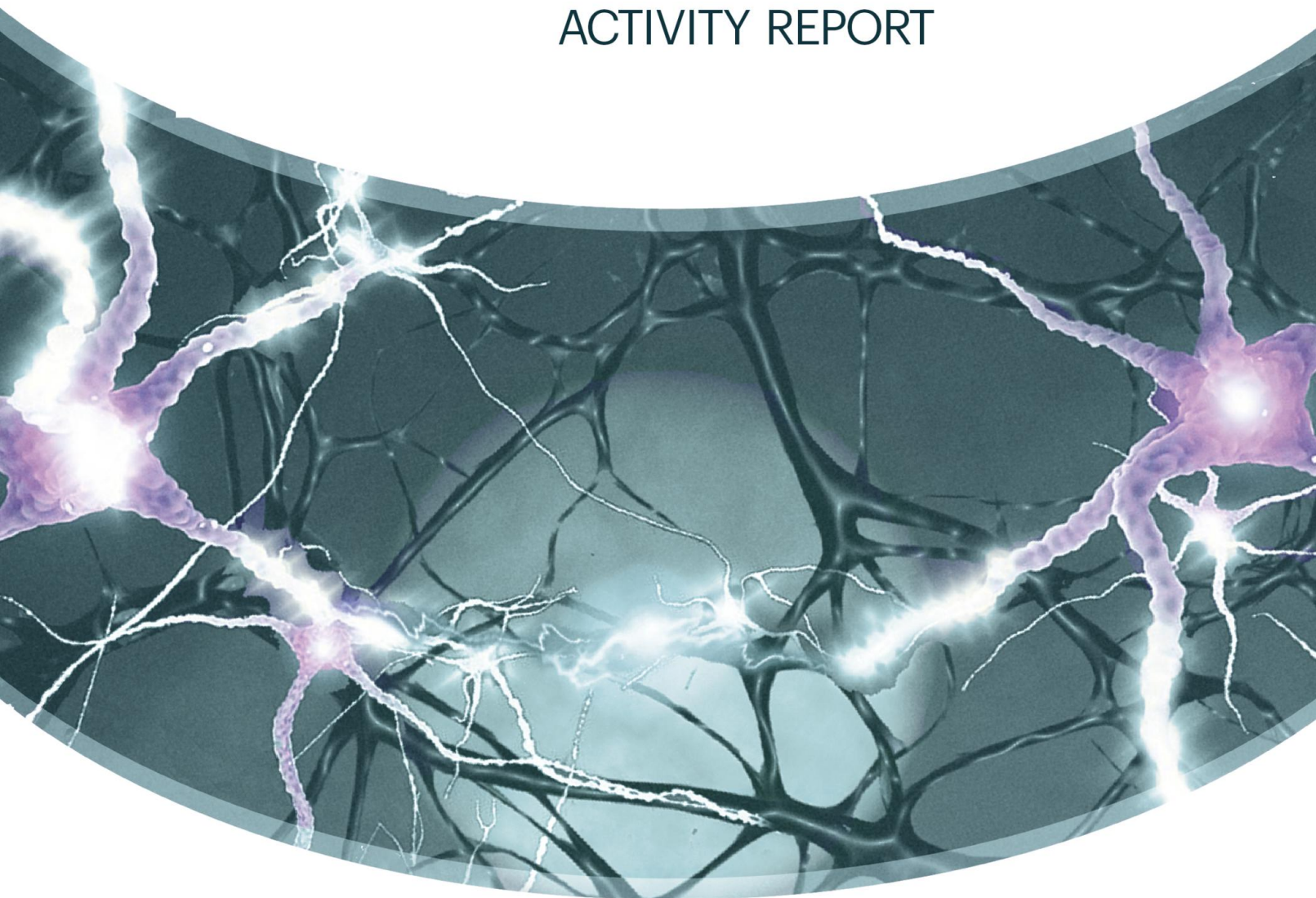


CICbiomaGUNE

MEMBER OF BASQUE RESEARCH  
& TECHNOLOGY ALLIANCE

2019

ACTIVITY REPORT



EXCELENCIA  
MARÍA  
DE MAEZTU





CIC biomaGUNE

2019

ANNUAL REPORT

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# DIRECTORS' MESSAGE

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This annual report summarizes the research and the various activities at CIC biomaGUNE during 2019. We are proud to show an excellent output, both in terms of research and technological development, which clearly reflects the great enthusiasm and skills of our researchers and support personnel. It is thanks to every single person in the Center that we have been able to strongly contribute to the advancement of knowledge and transfer of technology.



2019 was the second year of CIC biomaGUNE as a María de Maeztu Unit of Excellence and our strategic scientific project has been reinforced with the recruitment of Fernando López-Gallego as Ikerbasque Professor and Group Leader of the Heterogeneous Biocatalysis Lab, as well as Ander Abarrategi as Ikerbasque Fellow and Junior Group Leader of the Regenerative Medicine Lab. Our priority regarding the attraction of new talent further succeeded through the incorporation of another Ikerbasque Fellow (Dorleta Jiménez de Aberasturi) and two Fellows Gipuzkoa (Ivan Ramos-Sasselli and Oscar Silvestre). We have also seen a significant increase of the total personnel at CIC biomaGUNE, with an average of 140 researchers and a total of 162 people. We had in 2019 a total of 46 PhD students and 27 postdoctoral researchers. Some reorganization of lab space has been required to properly accommodate this expanded research effort.

The International Scientific Advisory Board (ISAB) continued providing support to our strategic vision. Changes to the ISAB composition were needed during 2019, because of the sad news of the loss of our friend and colleague Helmuth Möhwald and the voluntary retirement of Jon Dilworth, who were both instrumental in previous assessments of the Center's performance. We are proud to announce the incorporation of Patrick Couvreur (Université Paris-Sud) and Aránzazu del Campo (Leibniz Institute for New Materials) as new ISAB members.

The volume of R&D activity is well reflected in the amount of grants and industrial contracts launched during the year (36 new projects for a total contribution of 4.1 M€). We were also awarded with several highly competitive EU grants (FET-OPEN, Graphene Flagship, MCSA, etc.) and a new ERC Consolidator Grant, which adds to two other previously approved ERC Grants. Overall, during 2019 we had a total of 18 active European or international projects which added to a total budget of over 10 M€. The success in attracting and managing competitive funds strongly relies on the international leadership of our researchers and also on the support of the Project Management Unit and the General Administration and other support units. In the context of the María de Maeztu project, internal calls were opened which strongly promoted internal collaboration between research groups, further interaction with other institutions in the Basque R&D system, and with the industrial sector.

The scientific production of our researchers maintains a remarkable quality and impact, with a total of 152 articles published during 2019, reaching an average impact factor of the journals of 7.7 and over 7000 citations. It is worth mentioning that, among various awards and recognitions, two of our group leaders were selected by Clarivate Analytics as Highly Cited Researchers in 2019. We hope you will enjoy our selection of scientific highlights, which exemplify the activity of the different Research Lines. Additionally, we filed 3 new patents and 19 new agreements with companies and external partners were signed.

An effort has also been made to increase CIC biomaGUNE visibility, through public communication and outreach activities. Our researchers participated in a large number of outreach activities, our work was featured in over 200 impacts in the media, and we hosted visits of a large number of students from local schools during the year.

We are confident that this report will provide a clear view of the objectives of CIC biomaGUNE as an institution, as well as the enthusiasm and excellent performance of all and every one of us, toward new discoveries that can advance the frontiers of knowledge and be ultimately implemented as products that improve the quality of life around us.

Kind regards,

Luis Liz-Marzán, Scientific Director  
José M Mato, General Director





# 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, in order to 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 a team of 13 international and dynamic research groups, which develop high-level research at the interface between chemistry, physics and biology, with particular emphasis on the properties and applications of nanostructures at the biomolecular level. The final aim of CIC biomaGUNE's research is to contribute to understanding the way in which biological systems interact with nanometer-sized materials, at the molecular level.

The main research lines deal with the design, preparation and characterization of biofunctional nanostructures and their *in vitro* and *in vivo* biological evaluation, to be used in the study of biological processes and the development of biomedical tools such as theranostic or multitherapeutic platforms.

To carry out this ambitious program of research, the Center counts with a unique research infrastructure equipped with the most advanced nanoscience, biochemistry and molecular imaging facilities, including fully equipped research laboratories, Technological Platforms and the Molecular Imaging Facility, one of the biggest preclinical imaging research infrastructures in Europe.

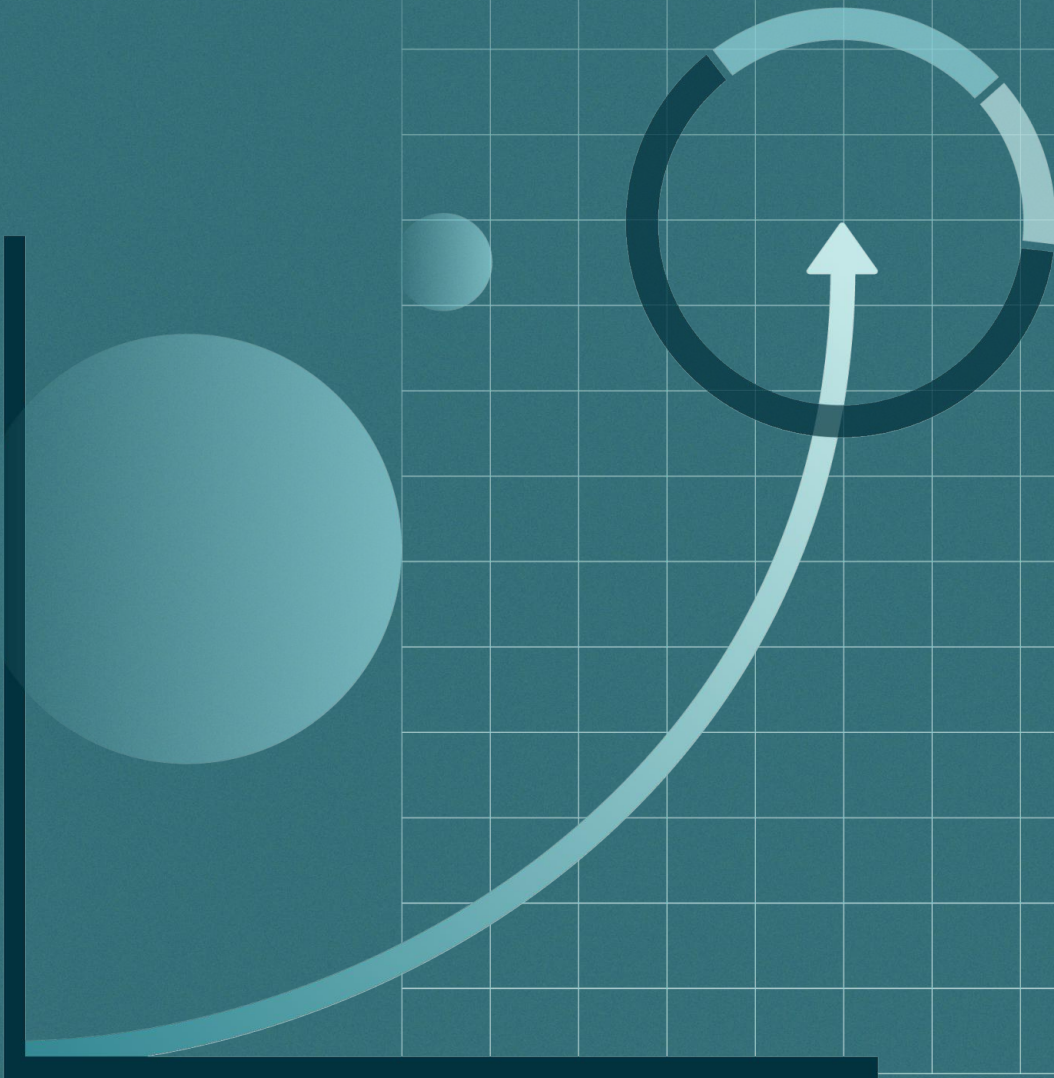
CIC biomaGUNE celebrated its 10<sup>th</sup> anniversary in 2016. In the course of these ten years, with an average critical mass of around 120 researchers, the Center has obtained national and international recognition as a scientific leader and knowledge builder in the field of biomaterials. Among 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.

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) - which further confirms this recognition.

# 2019

## At a Glance

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# At a Glance

## 2019 ORGANIZATION

### RESEARCH GROUPS

- 01 GLYCOTECHNOLOGY
- 02 BIOSENSING
- 03 BIONANOPLASMONICS
- 04 BIOENGINEERED PARTICLES
- 05 CARBON BIONANOTECHNOLOGY
- 06 BIOMOLECULAR NANOTECHNOLOGY
- 07 HETEROGENEOUS BIOCATALYSIS
- 08 SOFT MATTER NANOTECHNOLOGY
- 09 COMPUTATIONAL BIOPHYSICS
- 10 MOLECULAR & FUNCTIONAL BIOMARKERS
- 11 RADIOCHEMISTRY & NUCLEAR IMAGING
- 12 MAGNETIC RESONANCE IMAGING
- 13 REGENERATIVE MEDICINE

### SUPPORT

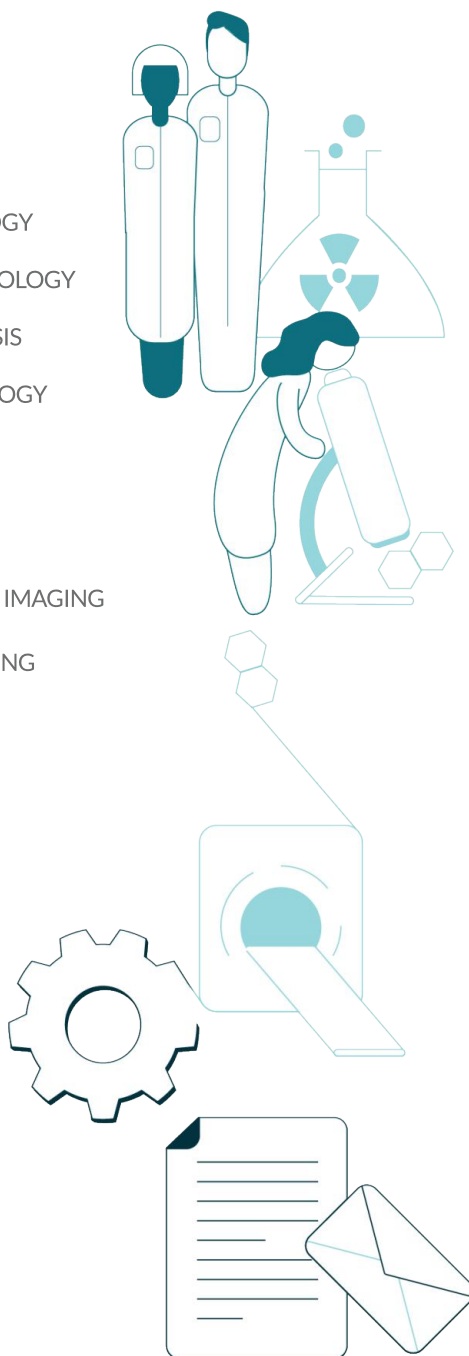
- 01 DIRECTION
- 02 GENERAL MANAGEMENT
- 03 ADMINISTRATION
- 04 PROJECT MANAGEMENT
- 05 TECH TRANSFER & EXPLOITATION
- 06 BIOSAFETY
- 07 IT
- 08 MAINTENANCE

### MOLECULAR & FUNCTIONAL IMAGING FACILITY

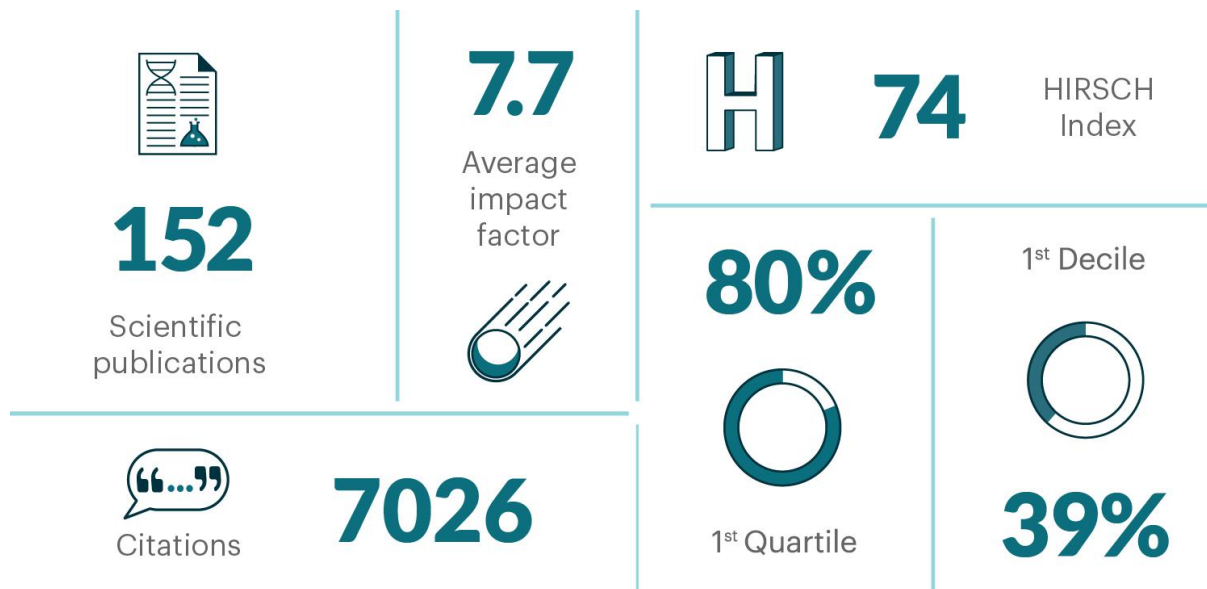
- 01 RADIOCHEMISTRY
- 02 NUCLEAR IMAGING (PET/SPECT/CT)
- 03 MAGNETIC RESONANCE IMAGING (MRI)
- 04 IMAGE ANALYTICS
- 05 ANIMAL HOUSE

