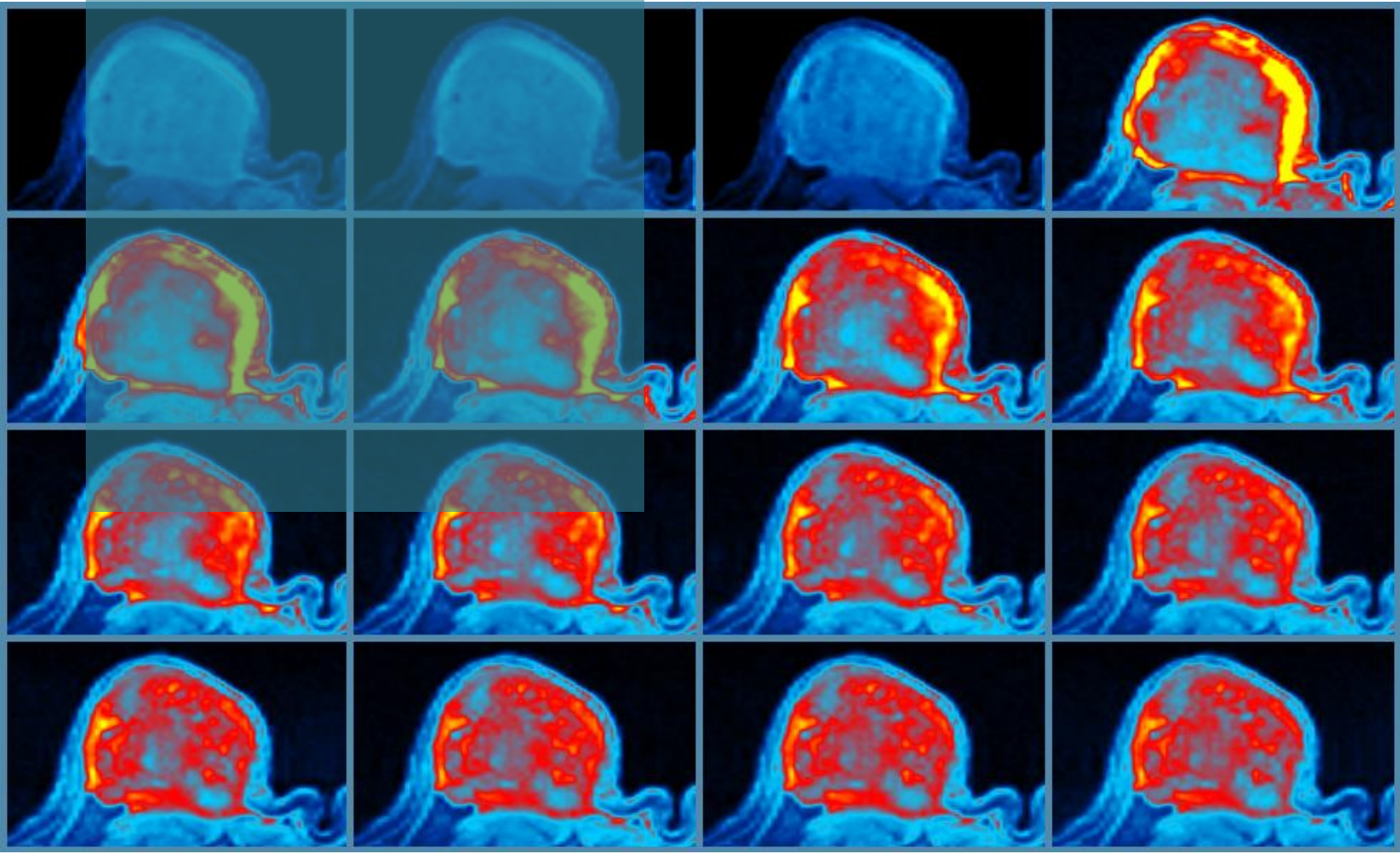


# Activity Report 2018

CICbiomaGUNE  
CENTER FOR COOPERATIVE RESEARCH IN BIOMATERIALS

EXCELENCIA  
MARÍA  
DE MAEZTU  
2018 - 2022



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Report Production: Anna Llanes

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# Activity

# Report

# 2018

**CICbiomaGUNE**  
CENTER FOR COOPERATIVE RESEARCH IN BIOMATERIALS



EXCELENCIA  
MARÍA  
DE MAEZTU  
2018 - 2022



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## The Center

The Center for Cooperative Research in Biomaterials - CIC biomaGUNE, located in San Sebastian (Spain), was officially opened in December 2006. CIC biomaGUNE is a non-profit research organization created to promote scientific research and technological innovation at the highest levels in the Basque Country, following the BioBasque policy to create a new business sector based on biosciences.

CIC biomaGUNE currently comprises 11 international and dynamic research teams, which conduct 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.

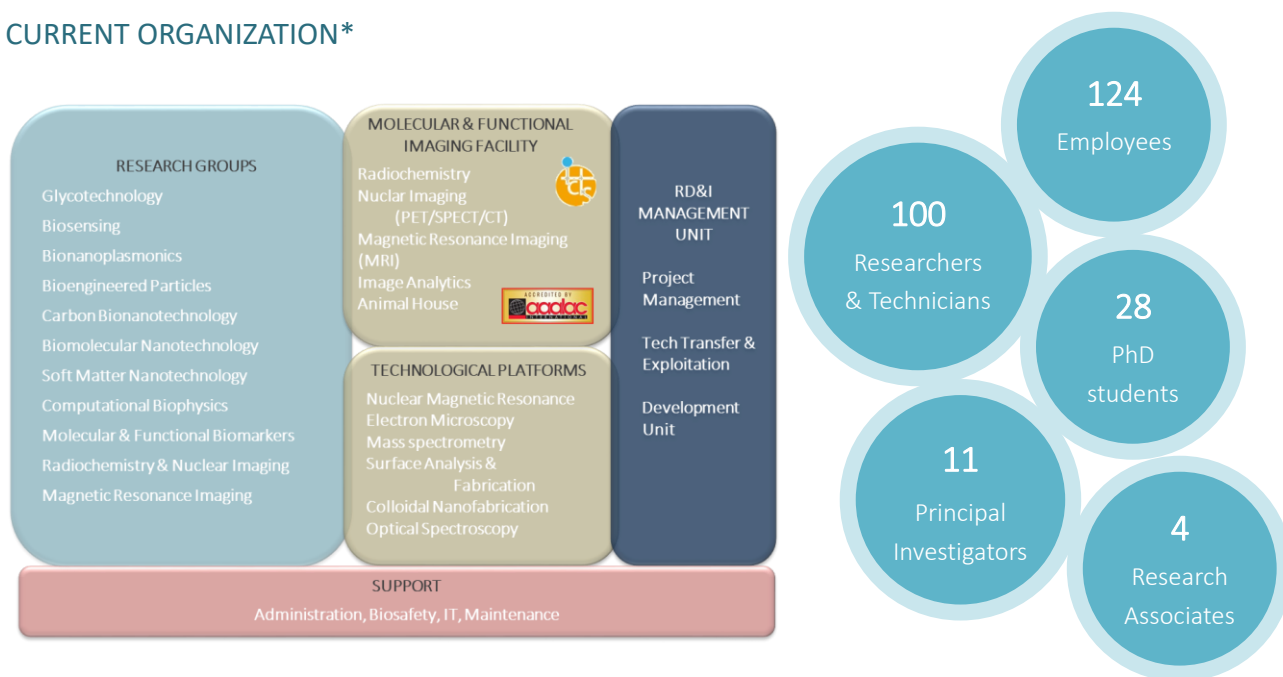
In 2018 CIC biomaGUNE earned the accreditation as a "**María de Maeztu Unit of Excellence**"- the highest recognition of scientific excellence in Spain awarded by the Spanish State Research Agency (AEI) - which further confirms this recognition.

2018

At a Glance

# 2018 At a Glance

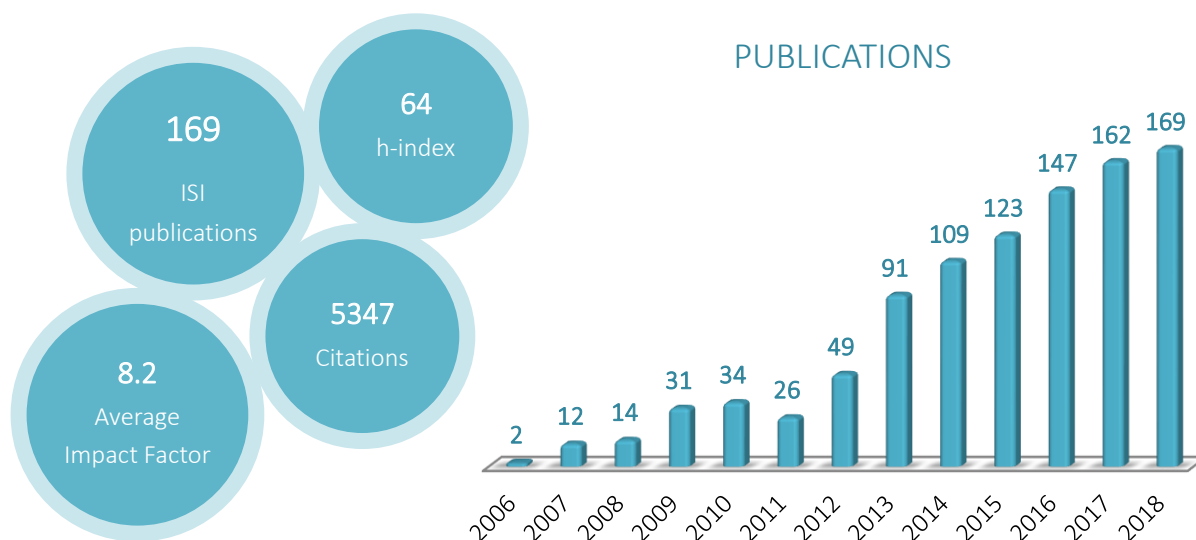
## CURRENT ORGANIZATION\*



\*Data from 31/12/2018

## SCIENTIFIC OUTPUT

In 2018, 169 articles in high impact scientific journals have been published.





## FUNDING

### Competitive public funding

36 new projects have been launched with a total contribution of **7.7 M€** from competitive funding.

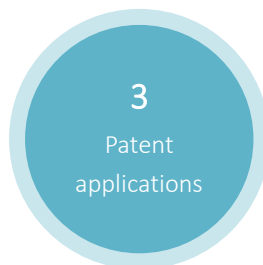
### Private funding

Income from private sources amounted **0.5 M€**.



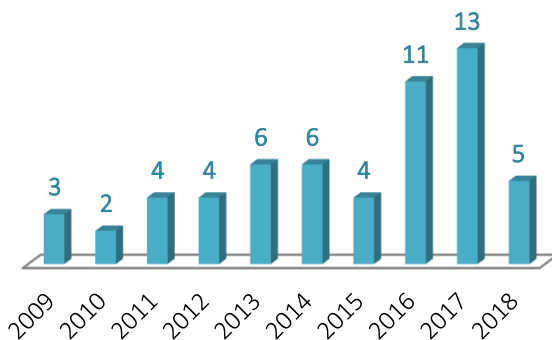
## TECHNOLOGY TRANSFER

During 2018, **3** new patent applications have been filed and **11** agreements have been established with industrial or clinical partners.



## TRAINING AND OUTREACH ACTIVITY

### PhD Theses



# 2018 At a Glance

## AWARDS & RECOGNITIONS

### CIC biomaGUNE Accreditations

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

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

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

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

### Awards/Recognitions

**Wolfgang J. Parak** received the **2018 Bioconjugate Chemistry Lectureship Award** (American Chemical Society).

**Maurizio Prato**, **Luis Liz-Marzán** and **Wolfgang Parak** included in the 2018 list of **Highly Cited Researchers** (Clarivate Analytics), in the categories of Materials Science (Liz-Marzán) and Cross-Field (Prato and Parak).

The **Basque Government** recognizes the work carried out by **Niels Reichardt**, leader of the Glycotechnology laboratory at CIC biomaGUNE and co-founder of the spin-off Asparia Glycomics.

**Enrique Moles National Chemistry Award** awarded to **Luis Liz-Marzán** by the *Spanish Ministry of Science, Innovation and Universities*, in the category of Chemical Science and Technology for his numerous and significant contributions to the fields of Colloid Chemistry and Nanoscience.

**Luis Liz-Marzán** awarded his second **ERC Advanced Grant** for the project entitled "Four-Dimensional Monitoring of Tumour Growth by Surface Enhanced Raman Scattering".

**Aitziber L. Cortajarena** awarded with an **ERC Proof of Concept Grant** for the project entitled "Fluorescence-based nano-immunoassay IVD platform".

