our commitment to dissemination and outreach, particularly to promote STEAM careers among young girls and to increase the visibility of women in science. The detailed list of activities can be found at https://www.cicbiomagune.es/outreach.

During this period **26 outreach activities** were organized including open-doors/visits by high-school and university students **24 of these activities** aimed to promote STEAM careers in young girls and improve visibility of women in science.

EMAKUMEAK ZIENTZIAN

Since 2017 CIC biomaGUNE participates together with **32** Basque research Centers and Institutions in the **EMAKUMEAK ZIENTZIAN** event on the celebration on February 11 of the "International Day of Women and Girls in Science". The activites organized include: Activites for 5th elementary grade students, colloquiums about past and present women scientists, women and science exhibition, practical workshops for retired women, seminars by women scientists on career development outside academia and YouTube videos on laboratory experiments.

NANOCIENTÍFICAS EN 60 SEGUNDOS

Nanoscientists in 60 Seconds is a short video contest held as part of the 10alamenos9 Festival. It is aimed at high school students, who after choosing a women scientist working in nanoscience record a short video about her work. Several CIC biomaGUNE women researchers have participated in this event, explaining their work to high school students.

BIOPHYZZA

To celebrate the Biophysics Week. the Spanish Biophysical Society coordinates a series of affilate events locally organized by its members under the umbrella of the «Biophyzza Connection» and sponsored by Domino's Pizza. In Gipuzkoa, CIC biomaGUNE has taken the lead to organize this event since 2023.

INSPIRA

The **INSPIRA project** is a pioneering project in the Basque Country for the promotion of the scientific-technological vocation (STEAM: Science, Technology, Engineering, Arts and Maths) among girls.
Several CIC biomaGUNE mentors accompany students during a period of two months with the following aims:

- Provide new references of nearby women technologists.
- For boys and girls to discover the STEAM professions.
- Raise awareness of the need for the development of the country to occur between men and women.
- Sensitize and guide on the career in technology.
- Make visible and value women technologists.

ENCOUNTER OF SCIENTIFIC LIVES

CIC biomaGUNE participates in the "Encuentro de Vidas Científicas" organized by Eureka! Zientzia Museoa. located in the Gipuzkoa Science Park. This activity is directed to 4th elementary grade and bachelor students with the aim of boosting scientific vocations. The objective is to create a space where students can speak, ask questions and exchange opinions directly with various professionals from different scientific and technological fields.

"DONOSTIA WEEKINN" Innovation Week

CIC biomaGUNE participes since 2016 at the Innovation Week (Donostia WeekINN) an initiative of the San Sebastián city council. whose objectives are:

- To raise awareness about the importance of innovation.
- To train and bring knowledge. share. learn. etc.
- To recognize and make visible different organizations from the city that have an orientation towards Innovation.

WORLD BREAST CANCER DAY
Awareness Campaign

In October 2023, we launched an awareness campaign on social media on the World Breast Cancer Day, showcasing the research conducted at the Center. The campaign highlighted projects led by the following groups:

- Radiochemistry and Nuclear Imaging
- Bionanoplasmonics
- Hybrid Biofunctional Materials
- Molecular and Functional Biomarkers
- Biomolecular Nanotechnology

PINT OF SCIENCE

This initiative brings Science to local pubs thereby breaking down the barriers that separate science from society.
CIC biomaGUNE researchers have taken active part in the organization of the Pint of Science event in San Sebastián during 6 editions.

OUTREACH CAMPAIGN in honor of the Nobel Prize in Chemistry

In October 2023, we launched an outreach campaign in honor of the 2023 Nobel Prize in Chemistry on Quantum Dots (QDs), showcasing CIC biomaGUNE research on QDs. The campaign highlighted projects led by the following groups:

- Carbon Bionanotechnology
- Biomolecular Nanotechnology
- Bionanoplasmonics

OPEN DAYS & VISITS

UNDEGRADUATE & HIGHSCHOOL VISITS	
2015	7
2016	7
2017	12
2018	9
2019	9
2020	4
2021	1
2022	12
2023	12

CIC biomaGUNE regularly receives visits from high-school and university students who come to have a closer look at our activity. These visits typically include a lecture about biomaterials in the context of life sciences. an open discussion with CIC biomaGUNE researchers. and a guided tour to six technical facilities/laboratories (Nanoparticle synthesis platform. Confocal Microscopy. Radiochemistry platform. Molecular Imaging Facility. Scanning Electron Microscopy. Atomic Force Microscopy). The program of visits is run by **Javier Calvo** with the support of **Daniel Padró**, **Marco Möller**, **Desiré di Silvio**, **Irantzu Llarena**, **Judith Langer**, **Unai Cossío**, and **Vanessa Gómez** along with the assistance of other Platform Managers, PhDs, Postdocs, and Group Leaders.