### TECHNOLOGICAL PLATFORMS

- 01 NUCLEAR MAGNETIC RESONANCE
- 02 ELECTRONIC MICROSCOPY
- 03 MASS SPECTROMETRY
- 04 SURFACE ANALYSIS & FABRICATION
- 05 COLLOIDAL NANOFABRICATION
- 06 OPTICAL SPECTROSCOPY

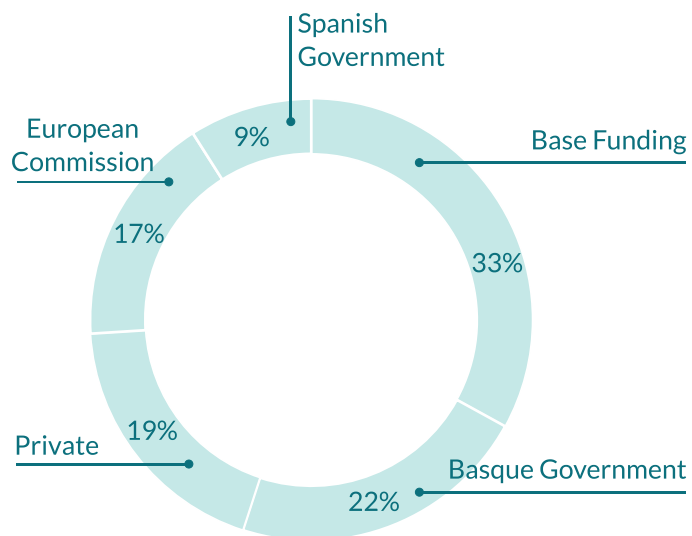
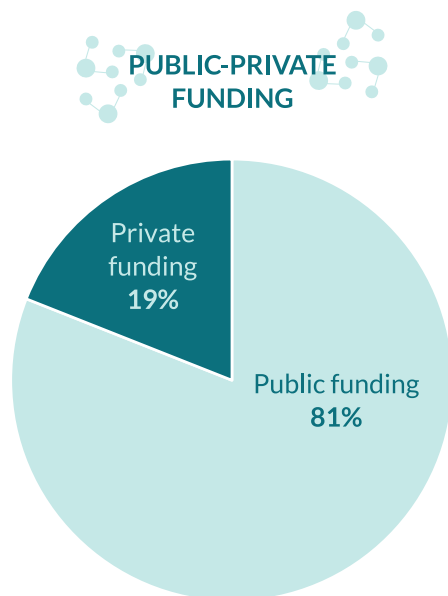


## SCIENTIFIC OUTPUT



## FUNDING

Total funding: **10.124.162€**



Additionally **36** new Projects launched in 2019 with a total contribution of **4.101.418 €**

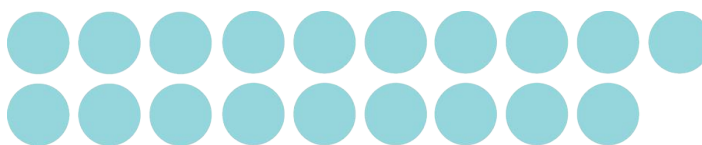


## TECHNOLOGY TRANSFER

**3** New patent applications



**19** Agreements with industrial or clinical partners



## TRAINING



**4**

PhD Theses defended

Ongoing PhD Theses

**55**



**43**

Seminars



**98**

Received research stays

**23**

Stays abroad



**5**

Organized Workshops/  
Conferences



**10**

Co-Organized Workshops/  
Conferences

## OUTREACH & MEDIA



**207**

Impacts in media

**10**

Awards/  
Recognitions



Outreach activities



**11**

**52**



Facility Visits

## AWARDS AND RECOGNITIONS



### 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.

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

**Maria de Maeztu Unit of Excellence** accredited by the Spanish State Research Agency (Ministry of Science, Innovation and Universities).

**Certification** of CIC biomaGUNE RD&I management system according to **UNE 166002:2014** standard.



### AWARDS

#### Luis Liz-Marzán

**Hermanos Elhuyar-Hans Goldschmidt Award** for 2019 (Premio Hispano-Alemán Hermanos Elhuyar-Hans Goldschmidt de 2019) an award presented jointly by the Royal Spanish Chemical Society and the German Chemical Society. **28/05/19**

#### Maurizio Prato

**Richard E. Smalley Research Award** from the Nanocarbons Division of the ECS (Electrochemical Society). **28/05/19**

#### Wolfgang J. Parak

**Highly Cited Researcher** (Clarivate Analytics) in the Cross-field category. **21/11/19**

#### Luis Liz-Marzán

**Highly Cited Researcher** (Clarivate Analytics) in the Cross-field category. **21/11/19**



### RECOGNITIONS

#### Aitziber L. Cortajarena

Ikerbasque recognizes the work carried out by Aitziber L. Cortajarena, leader of the Biomolecular Nanotechnology laboratory of CIC biomaGUNE. **06/05/19**

#### Luis Liz-Marzán

**Nanyang-SNIC Distinguished Lectureship** to Luis Liz-Marzán. The Nanyang-SNIC Distinguished Chemistry Lectureship series was established in 2019. It brings the most influential chemists around the world for a short stay in NTU. Each recipient will present one or more seminars on their esteemed academic career, with the goal of stimulating an exchange of ideas, encouraging scientific interactions, and providing a launching pad for future research collaborations. **28/09/19**



## ACADEMY MEMBERSHIP

### Luis Liz-Marzán

Luis Liz-Marzán elected Corresponding Member of the Academy of Mathematical, Physico-Chemical and Natural Sciences of Granada. 22/03/19



## BEST PRESENTATION POSTER AWARDS

### Ana Joya Villanua

The work entitled *In vivo Imaging of adenosine A1 receptors in neuroinflammatory response after experimental stroke*, presented by Ana Joya Villanúa, a PhD student of the Radiochemistry and Nuclear Imaging Lab of CIC biomaGUNE and the Neuroimaging and biomarkers of inflammation Lab of Achucarro Basque Center of Neuroscience, has been awarded as the best presentation at the scope of the 3<sup>rd</sup> young Spanish ESMI Group Meeting celebrated in Barcelona the 13<sup>th</sup> of May, 2019. 17/05/19

### Mathias Charconnet

The work entitled *Tunable plasmonics by self-assembled stretchable superlattices on macroscopic scale*, presented by Mathias Charconnet, PhD student of the Bionanoplasmonics Lab of CIC biomaGUNE and the Nanoengineering Lab of CIC nanoGUNE has been awarded as Best Student Paper Award at the Optical MEMS and Nanophotonics celebrated between July 28<sup>th</sup> and August 1<sup>st</sup>, 2019 in Daejeon, Korea. 01/08/19

### Irene Veronika Judith Feiner

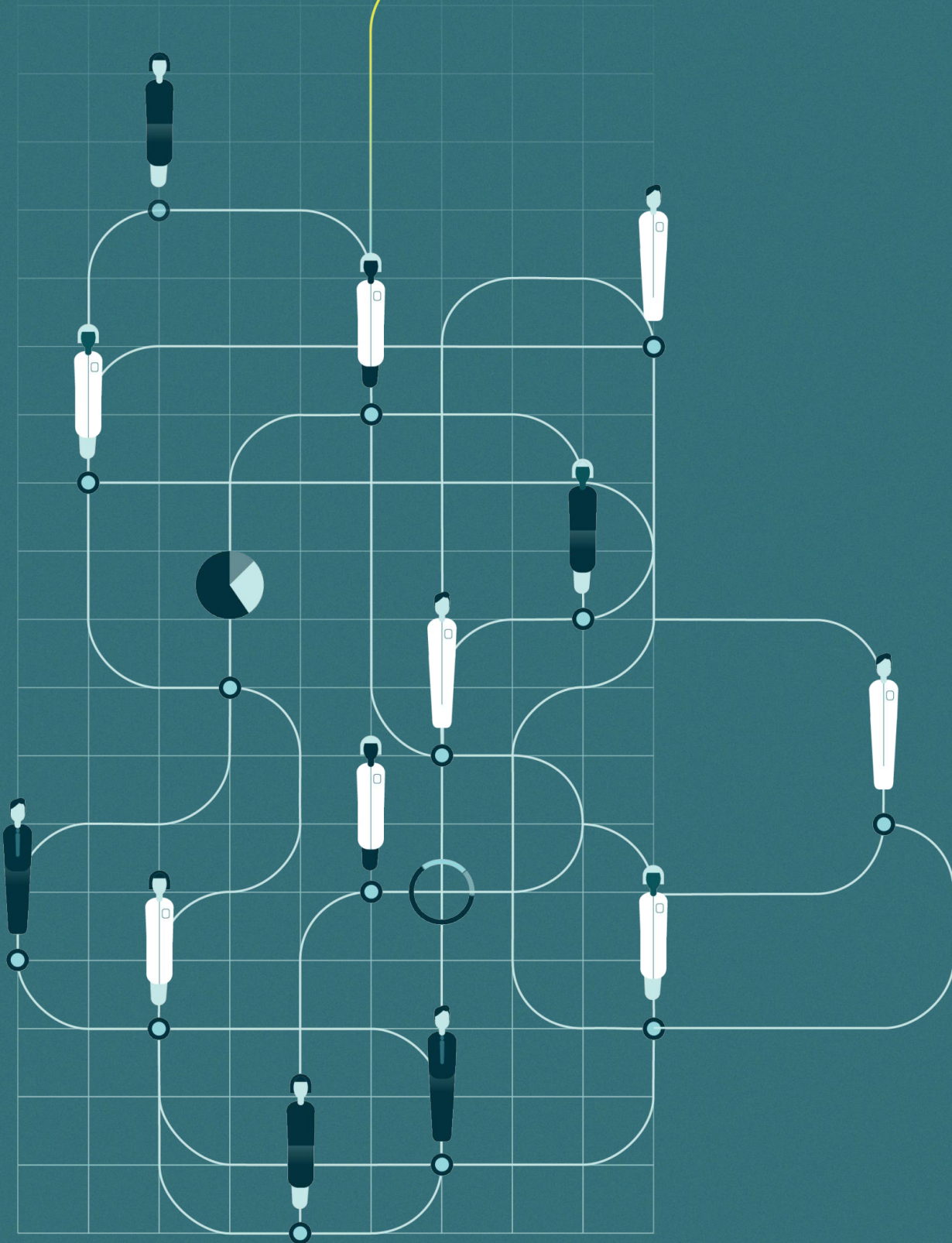
The work entitled *A pre-targeting strategy for multifunctionalized gold nanoparticles (GNP) as boron delivery agents with application in Boron Neutron Capture Therapy (BNCT)*, presented by Irene V. J. Feiner, PhD student of the Radiochemistry and Nuclear Imaging Group of CIC biomaGUNE, has been awarded as the best poster at the 3<sup>rd</sup> Biannual young Researchers Workshop on Biomaterials and Applications-bioMAPP19 celebrated in Bilbao the 4<sup>th</sup> and 5<sup>th</sup> of December, 2019. 05/12/19

### Pilar Castellnou Arenas

The work entitled *In vivo PET study of [11C]L-Alanine and [11C]D-Alanine in a mouse model of prostate cancer*, presented by Pilar Castellnou, PhD student of the Radiochemistry and Nuclear Imaging Group of CIC biomaGUNE, receives the award for the best Imaging presentation at the 3<sup>rd</sup> Biannual young Researchers Workshop on Biomaterials and Applications-bioMAPP19 celebrated in Bilbao the 4<sup>th</sup> and 5<sup>th</sup> of December, 2019. 05/12/19



# Organization



## GENERAL ASSEMBLY

### Public administration

**bioef**

basque foundation for  
health innovation and research

**Bizkaia**  
foru aldundia  
diputación foral



Gipuzkoako  
Foru Aldundia

**Parke**  
EUSKADIKO  
PARKE  
TEKNOLOGIKOAK



Universidad  
del País Vasco

Euskal Herriko  
Unibertsitatea

### Companies

**bti**  
Biotechnology  
Institute

**CURIUM**  
LIFE FORWARD

**MONDRAGON**  
HUMANITY  
AT WORK



Química del Nalón

### Technology corporations

**IK4**  
Research Alliance

**tecnalia**  
Corporación Tecnológica

## INTERNATIONAL SCIENTIFIC ADVISORY BOARD



**Prof. Peter Morris**  
Sir Peter Mansfield  
Magnetic Resonance  
Centre  
University of  
Nottingham, UK



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



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



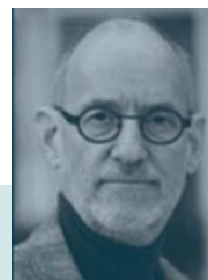
**Prof. Peter  
Seeberger**  
Max-Planck Institute  
of Colloids and  
Interfaces, Germany



**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

## GLYCOTECHNOLOGY

**Niels Reichardt** - Principal Investigator  
**Sonia Serna** - Research Assistant

The Glycotechnology Laboratory carries out projects in basic and applied glycoscience, the science and technology of carbohydrates with a large 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 exploit the potential of sugars for cancer immune therapy, as biomarkers and biomaterials for biomedical applications.

## BIOMOLECULAR NANOTECHNOLOGY

**Aitziber L. Cortajarena** - Principal Investigator (Ikerbasque Professor)  
**Ivan Sasselli-Ramos** - Research Associate (Fellow Gipuzkoa)

The group focuses on protein engineering toward the generation of functional nanostructures and bioinspired materials for applications in nanobiotechnology and nanomedicine.

The research focuses mainly on protein engineering in order to develop versatile platforms for the bottom-up fabrication of protein-based hybrid functional biomaterials. We are also interested in the tailored biofunctionalization of nanomaterials for biomedical applications, from disease treatment to diagnosis.

## BIONANOPLASMONICS

**Luis Liz-Marzán** - Principal Investigator (Ikerbasque Professor)  
**Isabel García** - Research Associate (CIBER-BBN)  
**Dorleta Jiménez de Aberasturi** - Research Associate (Ikerbasque Fellow)  
**Óscar Ferreira-Silvestre** - Research Associate (Fellow Gipuzkoa)  
**Malou Henriksen** - Research Assistant

The activity of the Bionanoplasmonics Laboratory focuses on the biomedical applications of plasmonic nanomaterials, including new chemical methods for the synthesis of colloidal metal nanoparticles with tailored size, shape and surface chemistry, their directed self-assembly and applications in biosensing, diagnostics and therapy, based on plasmonic effects.

One of the current central topics of the group is the development of platforms that can be used for ultrasensitive detection based on SERS. The group is interested in the incorporation of such nanostructured substrates within devices for implementation of real detection techniques.



## SOFT MATTER NANOTECHNOLOGY

**Sergio Moya** - Principal Investigator

The Soft Matter Nanotechnology Laboratory makes use of elements of soft matter, mainly polyelectrolytes, in nanofabrication and in the development of hybrid materials for biomedical applications.

The group has expertise in several physico-chemical characterization techniques, especially in fluorescence spectroscopy. The group interests include the synthesis of polyelectrolytes, self-assembly, physical characterization, the development of drug delivery systems, and hybrid materials for tissue engineering.

## BIOSENSING

**Valery Pavlov** - Principal Investigator

The Biosensing Laboratory carries out research aimed at the development of new analytical and bioanalytical techniques, using metal and semiconductor nanoparticles.

The group is also focused on the fabrication of novel biosensors employing different read-out methods, such as UV-visible and fluorescence spectroscopy, quartz crystal microbalance, electrochemistry and photo-electrochemistry.

## BIOENGINEERED PARTICLES

**Wolfgang J. Parak** - Principal Investigator

**Carlos Sánchez-Cano** - Research Associate (Gipuzkoa Fellow)

The Bioengineered Particles Laboratory focuses on understanding the interaction of colloidal nanomaterials with the biological matter, such as proteins and cells.

Our work is dedicated to the synthesis of highly defined nanoparticle libraries, their physicochemical characterization, and correlation of biological effects to their physicochemical properties. We also develop new methods toward novel methodologies for physicochemical characterization in situ and in complex environments.

## CARBON BIONANOTECHNOLOGY

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

The mission of the Carbon Bionanotechnology Laboratory is the design and synthesis of tailored carbon nanostructures for bionanotechnology applications and solar energy conversion through biomimetic approaches.

The group explores new synthetic protocols and new analytical methods, enabling innovative, controlled and reproducible ways toward the designer functionalization of carbon nanostructures, such as fullerenes, carbon nanotubes, graphene and carbon nanodots.

## HETEROGENEOUS BIOCATALYSIS



**Fernando López-Gallego** - Principal Investigator (Ikerbasque Professor)

The Laboratory of Heterogeneous Biocatalysis is applying multi-enzyme systems to synthetic, environmental, medical and analytical chemistries by harnessing the exquisite selectivity of enzymes (biological catalysts) for the development of more sustainable and effective chemical processes. We are mimicking the spatial organization found inside the living organisms, but using ex-vivo systems supported on solid materials. To address such goal, we are interfacing chemistry and biology utilizing multidisciplinary tools that involve molecular biology, enzymology and materials chemistry.

## REGENERATIVE MEDICINE

**Ander Abarrategi-López** - 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 in 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.

## COMPUTATIONAL BIOPHYSICS

**Ivan Coluzza** - Principal Investigator (Ikerbasque Professor)  
**Ivan Sasselli-Ramos** - Research Associate (Fellow Gipuzkoa)

The Computational Biophysics Laboratory is composed by an interdisciplinary team of scientists from different backgrounds but all with experience in computational modeling of biological systems and statistical mechanics.

Our research focuses on the application of statistical mechanics to soft-matter and complex biological systems.

Our goal is to build simple models of natural complex systems, such as proteins, and in doing so learn their fundamental function and copy it into artificial systems.

## RADIOCHEMISTRY & NUCLEAR IMAGING

**Jordi Llop** - Principal Investigator

The activity of the Radiochemistry and Nuclear Imaging Laboratory focuses on the development of innovative radiochemistry and the application of positron emission tomography (PET) and single photon emission computed tomography (SPECT) tracers toward the investigation of biological, physiological and pathological processes in the fields of oncology, neurology, pneumology, infection and cardiovascular diseases.