### Academy Memberships/Fellowships

**Maurizio Prato** named corresponding member of the **Venetian Institute of Sciences, Letters and Arts**.

**Luis Liz-Marzán** elected as a new member of the **Academia Europaea** (The Academy of Europe).

**Maurizio Prato** named **ChemPubSoc Fellow**. This is the highest award given by the organization to recognize outstanding support and contributions towards the European joint publishing venture.

### Best PhD thesis Awards

**Guillermo González-Rubio** received four prizes for his PhD thesis entitled "*Synthesis and Assembly of Uniform Plasmonic Gold Nanostructures for Biomedical Applications*". The thesis was carried out at Complutense University of Madrid and CIC biomaGUNE, under joint supervision of Andrés Guerrero-Martínez and Luis Liz-Marzán. It has not only received the **Extraordinary thesis award** from Complutense University, the **Best doctoral thesis** by the **Specialized Group on Nanoscience and Molecular Materials** and the **Specialized Group of Colloids and Interfaces of the Spanish Royal Society of Chemistry**, but it was also selected as the **best thesis of the year in chemistry** at all universities in Madrid by RSEQ.

### Best Presentation/ Poster Awards

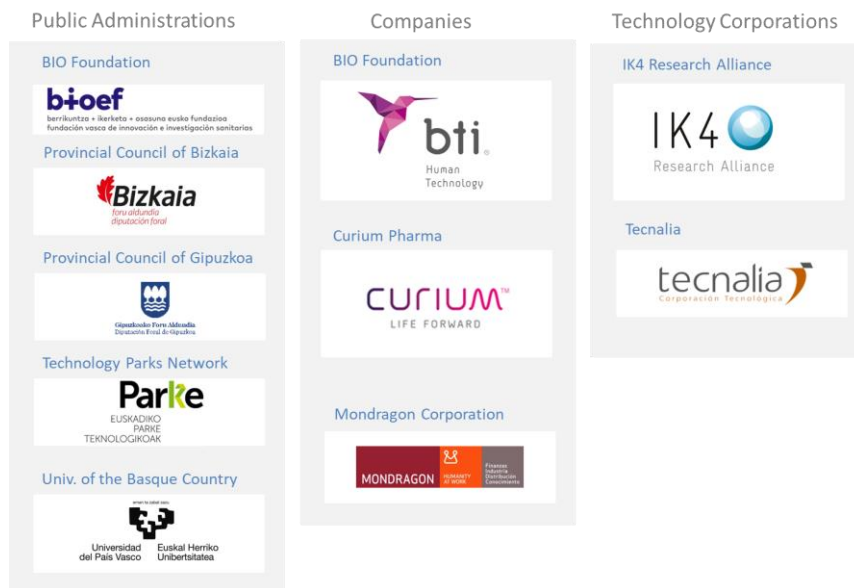
The work Entitled "*In vivo imaging of  $\alpha 7$  nicotinic receptors as a novel method to monitor neuroinflammation after cerebral ischemia*" by **Abraham Martin** and 3 members of the Molecular Imaging Laboratory, was awarded the **best poster prize** in the category *Neuroimaging / Disease Models* at **EMIM 2018**.

**Best Oral Presentation** and **Best Poster** in Radiopharmacy awarded to members of the Radiochemistry and Nuclear Imaging Group and the Radiochemistry Platform in the **37 Congreso de la Sociedad Española de Medicina Nuclear e Imagen Molecular** (SEMNUM 2018). **Jordi Llop** awarded for the Best oral presentation for his talk entitled "*Marcaje de inhibidores de butirilcolinesterasa con carbono-11 y evaluación como biomarcadores para el diagnóstico precoz de la enfermedad de Alzheimer*".

**Best presentation/poster awards** at the **International Workshop SAHMB** to **Ángel Martínez-Villacorta** (Best oral presentation) for his talk "*Polymeric Nanoparticles as hydrophobic carriers: from synthesis to in vivo evaluation*" and **Mathias Charconnet** for his poster "*Universal self-assembly process of differently shaped nanoparticles*".

# Organization

## GENERAL ASSEMBLY



## INTERNATIONAL SCIENTIFIC ADVISORY BOARD

The scientific activity of CIC biomaGUNE is regularly assessed by the International Scientific Advisory Board (ISAB), composed of internationally distinguished scientists, who are active in CIC biomaGUNE's research fields.

The ISAB is currently formed by the following members:



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



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 Plank Institute of  
Colloids and  
interfaces, Germany



Prof. Jon Dilworth  
Depart. of Inorganic  
Chemistry University  
of Oxford, UK



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



Prof. Patrick  
Couvreur  
Université Paris-Sud,  
France

# Organization

## 2018 GROUP LEADERS

Glycotechnology

Niels Reichardt



Biosensing

Valery Pavlov



Bionanoplasmonics

Luis Liz-Marzán  
Ikerbasque Professor



Bioengineered  
Particles

Wolfgang Parak



Carbon  
Bionanotechnology

Maurizio Prato  
Ikerbasque Professor



Biomolecular  
Nanotechnology

Aitziber L. Cortajarena  
Ikerbasque Professor



Soft matter  
Nanotechnology

Sergio E. Moya



Computational  
Biophysics

Ivan Coluzza  
Ikerbasque Professor



Molecular and  
Functional Biomarkers

Jesús Ruiz Cabello  
Ikerbasque Professor



Radiochemistry and  
Nuclear Imaging

Jordi Llop



Magnetic Resonance  
Imaging

Pedro Ramos  
Ikerbasque Professor



## FORMER GROUP LEADERS

Biosurfaces  
Ralf Richter  
2007 – Feb 2018



Theranostic  
Nanomedicine  
Juan C. Mareque-Rivas  
Ikerbasque Professor  
2011 – June 2018



## 2018 RESEARCH ASSOCIATES

Bionanoplasmonics  
Javier Reguera  
Ikerbasque Fellow



Bionanoplasmonics  
Isabel García-Martín  
CIBER-BBN



Bioengineered Particles  
Carlos Sánchez Cano  
Gipuzkoa Fellow



Molecular & Functional  
Biomarkers  
Susana Carregal  
CIBERES



Bioengineered Particles  
Mónica Carril  
Ikerbasque Fellow  
2010 – Apr 2018



Experimental Molecular  
Imaging  
Abraham Martín Muñoz  
2010 – Sept 2018



## FORMER RESEARCH ASSOCIATES

## RESEARCH SUPPORT

### Molecular & Functional Imaging Facility

This integrated bioimaging structure 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).

### Technological platforms

Each platform is managed by an expert platform manager, who provides technical and scientific support to the research activities at CIC biomaGUNE. The Platforms comprise the following state-of-the-art research infrastructures: Electron Microscopy, Nuclear Magnetic Resonance, Mass Spectrometry, Surface Analysis and Fabrication, Colloidal Nanofabrication and Optical Spectroscopy and Microscopy. All researchers have access to the platforms, upon training and supervision by the platform managers.

### 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.

## FINANCIAL AND ECONOMIC MANAGEMENT AREA

### 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.

### 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.

### Biosafety & Radioprotection

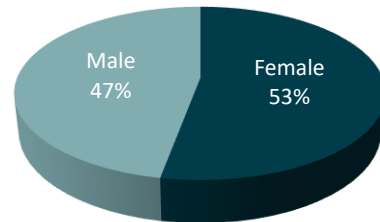
Dedicated to establish safe working conditions of all CIC biomaGUNE’s personnel by promoting good laboratory practices. The service is also in charge of the appropriate operation of the Center’s Radioactive Facility.

# Organization

The table below provides the distribution of CIC biomaGUNE's personnel as per December 31, 2018

CIC biomaGUNE's Personnel	
Principal Investigators	11
Associate Researchers	4
Research Assistants	2
Platform Managers	9
Laboratory Technicians and Platform Specialists	26
Postdoctoral Researchers	19
PhD Students	28
Direction and Administration	16
IT and Maintenance	8
Biosafety and Radioprotection	1
<b>Total</b>	<b>124</b>

Gender Distribution



Argentina 1	Germany 7	Russia 1
China 1	India 2	Slovenia 1
Denmark 1	Italy 12	Spain 94
France 3	Lithuania 1	UK 1





## GROUP LEADER RECRUITMENTS

**Jesús Ruiz-Cabello Osuna** joined CIC biomaGUNE in January 2018 as Ikerbasque Research Professor and head of the Molecular and Functional Biomarkers group.

Prof. Ruiz-Cabello graduated in Chemistry from the Universidad de Granada in 1986, and obtained a PhD in Pharmaceutical Physical Chemistry from the Universidad Complutense de Madrid in 1990. Since January 2018 he is Ikerbasque Research Professor at CIC biomaGUNE. He has been Professor of Physical Chemistry at the Complutense University of Madrid (UCM) since 2010 and from February 2012 to February 2017 he held the position of Head of the Advanced Imaging Unit of the National Center for Cardiovascular Research (CNIC). Since 2008, he is also a member of CIBERES (Biomedical Research Networking Center of Respiratory Diseases, as head of one of the associated research groups, and since the end of 2015, he is the Scientific Deputy Director of CIBERES). He has directed several research initiatives in the EU and coordinated Marie Curie European networking projects. He has participated in more than 40 projects funded under competitive calls, 18 as Principal Investigator (3 of them EU grants), 4 as coordinator (1 EU grant) and co-authored more than 170 articles and book chapters. He is co-inventor of 6 patents, four of them European patents, and has been a founding partner of the technology-based company *Numio Technologies*. He has advanced knowledge on multimodal images and advanced skills in statistical analysis. The focus of his current research is pulmonary hypertension, in particular focusing on the identification of new (early) images and markers derived from system's biology, of use for the diagnosis and monitoring of new treatments for pulmonary hypertension. He is particularly interested in the role of pulmonary vascular remodeling, metabolic changes associated with cell growth, RV structure and function, and cardio-vascular coupling.

## DEPARTURES

- **Juan Mareque-Rivas**, leader of the Theranostic Nanomedicine group (2011 – 2018), joined Swansea University in August 2016 as Co-Head of the new Department of Chemistry. He held this position as a secondary affiliation next to his position as Ikerbasque Research Professor and Group Leader of the Theranostic Nanomedicine Laboratory at CIC biomaGUNE, until June 2018, when he finalized his affiliation with CIC biomaGUNE, although he maintains a link with us, through a collaboration agreement.
- **Ralf Richter**, leader of the Biosurfaces group (2007 – 2018), joined the University of Leeds in October 2016 as a secondary affiliation next to his position as Group Leader of the Biosurfaces Laboratory at CIC biomaGUNE, until February 2018 when he finalized his activity at CIC biomaGUNE.
- **Mónica Carril**, Ikerbasque Fellow associated to the Glyconanoparticles Laboratory (2010 - 2015) and to the Bioengineered Particles Laboratory (2015 – April 2018) joined the Basque Centre for Biophysics as Ikerbasque Associate Researcher.
- **Abraham Martín**, responsible of the Experimental Molecular Imaging area (2010 – September 2018) joined the Achucarro Basque Center for Neuroscience as Ikerbasque Research Fellow.

Funding

During 2018, **36** new projects (from competitive funding sources) have been launched with a total contribution of **€ 7,737,650**.