MEDIA RELATIONS

In line with our philosophy of not only generating knowledge, but also disseminating it, we have increased our presence in general media exceeding 479 media hits in 2023.

MODALITY	2021	2022	2023
Written Media	71	49	73
Online Media	209	33	281
Specialized Online Media	105	184	105
Expo		2	
Radio	15	10	9
TV	7	2	11
MODALITY	**407**	**280**	**479**

WEB & PRESENCE ON SOCIAL MEDIA

With almost 10,000 followers, our social networks and website focus on disseminating scientific content in an accessible way.

MODALITY	2021	2022	2023
Web Visits	55,142	47,955	48,529
X Followers	2,726	3,139	3,769
LinkedIn Followers	3,368	4,350	5,533
Instagram Followers			384
YouTube Subscribers			22

* Data reported refers to December of every year.

SUSTAINABILITY, COMPLIANCE & **SOLIDARITY**

SUSTAINABILITY, COMPLIANCE & SOLIDARITY

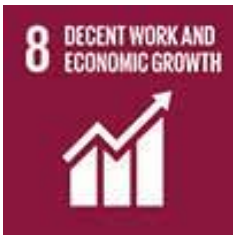
CIC biomaGUNE Strategic Plan includes a commitment to 10 of the 17 United Nations Sustainable Development Goals (SDGs) and foresees the implementation of sustainability measures to ensure ethics, sustainablibity, transparency, compliance and respect for the environment.

Contribution to SDGs

Research conducted at CIC biomaGUNE aims to develop innovative solutions that address health challenges. Investigation conducted at CIC biomaGUNE is aligned with the aims of Horizon Europe, the Spanish Science, Technology and Innovation Strategy, and the 2030 Basque Strategy for Science, Technology & Innovation, among others.

- Work conducted at CIC biomaGUNE contributes to increasing the number of people who have relevant technical and vocational skills aimed at improving employment opportunities and entrepreneurship.
- Dissemination and outreach actions aimed at promoting STEAM areas among girls and women, including highlighting the figure of women in science, and thus contributing to the elimination of gender disparities in education to ensure equal access to all at all levels of education and vocational training.

- CIC biomaGUNE conducts a triannual equality analysis and action plan with the aim of:
  - Ensuring women's full and effective participation and equal opportunities for leadership at all levels of decision-making
  - Promoting initiatives that contribute to gender equity, leadership diversity, and an inclusive, discrimination-free environment



- Scientific Research activities upgrade the technological capabilities of industrial sectors encouraging innovation and contribute to increasing the number of research and development workers and public and private research and development spending.
- Activities to promote technology transfer and entrepreneurship at CIC biomaGUNE contribute to creativity and innovation, and promotion of sustainable economic growth.
- Measures contemplated in our ***Equality Plan*** and in the ***Prevention*** *protocol of, and action against, sexual or gender-based workplace harassment*, contribute to:
  - Achieving a full and productive employment and fair work for all women and men, including equal pay for work of equal value
  - Promoting a safe and secure work environment

- Activities to promote technology transfer enhance scientific research and upgrade the technological capabilities of industrial sectors encouraging innovation and contribute to increasing the number of research and development workers and public and private research and development spending.

- Measures contemplated in our ***Equality Plan*** contribute to empower and promote the inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status.

- Subcontracting services to special employment centers promotes the social inclusion of all people, regardless of their conditions and circumstances.

- Actions to promote selective waste collection will contribute, with a view to 2030, to a substantial reduction in the generation of waste by means of prevention, reduction, recycling, and reuse policies.

- Actions carried out in the responsible energy consumption have contributed to reducing the environmental impact (reduction of greenhouse gas emissions) of the Centre's activity and to improving the energy efficiency of the building.

- The ***Anti-Fraud Protocol***, the *Protocol for Dealing with Conflicts of Interest*, and the *Code of Ethics* contribute to substantially reducing corruption and bribery that may occur in CIC biomaGUNE, with the goal to create an accountable and transparent institution at all levels.

- Our Research Program is conducted in collaboration with regional, national and international partners. We aim at fostering external cooperation and knowledge sharing by integrating our knowledge and research infrastructure within international consortia and networks.

ACCREDITATIONS

FUNDING

CIC biomaGUNE

MEMBER OF BASQUE RESEARCH
& TECHNOLOGY ALLIANCE

Activity REPORT 2023

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