## MAGNETIC RESONANCE IMAGING

**Pedro Ramos** - Principal Investigator  
(Ikerbasque Professor)

The Magnetic Resonance Imaging (MRI) Laboratory makes use of nanomaterials and magnetic resonance imaging techniques on animal models.

On one hand, we intend to characterize the onset and evolution of diseases of the central nervous system (CNS), from development of early markers to imaging methods that quantify the progression of the pathological processes and their consequences at anatomical and functional levels.

We additionally develop new therapeutic approaches to treat such diseases, with special emphasis on the penetration through the blood- brain-barrier, and monitoring the effective release of drugs in the brain parenchyma.

## MOLECULAR & FUNCTIONAL BIOMARKERS

**Jesús Ruiz-Cabello** - Principal Investigator (Ikerbasque Professor)  
**Susana Carregal** - Research Associate (CIBER-BBN)

The Molecular & Functional Biomarkers Laboratory studies cardio-pulmonary and vascular diseases through functional and molecular imaging and system biology approaches.

The group is particularly interested in the potential of new imaging techniques, including nanotechnology-based applications, in early diagnosis of pulmonary and cardiovascular remodelling, the assessment of metabolic changes associated with cell growth, the structure and function of the right ventricle and cardiovascular coupling signals.



# DIRECTION AND MANAGEMENT AREA

## Direction

Designs, defines and coordinates the Center's scientific strategies and activities.

## General Management

The General Manager is responsible for supervising the management of the administration department, project management and the IT, maintenance and biosafety units of the Center.

## Biosafety & Radioprotection

Dedicated to establish safe working conditions of 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

The IT service is in charge of supporting the staff of the Center with setting up and maintaining computer related equipment, data storage, e-mail servers, as well as the website and other social media.

## Administration

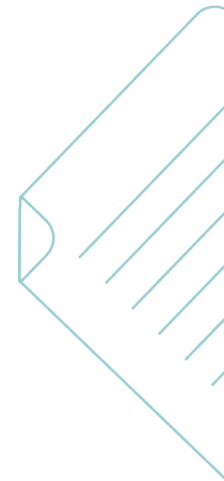
This department is responsible for the management of finances, accounting, administration, and the human resources of the Center.

## Maintenance

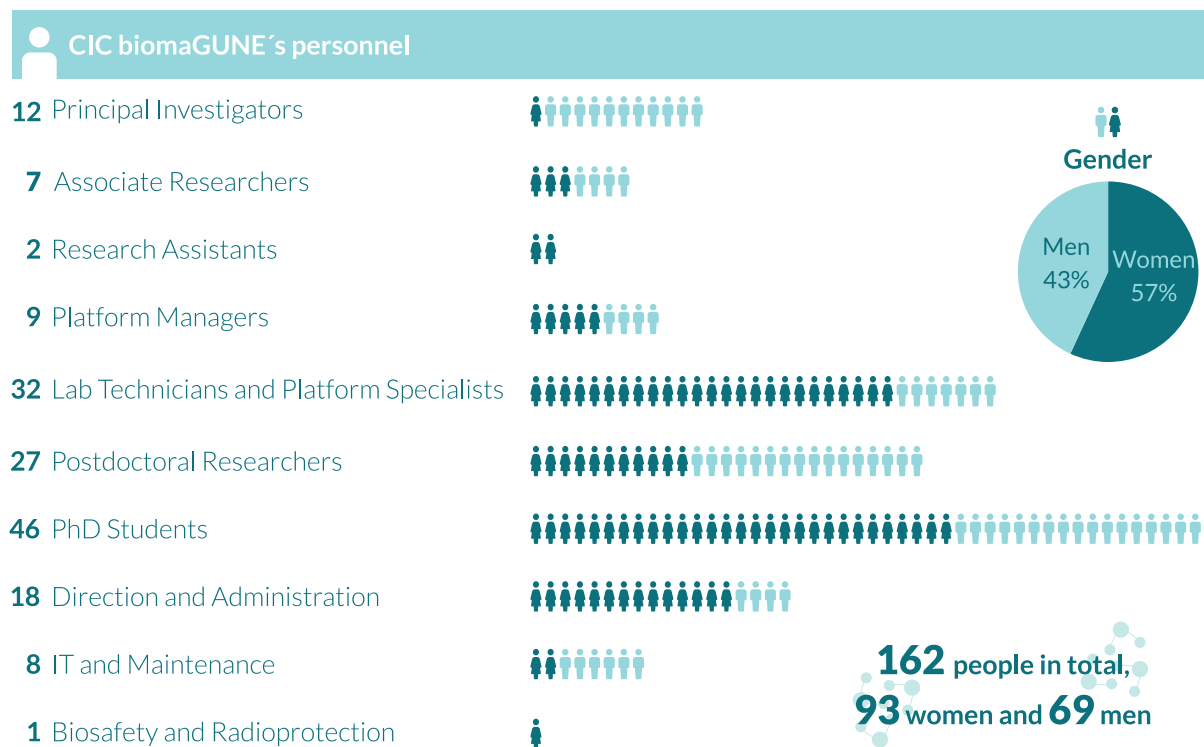
This department takes care of the preventive, predictive and corrective maintenance of all CIC biomaGUNE facilities.

## R&D&I Management Unit

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



The table below provides the distribution of CIC biomaGUNE's personnel during 2019



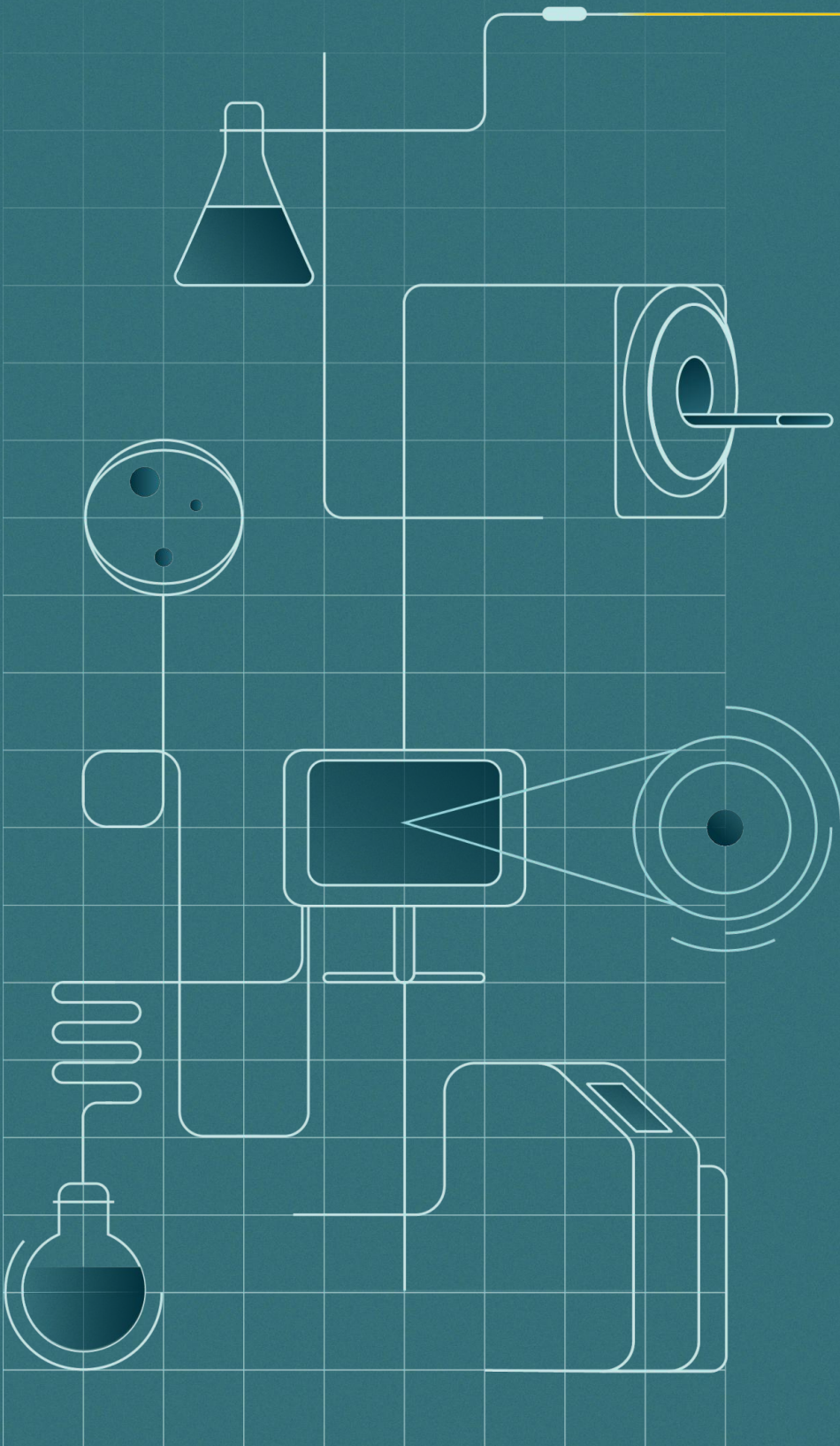
**43** Researchers from  
**19** Countries



Argentina	1	Denmark	1	India	4	Portugal	1	Ukraine	1
Bolivia	1	Dominican Republic	1	Iran	1	Romania	1	UK	1
Bulgaria	1	France	1	Italy	14	Russia	1	Venezuela	1
China	2	Germany	8	Lithuania	1	South Africa	1		

# Facilities

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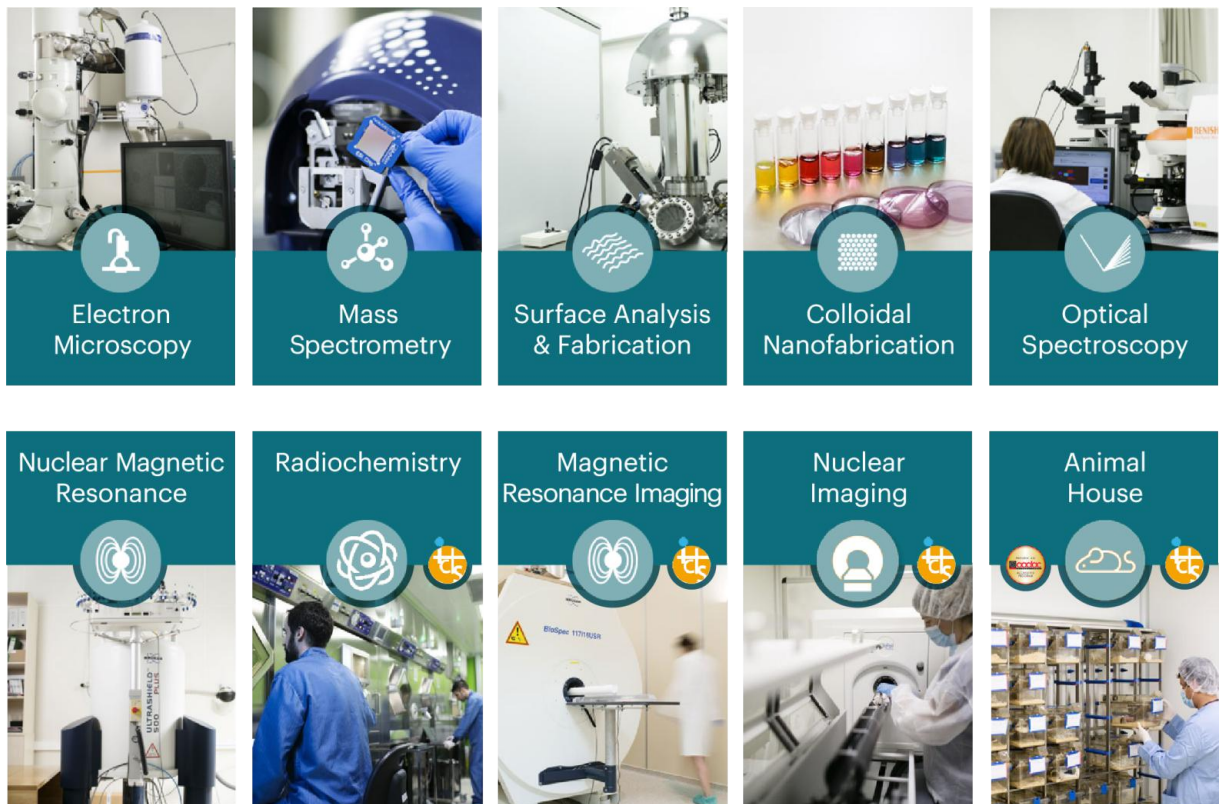


## RESEARCH FACILITIES

All the research lines, framed within the strategic research program of CIC biomaGUNE, are strongly supported by the Molecular & Functional Imaging Facility and the Technological Platforms, which constitute a major strength of the Center.

CIC biomaGUNE's state-of-the-art facilities are depicted in the images below. In the first row the Technological Platforms are presented, whereas the second row shows the instruments of the Molecular Imaging Facility.

### CIC biomaGUNE Technological Platforms & Molecular Imaging Facility



## | MOLECULAR & FUNCTIONAL IMAGING FACILITY

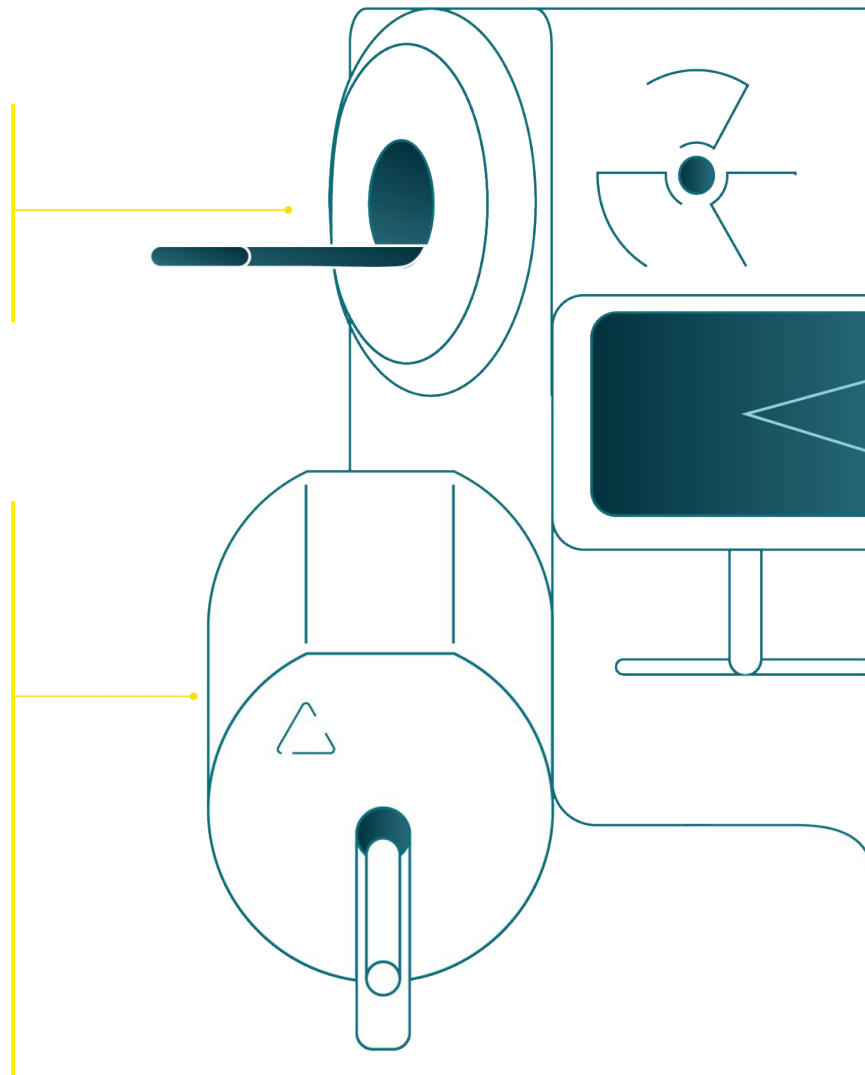
Housed within 900 m<sup>2</sup>, the Molecular and Functional Imaging Facility at CIC biomaGUNE is an integrated bioimaging structure that offers state-of-the-art preclinical imaging instrumentation in Positron Emission Tomography (PET), Single Photon Emission Computed Tomography (SPECT), Computerized Tomography (CT), Magnetic Resonance Imaging (MRI), Optical/Fluorescence and Ultrasound (US) Imaging. It includes a fully equipped radiochemistry laboratory with a biomedical cyclotron, advanced microscopy equipment, a dedicated animal housing facility for rodents which holds AAALAC accreditation, and complementary equipment including gamma spectrometry and autoradiography. The Facility is currently integrated in the “Distributed Biomedical Imaging Network” (ReDIB, [www.redib.net](http://www.redib.net)), recognized by the Spanish Government as a Singular Scientific and Technical Infrastructure (ICTS). The infrastructure has been designed, built and equipped to tackle longitudinal and multimodal pre-clinical projects and to develop applications in the area of Preclinical Molecular and Functional Imaging and Nanomedicine.

### **Nuclear Imaging:**

Equipped with a hybrid PET-CT (eXplore Vista-CT) and full ring SPECT-CT (eXplore speCZT CT 120), the latter offering the possibility of multi-isotope studies with energy discrimination. An additional trimodal PET-SPECT-CT has been installed in 2019.

### **Magnetic Resonance Imaging:**

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).





### Radiochemistry Platform:

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  $^{18}\text{F}$  F,  $^{18}\text{F}$  F<sub>2</sub>,  $^{13}\text{N}$ -NH<sub>4</sub><sup>+</sup>,  $^{15}\text{O}$ -O<sub>2</sub>,  $^{11}\text{C}$ -CO<sub>2</sub> and  $^{11}\text{C}$ -CH<sub>4</sub>. It also has a solid target for the production of  $^{89}\text{Zr}$  and  $^{64}\text{Cu}$ . 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  $^{11}\text{C}$  CH<sub>3</sub>I /  $^{11}\text{C}$  CH<sub>3</sub>OTf from  $^{11}\text{C}$  CO<sub>2</sub> /  $^{11}\text{C}$  CH<sub>4</sub>, and subsequent methylation reaction
- $^{18}\text{F}$ -fluorination by nucleophilic and electrophilic substitution
- Radiotracer synthesis using microfluidics technology
- Chelation reactions using radiometals ( $^{68}\text{Ga}$ ,  $^{67}\text{Ga}$ ,  $^{64}\text{Cu}$ ,  $^{89}\text{Zr}$ , etc.)