## LIST OF FINANCED PROJECTS STARTING IN 2018



PI	CALL	AMOUNT (€)	PERIOD	FULL TITLE
<b>Luis Liz-Marzán</b>	ERC-AdG-2017	2,410,771.00	2018 - 2023	<b>4DBIOSERS</b> - Four-Dimensional Monitoring of Tumour Growth by Surface Enhanced Raman



PI	CALL	AMOUNT (€)	PERIOD	FULL TITLE
<b>Maurizio Prato</b>	H2020-SGA-FET-GRAPHENE-2017	400,000.00	2018 - 2020	<b>GrapheneCore2</b> - Graphene Flagship Core 2
<b>Luis Liz-Marzán</b>	MSCA-IF-2017	158,121.60	2018 - 2020	<b>NANOBIOME</b> - Gradient nanocluster screening arrays for sers analytics of wound microbiome
<b>Sergio Moya</b>	H2020-MSCA-ITN-2018	501,809.76	2018 - 2022	<b>NanoCarb</b> - Glyco-Nanoparticles for Applications in Advance Nanomedicine



UNIDAD DE EXCELENCIA MARÍA DE MAEZTU 07/2018-06/2022

CALL	AMOUNT (€)	PERIOD
Apoyo a Centros de Excelencia “Severo Ochoa” y a Unidades de Excelencia “María de Maeztu	2,000,000.00	2018 - 2022

# Funding



PI	CALL	AMOUNT (€)	PERIOD	FULL TITLE
Niels Reichardt	Retos de la Sociedad - proyectos I+D	261,360.00	2018-2020	<b>GLYCOBIOMED</b> - Novel tools and Approximations for Biomedical Glycoscience
Valery Pavlov	Retos de la Sociedad - proyectos I+D	175,450.00	2018-2020	<b>BIOClust</b> - Biocatalytical synthesis of nano atomic clusters for bioanalysis
Ivan Coluzza	Retos de la Sociedad - proyectos I+D	60,500.00	2018-2020	<b>BioVelcro</b> - Computational design of highly selective tumour targeting nanoparticles
Sergio Moya	Retos de la Sociedad - proyectos I+D	121,000.00	2018-2020	<b>FATENANOPOL</b> - Biological Fate, Stability, Translocation, and Protein Corona Formation of Polymer Nanocarriers based on Polyelectrolytes, Proteins and biodegradable Polymers
Luis Liz-Marzán	Retos de la Sociedad - proyectos I+D	302,500.00	2018-2020	<b>MultImage</b> - Design of plasmonic colloidal nanostructures as multimodal contrast agents for bioimaging and diagnostics
Pedro Ramos	Retos de la Sociedad - proyectos I+D	105,754.00	2018-2020	<b>NANO-acAST</b> - Novel nanomolecular systems for the treatment of cerebral ischemia
Jordi Llop	Retos de la Sociedad - proyectos I+D	94,380.00	2018-2020	<b>innoPET</b> - Innovative 18F-, 11C- and 13N-radiochemistry: Ion-induced isotopic exchange, Negishi cross-coupling and enzymatic reactions to expand the portfolio of PET tracers
Jesús Ruiz Cabello	Retos de la Sociedad - proyectos I+D	193,600.00	2018-2020	<b>PUOVADYS</b> - New biomarkers for the comprehensive characterization of pulmonary vascular dysfunction: evaluation of molecular mechanisms and therapeutic response
Aitziber L. Cortajarena	Proyectos de I+D+I «Programación Conjunta Internacional» 2018	200,000.00	2018-2021	<b>HOMBIOCAT</b> - Fabrication of hierarchically organized multi-functional heterogeneous biocatalysts for the modular synthesis of w-amino acids from renewable feedstocks
Jordi Llop	Redes Excelencia - 2017	65,000.00	2018-2020	<b>IMBIORED</b> - Imagen Biomédica en Red
Niels Reichardt	Redes Excelencia - 2017	17,000.00	2018-2020	<b>GLYCOBIOCHEM</b> - Red Española de Glicobiología Química



PI (Fellow)	CALL	AMOUNT (€)	PERIOD
<b>Maurizio Prato (Alejandro Criado)</b>	Juan de la Cierva – Incorporación Fellowship	64,000.00	2018-2020
<b>Luis Liz-Marzán (Clara Garcia)</b>	Juan de la Cierva – Formación Fellowship	50,000.00	2018-2020
<b>Maurizio Prato (Donato Maria Mancino)</b>	Ayudas para contratos predoctorales	92,750.00	2018-2022
<b>Aitziber L. Cortajarena (Elena López)</b>	Ayudas para contratos predoctorales	92,750.00	2018-2022
<b>Javier Calvo (Dorleta Otaegui)</b>	Personal Tecnico de Apoyo (PTA)	39,000.00	2018-2020
<b>Luis Liz-Marzán (Javier Plou)</b>	ayudas para la Formación del Profesorado Universitario (FPU)	49,266.00	2018-2021



PI	CALL	AMOUNT (€)	PERIOD	FULL TITLE
<b>Niels Reichardt</b>	Retos-Colaboracion 2017	159,776.00	2018-2021	Advanced Tools for Quantitative and Functional Glycomics



Gipuzkoako Foru Aldundia  
Diputación Foral de Gipuzkoa

PI	CALL	AMOUNT (€)	PERIOD	FULL TITLE
<b>Jesús Ruiz Cabello</b>	Programa RED - Investigación	89,655.00	2017 - 2018	<b>diBIOVADYS</b> - Nuevos biomarcadores diagnósticos de disfunción vascular pulmonar
<b>Luis Liz-Marzán</b>	Programa RED-Infraestructura	100,000.00	2018-2019	<b>BIOPRINT3D</b> - Adquisición de una bioimpresora 3D
<b>Carlos Sánchez Cano</b>	Programa Fellows Gipuzkoa	46,961.55	2018 - 2019	<b>NanoBioMeSi</b> - Nano-materiales metálicos en muestras Biológicas; explorando interacciones entre Metales usando radiación de Sincrotrón

# Funding



PI	CALL	AMOUNT (€)	PERIOD	FULL TITLE
Niels Reichardt	Elkartek 2018	1,641,866.02	2018-2019	<b>biomaGUNE 2018</b> – Herramientas y Oportunidades paraq la glicociencia biomédica
Pedro Ramos Cabrer	Ayudas a proyectos de investigación y desarrollo en salud	7,500.00	2018	Vesículas extracelulares como vehículo de sncRNA al sistema nervioso central
Aitziber L. Cortajarena	Ayudas a proyectos de investigación y desarrollo en salud	11,646.00	2018	<b>NKTPH</b> - Papel de las células NK en el trasplante de precursores hematopoyéticos autólogo en el tratamiento de cáncer y enfermedades raras
Aitziber L. Cortajarena	Ayudas a proyectos de investigación y desarrollo en salud	8,271.00	2018	Medicina personalizada en tumores cerebrales : desarrollo y validación de estrategias terapéuticas basadas en la inhibición de la auto-renovación
Luis Liz-Marzán	Ayudas a proyectos de investigación y desarrollo en salud	35,054.00	2018	<b>BACA 2018</b> - Bio-Reactor automatizado para células adherentes
Luis Liz-Marzán	Ayudas a proyectos de investigación y desarrollo en salud	26.961,00	2018	<b>INDICATE 2018</b> - Desarrollo de un biosensor económico, sensible y rápido para detectar mutaciones en sangre asociadas a medicina personalizada
Niels Reichardt (Anna Ballesteros)	BIKAINTEK2018 - doctorado Industrial	64.160,12	2018 - 2022	<b>GlycoNat</b> - Desarrollo de metodología para el aislamiento de N-glicanos de fuentes naturales (in coll. With Asparia)
Sergio Moya	Ayudas Organización de Congresos	6.240,00	2018	1 <sup>st</sup> International Workshop in Self-assembly and Hierarchical Materials in Biomedicine: Drug Delivery, Tissue Engineering, Sensing and Safety Issues



PI	CALL	AMOUNT (€)	PERIOD	FULL TITLE
Pedro Ramos	La Marató 2017	133,312.50	2018 - 2021	Blood brain barrier disruption after subarachnoid hemorrhage: clinical relevance, role of hyperglycemia and effect of potentiating endogenous antioxidant mechanisms. A translational study



PI	CALL	AMOUNT (€)	PERIOD	FULL TITLE
Jordi Llop	Health Research Call 2017	29,150.00	2018 - 2021	<b>HIDDENMETS</b> - Eradicating prostate cancer metastasis before clinical manifestation

Technology

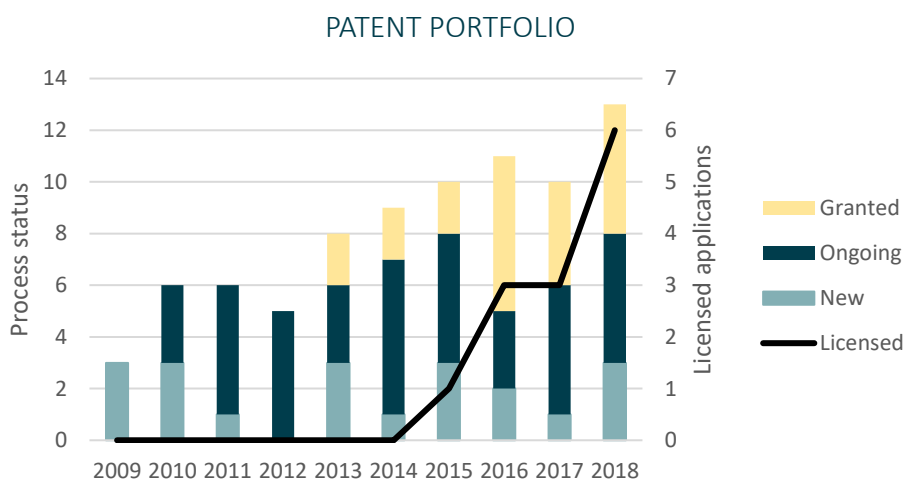
Transfer



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:



### 2018 Patent Applications

#### Method and apparatus for the cardiovascular assessment of a subject in need thereof

[EP18382080.2](#) (13/02/2018)

J.M. Ruiz Cabello, A. J. Santos Oviedo

#### Vacuna multivalente para el tratamiento y prevención de la tuberculosis, listeriosis y neumonía

[P201830628](#) (22/06/2018)

I. García, M. Marradi, S. Penadés, C. Álvarez, R. Calderón, H. Terán, D. Salcines, E. Frande

#### Support coil

[EP18382944.9](#) (19/12/2018)

M. Simon

# Knowledge & Technology Transfer

## SPIN-OFFS

### Asparia Glycomics

[www.aspariaglycomics.com](http://www.aspariaglycomics.com)



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

The business initiative markets the leading technology developed by CIC biomaGUNE's Glycotechnology Laboratory, directed by Niels 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.

"The company is led by Dr. Juan Echevarria, co-inventor of the technology, who moved to *Asparia Glycomics* from the Glycotechnology laboratory. The standards and kit solutions offered by *Asparia Glycomics* find multiple applications in clinical glycomics research, biopharmaceutical glycan analysis and glycobiology in general.

The company started operating in October 2016 and has currently obtained ca. **117 k€** from direct sales and signed a distribution agreement with the multinational company Sigma.

The company also managed to obtain public funding in the form of **3** Torres Quevedo postdoctoral fellowships, **2** industrial PhD studentships (in collaboration with CIC biomaGUNE), **1** Hazitek grants from SPRI- Basque Government, **1** NEOTEC grant from the Spanish Government and **1** collaborative research project (Retos-Colaboración), also with CIC biomaGUNE. Additionally, Asparia's innovation has been recognized by the MBAe3-Gaztenpresa (Laboral Kutxa) award, has been finalist of EmprendedorXXI awards in the Basque Country and has passed the world final to access to the 2018 program of the prestigious MassChallenge Accelerator in Boston (MA). **The company has been certified as Innovative SME by the Spanish government"**

## RESEARCH AGREEMENTS WITH COMPANIES

CIC biomaGUNE 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 2018, besides several technical services provided to industry and the initiation of conversations with many companies, twelve collaboration agreements with industrial or clinical partners were signed:

**Solmeglas (Spain)** – Specialty nanoparticles distribution agreement.

**Nanolike (France)** – Design and tailor made synthesis of nanoparticles.

**IIS Biodonostia (Spain)** – Service provision in connection to the development of nanoparticle-based thermosensitive devices.

**Policlínica de Gipuzkoa (Spain)** – Collaborative clinical assay on the therapeutic effect of a pro-coagulant drug

**Asparia Glycomics (Spain)** – Extension of agreement for custom production of specialty chemicals.

**Midatech Pharma España (Spain)** – Extension of agreement for analytical services provision.

**Curium Pharma Spain (Spain)** – Grant of use and exploitation rights of the cyclotron and radio-pharmacy laboratories for the production of radio-labeled drugs.

**Janssen Pharmaceutica NV (Belgium)** – Pre-clinical evaluation of a radiotracer.

**Nanovex Biotechnologies (Spain)** - Specialty nanoparticles distribution agreement.

**Biokit Research & Development (Spain)** – Characterization of microparticle aggregation processes at single particle level.