The quality control lab, sited into 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.

### Pre-Clinical Image Analytics:

The Image Analytics service takes care of processing all the outgoing multimodal images obtained within the Molecular Imaging Unit (PET, SPECT, CT, MRI and Optical Imaging). Working on different operating systems, we carry out co-registration, segmentation, and quantification of multimodal images. Moreover, we also work with Matlab, FSL and IDL in the development of analysis and processing algorithms. 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.

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)**, and is prepared to house up to 800 mice and 400 rats in individually ventilated cages, with an experimental area specifically devoted to perform longitudinal studies. The animal house is complemented with microsurgery areas for animal preparation. Four work stations and a data storage system in the Terabyte scale enable image reconstruction, processing, quantification and archiving.



## 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)

#### - 500 MHz NMR:

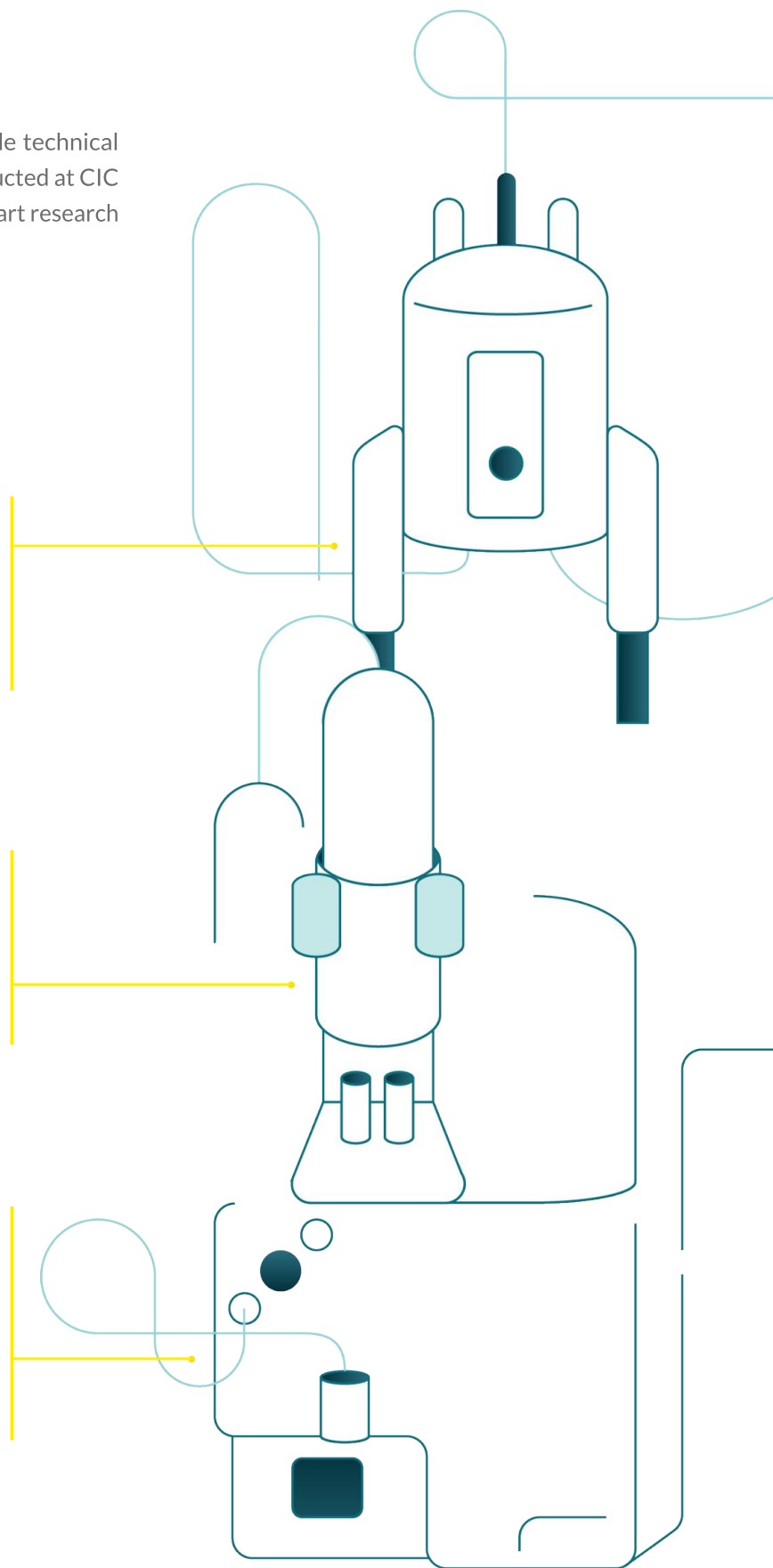
Provides essential service for the characterization of molecules with biological activity, from complex glycans to molecules used in the design of nanostructures for biomedical applications.

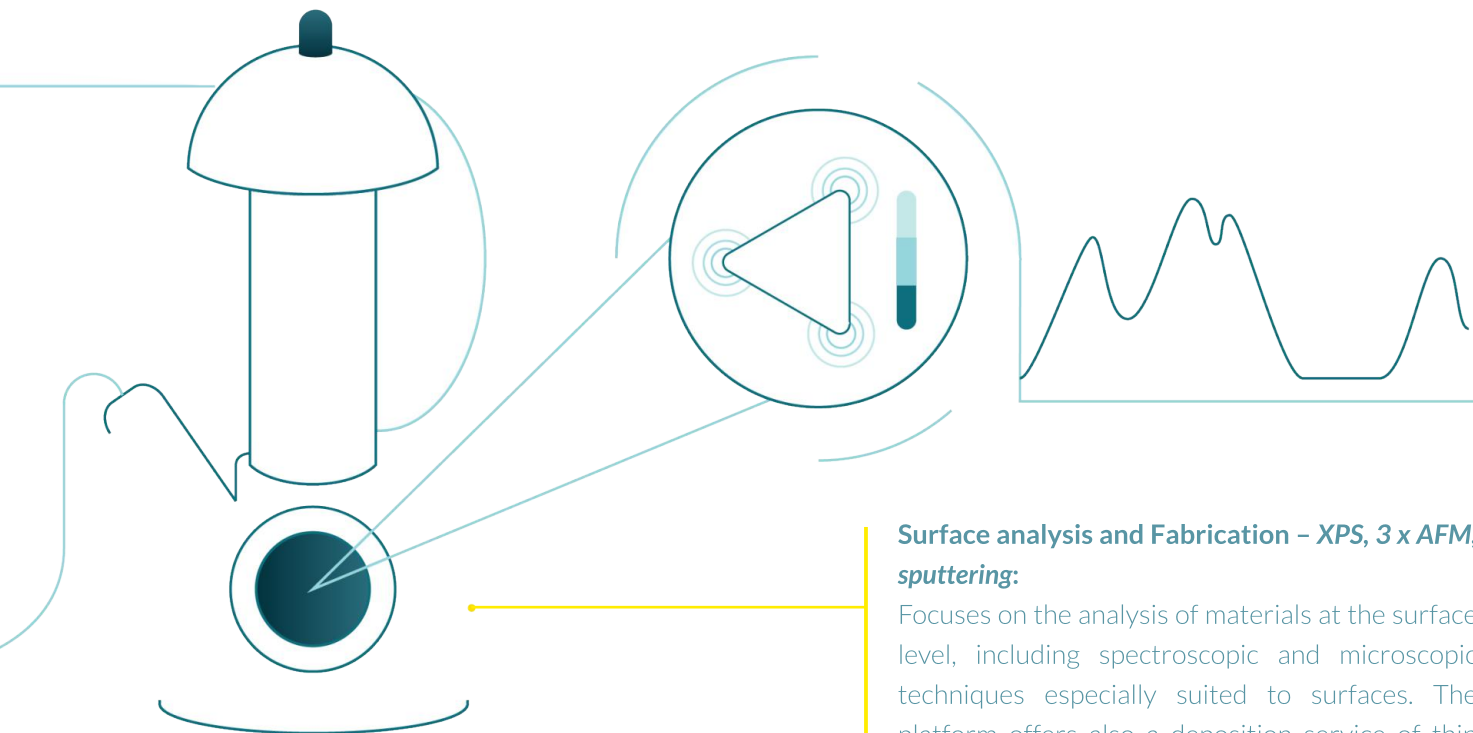
### Electron Microscopy - SEM-EDX, TEM - 120 keV and 200 keV:

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 - MALDI-TOF, ICP-MS:** Provides several high quality mass spectrometry techniques for the analysis of small molecules, complex biomolecules and nanomaterials.

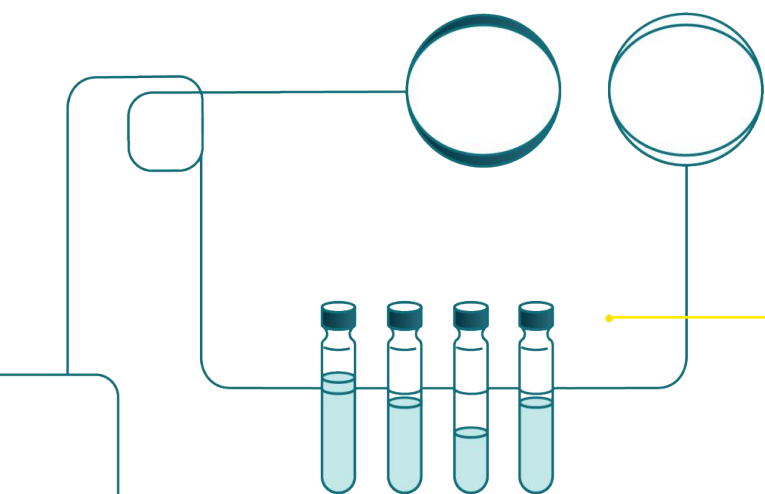
The platform is equipped with modern instrumentation and offers different ionization techniques.





**Surface analysis and Fabrication – XPS, 3 x AFM, sputtering:**

Focuses on the analysis of materials at the surface level, including spectroscopic and microscopic techniques especially suited to surfaces. The platform offers also a deposition service of thin layers for controlled manufacture at the nanoscale.



**Colloidal Nanofabrication:**

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 – 2 x Confocal, Confocal-Raman, UV-VIS-NIR, Flow Cytometer, Cell Observer, CD, DLS, DCS, ITC, TGA, SPR:**

Offers a wide variety of techniques for the spectroscopic characterization of biomaterials and biosurfaces. Also included are optical microscopy techniques (confocal, Raman, etc.) that allow to investigate the interaction of nanomaterials with cellular systems of diverse complexity.

# Funding





The total Funding for **2019** has amounted **10.124.162 €**.  
 Additionally **36** new projects (from competitive funding sources)  
 have been launched in 2019 with a total contribution of **4.101.418 €**.



CALL	PI	PERIOD	AMOUNT (€)
Ayudas para contratos predoctorales	Ander Abarrategi-López	2019-2023	92.750,00
Ayudas para contratos predoctorales	Pedro Ramos-Cabrer	2019-2023	92.750,00
Ayudas para contratos predoctorales	Luis Liz-Marzán	2019-2023	92.750,00
Ayudas para contratos predoctorales	Niels Reichardt	2019-2023	92.750,00
Ayudas para contratos predoctorales	Jesús Ruiz-Cabello	2019-2023	92.750,00
Ayudas para contratos predoctorales	Valery Pavlov	2019-2023	92.750,00
Juan de la Cierva - Incorporación	Niels Reichardt	2019-2021	64.000,00

CALL	PI	FULL TITLE	PERIOD	AMOUNT (€)
Proyectos I+D+i «Retos Investigación»	Ander Abarrategi-López	Cartilage transdifferentiation: Towards a redefinition of Mesechymal Stem Cell hierarchy	2019-2021	145.200,00
Proyectos I+D+i «Retos Investigación»	Fernando López-Gallego	Organización espacial de sistemas multienzimáticos en espacios confinados. Una nueva herramienta para la optimización de la biosíntesis in vitro de omega-hydroxyacidos	2019-2021	114.950,00
Redes y Gestores	Anna Llanes Pallàs	Fortalecimiento de la Unidad de Gestión de la I+D+i de CIC biomaGUNE	2019-2020	140.722,08

**bioef**

berrikuntza + ikerketa + osasuna eusko fundazioa  
 fundación vasca de innovación e investigación sanitarias

CALL	PI	FULL TITLE	PERIOD	AMOUNT (€)
Ayudas 2018 a proyectos de investigación en ictus de BIOEF	Pedro Ramos-Cabrer	Multimodal imaging of neuroinflammation in stroke: the role of nicotinic receptors and glutamate transporters	2019-2022	26.640,00

CALL	PI	FULL TITLE	PERIOD	AMOUNT (€)
Ayudas Fundación BBVA a Proyectos de Investigación	<b>Jesús Ruíz-Cabello</b>	Early diagnosis of atherosclerotic plaque with new nano-radiotracers for molecular imaging	2019-2022	125.000,00
Becas Leonardo a Investigadores y Creadores Culturales	<b>Ander Abarategi-López</b>	De cartílago a hueso: Estudio de los mecanismos de plasticidad celular y su relevancia en procesos de formación ósea.	2019-2021	33.058,00



CALL	PI	FULL TITLE	PERIOD	AMOUNT (€)
RED - infraestructura	<b>Jesús Ruíz-Cabello</b>	Proyecto adquisición de un laser multifotón	2019-2020	100.000,00
Programa Fellows	<b>Ivan Sasselli-Ramos</b>	Estudio de la Interfase entre Nanomateriales Peptídicos y Sistemas Biológicos	2019-2020	47.802,00
Programa Fellows	<b>Carlos Sánchez-Cano</b>	Nanomateriales metálicos en muestras Biológicas; explorando interacciones entre Metales usando radiación de Sincrotrón	2019-2020	38.879,00
Programa Fellows	<b>Óscar Ferreira</b>	Nanoterapias dirigidas a la mitocondria y herramientas de imagen de precisión avanzadas para la administración de medicamentos	2019-2020	47.802,00
RED I+D 2019	<b>Ivan Coluzza</b>	Diseño de coberturas inteligentes para el control de la corona proteica de nanopartículas	2019-2020	89.534,00



CALL	PI	FULL TITLE	PERIOD	AMOUNT (€)
H2020-MSCA-RISE-2018	<b>Sergio Moya</b>	Hemoglobin-based Protein Nanocarriers for Tumour Oxygenation and a more effective Photodynamic Therapy	2019-2023	529.000,00
H2020 FETOPEN-2018-2020	<b>Fernando López-Gallego</b>	Redesigning biocatalysis: Thermal-tuning of one-pot multienzymatic cascades by nanoactuation	2019-2022	303.535,55
MSCA-RISE-2018	<b>Jesús Ruíz-Cabello</b>	Innovation in Tuberculosis	2019-2022	18.400,00
MSCA-IF-2018	<b>Niels Reichardt</b>	Targeting hMGL-GalNAc interactions to reverse immune suppression in cancer	2019-2021	172.932,48

CALL	PI	FULL TITLE	PERIOD	AMOUNT (€)
ERC-2018-PoC	<b>Aitziber L. Cortajarena</b>	Fluorescence-based nano-immunoassay IVD platform	2019-2020	149.952,00

CALL	PI	FULL TITLE	PERIOD	AMOUNT (€)
ELKARTEK 2019	<b>Jesús Ruiz-Cabello</b>	Biomarcadores para el diagnóstico precoz y seguimiento de tratamiento en hipertensión pulmonar	2019-2020	1.088.136,00
Equipamiento Científico EKIZIEN 2019	<b>Aitziber L. Cortajarena</b>	Lector multimodal de microplacas	2019-2020	45.959,30
BIKAINTEK 2019	<b>Jesús Ruiz-Cabello</b>	Biomarcadores basados en imagen para diagnóstico en Hipertensión Pulmonar	2019-2021	45.338,04
Ayudas a proyectos de investigación y desarrollo en salud	<b>Aitziber L. Cortajarena</b>	Trasplante de precursores hematopoyéticos autólogo en el tratamiento de cáncer y enfermedades raras: Papel de las células NK	2019	19.489,00
Ayudas a proyectos de investigación y desarrollo en salud	<b>Aitziber L. Cortajarena</b>	Medicina personalizada en tumores cerebrales : desarrollo y validación de estrategias terapéuticas basadas en la inhibición de la auto-renovación	2019	11.696,00
Ayudas a proyectos de investigación y desarrollo en salud	<b>Ander Abarrategi-López</b>	Dolor y pérdida de la capacidad funcional en las personas mayores: Desarrollo de procedimientos y tecnologías para su valoración integral	2019	11.670,00
Ayudas a proyectos de investigación y desarrollo en salud	<b>Jordi Llop</b>	Biomarcadores de imagen para el diagnóstico precoz, la predicción del deterioro cognitivo y la monitorización de la progresión de la Enfermedad de Alzheimer: un abordaje traslacional	2019	12.520,00
Ikerbilerak 2019-1	<b>Niels Reichardt</b>	International Workshop on Biomedical Glycoscience	2019	2.927,00



CALL	PI	FULL TITLE	PERIOD	AMOUNT (€)
Talento Innovador 2019	Ander Abarrategi-López	Estudio de materiales poliméricos 3D para su uso en regeneración de tejido óseo	2019-2020	10.000,00

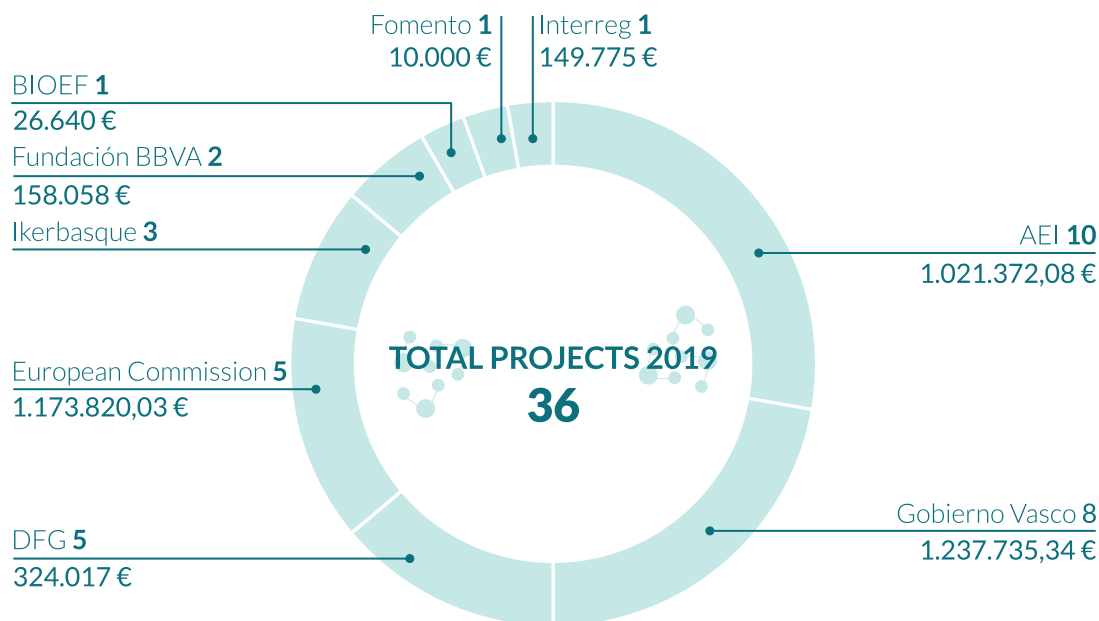
## ikerbasque

Basque Foundation for Science

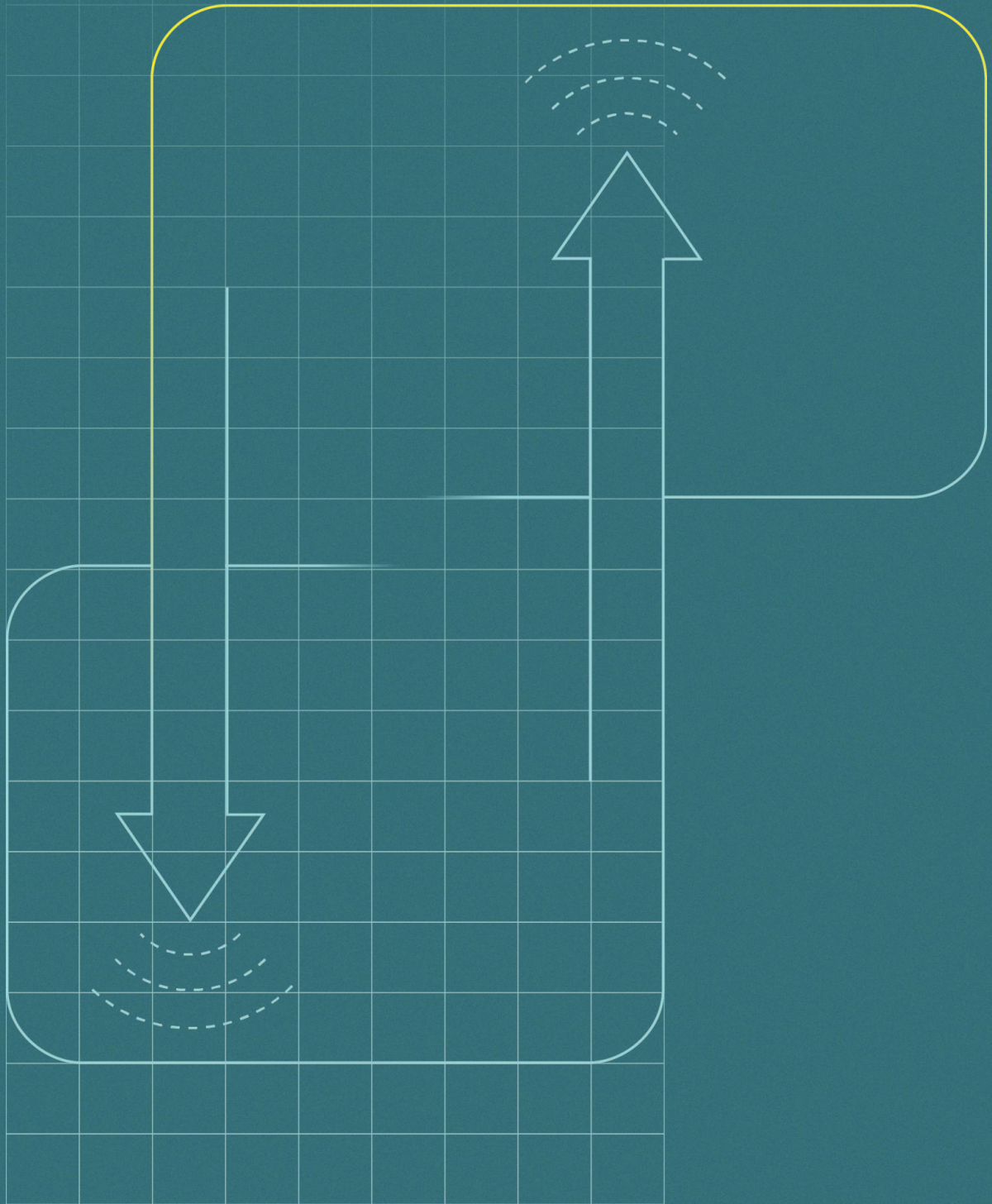
CALL	PI	PERIOD
Ikerbasque Research Professor	Fernando López-Gallego	2019-2025
Ikerbasque Research Fellows	Ander Abarrategi-López	2019-2024
Ikerbasque Research Fellows	Dorleta Jiménez de Aberasturi	2019-2024



CALL	PI	FULL TITLE	PERIOD	AMOUNT (€)
Interreg Atlantic Area 2018	Jordi Llop	An Atlantic innovation platform on diagnosis and treatment of neurological diseases and aging	2019-2021	149.775,00



# Knowledge & Technology Transfer



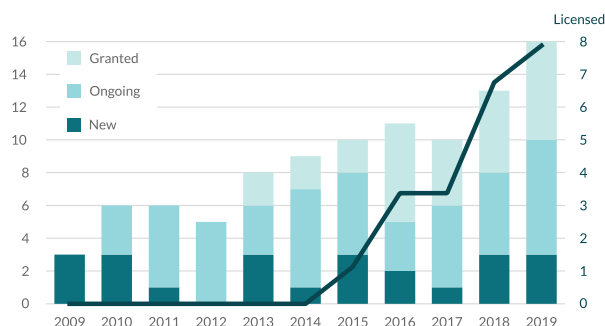
In 2019 **3** new **patent applications** have been filed and **19** **collaboration agreements** with industrial or clinical partners signed.

CIC biomaGUNE is making a substantial effort to promote the transfer to the market of research results produced at the Center. In this respect, an initiative has been launched to identify and support the development of those technologies with a clear market potential, namely the development unit (DU) initiative, within the R&D&I management unit. The DU acts as an antenna and incubator of ideas, with the main objective of identifying and transferring research results from the Center into the market, by protecting the results, encouraging their exploitation and strengthening patent licensing. Projects to be matured within the DU are initially evaluated by the scientific direction of the Center, on the basis of criteria that include the consistency of the initiative with the Center's activity and the benefit that the initiative can obtain from the infrastructure/resources of the Center for its maturation. In addition, the R&D&I management unit works on establishing new

contracts with companies, promoting cross-sectorial research and maximizing the transfer of knowledge and technology.

## PATENTS

The generation of patents is one of the instruments that indicate the transfer of knowledge from the Center to Society and to business development. The graph below shows the evolution over the years:



## 2019 Patent Applications

Methacrylate or acrylate modified polysaccharide-based oil-in-water emulsion stabilizer

J. Llop,  
F. López-Gallego,  
M. Navascués Lominchar,  
D. Dupin,  
I. Loinaz Bordonabe

EP19383134.4  
(18/12/2019)

Nanocluster-antibody conjugates and uses thereof

V. Pavlov,  
L. Saa Peña,  
V. Mora Sanz,  
N. Briz Icetae

EP19382894.4  
(11/10/2019)

In vitro method for the diagnosis of tuberculosis

J.M. Ruiz-Cabello,  
J. L. Izquierdo García,  
J. M. Garrido Urkullu,  
I. Agirregomoscorta Sevilla

EP19383117.9  
(16/12/2019)



## | SPIN-OFFS



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 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 during the last two years by the CIC biomaGUNE Development Unit are aimed at researchers, academia and pharmaceutical companies around the world.

The company has been certified as Innovative SME by the Spanish government.

The collaboration between Asparia and CIC biomaGUNE has continued during 2019 with several ongoing research projects and 3 co-directed PhD Theses.

### **CICbiomaGUNE develops joint research activities in collaboration with different types of organizations and companies, including spin-offs, SMEs, large companies and research organizations.**

This research 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 2019, besides several technical services provided to industry and the initiation of conversations with many companies, nineteen collaboration agreements with industrial or clinical partners were signed:

#### **Service Contract**

IDIBAPS, Institut d'Investigacions Biomèdiques  
August Pi i Sunyer (Spain)  
Midatech Pharma España S.L.U. (Spain)  
The University of Manchester (UK)

#### **Material Transfer Agreement**

VTT Technical Research Center (Finland)  
Plexikon Inc. (USA)  
Janssen Pharmaceutica NV (Belgium)  
F. Hoffmann-La Roche Ltd (Switzerland)  
Fundación CIDETEC (Spain)

#### **Three parties confidentiality agreement**

Biokit Research & Development (Spain) and  
Ikerlat Polymers, S.L. (Spain)

#### **Patent co-ownership agreement**

Tecnalia (Spain)  
NEIKER, Instituto Vasco de Investigación y  
Desarrollo Agrario (Spain)

#### **External use of scientific equipment agreement**

Tecnalia (Spain)  
Fundación CIDETEC (Spain)

#### **Non-disclosure agreement**

BioTechFoods (Spain)  
BioFeyn (France)  
Starget Pharma (Israel)  
GlaxoSmithKline Investigación y Desarrollo, S.L  
(Spain)  
Ikerlat Polymers (Spain)

#### **Collaboration agreement**

Fomento San Sebastián (Spain)  
Mutualfruit Ltd. (UK)

#### **IP rights assignment**

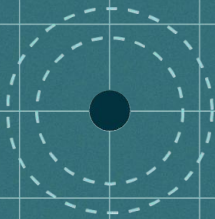
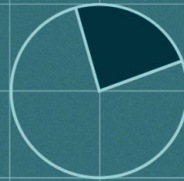
Fundación CIDETEC (Spain)

#### **Mutual Confidentiality Disclosure Agreement (CDA)**

Novadip Biosciences (Belgium)

# Scientific Output


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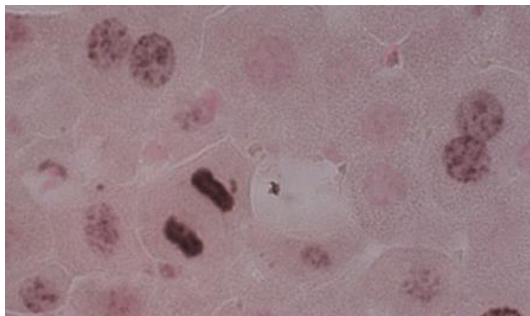
In 2019, **152 research articles** have been published in international scientific journals with an **average impact factor of 7.7**, **22%** of them have been published in journals with **impact factors above 10**. From the total published articles, **80%** of them have been published in journals from the **1<sup>st</sup> quartile**, and **39 %** in journals from the **1<sup>st</sup> decile**.

## ARTICLES PUBLISHED IN JOURNALS WITH IMPACT FACTORS ABOVE 10 (22%)

 <b>Journal</b>	<b>Impact factor</b> 	<b>N° articles</b> 
Nature	43.07	1
Chemical Society Reviews	40.44	1
Advanced Materials	25.81	1
Nature Chemistry	23.19	1
Cell Metabolism	22.41	1
Accounts of Chemical Research	21.66	3
Intensive Care Medicine	18.97	1
Journal of the American College of Cardiology	18.64	1
Advanced Functional Materials	15.62	2
Advanced Drug Delivery Reviews	15.52	1
Journal of the American Chemical Society	14.69	1
ACS Nano	13.90	8
Nano Letters	12.28	2
Angewandte Chemie International Edition	12.26	1
ACS Catalysis	12.22	1
Nature Protocols	11.33	1
Small	10.86	2
Chemistry of Materials	10.16	2
<b>Total</b>		<b>31</b>

## HIGHLIGHTS

### p38 gamma is essential for cell cycle progression and liver tumorigenesis



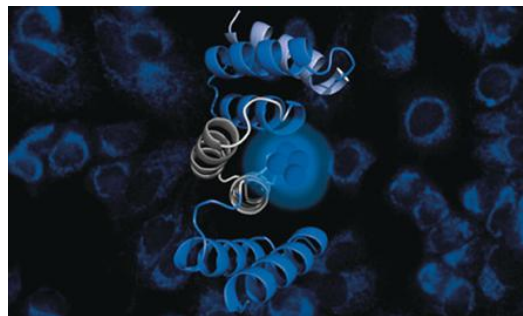
Mitosis in hepatocytes (Photo: Alfonso Mora/CNIC)

Tomás-Loba, A; Manieri, E; González-Terán, B; Mora, A; Leiva-Vega, L; Santamans, AM; Romero-Becerra, R; Rodríguez, E; Pintor-Chocano, A; Feixas, F; López, JA; Caballero, B; Trakala, M; Blanco, Ó; Torres, JL; Hernández-Cosido, L; Montalvo-Romeral, V; Matesanz, N; Roche-Molina, M; Bernal, JA; Mischo, H; León, M; Caballero, A; Miranda-Saavedra, D; Ruiz-Cabello, J; Nevzorova, YA; Cubero, FJ; Bravo, J; Vázquez, J; Malumbres, M; Marcos, M; Osuna, S; Sabio, G.

*Nature*, 2019, 568, 557-560

The cell cycle is a tightly regulated process that is controlled by the conserved cyclin-dependent kinase (CDK)-cyclin protein complex<sup>1</sup>. However, control of the G<sub>0</sub>-to-G<sub>1</sub> transition is not completely understood. Here we demonstrate that p38 MAPK gamma (p38 $\gamma$ ) acts as a CDK-like kinase and thus cooperates with CDKs, regulating entry into the cell cycle. p38 $\gamma$  shares high sequence homology, inhibition sensitivity and substrate specificity with CDK family members. In mouse hepatocytes, p38 $\gamma$  induces proliferation after partial hepatectomy by promoting the phosphorylation of retinoblastoma tumour suppressor protein at known CDK target residues. Lack of p38 $\gamma$  or treatment with the p38 $\gamma$  inhibitor pirfenidone protects against the chemically induced formation of liver tumours. Furthermore, biopsies of human hepatocellular carcinoma show high expression of p38 $\gamma$ , suggesting that p38 $\gamma$  could be a therapeutic target in the treatment of this disease.

### A Simple Approach to Design Proteins for the Sustainable Synthesis of Metal Nanoclusters



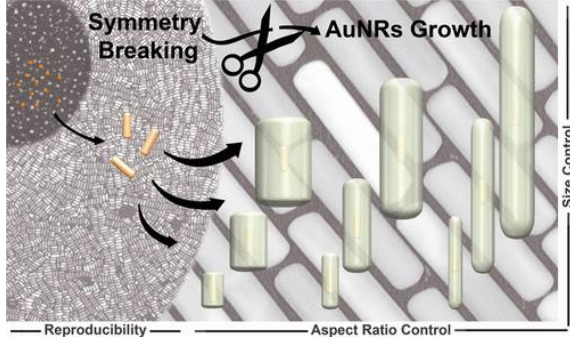
Aires, A; Llarena, I; Möller, M; Castro-Smirnov, J; Cabanillas-Gonzalez, J; Cortajarena, AL.

*Angew. Chem. Int. Ed.* 2019, 58, 6214-6219.

Metal nanoclusters (NCs) are considered ideal nanomaterials for biological applications owing to their strong photoluminescence (PL), excellent photostability, and good biocompatibility. This study presents a simple and versatile strategy to design proteins, via incorporation of a di-histidine cluster coordination site, for the sustainable synthesis and stabilization of metal NCs with different metal composition. The resulting protein-stabilized metal NCs (Prot-NCs) of gold, silver, and copper are highly photoluminescent and photostable, have a long shelf life, and are stable under physiological conditions.

The biocompatibility of the clusters was demonstrated in cell cultures in which Prot-NCs showed efficient cell internalization without affecting cell viability or losing luminescence. Moreover, the approach is translatable to other proteins to obtain Prot-NCs for various biomedical applications such as cell imaging or labeling.

## Disconnecting Symmetry Breaking from Seeded Growth for the Reproducible Synthesis of High Quality Gold Nanorods

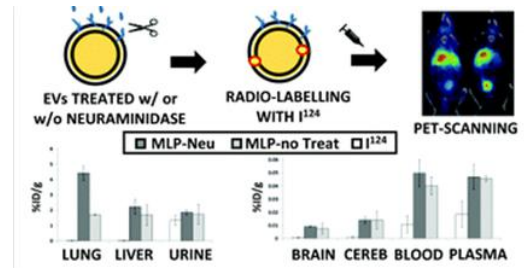


González-Rubio, G; Kumar, V; Llombart, P; Díaz-Núñez, P; Bladt, E; Altantzis, T; Bals, S; Peña-Rodríguez, O; Noya, EG; Macdowell, LG; Guerrero-Martínez, A; Liz-Marzán, LM.