**INDICATE Solutions (Spain)** – Service Provision.

Scientific

Output

## INDEXED PUBLICATIONS



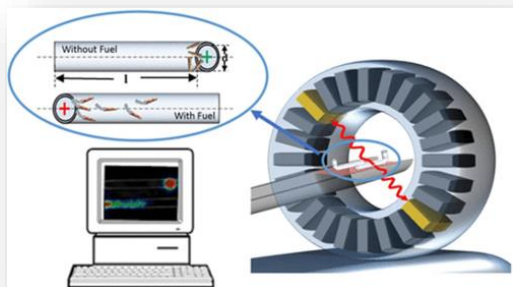
## ARTICLES PUBLISHED IN JOURNALS WITH IMPACT FACTORS ABOVE 9.5 (30%)

JOURNAL	IMPACT FACTOR	Nº OF ARTICLES
Nature Reviews Materials	51.941	1
Nature	41.577	1
Science	41.058	2
Chemical Society Reviews	40.182	1
Nature Materials	39.235	1
Nature Nanotechnology	37.490	1
Nature Photonics	35.521	1
Energy & Environmental Science	30.067	1
Advanced Materials	21.950	2
Advanced Energy Materials	21.875	1
Accounts of Chemical Research	20.955	1
Nano Today	17.753	1
Journal of the American Chemical Society	14.357	4
Chem	14.104	1
ACS Nano	13.709	7
Advanced Functional Materials	13.325	4
Nano Energy	13.120	1
Nature Protocols	12.423	1
Nature Communications	12.353	2
Angewandte Chemie International Edition	12.102	8
Applied catalysis B-environmental	11.698	1
ACS Catalysis	11.384	2
EMBO Molecular Medicine	10.293	1
Chemistry of Materials	9.890	1
Small	9.589	1
PNAS	9.504	1
<b>TOTAL</b>		<b>50</b>

# Scientific Output

## HIGHLIGHTS

### Positron emission tomography (PET) as an imaging tool for the in vivo localization of artificial micromotors



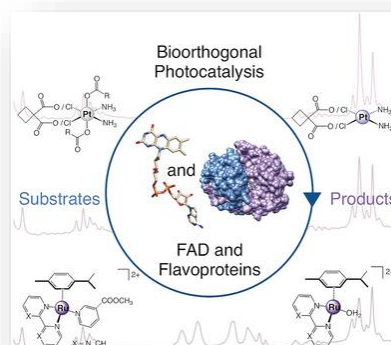
#### Medical Imaging for the Tracking of Micromotors

Vilela, D; Cossío, U; Parmar, J; Martínez-Villacorta, AM; Gómez-Vallejo, V; Llop, J; Sánchez, S.

*ACS Nano*, **2018**, *12*, 1220-1227

Micro/nanomotors are useful tools for several biomedical applications, including targeted drug delivery and minimally invasive microsurgeries. However, major challenges such as in vivo imaging need to be addressed before they can be safely applied on a living body. Here, we show that positron emission tomography (PET), a molecular imaging technique widely used in medical imaging, can also be used to track a large population of tubular Au/PEDOT/Pt micromotors. Chemisorption of an iodine isotope onto the micromotor's Au surface rendered them detectable by PET, and we could track their movements in a tubular phantom over time frames of up to 15 min. In a second set of experiments, micromotors and the bubbles released during self-propulsion were optically tracked by video imaging and bright-field microscopy. The results from direct optical tracking agreed with those from PET tracking, demonstrating that PET is a suitable technique for the imaging of large populations of active micromotors in opaque environments, thus opening opportunities for the use of this mature imaging technology for the in vivo localization of artificial swimmers.

### Flavins and flavoproteins: unconventional catalyzers of Pt IV and Ru II complexes: new opportunities for the design of chemically-and light-activated metal-based prodrugs



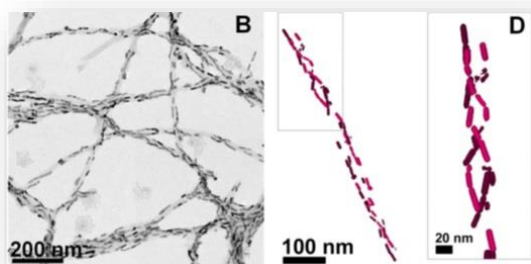
#### Bioorthogonal Catalytic Activation of Platinum and Ruthenium Anticancer Complexes by FAD and Flavoproteins

Alonso-de Castro, S; Cortajarena, AL; López-Gallego, F; Salassa, L.

*Angew. Chem. Int. Ed.* **2018**, *57*, 3143-3147

Recent advances in bioorthogonal catalysis promise to deliver new chemical tools for performing chemoselective transformations in complex biological environments. Herein, we report how FAD (flavin adenine dinucleotide), FMN (flavin mononucleotide), and four flavoproteins act as unconventional photocatalysts capable of converting Pt(IV) and Ru(II) complexes into potentially toxic Pt(II) or Ru(II)-OH<sub>2</sub> species. In the presence of electron donors and low doses of visible light, the flavoproteins mini singlet oxygen generator (miniSOG) and NADH oxidase (NOX) catalytically activate Pt(IV) prodrugs with bioorthogonal selectivity. In the presence of NADH, NOX catalyzes Pt(IV) activation in the dark as well, indicating for the first time that flavoenzymes may contribute to initiating the activity of Pt(IV) chemotherapeutic agents.

## Gold nanorods for early stage detection of amyloids in Parkinson's and prion diseases



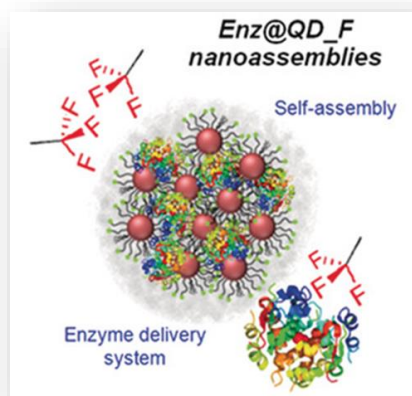
### Detection of amyloid fibrils in Parkinson's disease using plasmonic chirality

Kumar, J; Eraña, H; López-Martínez, E; Claes, N; Martín, VF; Solís, DM; Bals, S; Cortajarena, AL; Castilla, J; Liz-Marzán, LM.

*Proc. Natl. Acad. Sci. U. S. A.*, **2018**, 201721690

This contribution reports on the application of gold nanorods to the detection of amyloids in Parkinson's and prion diseases. We found that gold nanorods show no interaction with monomeric proteins but adsorb onto helical protein fibrils. Chiral amyloid templates induce helical arrangement of nanorods, giving rise to intense optical activity at the plasmon resonance wavelengths. This report shows the use of protein fibrils as templates for chiral nanoparticle assembly and development of a biodetection technique. We show this effect on a model recombinant protein,  $\alpha$ -synuclein (involved in Parkinson's disease), using CD, cryogenic transmission EM tomography, and theoretical simulations supporting the experimental findings. We additionally show application to identify patients with Parkinson's disease from human brain homogenates.

## Hydrophobic fluorine interactions key elements for the encapsulation and release of enzymes



### Taking advantage of hydrophobic fluorine interactions for self-assembled nanoclusters of quantum dots as delivery platform for enzymes

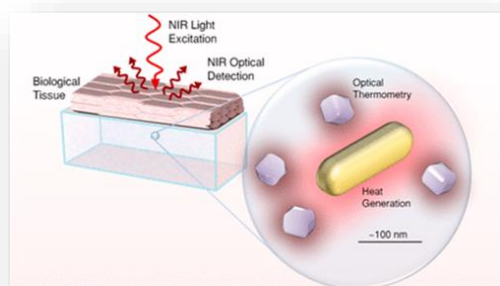
Carrillo-Carrión, C; Atabakhshi-Kashi, M; Carril, M; Khajeh, K; Parak, WJ.

*Angew. Chem. Int. Ed.* **2018**, 57, 5033-5036

Self-assembly of nanoparticles provides unique opportunities as nanoplatforms for controlled delivery. By exploiting the important role of noncovalent hydrophobic interactions in the engineering of stable assemblies, nanoassemblies were formed by the self-assembly of fluorinated quantum dots in aqueous medium through fluorine-fluorine interactions. These nanoassemblies encapsulated different enzymes (laccase and  $\alpha$ -galactosidase) with encapsulation efficiencies of  $\geq 74\%$ . Importantly, the encapsulated enzymes maintained their catalytic activity, following Michaelis-Menten kinetics. Under an acidic environment the nanoassemblies were slowly disassembled, thus allowing the release of encapsulated enzymes. The effective release of the assayed enzymes demonstrated the feasibility of this nanoplatform to be used in pH-mediated enzyme delivery. In addition, the as-synthesized nanoassemblies, having a diameter of about 50 nm, presented high colloidal stability and fluorescence emission, which make them a promising multifunctional nanoplatform.

# Scientific Output

## Plasmonic nanothermometers



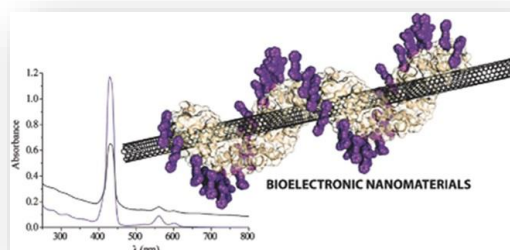
### Subtissue Plasmonic Heating Monitored with $\text{CaF}_2:\text{Nd}^{3+}, \text{Y}^{3+}$ Nanothermometers in the Second Biological Window

Quintanilla, M; Zhang, Y; Liz-Marzán, LM.

*Chem. Mater.*, **2018**, *30*, 2819-2828

Measuring temperature in biological environments is an ambitious goal toward supporting medical treatment and diagnosis. Minimally invasive techniques based on optical probes require very specific properties that are difficult to combine within a single material. These include high chemical stability in aqueous environments, optical signal stability, low toxicity, high emission intensity, and, essential, working at wavelengths within the biological transparency windows so as to minimize invasiveness while maximizing penetration depth. We propose  $\text{CaF}_2:\text{Nd}^{3+}, \text{Y}^{3+}$  as a candidate for thermometry based on an intraband ratiometric approach, fully working within the biological windows (excitation at 808 nm; emission around 1050 nm). We optimized the thermal probes through the addition of  $\text{Y}^{3+}$  as a dopant to improve both emission intensity and thermal sensitivity. To define the conditions under which the proposed technique can be applied, gold nanorods were used to optically generate subtissue hot areas, while the resulting temperature variation was monitored with the new nanothermometers.

## Biomolecules as efficient scaffolds to organize photoactive and electroactive moieties: a promising strategy for the fabrication of the next-generation of bioelectronic nanomaterials



### Toward Bioelectronic Nanomaterials: Photoconductivity in Protein-Porphyrin Hybrids Wrapped around SWCNT

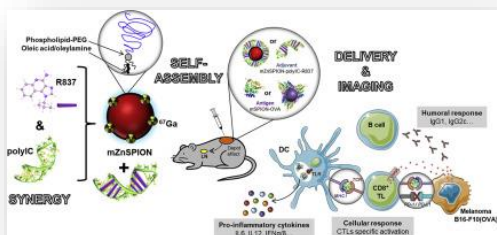
López-Andarias, J; Mejías, SH; Sakurai, T; Matsuda, W; Seki, S; Feixas, F; Osuna, S; Atienza, C; Martín, N; Cortajarena, AL

*Adv. Funct. Mater.*, **2018**, *28*, 1704031

The development of sophisticated ordered functional materials is one of the important challenges in current science. One of the keys to enhance the properties of these materials is the control of the organization and morphology at different scales. This work presents a novel bioinspired methodology to achieve highly ordered donor/acceptor bio-nanohybrids using a designed repeat protein as scaffold, endowed with photoactive and electron donating porphyrin (P) units, to efficiently wrap around electron accepting single wall carbon nanotubes (SWCNT). A systematic experimental and theoretical study to evaluate the effect of the length of the protein reveals that longer proteins wrap around the SWCNT in a more efficient manner due to the stronger supramolecular interaction existing between the inner concave surface of the protein and the convex surface of the SWCNT. Finally, the new bio-nanohybrids show a remarkable enhancement on the photoconductivity values by flash-photolysis microwave conductivity (FP-TRMC technique) demonstrating that the major charge carriers of electrons are injected into the SWCNTs and move along the 1D-structures.



## Magnetic nanoparticles for cancer immunotherapy



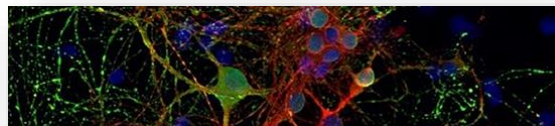
### Effective cancer immunotherapy in mice by polyIC-imiquimod complexes and engineered magnetic nanoparticles

Bocanegra Gondan, AI; Ruiz-de-Angulo, A; Zabaleta, A; Gómez Blanco, N; Cobaleda-Siles, BM; García-Granda, MJ; Padro, D; Llop, J; Arnaiz, B; Gato, M; Escors, D; Mareque-Rivas, JC.

*Biomaterials* **2018**, *170*, 95-115

Encouraging results are emerging from systems that exploit Toll like receptor (TLR) signaling, nanotechnology, checkpoint inhibition and molecular imaging for cancer immunotherapy. A major remaining challenge is developing effective, durable and tumour-specific immune responses without systemic toxicity. Here, we report a simple and versatile system based on synergistic activation of immune responses and direct cancer cell killing by combined TLR ligation using polyIC as TLR3 and imiquimod (R837) as TLR7 agonist, in combination with the model antigen ovalbumin (OVA) and phospholipid micelles loaded with zinc-doped iron oxide magnetic nanoparticles (MNPs). The combination of TLR agonists triggered a strong innate immune response in the lymph nodes (LNs) without systemic release of pro-inflammatory cytokines. Overall, we show this synergistic TLR agonists and their combination with MNPs and immune checkpoint blockade to have considerable potential for preclinical and clinical development of vaccines for cancer immunotherapy.