*ACS Nano* 2019, 13, 4, 4424–4435

One of the major difficulties hindering the widespread application of colloidal anisotropic plasmonic nanoparticles is the limited robustness and reproducibility of multistep synthetic methods. We demonstrate herein that the reproducibility and reliability of colloidal gold nanorod (AuNR) synthesis can be greatly improved by disconnecting the symmetry-breaking event from the seeded growth process. We have used a modified silver-assisted seeded growth method in the presence of the surfactant hexadecyltrimethylammonium bromide and n-decanol as a co-surfactant to prepare small AuNRs in high yield, which were then used as seeds for the growth of high quality AuNR colloids. Whereas the use of n-decanol provides a more-rigid micellar system, the growth on anisotropic seeds avoids sources of irreproducibility during the symmetry breaking step, yielding uniform AuNR colloids with narrow plasmon bands, ranging from 600 to 1270 nm, and allowing the fine-tuning of the final dimensions. This method provides a robust route for the preparation of high quality AuNR colloids with tunable morphology, size, and optical response in a reproducible and scalable manner.

## Modification of the glycosylation of extracellular vesicles alters their biodistribution in mice

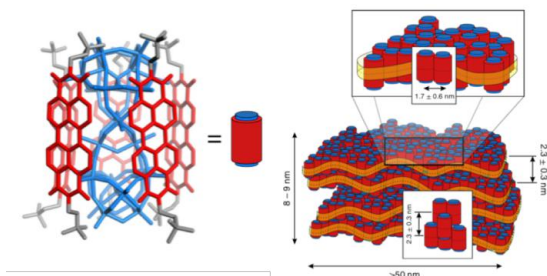


Royo F, Cossío U, Ruiz de Angulo A, Llop J, Falcon-Perez JM.

*Nanoscale* 2019, 11, 4, 1531-1537

Extracellular vesicles (EVs) are considered sophisticated vehicles for cell-to-cell communication, thanks to the possibility of handling a variable cargo in a shell with multiple types of decoders. Surface glycosylation of EVs is a method that could be used to control their interaction with different cells and, consequently, the biodistribution of the vesicles in the body. Herein, we produced EVs derived from mouse liver proliferative cells, and we treated them with neuraminidase, an enzyme that digests the terminal sialic acid residues from glycoproteins. Afterwards, we labeled the EVs directly with  $[^{124}\text{I}]\text{Na}$  and injected them in mice intravenously or into the hock. The amount of radioactivity in major organs was measured at different time points after administration both in vivo using positron emission tomography and ex vivo (after animal sacrifice) using dissection and gamma counting. The results showed that intravenous injection leads to the rapid accumulation of EVs in the liver. Moreover, after some hours the distribution led to the presence of EVs in different organs including the brain. Glycosidase treatment induced an accumulation in the lungs, compared with the intact EVs. Furthermore, when the EVs were injected through the hock, the neuraminidase-treated vesicles distributed better at the axillary lymph nodes than the untreated EVs. This result shows that modification of the glycosylated complexes on the EV surface can affect the distribution of these vesicles, and specifically removing the sialic acid residues allows more EVs to reach and accumulate at the lungs.

## Hierarchical organization of perylene bisimides and polyoxometalates for photo-assisted water oxidations

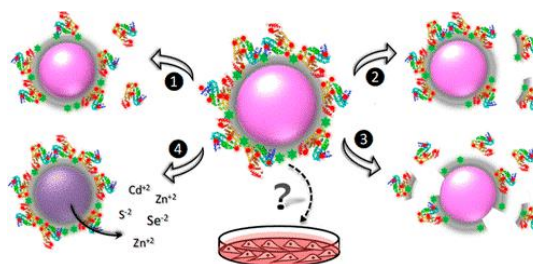


Bonchio, M; Syrgiannis, Z; Burian, M; Marino, N; Pizzolato, E; Dirian, K; Rigodanza, F; Volpato, GA; La Ganga, G; Demitri, N; Berardi, S; Amenitsch, H; Guldi, DM; Caramori, S; Bignozzi, CA; Sartorel, A; Prato, M.

*Nature Chemistry*, 2019, 11 - 2, 146-153

The oxygen in Earth's atmosphere is there primarily because of water oxidation performed by photosynthetic organisms using solar light and one specialized protein complex, photosystem II (PSII). High-resolution imaging of the PSII 'core' complex shows the ideal co-localization of multi-chromophore light-harvesting antennas with the functional reaction centre. Man-made systems are still far from replicating the complexity of PSII, as the majority of PSII mimetics have been limited to photocatalytic dyads based on a 1:1 ratio of a light absorber, generally a Ru-polypyridine complex, with a water oxidation catalyst. Here we report the self-assembly of multi-perylene-bisimide chromophores (PBI) shaped to function by interaction with a polyoxometalate water-oxidation catalyst ( $\text{Ru}_4\text{POM}$ ). The resulting  $[\text{PBI}]_5\text{Ru}_4\text{POM}$  complex shows a robust amphiphilic structure and dynamic aggregation into large two-dimensional paracrystalline domains, a redshifted light-harvesting efficiency of >40% and favourable exciton accumulation, with a peak quantum efficiency using 'green' photons ( $\lambda > 500 \text{ nm}$ ). The modularity of the building blocks and the simplicity of the non-covalent chemistry offer opportunities for innovation in artificial photosynthesis.

## Triple-Labeling of Polymer-Coated Quantum Dots and Adsorbed Proteins for Tracing their Fate in Cell Cultures



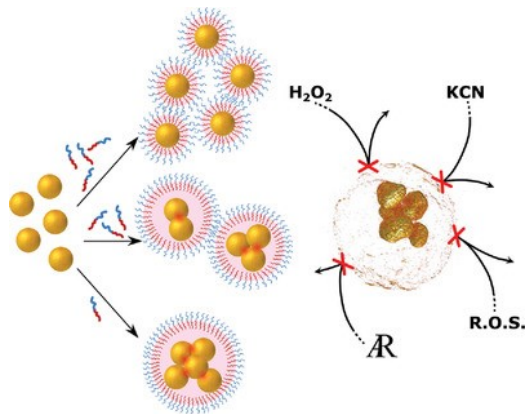
Carrillo-Carrion, C; Bocanegra, AI; Arnaiz, B; Feliu, N; Zhu, DC; Parak, WJ.

*ACS Nano* 2019, 13, 4, 4631-4639.

Colloidal CdSe/ZnS quantum dots were water solubilized by overcoating with an amphiphilic polymer. Human serum albumin (HSA) as a model protein was either adsorbed or chemically linked to the surface of the polymer-coated quantum dots. As the quantum dots are intrinsically fluorescent, and as the polymer coating and the HSA were fluorescently labeled, the final nanoparticle had three differently fluorescent components: the quantum dot core, the polymer shell, and the human serum albumin corona. Cells were incubated with these hybrid nanoparticles, and after removal of non-internalized nanoparticles, exocytosis of the three components of the nanoparticles was observed individually by flow cytometry and confocal microscopy. The data indicate that HSA is partly transported with the underlying polymer-coated quantum dots into cells. Upon desorption of proteins, those initially adsorbed to the quantum dots remain longer inside cells compared to free proteins. Part of the polymer shell is released from the quantum dots by enzymatic degradation, which is on a slower time scale than protein desorption. Data are quantitatively analyzed, and experimental pitfalls, such as the impact of cell proliferation and fluorescence quenching, are discussed.



## Encapsulation of Noble Metal Nanoparticles through Seeded Emulsion Polymerization as Highly Stable Plasmonic Systems

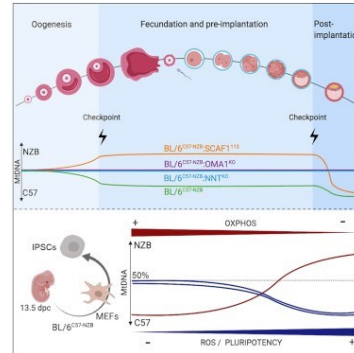


Scarabelli, L; Schumacher, M; Jimenez de Aberasturi, D; Merkl, J; Henriksen-Lacey, M; Milagres de Oliveira, T; Janschel, M; Schmidtke, C; Bals, S; Weller, H; Liz-Marzán, LM.

*Adv. Funct. Mater.* 2019, 29 - 14, 1809071

The implementation of plasmonic nanoparticles *in vivo* remains hindered by important limitations such as biocompatibility, solubility in biological fluids, and physiological stability. A general and versatile protocol is presented, based on seeded emulsion polymerization, for the controlled encapsulation of gold and silver nanoparticles. This procedure enables the encapsulation of single nanoparticles as well as nanoparticle clusters inside a protecting polymer shell. Specifically, the efficient coating of nanoparticles of both metals is demonstrated, with final dimensions ranging between 50 and 200 nm, i.e., sizes of interest for bio-applications. Such hybrid nanocomposites display extraordinary stability in high ionic strength and oxidizing environments, along with high cellular uptake, and low cytotoxicity. Overall, the prepared nanostructures are promising candidates for plasmonic applications under biologically relevant conditions.

## Regulation of Mother-to-Offspring Transmission of mtDNA Heteroplasmy

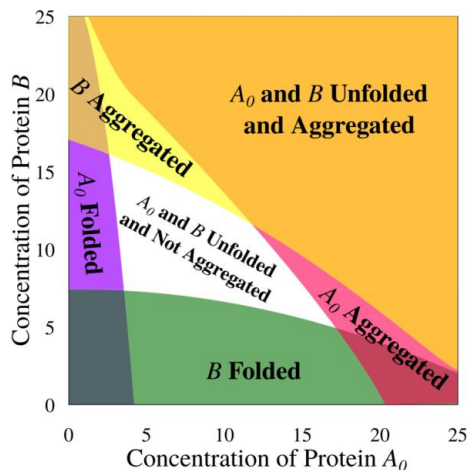


Latorre-Pellicer, a; Lechuga-Vieco, A. V.; Johnston, I. G.; Hämäläinen, R. H.; Pellico, J.; Justo-Méndez, R.; Fernández-Toro, J. M.; Clavería, C.; Guaras, A.; Sierra, R.; Llop J.; Torres, M.; Criado, L.M.; Suomalainen, A.; Jones, N. S.; Ruíz-Cabello, J. and Enríquez, J. A.;

*Cell Metabolism* 2019, 30, 1120-1130.

mtDNA is present in multiple copies in each cell derived from the expansions of those in the oocyte. Heteroplasmy, more than one mtDNA variant, may be generated by mutagenesis, paternal mtDNA leakage, and novel medical technologies aiming to prevent inheritance of mtDNA-linked diseases. Heteroplasmy phenotypic impact remains poorly understood. Mouse studies led to contradictory models of random drift or haplotype selection for mother-to-offspring transmission of mtDNA heteroplasmy. Here, we show that mtDNA heteroplasmy affects embryo metabolism, cell fitness, and induced pluripotent stem cell (iPSC) generation. Thus, genetic and pharmacological interventions affecting oxidative phosphorylation (OXPHOS) modify competition among mtDNA haplotypes during oocyte development and/or at early embryonic stages. We show that heteroplasmy behavior can fall on a spectrum from random drift to strong selection, depending on mito-nuclear interactions and metabolic factors. Understanding heteroplasmy dynamics and its mechanisms provide novel knowledge of a fundamental biological process and enhance our ability to mitigate risks in clinical applications affecting mtDNA transmission.

## Proteins Are Solitary! Pathways of Protein Folding and Aggregation in Protein Mixtures

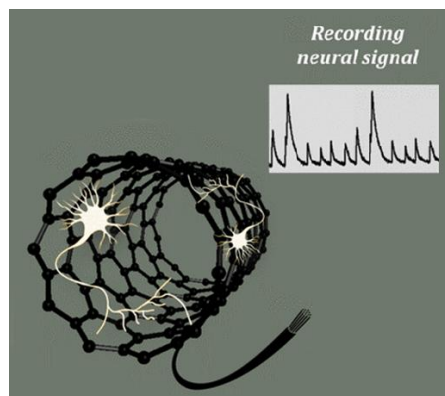


Bianco, V.; Alonso-Navarro, M.; Di Silvio, D.; Moya, S.; Cortajarena, A. L.; Coluzza, I.

*J. Phys. Chem. Lett.* 2019, 4800–4804.

The cellular environment is highly heterogeneous and facing the constant threat of protein aggregation. The concentration of each protein type is highly controlled. But how is such regulation achieved when there are thousands of proteins and a combinatorial number of possible interactions? With computer simulations and experiments, we show that the protein folding phase diagram depends largely on the fraction of that protein and is rather insensitive to the presence of the other species. Hence, here we demonstrate that proteins are fundamentally solitary, making the regulation control against aggregation a simple linear problem.

## Chemically Cross-Linked Carbon Nanotube Films Engineered to Control Neuronal Signaling

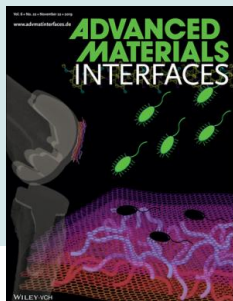


Barrejón, M.; Rauti, R.; Ballerini, L.; Prato, M.

*ACS Nano*, 2019, 13, 8, 8879–8889

In recent years, the use of free-standing carbon nanotube (CNT) films for neural tissue engineering has attracted tremendous attention. CNT films show large surface area and high electrical conductivity that combined with flexibility and biocompatibility may promote neuron growth and differentiation while stimulating neural activity. In addition, adhesion, survival, and growth of neurons can be modulated through chemical modification of CNTs. Axonal and synaptic signaling can also be positively tuned by these materials. Here we describe the ability of free-standing CNT films to influence neuronal activity. We demonstrate that the degree of cross-linking between the CNTs has a strong impact on the electrical conductivity of the substrate, which, in turn, regulates neural circuit outputs.

## COVER PAGES



**Antibacterial Coatings: Antibacterial Layer-by-Layer Films of Poly(acrylic acid)-Gentamicin Complexes with a Combined Burst and Sustainable Release of Gentamicin**

Escobar, A; Muzzio, N; Coy, E; Liu, H; Bindini, E; Andreozzi, P; Wang, G; Angelomé, P; Delcea, M; Grzelczak, M; Moya, SE.

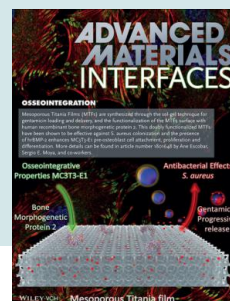
*Adv. Mater. Interfaces*, 2019, 6, 1970140



**Cell-Interface Interactions: Adsorption and Exchangeability of Fibronectin and Serum Albumin Protein Corona on Annealed Polyelectrolyte Multilayers and Their Consequences on Cell Adhesion**

Muzzio, NE; Pasquale, MA; Rios, X; Azzaroni, O; Llop, J; Moya, SE.

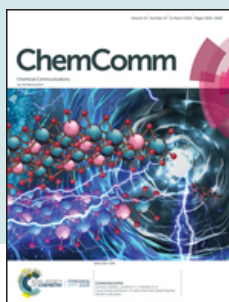
*Adv. Mater. Interfaces*, 2019, 6, 1970049



**Osseointegration: Antibacterial Mesoporous Titania Films with Embedded Gentamicin and Surface Modified with Bone Morphogenetic Protein 2 to Promote Osseointegration in Bone Implants**

Escobar, A; Muzzio, N; Coy, E; Liu, H; Bindini, E; Andreozzi, P; Wang, G; Angelomé, P; Delcea, M; Grzelczak, M; Moya, SE.

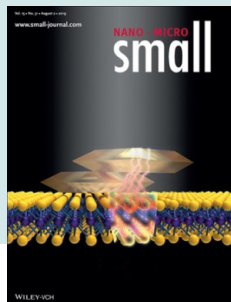
*Adv. Mater. Interfaces*, 2019, 6, 1970057



**Repeat proteins as versatile scaffolds for arrays of redox-active FeS clusters**

Mejias, SH; Bahrami-Dizicheh, Z; Liutkus, M; Sommer, DJ; Astashkin, A; Kodis, G; Ghirlanda, G; Cortajarena, AL.

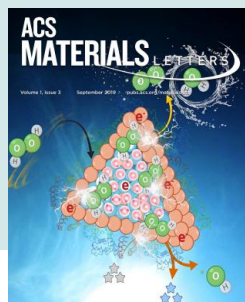
*Chem. Commun.* 2019, 55, 3319-3322



**Dark-Exciton-Mediated Fano Resonance from a Single Gold Nanostructure on Monolayer WS<sub>2</sub> at Room Temperature**

Wang, MS; Krasnok, A; Zhang, TY; Liu, MZ; Liu, H; Scarabelli, L; Fang, J; Liz-Marzan, LM; Terrones, M; Alu, A; Wu, ZL; Zheng, YB.

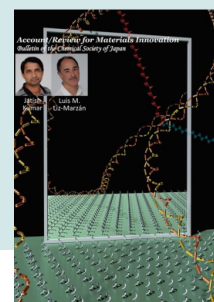
*Small*, 2019, 15, 1900982



**Protein-Protected Porous Bimetallic AgPt Nanoparticles with pH-Switchable Peroxidase/Catalase-Mimicking Activity**

Gharib, M; Kornowski, A; Noei, H; Parak, WJ; Chakraborty, I.

*ACS Mater. Lett.*, 2019, 1, 310-319



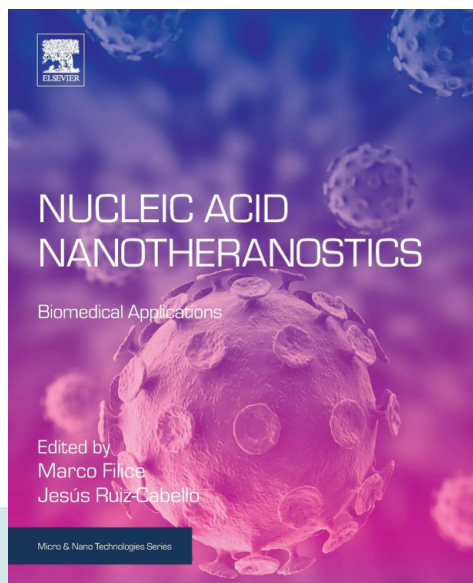
**Recent Advances in Chiral Plasmonics - Towards Biomedical Applications**

Kumar, J; Liz-Marzán, LM.