## Graphene carpets: Better communication for neurons



### Single-layer graphene modulates neuronal communication and augments membrane ion currents

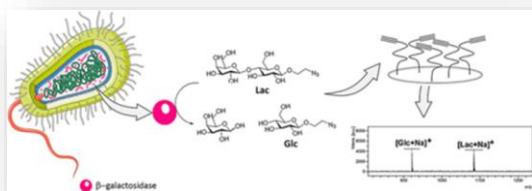
Pampaloni NP, Lottner M, Giugliano M, Matruglio A, D'Amico F, Prato M, Garrido JA, Ballerini L, Scaini D

*Nature Nanotechnology* **2018**, *13*, 755–764

The use of graphene-based materials to engineer sophisticated biosensing interfaces that can adapt to the central nervous system requires a detailed understanding of how such materials behave in a biological context. Graphene's peculiar properties can cause various cellular changes, but the underlying mechanisms remain unclear. Here, we show that single-layer graphene increases neuronal firing by altering membrane-associated functions in cultured cells. Graphene tunes the distribution of extracellular ions at the interface with neurons, a key regulator of neuronal excitability. The resulting biophysical changes in the membrane include stronger potassium ion currents, with a shift in the fraction of neuronal firing phenotypes from adapting to tonically firing. By using experimental and theoretical approaches, we hypothesize that the graphene-ion interactions that are maximized when single-layer graphene is deposited on electrically insulating substrates are crucial to these effects.

# Scientific Output

## Quantification of glycosyl hydrolase activity by Mass Spectrometry



### Measuring Bacterial Glycosyl Hydrolase Activity with a Soluble Capture Probe by Mass Spectrometry

Serna, S; Ercibengoa, M; Marimón, JM; Reichardt, N.

*Anal. Chem.* **2018**, *90*, 12536–12543

A solution-phase enzymatic assay has been developed to track bacterial glycosyl hydrolase activity by surface-assisted MALDI-TOF mass spectrometry. Lactose was equipped with an azide-functionalized linker and was supplemented to bacterial cultures as an artificial substrate for bacterial  $\beta$ -galactosidase enzyme. The azide linked glycoside probe was then covalently captured on an alkyne-functionalized indium tin oxide sample plate via a bio-orthogonal copper-catalyzed azide alkyne cycloaddition (CuAAC). The noncovalent immobilization of the alkyne capture tag via hydrophobic interactions on the ITO-sample plate allowed the analysis of the probe conjugate by surface-based mass spectrometry. The ratio of digested to nondigested lactose probe was then employed as a measure for bacterial hydrolase activity, which correlated well with bacterial growth measured by optical density. In addition, we established in a proof of concept experiment that the setup was well suited to identify antibiotic susceptibility of bacterial strains with a performance comparable to current state-of-the-art methods. While the proof of concept version is limited to the identification of a single enzyme activity, we envisage that the use of multiple substrate probes in a multiplexed version will allow the quantification of various glycosyl hydrolase activities with clinical relevance in a single experiment.

## Carbon nanotubes scaffolds as neural prostheses



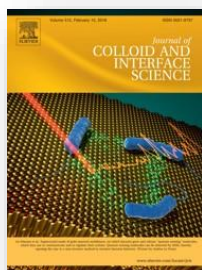
### 3D conductive scaffolds based on Carbon Nanotubes and Polypyrrole as Neural Prostheses with high biocompatibility

Alegret, N; Dominguez-Alfaro, A; Gonzalez-Dominguez, JM; Arnaiz, B; Cossío, U; Bosi, S; Vázquez, E; Ramos-Cabrer, P; Mecerreyes, D; Prato, M.

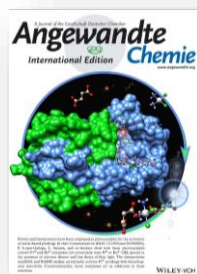
*ACS Appl. Mater. Interfaces* **2018**, *10*, 43904–43914

Here, we construct three-dimensional (3D) porous and conductive composites, where C8-D1A astrocytic cells were incubated to study their biocompatibility. The manufactured scaffolds are composed exclusively of carbon nanotubes (CNTs), a most promising material to interface with neuronal tissue, and polypyrrole (PPy), a conjugated polymer demonstrated to reduce gliosis, improve adaptability, and increase charge-transfer efficiency in brain-machine interfaces. We developed a new and easy strategy, based on the vapor phase polymerization (VPP) technique, where the monomer vapor is polymerized inside a sucrose sacrificial template containing CNT and an oxidizing agent. After removing the sucrose template, a 3D porous scaffold was obtained and its physical, chemical, and electrical properties were evaluated. The obtained scaffold showed very low density, high and homogeneous porosity, electrical conductivity, and Young's Modulus similar to the in vivo tissue. Its high biocompatibility was demonstrated even after 6 days of incubation, thus paving the way for the development of new conductive 3D scaffolds potentially useful in the field of electroactive tissues.

## COVER PAGES



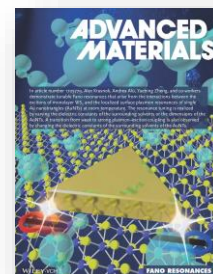
**Colloidal Design of Plasmonic Sensors Based on Surface Enhanced Raman Scattering**  
Hamon, C.; Liz-Marzán, LM  
*J. Colloid Interface Sci.* **2018**, *512*, 834-843



**Bioorthogonal Catalytic Activation of Platinum and Ruthenium Anticancer Complexes by FAD and Flavoproteins**  
Alonso-de Castro, S; Cortajarena, AL; López-Gallego, F; Salassa, L.  
*Angew. Chem. Int. Ed.* **2018**, *57*, 2980



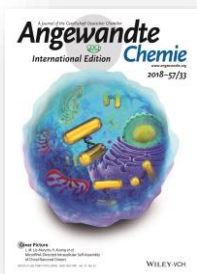
**Negishi coupling reactions with [<sup>11</sup>C]CH<sub>3</sub>I: a versatile method for efficient <sup>11</sup>C-C bond formation**  
Rejc, L; Gómez-Vallejo, V; Alcázar, J; Alonso, N; Andrés, JI; Arrieta, A; Cossío, FP; Llop, J.  
*Chem. Commun.* **2018**, *54*, 4398-4401



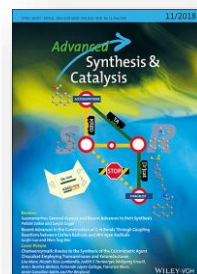
**Tunable Fano Resonance and Plasmon-Exciton Coupling in Single Au Nanotriangles on Monolayer WS<sub>2</sub> at Room Temperature**  
Wang, M; Krasnok, A; Zhang, T; Scarabelli, L; Liu, H; Wu, Z; Liz-Marzán, LM; Terrones, M; Alù, A; Zheng, Y.  
*Adv. Mater.* **2018**, *30*, 1705779



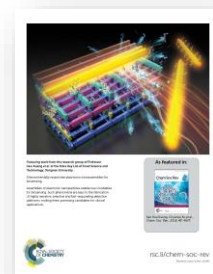
**Microwave-induced covalent functionalization of few-layer graphene with arynes under solvent-free conditions**  
Sulleiro, MV; Quiroga, S; Peña, D; Pérez, D; Guitián, E; Criado, A; Prato, M.  
*Chem. Commun.* **2018**, *54*, 2086-2089



**MicroRNA-Directed Intracellular Self-Assembly of Chiral Nanorod Dimers**  
Xu, L; Gao, Y; Kuang, H; Liz-Marzán, LM; Xu, C.  
*Angew. Chem. Int. Ed.* **2018**, *57*, 10381



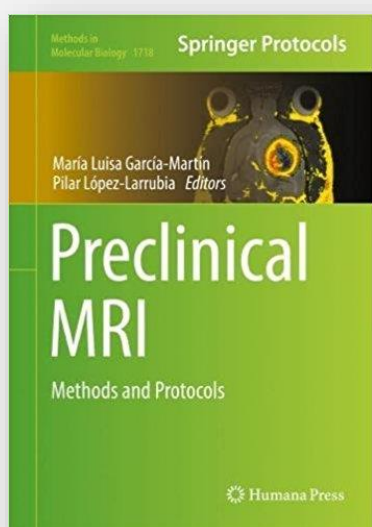
**Chemoenzymatic Approaches to the Synthesis of the Calcimimetic Agent Cinacalcet Employing Transaminases and Ketoreductases**  
Marx, L; Ríos-Lombardía, N; Farnberger, JF; Kroutil, W; Benítez-Mateos, AI; López-Gallego, F; Moris, F; González-Sabín, J; Berglund, P.  
*Adv. Synth. Catal.* **2018**, *360*, 2165-2157



**Environmentally responsive plasmonic nanoassemblies for biosensing**  
Wu, XL; Hao, CL; Kumar, J; Kuang, H; Kotov, NA; Liz-Marzán, LM; Xu, CL  
*Chem. Soc. Rev.* **2018**, *47*, 4696-4677

# Scientific Output

## BOOK CHAPTERS



### **MRI in the Study of Animal Models of Stroke**

D. Padró, P. Ramos-Cabrera

*Preclinical MRI. Methods and Protocols. Springer science, Humana Press, NY.*

**2018**, pp. 377-392






### **Aging and the Inflammasomes**

F. Marin-Aguilar, J. Ruiz-Cabello, M D. Cordero

*Inflammasomes: Clinical and Therapeutic Implications, Springer*

**2018**, Volume 108, pp. 303-320

## EDITORIAL ACTIVITY

		
<p><b>Science</b> Board of Reviewing Editors – Luis Liz-Marzán</p>	<p><b>Nanotoxicology</b> Editorial Board – Wolfgang Parak</p>	<p><b>Theranostics</b> Editorial Board– Wolfgang Parak, Luis Liz-Marzán</p>
		
<p><b>ACS Omega</b> Co-Editor-in-Chief – Luis Liz-Marzán</p>	<p><b>Nanomaterials</b> Editorial Board – Wolfgang Parak</p> <p><b>Neurology</b> Editorial Board – Jesús Ruiz Cabello</p>	<p><b>Angewandte Chemie</b> Editorial Board – Wolfgang Parak</p> <p><b>Advanced Healthcare Materials</b> Advisory Board – Wolfgang Parak</p>
<p><b>ACS Nano</b> Associate Editor – Wolfgang Parak Editorial Advisory Board – Luis Liz-Marzán, Maurizio Prato</p>		<p><b>Advanced Optical Materials</b> International Advisory Board – Luis Liz-Marzán</p>
<p><b>ACS Applied Bio Materials</b> Editorial Board – Aitziber L. Cortajarena</p>	<p><b>Scientific Reports</b> Associate Editor – Maurizio Prato</p>	<p><b>Chemistry – A European Journal</b> Editorial Board – Luis Liz-Marzán</p>
<p><b>Accounts of Chemical Research</b> Editorial Advisory Board – Luis Liz-Marzán</p>		<p><b>ChemNanoMat</b> International Advisory Board– Wolfgang Parak, Luis Liz-Marzán</p>
<p><b>Chemistry of Materials</b> Editorial Advisory Board – Wolfgang Parak</p>	<p><b>Carbohydrate Research</b> Editorial Board – Niels Reichardt</p>	<p><b>ChemSusChem</b> Editorial Board – Maurizio Prato</p>
	<p><b>Chemical Physics Letters</b> Advisory Board – Maurizio Prato</p>	<p><b>Particle &amp; Particle Systems Characterization</b> Executive Editorial Board – Luis Liz-Marzán</p>
<p><b>Chemical Communications</b> International Editorial Advisory Board – Maurizio Prato</p>	<p><b>Journal of Colloid and Interface Science</b> Advisory Board – Wolfgang Parak</p>	<p><b>Advisory Editorial Board – Wolfgang Parak</b></p>
<p><b>Faraday Discussions</b> Advisory Board – Luis Liz-Marzán</p>	<p><b>Colloid and Interface Science Communications</b> Advisory Board – Wolfgang Parak</p>	<p><b>Small Mehtods</b> Advisory Board – Wolfgang Parak</p>
<p><b>Journal of Materials Chemistry B</b> International Editorial Advisory Board – Luis Liz-Marzán</p>		
	<p><b>Journal of Cerebral Blood Flow and Metabolism</b> Editorial Board – Abraham Martín</p>	<p><b>Journal of Nanobiotechnology</b> Editorial Board - Wolfgang Parak</p>

# Scientific Output

## PUBLICATION LIST

Aires, A; Lopez-Martinez, E; Cortajarena, AL **Sensors Based on Metal Nanoclusters Stabilized on Designed Proteins. *Biosensors* 2018, 8, 110**

Carregal-Romero, S; Plaza-García, S; Piñol, R; Murillo, J; Ruiz-Cabello, J; Padro, D; Millán, A; Ramos-Cabrera, P. **MRI Study of the Influence of Surface Coating Aging on the In Vivo Biodistribution of Iron Oxide Nanoparticles. *Biosensors* 2018, 8, 127**

Pérez-Salvia, M; Aldaba, E; Vara, Y; Fabre, M; Ferrer, C; Masdeu, C; Zubia, A; Sebastian, ES; Otaegui, D; Llinàs-Arias, P; Rosselló-Tortella, M; Berdasco, M; Moutinho, C; Setien, F; Villanueva, A; González-Barca, E; Muncunill, J; Navarro, J; Piris, MA; Cossio, FP; Esteller, M. **In vitro and in vivo activity of a new small-molecule inhibitor of HDAC6 in mantle cell lymphoma. *Haematologica* 2018, 103, E537-E540**

Coy, E; Fina, I; Za??ski, K; Krysztofik, A; Yate, L; Rodriguez, L; Graczyk, P; G?owi?ski, H; Ferrater, C; Dubowik, J; Varela, M. **High-temperature Magnetodielectric Bi(Fe<sub>0.5</sub>Mn<sub>0.5</sub>)O-3 Thin Films with Checkerboard-Ordered Oxygen Vacancies and Low Magnetic Damping. *Phys Rev Appl* 2018, 10, 054072**

Joya, A; Padro, D; Gómez-Vallejo, V; Plaza-García, S; Llop, J; Martín, A. **PET Imaging of Crossed Cerebellar Diaschisis after Long-Term Cerebral Ischemia in Rats. *Contrast Media Mol. Imaging* 2018, 2018, 2483078**

Tizei, LHG; Lourenço-Martins, H; Das, P; Woo, SY; Scarabelli, L; Hanske, C; Liz-Marzán, LM; Watanabe, K; Taniguchi, T; Kociak, M. **Monolayer and thin h-BN as substrates for electron spectro-microscopy analysis of plasmonic nanoparticles. *Appl. Phys. Lett.* 2018, 113, 231108**

Mondejar-Parreño, G; Morales-Cano, D; Barreira, B; Callejo, M; Ruiz-Cabello, J; Moreno, L; Esquivel-Ruiz, S; Mathie, A; Butrous, G; Perez-Vizcaino, F; Cogolludo, A. **HIV transgene expression impairs K<sup>+</sup> channel function in the pulmonary vasculature. *Am J Physiol-lung C* 2018, 315, L711-L723**

Matassini, C; Vanni, C; Goti, A; Morrone, A; Marradi, M; Cardona, F **Multimerization of DAB-1 onto Au GNPs affords new potent and selective N-acetylgalactosamine-6-sulfatase (GALNS) inhibitors. *Org. Biomol. Chem.* 2018, 16, 8604-8612**

Alonso-de Castro, S; Terenzi, A; Hager, S; Englinger, B; Faraone, A; Calvo, J; Galanski, M; Keppler, BK; Berger, W; Salassa, L. **Biological activity of Pt-IV prodrugs triggered by riboflavin-mediated bioorthogonal photocatalysis. *Sci. Rep.* 2018, 8, 17198**

Valencia, DP; Yate, L; Aperador, W; Li, Y; Coy, E. **High Electrocatalytic Response of Ultra-refractory Ternary Alloys of Ta-Hf-C Carbide toward Hydrogen Evolution Reaction in Acidic Media. *J. Phys. Chem. C* 2018, 122, 25433-25440**

Fadeel, B; Bussy, C; Merino, S; Vázquez, E; Flahaut, E; Mouchet, F; Evariste, L; Gauthier, L; Koivisto, AJ; Vogel, U; Martín, C; Delogu, LG; Buerki-Thurnherr, T; Wick, P; Beloin-Saint-Pierre, D; Hischier, R; Pelin, M; Candotto Carniel, F; Tretiach, M; Cesca, F; Benfenati, F; Scaini, D; Ballerini, L; Kostarelos, K; Prato, M; Bianco, A. **Safety Assessment of Graphene-Based Materials: Focus on Human Health and the Environment. *ACS Nano* 2018, 12, 10582-10620**

Vanrompay, H; bladt, e; Albrecht, W; Béché, A; Zakhosheva, M; Sánchez-Iglesias, A; Liz-Marzan, LM; Bals, S. **3D characterization of heat-induced morphological changes of Au nanostars by fast in situ electron tomography. *Nanoscale* 2018, 10, 22792-22801**

Alegret, N; Dominguez-Alfaro, A; Gonzalez-Dominguez, JM; Arnaiz, B; Cossío, U; Bosi, S; Vázquez, E; Ramos-Cabrer, P; Mecerreyes, D; Prato, M. Three-Dimensional Conductive Scaffolds as Neural Prostheses Based on Carbon Nanotubes and Polypyrrole. *ACS Appl. Mater. Interfaces* **2018**, *10*, 43904-43914

Brzezicka, KA; Serna, S; Reichardt, NC. Fluorescent Neoglycoprotein Gold Nanoclusters: Synthesis and Applications in Plant Lectin Sensing and Cell Imaging. *Nanoscale Res. Lett.* **2018**, *13*, 360

Serna, S; Ercibengoa, M; Marimón, JM; Reichardt, N. Measuring Bacterial Glycosyl Hydrolase Activity with a Soluble Capture Probe by Mass Spectrometry. *Anal. Chem.* **2018**, *90*, 12536-12543

Okrugin, BM; Richter, RP; Leermakers, FAM; Neelov, IM; Borisov, OV; Zhulina, EB. Structure and properties of polydisperse polyelectrolyte brushes studied by self-consistent field theory. *Soft Matter* **2018**, *14*, 6230-6242

Cardelli, C; Tubiana, L; Bianco, V; Nerattini, F; Dellago, C; Coluzza, I. Heteropolymer Design and Folding of Arbitrary Topologies Reveals an Unexpected Role of Alphabet Size on the Knot Population. *Macromolecules* **2018**, *51*, 8346-8356

Zhu, D; Yan, H; Zhou, Z; Tang, J; Liu, X; Hartmann, R; Parak, WJ; Feliu, N; Shen, Y. Detailed investigation on how the protein corona modulates the physicochemical properties and gene delivery of polyethylenimine (PEI) polyplexes. *Biomater. Sci.* **2018**, *6*, 1800-1817

Pampaloni, NP; Scaini, D; Perissinotto, F; Bosi, S; Prato, M; Ballerini, L. Sculpting neurotransmission during synaptic development by 2D nanostructured interfaces. *Nanomed. Nanotechnol. Biol. Med.* **2018**, *14*, 2521-2532

Benítez-Mateos, AI; Contente, ML; Velasco-Lozano, S; Paradisi, F; López-Gallego, F. Self-Sufficient Flow-Biocatalysis by Coimmobilization of Pyridoxal 5'-Phosphate and omega-Transaminases onto Porous Carriers. *ACS Sustain Chem Eng* **2018**, *6*, 13151-13159

Yang, YYM; van Diepen, A; Brzezicka, K; Reichardt, N; Hokke, CH. Glycan Microarray-Assisted Identification of IgG Subclass Targets in Schistosomiasis. *Front. Immunol.* **2018**, *9*, 2331

Sánchez, A; Ovejero Paredes, K; Ruiz-Cabello, J; Martínez-Ruiz, P; Pingarrón, JM; Villalonga, R; Filice, M. Hybrid Decorated Core@Shell Janus Nanoparticles as a Flexible Platform for Targeted Multimodal Molecular Bioimaging of Cancer. *ACS Appl. Mater. Interfaces* **2018**, *10*, 31032-31043

Guisasola, E; Baeza, A; Asín, L; de la Fuente, JM; Vallet-Regí, M. Heating at the Nanoscale through Drug-Delivery Devices: Fabrication and Synergic Effects in Cancer Treatment with Nanoparticles. *Small Methods* **2018**, *2*, 1800007

Fu, F; Ciganda, R; Wang, Q; Tabey, A; Wang, C; Escobar, A; Martinez-Villacorta, AM; Hernández, R; Moya, S; Fouquet, E; Ruiz, J; Astruc, D. Cobaltocene Reduction of Cu and Ag Salts and Catalytic Behavior of the Nanoparticles Formed. *ACS Catal.* **2018**, *8*, 8100-8106

Gutiérrez-Pineda, E; Cáceres-Vélez, PR; Rodríguez-Presa, MJ; Moya, SE; Gervasi, CA; Amalvy, JI. Hybrid Conducting Composite Films Based on Polypyrrole and Poly(2-(diethylamino)ethyl methacrylate) Hydrogel Nanoparticles for Electrochemically Controlled Drug Delivery. *Adv. Mater. Interfaces* **2018**, *5*, 1800968

Mair, A; Tung, C; Cacciuto, A; Coluzza, I. Translocation of a globular polymer through a hairy pore. *J Mol Liq* **2018**, *265*, 603-610

## Scientific Output

Díaz-Núñez, P; González-Rubio, G; Prada, A; González Izquierdo, J; Rivera, A; Bañares, L; Guerrero-Martínez, A; Peña-Rodríguez, O. Using Femtosecond Laser Irradiation To Grow the Belly of Gold Nanorods. *J. Phys. Chem. C* **2018**, *122*, 19816-19822

Chakraborty, I; Jimenez de Aberasturi, D; Pazos-Perez, N; Guerrini, L; Masood, A; Alvarez-Puebla, RA; Feliu, N; Parak, WJ. Ion-Selective Ligands: How Colloidal Nano- and Micro-Particles Can Introduce New Functionalities. *Z. Phys. Chem.* **2018**, *232*, 1307-1317

Barrejón, M; Syrgiannis, Z; Prato, M. Ionic liquids plus microwave irradiation: a general methodology for the retro-functionalization of single-walled carbon nanotubes. *Nanoscale* **2018**, *10*, 15782-15787

Pastoriza-Santos, I; Kinnear, C; Pérez-Juste, J; Mulvaney, P; Liz-Marzán, LM. Plasmonic polymer nanocomposites. *Nat. Rev. Mater.* **2018**, *3*, 375-391

Fernández-Barahona, I; Muñoz-Hernando, M; Pellico, J; Ruiz-Cabello, J; Herranz, F. Molecular Imaging with Ga-68 Radio-Nanomaterials: Shedding Light on Nanoparticles. *Appl. Sci.* **2018**, *8*, 1098

Cáceres, R; Chavez, T; Maestro, D; Palanca, A; Bolado, P; Madrazo, F; Aires, A; Cortajarena, A; Villar, A. Reduction of cardiac TGF beta-mediated profibrotic events by inhibition of Hsp90 with engineered protein. *J. Mol. Cell Cardiol.* **2018**, *123*, 75-87

Giorgio, V; Schiavone, M; Galber, C; Carini, M; Da Ros, T; Petronilli, V; Argenton, F; Carelli, V; Acosta Lopez, MJ; Salviati, L; Prato, M; Bernardi, P. The idebenone metabolite QS10 restores electron transfer in complex I and coenzyme Q defects. *Bba-bioenergetics* **2018**, *1859*, 901-908

Reguera, J. Nanoscale Phase Segregation on Binary-Coated Nanoparticles Analyzed by MALDI-MS: Influence of Patchy Morphology. *J. Phys. Chem. C* **2018**, *122*, 20871-20879

Pretscher, M; Pineda-Contreras, BA; Kaiser, P; Reich, S; Schöbel, J; Kuttner, C; Freitag, R; Fery, A; Schmalz, H; Agarwal, S. pH-Responsive Biohybrid Carrier Material for Phenol Decontamination in Wastewater. *Biomacromolecules* **2018**, *19*, 3224-3232

Mosquera, J; García, I; Liz-Marzán, LM. Cellular Uptake of Nanoparticles versus Small Molecules: A Matter of Size. *Acc. Chem. Res.* **2018**, *51*, 2305-2313

Pelin, M; Sosa, S; Prato, M; Tubaro, A. Occupational exposure to graphene based nanomaterials: risk assessment. *Nanoscale* **2018**, *10*, 15894-15903