*Bull. Chem. Soc. Jpn.* 2019, 92, 30-37



## EDITED BOOKS AND BOOK CHAPTERS



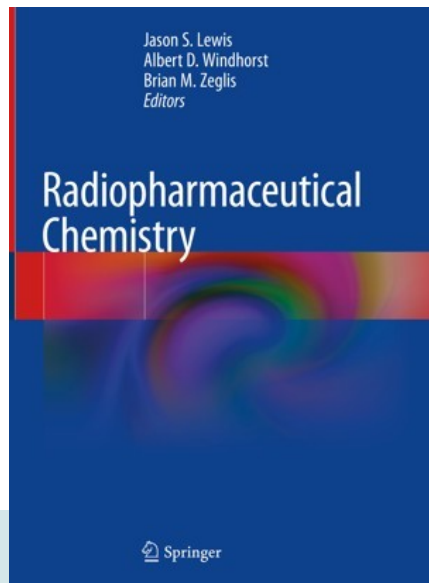
The State of the Art of Investigational and Approved Nanomedicine Products for Nucleic Acid Delivery

K. Ovejero-Paredes, J. Ruiz-Cabello, D. Izquierdo-Alarcón, M. Filice

*Nucleic Acid Nanotheranostics: Biomedical Applications (Micro and Nano Technologies)*, Elsevier

Editors: Marco Filice Jesús Ruiz-Cabello

2019, 421-456



The Radiopharmaceutical Chemistry of Nitrogen-13 and Oxygen-15

Vanessa Gómez-Vallejo, Luka Rejc, Fernando López-Gallego, Jordi Llop.

*Radiopharmaceutical Chemistry*, Springer

2019, 237-254

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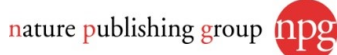
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Velasco, C; Mota-Cobián, A; Mota, RA; Pellico, J; Herranz, F; Galán-Arriola, C; Ibáñez, B; Ruiz-Cabello, J; Mateo, J; España, S. **Quantitative assessment of myocardial blood flow and extracellular volume fraction using <sup>68</sup>Ga-DOTA-PET: A feasibility and validation study in large animals.**

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Cuenca, VE; Martinelli, H; Ramirez, MD; Ritacco, HA; Andreozzi, P; Moya, SE. **Polyphosphate Poly(amine) Nanoparticles: Self-Assembly, Thermodynamics, and Stability Studies.**

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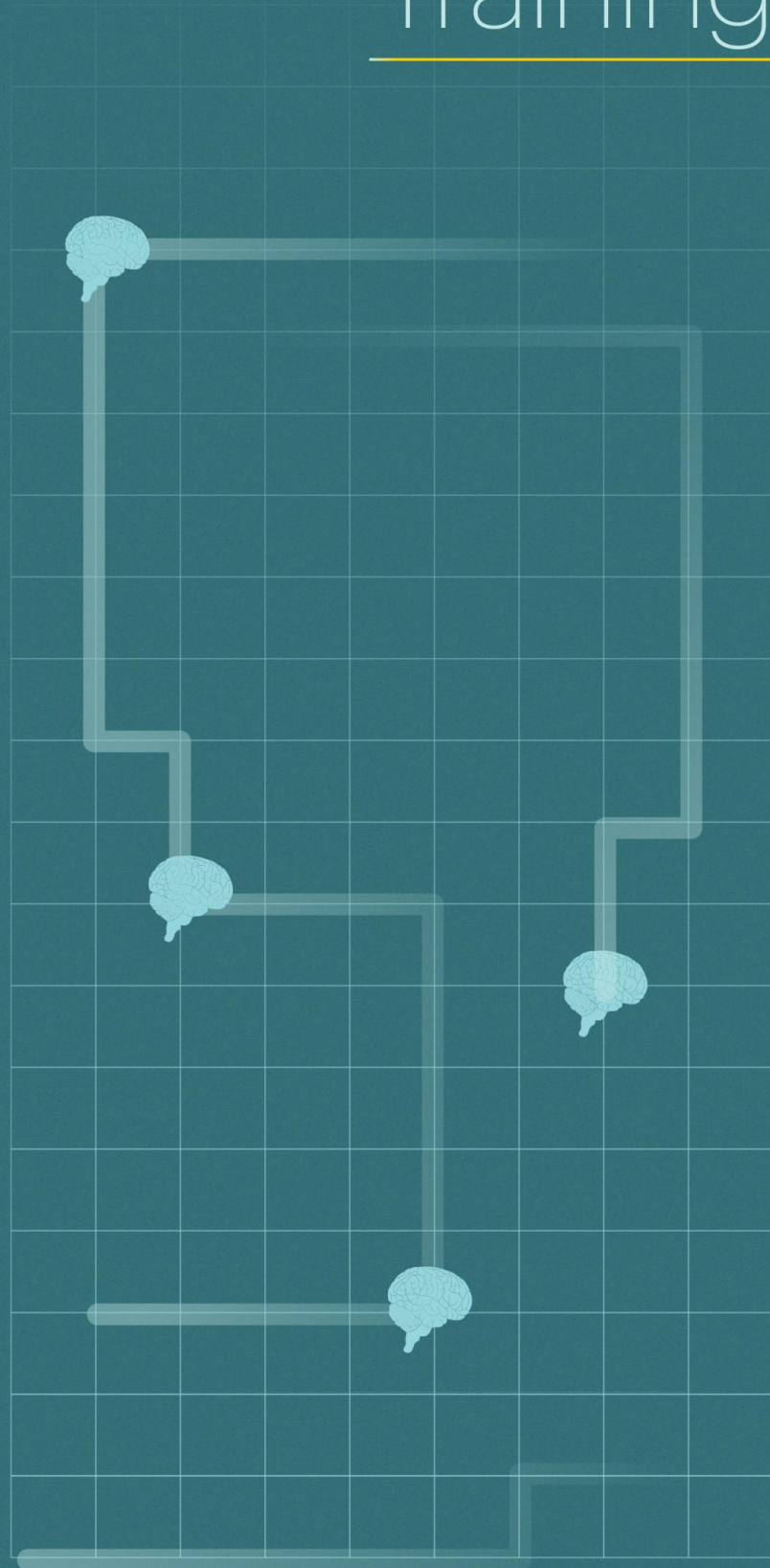
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# Training

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In 2019 there have **59** active **PhD thesis**, **4** of them defended during the year. Our researchers performed **23** secondments at collaborating organizations and we hosted **98** stays of visiting researchers. The Center has organized **43** seminars, **5** workshops/conferences and our researchers have participated as co-organizers of **10** international conferences.

## | PhD PROGRAMS

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.

CIC biomaGUNE has agreements with several universities (which are the degree-grating bodies) to enroll PhD students in different PhD programs. Additionally, CIC biomaGUNE principal researchers are PhD Program Professors in the following Doctoral programs from the **University of the Basque Country (UPV/EHU)**, CIC biomaGUNE participates in the following Doctoral programs:

**Synthetic and Industrial Chemistry**  
**Applied Chemistry and Polymeric Materials**  
**Molecular Biology and Biomedicine**  
**Medicine and 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 2019, 50 PhD theses were co-directed with the following institutions:

**POLYMAT** - Basque Center for Macromolecular Design & Engineering  
**DIPC**  
**CIC bioGUNE**  
**CIC nanoGUNE**  
**IIS BioCruces**  
**IIS BIODONOSTIA**

**TECNALIA**  
**GAIKER**  
**CIDETEC**  
**ACHUCARRO** - Basque Center for Neuroscience  
**UPV-EHU**  
**BIOFISICA** - Basque Center for Biophysics



### Industrial PhD Scheme

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

## PHD THESES

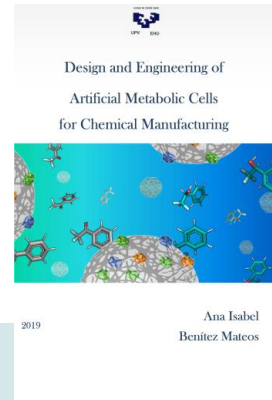
During 2019, 4 students obtained their PhD at CIC biomaGUNE.



**Anna Cioco**

Synthesis of N-glycan mimetics and their Evaluation as C-type Lectin Receptor Antagonists using Microarray Technology.

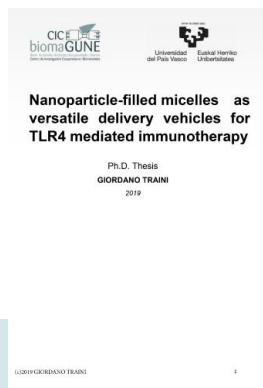
Supervisor: Dr. Niels Reichardt  
Defense Date: 01/02/2019



**Ana Isabel Benítez**

Design and engineering of artificial metabolic cells for chemical manufacturing.

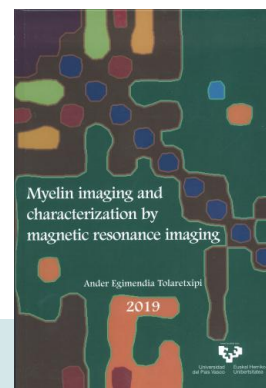
Supervisor: Dr. Fernando López-Gallego  
Defense Date: 10/04/2019



**Giordano Traini**

Nanoparticle-filled micelles as versatile delivery vehicles for TLR4 mediated immunotherapy.

Supervisor: Dr. Juan Mareque-Rivas  
Defense Date: 11/07/2019



**Ander Egimendia Tolaretxipi**

Myelin imaging and characterization by magnetic resonance imaging.

Supervisor: Dr. Pedro Ramos  
Defense Date: 3/12/2019

## MASTER & VOCATIONAL TRAINING PROGRAMS

### Master Students

CIC biomaGUNE has agreements with several universities (which are the degree-grating bodies) in different Master programs.

Additionally, in partnership with the [University of the Basque Country \(UPV/EHU\)](#), CIC biomaGUNE participates in the following MSc courses by providing lectures and direction of master thesis:

- [Molecular Biology and Biomedicine](#)
- [Nanoscience](#)
- [Chemistry and Polymers](#)

### Vocational Training Program

CIC biomaGUNE has agreements with [CPES CESA BHIP](#), [Don Bosco](#) 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.

Every year several training placements take place at different laboratories of the Center.

The selected students are mentored and supervised by postdoctoral researchers or PhD students and receive hands-on training.

## RESEARCH SECONDMENTS & SUMMER INTERNSHIPS

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 2019, our researchers performed **23** secondments at collaborating partners and we hosted **98** stays of visiting researchers.

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 a research 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.

	2015	2016	2017	2018	2019
Research stays <b>from</b> CIC biomaGUNE	30	30	19	11	<b>23</b>
Research stays <b>to</b> CIC biomaGUNE	59	105	92	84	<b>98</b>
Visiting Professors/Sabbaticals	1	4	1	2	2
Erasmus placements	1	7	7	2	8
Summer placements	2	5	6	6	15
Vocational training	4	7	5	3	5



## SEMINARS

CIC biomaGUNE runs an annual program of scientific seminars, which includes: i) **International seminars** delivered by internationally recognized researchers of varying scientific backgrounds and fields, ii) **PhD seminars** delivered by PhD students of the Center, and iii) **Training seminars** delivered by CIC biomaGUNE's PIs or Platform Managers, aimed at strengthening the technical training program and soft skills training. Altogether, these programs contribute to the career development of our researchers. During 2019, **43 seminars have been delivered:**



- 15/01/2019  
**Nanoparticles Interactions with Viruses: From Stabilization to Virucidal Drugs**  
Prof. Francesco Stellacci - École Polytechnique Fédérale de Lausanne (EPFL)
- 29/01/2019  
**Synthesis of N-glycan mimetics and their evaluation as C-type lectin receptor (CLR) antagonists using microarray technology**  
Anna Cioce - CIC biomaGUNE
- 05/02/2019  
**A Scientific Journey to Entrepreneurship**  
Dr. Gorka Orive - UPV/EHU
- 15/02/2019  
**Environment-Responsive Polymers as Versatile Platform for Nanomedicine**  
Prof. Marcelo Calderón - Polymat
- 19/02/2019  
**Cryo-electron microscopy of protein machines involved in tumor survival**  
Prof. Iban Ubarretxena - Biophysics Unit of UPV/EHU
- 26/02/2019  
**Interfacing with Biology through Polymer Chemistry and Nanotechnology**  
Dr. Francisco Fernández-Trillo - University of Birmingham
- 06/03/2019  
**Dendritic cells orchestrate immunity and inflammation**  
Dr. David Sancho - CNIC
- 20/03/2019  
**Dark matter and liquid biopsies: Molecular Oncology research in Biodonostia**  
Prof. Charles Lawrie - IIS Biodonostia
- 21/03/2019  
**EM Workshop: Zeiss on Your Campus**  
Zeiss
- 25/03/2019  
**Design and engineering of artificial metabolic cells for chemical manufacturing**  
Ana Isabel Benítez Mateos - CIC biomaGUNE

02/04/2019  
**"How does an MRI work?", "Image contrast in MRI" and "Relaxivity and contrast agents"**  
Pedro Ramos - CIC biomaGUNE

03/04/2019  
**Rethinking regeneration: role of nerve-derived cells in tissue homeostasis and injury response**  
Dr. Ander Izeta - IIS Biodonostia

11/04/2019  
**Imaging inflammation in action**  
Dr. Andrés Hidalgo - CNIC

15/04/2019  
**Small-Angle Scattering: an introduction to the characterisation of nanostructures**  
Dr. Julien Oberdisse - University of Montpellier

08/05/2019  
**Shine a Light on Carbohydrates**  
Dr. Martina Delbianco - Max Planck Institute of Colloids and Interfaces

15/05/2019  
**p38gamma is essential for cell cycle progression and liver tumourigenesis**  
Prof. Guadalupe Sabio - CNIC

21/05/2019  
**Understanding Supramolecular Peptide Nanostructures**  
Dr. Ivan R. Sasselli - Northwestern University

23/05/2019  
**Adding the Chemical Dimension to Lithography at All Scales: Enabling Cellular Therapies & Other Adventures in Biology and Medicine**  
Prof. Paul Weiss - University of California, Los Angeles (UCLA)

04/06/2019  
**How fast are functional motions of protein machines? A single-molecule perspective**  
Prof. Gilad Haran - Weizmann Institute of Science

11/06/2019  
**Positron emission tomography of tau pathology**  
Dr. Michael Schöll - University of Gothenburg

18/06/2019  
**Nanocarriers for anticancer drug delivery and live cells therapeutic monitoring with optical microscopy**  
Dr. Oscar F. Silvestre - Portugal

20/06/2019  
**HEALTH AND SAFETY AT WORK -Working together**  
Paola Ferreira - CIC biomaGUNE

26/06/2019  
**Tuning Nanoparticle Dispersion in Polymer Hosts and their Consequences on Properties**  
Prof. Sanat K. Kumar - Columbia University

03/07/2019  
**Mitochondria The Culinary Centre of the Cell**  
Dr. Ian Holt - IIS Biodonostia

12/07/2019  
**Nanoparticle-filled micelles as versatile delivery vehicles for TLR4 mediated cancer immunotherapy**  
Dr. Giordano Traini - CIC biomaGUNE

16/07/2019  
**Between Energy Conservation and Energy Dissipation: The Dual Life of F-ATP synthase**  
Prof. Paolo Bernardi - University of Padova

19/07/2019  
**From Aqueous Graphene Dispersions to Smart Soft Materials**  
Prof. Ester Vázquez - Instituto Regional de Investigación Científica Aplicada (IRICA)

23/07/2019  
**The role of quantification in the future of clinical and preclinical PET**  
Prof. Adriaan Lammertsma - VU University Medical Centre

28/08/2019  
**Translational medicine, fashion or necessity?**  
Dr. Juan Marques-Rodriguez - MSD/Mexico

05/09/2019  
**Multilateral understanding of the host-pathogen interplay at the human airways towards development of innovative therapeutics**  
Dr. Junkal Garmendia - Public University of Navarre

19/09/2019  
**Protein interactions and signaling: From in-cell molecular spectroscopy to super-resolution imaging**  
Dr. Valeria Caiolfa - Centro Nacional de Investigaciones Cardiovasculares (CNIC) Carlos III

26/09/2019  
**Gene-modified minipigs with atherosclerosis: Applications in translational imaging**  
Prof. Jacob Fog Bentzon - Centro Nacional de Investigaciones Cardiovasculares (CNIC) Carlos III

08/10/2019  
**Nanomedicines: A new way for Drug Delivery**  
Prof. Patrick Couvreur - Université Paris-Saclay

16/10/2019  
**Spectroscopic techniques from fundamental to biological applications**  
Dr. Carlos Renero-Lecuna - Fundación Instituto de Investigación Marqués de Valdecilla (IDIVAL)

24/10/2019  
**CIC biomaGUNE 1<sup>st</sup> PhD Day**  
CIC biomaGUNE

30/10/2019  
**New enzymes for cell surface modification: Towards universal blood**  
Prof. Stephen G. Whitters - University of British Columbia

06/11/2019  
**Metabolic-based improvements in biomedical imaging: Enhanced PET imaging in atherogenesis**  
Prof. Lisardo Boscá - Instituto de Investigaciones Biomédicas Alberto Sols (CSIC-UAM)

12/11/2019  
**Replication of biological functions using gels of electrochemical macromolecular machines**  
Prof. Toribio Fernández Otero - Technical University of Cartagena

21/11/2019  
**Polymeric amphiphiles: Targeting pediatric tumors and beyond**  
Dr. Alejandro Sosnik - Technion-Israel Institute of Technology

04/12/2019  
**In vivo therapy and diagnosis by infrared luminescent nanothermometers**  
Prof. Daniel Jaque - Universidad Autónoma de Madrid & Instituto Ramón y Cajal de Investigación Sanitaria

10/12/2019  
**Myelin imaging and characterization by magnetic resonance imaging**  
Ander Egimendia - CIC biomaGUNE

11/12/2019  
**Delivery of therapeutic agents to the brain guided by multimodality imaging**  
Prof. Piotr Walczak - University of Maryland

18/12/2019  
**Knocking the SOX off Breast Cancer**  
María dM Vivanco - CIC bioGUNE

## ORGANIZATION OF SCIENTIFIC WORKSHOPS/CONFERENCES

**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 2019:

**INTRODUCTORY WORKSHOP ON BIOMEDICAL GLYCOSCIENCE**

Organizer: Niels Reichardt  
*San Sebastián*



**3-5 JUN**

**1<sup>ST</sup> CIC BIOMAGUNE PhD DAY**

Organizer: CIC biomaGUNE Associate Researchers  
*San Sebastián*



**24 OCT**

**Our researchers chaired or co-organized a number of international symposia:**

**2-7 FEB**

**COLLOIDAL NANOPARTICLES FOR BIOMEDICAL APPLICATIONS**

Wolfgang J. Parak - Organizer  
*SPIE's Photonics West conference, San Francisco (USA)*

**11-15 MAR**

**6<sup>TH</sup> INTERNATIONAL CONFERENCE ON MULTIFUNCTIONAL, HYBRID AND NANOMATERIALS (HYBRID MATERIALS 2019)**

Luis Liz-Marzán - Local chair  
*Sitges*

**3<sup>RD</sup> ANNUAL MEETING OF RESEARCH IN PULMONARY HYPERTENSION**

Jesús Ruiz-Cabello - Organizer  
*Barcelona*

**1 MAR**

**SYMPOSIA IN THE 257<sup>TH</sup> ACS NATIONAL MEETING**

Wolfgang J. Parak, Luis Liz-Marzán - Co-organizers  
*257<sup>th</sup> ACS National Meeting, Orlando (USA)*

**29 MAR-4 APR**



### EUTOPIA MEETING 2019

Organizer: Ivan Coluzza  
*San Sebastián*



**4-7 NOV**

### THE 3<sup>RD</sup> BIENNIAL YOUNG RESEARCHERS WORKSHOP ON BIOMATERIALS AND APPLICATIONS (BIOMAPP19)

Organizers: Fernando López-Gallego & Pedro Ramos-Cabrer  
*Bilbao*



**4-5 DEC**

### CHRISTMAS LECTURE "KNOCKING THE SOX OFF BREAST CANCER"

Organizer:  
CIC biomaGUNE  
*San Sebastián*



**18 DEC**

### 12-18 MAY

#### CHALLENGES IN LARGE SCALE BIOMOLECULAR SIMULATIONS 2019: BRIDGING THEORY AND EXPERIMENTS

Ivan Coluzza -  
Co-organizer  
*Cargese, Corse, (France)*

### 26-30 MAY

#### HIDRATOS DE CARBONO, DESDE MONOSACÁRIDOS A NANOESTRUCTURAS. SÍNTESIS, ESTRUCTURA. INTERACCIONES Y APLICACIONES

Niels Reichardt -  
Co-organizer  
*The XXXVII Reunión Bienal de la Real Sociedad Española de Química, San Sebastián*

### 25-29 AUG

#### SYMPOSIA IN THE 258<sup>TH</sup> ACS NATIONAL MEETING

Wolfgang J. Parak -  
Organizer  
*San Diego, California (USA)*

#### ARTIFICIAL METALLOENZYMES AND PROTEIN DESIGN: APPLICATIONS IN CATALYSIS

Aitziber L. Cortajarena -  
Co-organizer

*The XXXVII Reunión Bienal de la Real Sociedad Española de Química, San Sebastián*

**26-30 MAY**

#### 2<sup>ND</sup> SPANISH CONFERENCE ON BIOMEDICAL APPLICATIONS OF NANOMATERIALS (SBAN1)

Jesús Ruiz-Cabello -  
Organizer

*Madrid*

**6-7 JUN**

#### 9<sup>TH</sup> INTERNATIONAL CONFERENCE "NANOSCIENCE WITH NANOCRYSTALS"

Wolfgang J. Parak -  
Co-organizer

*Hamburg (Germany)*

**16-18 SEP**

# Outreach



One of the strategic objectives of CIC biomaGUNE is the communication and dissemination of knowledge within and beyond the academic community. During 2019 the following outreach events have been organized:



### ZIENTZIA LANEAN - WOMEN WORKERS IN SCIENCE

Photo exhibition about women workers in science and their reality.



San Sebastián  
**1FEB - 23MAR**



### INTERNATIONAL DAY OF WOMEN AND GIRLS IN SCIENCE

CIC biomaGUNE in collaboration with CFM, CSIC-UPV/EHU, CIC nanoGUNE and DIPC commemorated the International Women and girl in Science day celebrating a series of events that aim to make visible the activity of women in science, break with the typically male roles attributed to scientific-technical activities and encourage the choice of scientific careers among girls. The activities organized included: Activities for 5<sup>th</sup> elementary grade students, an interactive visit for elderly women and a conferences about Scientist Women in History by Clara García-Astrain.



San Sebastián  
**11-15 FEB**



### PINT OF SCIENCE

For the fifth consecutive year CIC biomaGUNE researchers took active part in the organization of the Pint of Science event in San Sebastián, an initiative that brings science and its advances in research in multiple fields to a general public and in an entertaining way in different bars of the city.

During 3 days, in 4 bars with different sessions and with the collaboration of 25 volunteers, 23 lectures have been enjoyed, with the participation of 26 researchers from 16 centers who offered their views on current research in each of their areas of knowledge and about the technology of the future.



San Sebastián  
**20-22 MAY**





## ACS ON CAMPUS

ACS on Campus is the American Chemical Society's premier outreach program. Launched in 2010, they have hosted programming at hundreds of institutions around the world, bringing the world's leaders in chemistry, publishing, research, science communication and career development right to your doorstep. At their free events, students network with top researchers in the field, learn publishing directly from the ACS editors, and get tips for advancing your career.

CIC biomaGUNE principal researchers Aitziber López Cortajarena and Niels Reichardt took active role in such events:

- **Niels Reichardt**, head of the Glycotechnology group at CIC biomaGUNE participated at the ACS on Campus event organized at the Universidad Complutense de Madrid.
- **Aitziber L. Cortajarena**, head of the Biomolecular Nanotechnology group at CIC biomaGUNE participated at the ACS on Campus event organized at the University of Valencia.



Universidad Complutense de  
Madrid  
**25 SEP**



Universidad de Valencia  
**27 SEP**



## PASSION FOR KNOWLEDGE

**Aitziber L. Cortajarena** participated in the Passion For Knowledge scientific meeting, as recipient of the Ikerbasque Career Award.

The DIPC endorsed the purpose pursued by Ikerbasque to recognize and make visible the work of women researchers through the Ikerbasque Awards. Two of the award winners, Maia Garcia Vergniory and **Aitziber L. Cortajarena**, had the opportunity to deliver two lectures to the public of Victoria Eugenia Theater. Each spoke on a topic related to their field of research: the former about materials and the latter about protein engineering.



San Sebastián  
**30SEP- 5OCT**





## INSPIRA

The INSPIRA project is a pioneering project in Euskadi for the promotion of the scientific-technological vocation (STEAM: Science, Technology, Engineering, Arts and Maths) among girls.

The schools whose students received mentoring from CIC biomaGUNE scientists were:

- Mary Ward, where 5<sup>th</sup> elementary grade students received mentoring from the hand of **Clara García Astrain**.
- Salesianos, where students received mentoring from the hand of **Vanessa Gómez-Vallejo**.
- Deutsche Schule, where students received mentoring from the hand of **Elisa Bindini**.



San Sebastián  
**7 OCT**



## SCIENCE AND TECHNOLOGY IN FEMININE

CIC biomaGUNE participated in this initiative, that aims at promoting scientific and technological vocations with a view to increasing the choice of scientific and technological studies among young women in the future. In this event, 170 students from Secondary School learnt about women working in technological-scientific fields, the career opportunities, the historical and present contribution of women in these fields, and participated in practical workshops around innovative areas such as robotics, computational thinking and genetics. "Science and Technology in Women" is part of a campaign promoted by APTE (Association of Technology Parks of Spain), developed in different Parks throughout the State, and in Euskadi, in addition, coincided with the Equality Forum promoted by Emakunde, Basque Women's Institute, and in which the Parks Network collaborated.



Gipuzkoa Science and Technology  
Park-San Sebastián  
**9 OCT**



## DONOSTIA WeekINN

In the frame of the Donostia Week INN 2019 and in collaboration with Fomento San Sebastián, CIC biomaGUNE participated in two events aimed at bringing science closer to society, the first one on 28<sup>th</sup> October, when **Susana Carregal** participated in a discussion pannel about women and science and on 30<sup>th</sup> October with two different conferences about "Nanotechnology and Ageing".



San Sebastián  
**28-30 OCT**



## 100xCIENCIA

CIC biomaGUNE participated to the 4<sup>th</sup> edition of the 100xCiencia4 - Building bridges between Science and Society: "What is science doing for you? 100xCiencia.4 addressed technology transfer, and how research translates into benefits for society. An emphasis was put to the importance of R+D+i, and how this generates a return for society, and on how the generation of scientific knowledge translates into products and services that improve the well-being and quality of life of the public. At the same time, SOMMa institutions had the opportunity to put their projects on display. The event was organised by the Basque Centre on Cognition, Brain and Language (BCBL), together with SOMMa. Under the title "What is science doing for you?", this edition put on display

for citizens a number of successful cases of tech transfer, products, services, spin-offs, and more, showing society how science has an impact on the everyday life of common citizens. The initiatives presented, born from the members of the SOMM alliance, highlighted the impact generated by R+D+i on society. The meeting took the shape of a fair open to the public, with a host of on-site stands and an open space where talks took place. The format of the talks, with the exception of the keynote talk, were short, in the style of the notorious TED talks. Both the stands and short talks highlighted cases of success in the translation of research and technology by members of SOMMa resulting in benefits for society.

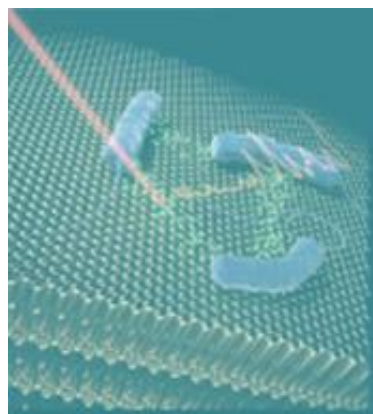


San Sebastián  
**22-23 NOV**



## REFLECTIONS ON NANOTECHNOLOGY IN THE INTERNATIONAL YEAR OF THE PERIODIC TABLE

Prof. Liz-Marzán gave a free webinar entitled "Reflections on Nanotechnology in the International Year of the Periodic Table" on November 27. This event was organized by the American Chemical Society in the frame of a series of Spanish Webinars.



Online  
**27 NOV**

## | OPEN DAYS & VISITS

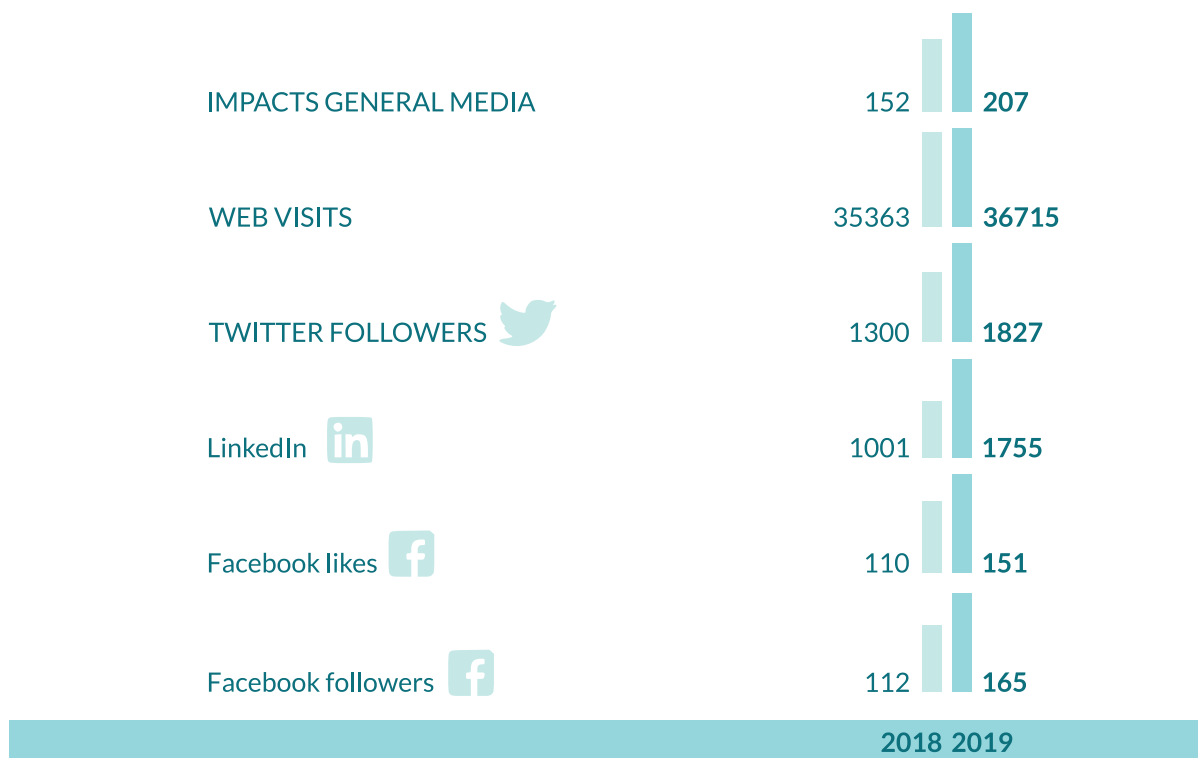
CIC biomaGUNE regularly receives visits from high-school and university students who come to have a closer look at our activity. These visits typically include a lecture about biomaterials in the context of life sciences, an open discussion with CIC biomaGUNE researchers, and a guided tour to six technical 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 [Ana Sánchez-Iglesias](#), [Marco Möller](#), [Daniel Padró](#), [Irantzu Llarena](#) and [Vanessa Gómez](#) with the support from other Platform Managers as well as PhDs, Postdocs and Principal Investigators.



	2015	2016	2017	2018	2019
Undergraduate and Highschool visits	7	7	12	9	9
Guided Visits at the Molecular Imaging Facility	23	38	40	45	43

## | MEDIA

CIC biomaGUNE is committed to disseminating research results and other news, not only to the scientific community but also to the general public. Our presence at social media has remained with an increase of the number of followers/connections.



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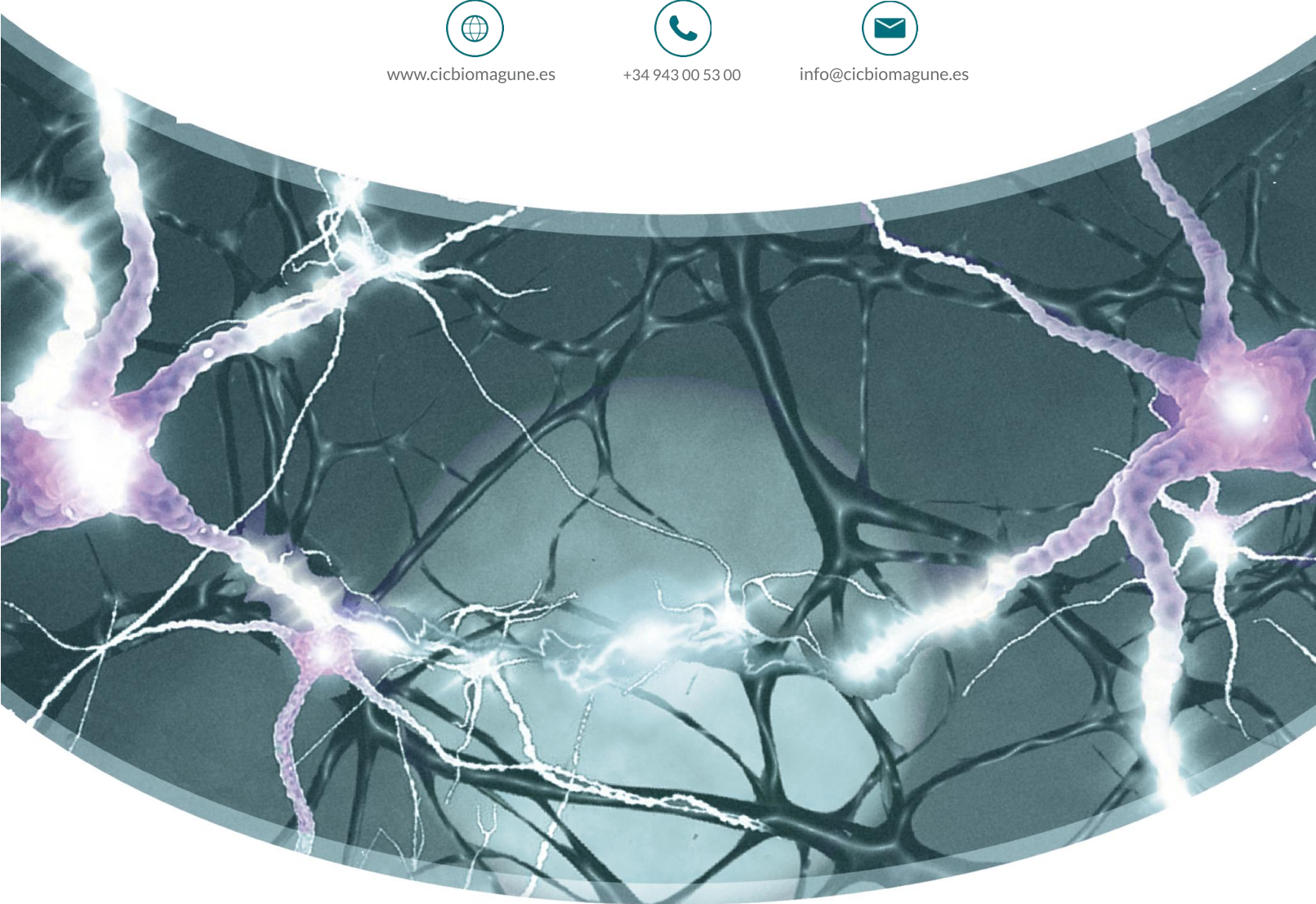
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