Macías, H; Yate, L; Coy, L; Olaya, J; Aperador, W. Effect of nitrogen flow ratio on microstructure, mechanical and tribological properties of TiWSiNx thin film deposited by magnetron co-sputtering. *Appl. Surf. Sci.* **2018**, *456*, 445-456

Izquierdo-Garcia, JL; Arias, T; Rojas, Y; Garcia-Ruiz, V; Santos, A; Martin-Puig, S; Ruiz-Cabello, J. Metabolic Reprogramming in the Heart and Lung in a Murine Model o Pulmonary Arterial Hypertension. *Front Cardiovasc Med* **2018**, *5*, 110

Đorđević, L; Arcudi, F; D'Urso, A; Cacioppo, M; Micali, N; Bürgi, T; Purrello, R; Prato, M. Design principles of chiral carbon nanodots help convey chirality from molecular to nanoscale level. *Nat. Commun.* **2018**, *9*, 3442

Gomez, IJ; Arnaiz, B; Cacioppo, M; Arcudi, F; Prato, M. Nitrogen-doped carbon nanodots for bioimaging and delivery of paclitaxel. *J. Mater. Chem. B* **2018**, *6*, 5540-5548

Martín, A; Domercq, M; Matute, C. Inflammation in stroke: the role of cholinergic, purinergic and glutamatergic signaling. *Ther Adv Neurol Diso* **2018**, *11*, 1-14



García, I; Mosquera, J; Plou, J; Liz-Marzán, LM. Plasmonic Detection of Carbohydrate-Mediated Biological Events. *Adv. Opt. Mater.* **2018**, *6*, 1800680

Quintanilla, M; Liz-Marzán, LM. Caged clusters shine brighter. *Science* **2018**, *361*, 645-645

Espinosa, A; Kolosnjaj-Tabi, J; Abou-Hassan, A; Plan Sangnier, A; Curcio, A; Silva, AKA; Di Corato, R; Neveu, S; Pellegrino, T; Liz-Marzán, LM; Wilhelm, C. Magnetic (Hyper)Thermia or Photothermia? Progressive Comparison of Iron Oxide and Gold Nanoparticles Heating in Water, in Cells, and In Vivo. *Adv. Funct. Mater.* **2018**, *28*, 1803660

Matricardi, C; Hanske, C; Garcia-Pomar, JL; Langer, J; Mihi, A; Liz-Marzán, LM. Gold Nanoparticle Plasmonic Superlattices as Surface-Enhanced Raman Spectroscopy Substrates. *ACS Nano* **2018**, *12*, 8531-8539

Martinez-Calvo, M; Couceiro, JR; Destito, P; Rodriguez, J; Mosquera, J; Mascarenas, JL Intracellular Deprotection Reactions Mediated by Palladium Complexes Equipped with Designed Phosphine Ligands. *ACS Catal.* **2018**, *8*, 6055-6061

Tubiana, L; Jurásek, M; Coluzza, I. Implementing efficient concerted rotations using Mathematica and C code. *Eur Phys J E* **2018**, *41*, 87

Candotto Carniel, F; Gorelli, D; Flahaut, E; Fortuna, L; Del Casino, C; Cai, G; Nepi, M; Prato, M; Tretiach, M. Graphene oxide impairs the pollen performance of *Nicotiana tabacum* and *Corylus avellana* suggesting potential negative effects on the sexual reproduction of seed plants. *Environ Sci-nano* **2018**, *5*, 1608-1617

Gabrielli, L; Carril, M; Padro, D; Mancin, F. Multimodal F-19 NMR Dopamine Detection and Imaging with a Nanoparticle-Based Displacement Assay. *Chem-eur J* **2018**, *24*, 13036-13042

Groult, H; García-Álvarez, I; Romero-Ramírez, L; Nieto-Sampedro, M; Herranz, F; Fernández-Mayoralas, A; Ruiz-Cabello, J. Micellar Iron Oxide Nanoparticles Coated with Anti-Tumor Glycosides. *Nanomaterials* **2018**, *8*, 567

Iatsunskyi, I; Baitimirova, M; Coy, E; Yate, L; Viter, R; Ramanavicius, A; Jurga, S; Bechelany, M; Erts, D. Influence of ZnO/graphene nanolaminate periodicity on their structural and mechanical properties. *J Mater Sci Technol* **2018**, *34*, 1487-1493

Rodriguez-Abetxuko, A; Morant-Minana, MC; Lopez-Gallego, F; Yate, L; Seifert, A; Knez, M; Beloqui, A Imidazole-Grafted Nanogels for the Fabrication of Organic-Inorganic Protein Hybrids. *Adv. Funct. Mater.* **2018**, *28*, 1803115

Echeverria, B; Serna, S; Achilli, S; Vives, C; Pham, J; Thepaut, M; Hokke, CH; Fieschi, F; Reichardt, NC Chemoenzymatic Synthesis of N-glycan Positional Isomers and Evidence for Branch Selective Binding by Monoclonal Antibodies and Human C-type Lectin Receptors. *ACS Chem. Biol.* **2018**, *13*, 2269-2279

Medve, L; Achilli, S; Serna, S; Zuccotto, F; Varga, N; Thépaut, M; Civera, M; Vivès, C; Fieschi, F; Reichardt, N; Bernardi, A. On-Chip Screening of a Glycomimetic Library with C-Type Lectins Reveals Structural Features Responsible for Preferential Binding of Dectin-2 over DC-SIGN/R and Langerin. *Chem. Eur. J.* **2018**, *24*, 14448-14460

Aperador, W; Yate, L; Pinzón, M; Caicedo, J. Optical and semiconductive properties of binary and ternary thin films from the Nb-Ti-O system. *Results Phys* **2018**, *9*, 328-336

Pelin, M; Fusco, L; Martin, C; Sosa, S; Frontinan-Rubio, J; Gonzalez-Dominguez, JM; Duran-Prado, M; Vazquez, E; Prato, M; Tubaro, A Graphene and graphene oxide induce ROS production in human HaCaT skin keratinocytes: the role of xanthine oxidase and NADH dehydrogenase. *Nanoscale* **2018**, *10*, 11820-11830

## Scientific Output

Christoforidis, KC; Syrgiannis, Z; La Parola, V; Montini, T; Petit, C; Stathatos, E; Godin, R; Durrant, JR; Prato, M; Fornasiero, P Metal-free dual-phase full organic carbon nanotubes/g-C<sub>3</sub>N<sub>4</sub> heteroarchitectures for photocatalytic hydrogen production. *Nano Energy* **2018**, *50*, 468-478

Fu, FY; Wang, CL; Wang, Q; Martinez-Villacorta, AM; Escobar, A; Chong, HB; Wang, X; Moya, S; Salmon, L; Fouquet, E; Ruiz, J; Astruc, D Highly Selective and Sharp Volcano-type Synergistic Ni<sub>2</sub>Pt@ZIF-8-Catalyzed Hydrogen Evolution from Ammonia Borane Hydrolysis. *J. Am. Chem. Soc.* **2018**, *140*, 10034-10042

Burian, M; Rigodanza, F; Demitri, N; D'ord'evi?, L; Marchesan, S; Steinhartova, T; Letofsky-Papst, I; Khalakhan, I; Mourad, E; Freunberger, SA; Amenitsch, H; Prato, M; Syrgiannis, Z. Inter-Backbone Charge Transfer as Prerequisite for Long-Range Conductivity in Perylene Bisimide Hydrogels. *ACS Nano* **2018**, *12*, 5800-5806

Iglesias, D; Melle-Franco, M; Kurbasic, M; Melchionna, M; Abrami, M; Grassi, M; Prato, M; Marchesan, S. Oxidized Nanocarbons-Tripeptide Supramolecular Hydrogels: Shape Matters!. *ACS Nano* **2018**, *12*, 5530-5538

DeGregorio-Rocasolano, N; Martí-Sistac, O; Ponce, J; Castelló-Ruiz, M; Millán, M; Guirao, V; García-Yébenes, I; Salom, JB; Ramos-Cabrera, P; Alborch, E; Lizasoain, I; Castillo, J; Dávalos, A; Gasull, T. Iron-loaded transferrin (Tf) is detrimental whereas iron-free Tf confers protection against brain ischemia by modifying blood Tf saturation and subsequent neuronal damage. *Redox Biol.* **2018**, *15*, 143-158

Bano, F; Tammi, MI; Kang, DW; Harris, EN; Richter, RP Single-Molecule Unbinding Forces between the Polysaccharide Hyaluronan and Its Binding Proteins. *Biophys J* **2018**, *114*, 2910-2922

Sanromán Iglesias, M; Lawrie, CH; Liz-Marzán, LM; Grzelczak, M. The Role of Chemically Modified DNA in Discrimination of Single Point Mutation through Plasmon-based Colorimetric Assays. *ACS Appl. Nano Mater.* **2018**, *1*, 3741-3746

Villaverde, G; Gomez-Grana, S; Guisasola, E; Garcia, I; Hanske, C; Liz-Marzan, LM; Baeza, A; Vallet-Regi, M Targeted Chemo-Photothermal Therapy: A Nanomedicine Approximation to Selective Melanoma Treatment. *Part. Part. Syst. Charact.* **2018**, *35*, 1800148

Amini, MN; Altantzis, T; Lobato, I; Grzelczak, M; Sanchez-Iglesias, A; Van Aert, S; Liz-Marzan, LM; Partoens, B; Bals, S; Neyts, EC Understanding the Effect of Iodide Ions on the Morphology of Gold Nanorods. *Part. Part. Syst. Charact.* **2018**, *35*, 1800051

Wu, XL; Hao, CL; Kumar, J; Kuang, H; Kotov, NA; Liz-Marzan, LM; Xu, CL Environmentally responsive plasmonic nanoassemblies for biosensing. *Chem. Soc. Rev.* **2018**, *47*, 4677-4696

Zalduendo, MM; Langer, J; Giner-Casares, JJ; Halac, EB; Soler-Illia, GJAA; Liz-Marzán, LM; Angelomé, PC. Au Nanoparticles-Mesoporous TiO<sub>2</sub> Thin Films Composites as SERS Sensors: A Systematic Performance Analysis. *J. Phys. Chem. C* **2018**, *122*, 13095-13105

Callejo, M; Mondejar-Parreño, G; Barreira, B; Izquierdo-Garcia, JL; Morales-Cano, D; Esquivel-Ruiz, S; Moreno, L; Cogolludo, Pulmonary Arterial Hypertension Affects the Rat Gut Microbiome. *Sci. Rep.* **2018**, *8*, 9681

Zabala, A; Vazquez-Villoldo, N; Rissiek, B; Gejo, J; Martin, A; Palomino, A; Perez-Samartin, A; Pulagam, KR; Lukowiak, M; Capetillo-Zarate, E; Llop, J; Magnus, T; Koch-Nolte, F; Rassendren, F; Matute, C; Domercq, M P2X<sub>4</sub> receptor controls microglia activation and favors remyelination in autoimmune encephalitis. *EMBO Mol. Med.* **2018**, *10*, e8743

Cox, A; Andreozzi, P; Dal Magro, R; Fiordaliso, F; Corbelli, A; Talamini, L; Chinello, C; Raimondo, F; Magni, F; Tringali, M; Krol, S; Silva, PJ; Stellacci, F; Masserini, M; Re, F Evolution of Nanoparticle Protein Corona across the Blood-Brain Barrier. *ACS Nano* **2018**, *12*, 7292-7300

Melchionna, M; Bracamonte, MV; Giuliani, A; Nasi, L; Montini, T; Tavagnacco, C; Bonchio, M; Fornasiero, P; Prato, M. Pd@TiO<sub>2</sub>/carbon nanohorn electrocatalysts: reversible CO<sub>2</sub> hydrogenation to formic acid. *Energ. Environ. Sci* **2018**, *11*, 1571-1580

Jardim, KV; Garfias, AFP; Andrade, BYG; Chaker, JA; Bão, SN; Márquez-Beltrán, C; Moya, SE; Parize, AL; Sousa, MH. Novel magneto-responsive nanoplatforms based on MnFe<sub>2</sub>O<sub>4</sub> nanoparticles layer-by-layer functionalized with chitosan and sodium alginate for magnetic controlled release of curcumin. *Mater. Sci. Eng. C* **2018**, *92*, 184-195

Caceres-Velez, PR; Fascineli, ML; Sousa, MH; Grisolia, CK; Yate, L; de Souza, PEN; Estrela-Lopis, I; Moya, S; Azevedo, RB Humic acid attenuation of silver nanoparticle toxicity by ion complexation and the formation of a Ag<sup>3+</sup> coating. *J. Hazard. Mater.* **2018**, *353*, 173-181

Gomez-Vallejo, V; Puigvila, M; Plaza-Garcia, S; Szczupak, B; Pinol, R; Murillo, JL; Sorribas, V; Lou, G; Veintemillas, S; Ramos-Cabrer, P; Llop, J; Millan, A PEG-copolymer-coated iron oxide nanoparticles that avoid the reticuloendothelial system and act as kidney MRI contrast agents. *Nanoscale* **2018**, *10*, 14153-14164

Di Silvio, D; Silvestri, A; Lay, L; Polito, L; Moya, SE. Impact of ConcanavalinA affinity in the intracellular fate of Protein Corona on Glucosamine Au nanoparticles. *Sci. Rep.* **2018**, *8*, 9046

Marx, L; Ríos-Lombardía, N; Farnberger, JF; Kroutil, W; Benítez-Mateos, AI; López-Gallego, F; Morís, F; González-Sabín, J; Berglund, P. Chemoenzymatic Approaches to the Synthesis of the Calcimimetic Agent Cinacalcet Employing Transaminases and Ketoreductases. *Adv. Synth. Catal.* **2018**, *360*, 2157-2165

Pampaloni, NP; Lottner, M; Giugliano, M; Matruggio, A; D'Amico, F; Prato, M; Garrido, JA; Ballerini, L; Scaini, D. Single-layer graphene modulates neuronal communication and augments membrane ion currents. *Nat. Nanotechnol.* **2018**, *13*, 755-764

Carrillo-Carrión, C; Gallego, M; Parak, W; Carril, M. Study of Fluorinated Quantum Dots-Protein Interactions at the Oil/Water Interface by Interfacial Surface Tension Changes. *Materials* **2018**, *11*, 750

Xu, L; Gao, Y; Kuang, H; Liz-Marzán, LM; Xu, C. MicroRNA-Directed Intracellular Self-Assembly of Chiral Nanorod Dimers. *Angew. Chem. Int. Ed.* **2018**, *57*, 10544-10548

Wang, Q; Fu, F; Martinez-Villacorta, AM; Moya, S; Salmon, L; Vax, A; Hunel, J; Ruiz, J; Astruc, D. Electron Flow in Large Metallomacromolecules and Electronic Switching of Nanoparticle Stabilization: Click Ferrocenyl Dendromers that Reduce Au-III to Au Nanoparticles. *Chem. Eur. J.* **2018**, *24*, 12686-12694

Davies, HS; Débarre, D; El Amri, N; Verdier, C; Richter, RP; Bureau, L. Elastohydrodynamic Lift at a Soft Wall. *Phys. Rev. Lett.* **2018**, *120*, 198001

Cossío, U; Gómez-Vallejo, V; Flores, M; Gañán-Calvo, B; Jurado, G; Llop, J. Preclinical evaluation of aerosol administration systems using Positron Emission Tomography. *Eur. J. Pharm. Biopharm.* **2018**, *130*, 59-65

Rigodanza, Dordevic, L; Arcudi, F; Prato, M. Customizing the Electrochemical Properties of Carbon Nanodots by Using Quinones in Bottom-Up Synthesis. *Angew. Chem. Int. Ed.* **2018**, *57*, 5062-5067

## Scientific Output

Münich, PW; Schierl, C; Dirian, K; Volland, M; Bauroth, S; Wibmer, L; Syrgiannis, Z; Clark, T; Prato, M; Guldi, DM. Tuning the Carbon Nanotube Selectivity: Optimizing Reduction Potentials and Distortion Angles in Perylenediimides. *J. Am. Chem. Soc.* **2018**, *140*, 5427-5433

Escobar, S; Bernal, C; Bolivar, JM; Nidetzky, B; López-Gallego, F; Mesa, M. Understanding the silica-based sol-gel encapsulation mechanism of *Thermomyces lanuginosus* lipase: The role of polyethylenimine. *J. Mol. Catal.* **2018**, *449*, 106-113

Hanske, C; Sanz-Ortiz, MN; Liz-Marzán, LM. Silica-Coated Plasmonic Metal Nanoparticles in Action. *Adv. Mater.* **2018**, *30*, 1707003

Chakraborty, I; Feliu, N; Roy, S; Dawson, K; Parak, WJ. Protein-Mediated Shape Control of Silver Nanoparticles. *Bioconjugate Chem.* **2018**, *29*, 1261-1265

Velasco-Lozano, S; Knez, M; López-Gallego, F. Coupling Enzymes and Inorganic Piezoelectric Materials for Electricity Production from Renewable Fuels. *ACS Appl. Energy Mater.* **2018**, *1*, 2032-2040

Ruiz-Gatón, L; Espuelas, S; Larrañeta, E; Reviakine, I; Yate, LA; Irache, JM. Pegylated poly(anhydride) nanoparticles for oral delivery of docetaxel. *Eur. J. Pharm. Sci.* **2018**, *118*, 165-175

Azinas, S; Bano, F; Torca, I; Bamford, DH; Schwartz, GA; Esnaola, J; Oksanen, HM; Richter, RP; Abrescia, NG. Membrane-containing virus particles exhibit the mechanics of a composite material for genome protection. *Nanoscale* **2018**, *10*, 7769-7779

Ananth, A; Genua, M; Aissaoui, N; Díaz, L; Eisele, NB; Frey, S; Dekker, C; Richter, RP; Görlich, D. Reversible Immobilization of Proteins in Sensors and Solid-State Nanopores. *Small* **2018**, *14*, 1703357

Fenoy, GE; Giussi, JM; von Bilderling, C; Maza, EM; Pietrasanta, LI; Knoll, W; Marmisollé, WA; Azzaroni, O. Reversible modulation of the redox activity in conducting polymer nanofilms induced by hydrophobic collapse of a surface-grafted polyelectrolyte. *J. Colloid Interface Sci.* **2018**, *518*, 92-101

Terrén, I; Mikelez, I; Odriozola, I; Gredilla, A; González, J; Orrantia, A; Vitallé, J; Zenarruzabeitia, O; Borrego, F. Implication of Interleukin-12/15/18 and Ruxolitinib in the Phenotype, Proliferation, and Polyfunctionality of Human Cytokine-Preactivated Natural Killer Cells. *Front. Immunol.* **2018**, *9*, 737

Wang, M; Krasnok, A; Zhang, T; Scarabelli, L; Liu, H; Wu, Z; Liz-Marzán, LM; Terrones, M; Alù, A; Zheng, Y. Tunable Fano Resonance and Plasmon-Exciton Coupling in Single Au Nanotriangles on Monolayer WS<sub>2</sub> at Room Temperature. *Adv. Mater.* **2018**, *30*, 1705779

Gonzalez-Rubio, G; Liz-Marzán, LM. A peptide-guided twist of light. *Nature* **2018**, *556*, 313-314

Quintanilla, M; Zhang, Y; Liz-Marzán, LM. Subtissue Plasmonic Heating Monitored with CaF<sub>2</sub>:Nd<sup>3+</sup>,Y<sup>3+</sup> Nanothermometers in the Second Biological Window. *Chem. Mater.* **2018**, *30*, 2819-2828

Rejc, L; Gómez-Vallejo, V; Alcázar, J; Alonso, N; Andrés, JI; Arrieta, A; Cossío, FP; Llop, J. Negishi coupling reactions with [<sup>11</sup>C]CH<sub>3</sub>I: a versatile method for efficient <sup>11</sup>C-C bond formation. *Chem. Commun.* **2018**, *54*, 4398-4401

Vargas-Alfredo, N; Martínez-Campos, E; Santos-Coquillat, A; Dorronsoro, A; Cortajarena, AL; del Campo, A; Rodríguez-Hernández, J. Fabrication of biocompatible and efficient antimicrobial porous polymer surfaces by the Breath Figures approach. *J. Colloid Interface Sci.* **2018**, *513*, 820-830

Lorenzo, A; Marmisollé, WA; Maza, EM; Ceolín, M; Azzaroni, O. Electrochemical nanoarchitectonics through polyaminobenzylamine-dodecyl phosphate complexes: redox activity and mesoscopic organization in self-assembled nanofilms. *Phys. Chem. Chem. Phys.* **2018**, *20*, 7570-7578

Simón-Gracia, L; Scodeller, P; Fuentes, SS; Vallejo, VG; Ríos, X; San Sebastián, E; Sidorenko, V; Di Silvio, D; Suck, M; De Lorenzi, F; Rizzo, LY; von Stillfried, S; Kilk, K; Lammers, T; Moya, SE; Teesalu, T. Application of polymersomes engineered to target p32 protein for detection of small breast tumors in mice. *Oncotarget* **2018**, *9*, 18682-18697

Bocanegra Gondan, AI; Ruiz-de-Angulo, A; Zabaleta, A; Gómez Blanco, N; Cobaleda-Siles, BM; García-Granda, MJ; Padro, D; Llop, J; Arnaiz, B; Gato, M; Escors, D; Mareque-Rivas, JC. Effective cancer immunotherapy in mice by polyIC-imiquimod complexes and engineered magnetic nanoparticles. *Biomaterials* **2018**, *170*, 95-115

Lin, L; Wang, M; Peng, X; Lissek, EN; Mao, Z; Scarabelli, L; Adkins, E; Coskun, S; Unalan, HE; Korgel, BA; Liz-Marzán, LM; Florin, E; Zheng, Y. Opto-thermoelectric nanotweezers. *Nat. Photonics* **2018**, *12*, 195-201

Melchionna, M; Beltram, A; Stopin, A; Montini, T; Lodge, RW; Khlobystov, AN; Bonifazi, D; Prato, M; Fornasiero, P. Magnetic shepherding of nanocatalysts through hierarchically-assembled Fe-filled CNTs hybrids. *Appl. Catal. B* **2018**, *227*, 356-365

Wang, Q; Fu, F; Escobar, A; Moya, S; Ruiz, J; Astruc, D. "Click" Dendrimer-Stabilized Nanocatalysts for Efficient Hydrogen Release upon Ammonia-Borane Hydrolysis. *ChemCatChem* **2018**, *10*, 2673-2680

Méndez, MB; Rivero, CW; López-Gallego, F; Guisán, JM; Trelles, JA. Development of a high efficient biocatalyst by oriented covalent immobilization of a novel recombinant 2'-N-deoxyribosyltransferase from *Lactobacillus animalis*. *J. Biotechnol.* **2018**, *270*, 39-43

González-Domínguez, JM; León, V; Lucío, MI; Prato, M; Vázquez, E. Production of ready-to-use few-layer graphene in aqueous suspensions. *Nat. Protoc.* **2018**, *13*, 495-506

Rizzo, C; Arcudi, Dordevic, L; Dintcheva, NT; Noto, R; D'Anna, F; Prato, M. Nitrogen-Doped Carbon Nanodots-Ionogels: Preparation, Characterization, and Radical Scavenging Activity. *ACS Nano* **2018**, *12*, 1296-1305

da Silva, D; Herrera, R; Heinzmann, B; Calvo, J; Labidi, J. Nectandra grandiflora By-Products Obtained by Alternative Extraction Methods as a Source of Phytochemicals with Antioxidant and Antifungal Properties. *Molecules* **2018**, *23*, 372

Mosquera, J; Henriksen-Lacey, M; García, I; Martínez-Calvo, M; Rodríguez, J; Mascareñas, JL; Liz-Marzán, LM. Cellular Uptake of Gold Nanoparticles Triggered by Host-Guest Interactions. *J. Am. Chem. Soc.* **2018**, *140*, 4469-4472

Piccinini, E; Tuninetti, JS; Irigoyen Otamendi, J; Moya, SE; Ceolín, M; Battaglini, F; Azzaroni, O. Surfactants as mesogenic agents in layer-by-layer assembled polyelectrolyte/surfactant multilayers: nanoarchitected "soft" thin films displaying a tailored mesostructure. *Phys. Chem. Chem. Phys.* **2018**, *20*, 9298-9308

Sanchez-deAlcazar, D; Mejias, SH; Erazo, K; Sot, B; Cortajarena, AL. Self-assembly of repeat proteins: Concepts and design of new interfaces. *J. Struct. Biol.* **2018**, *201*, 118-129

Kumar, J; Eraña, H; López-Martínez, E; Claes, N; Martín, VF; Solís, DM; Bals, S; Cortajarena, AL; Castilla, J; Liz-Marzán, LM. Detection of amyloid fibrils in Parkinson's disease using plasmonic chirality. *Proc. Natl. Acad. Sci. U. S. A.* **2018**, *115*, 3225-3230

## Scientific Output

Colás, L; Domercq, M; Ramos-Cabrer, P; Palma, A; Gómez-Vallejo, V; Padro, D; Plaza-García, S; Pulagam, KR; Higuchi, M; Matute, C; Llop, J; Martín, A. **In vivo** imaging of A7 nicotinic receptors as a novel method to monitor neuroinflammation after cerebral ischemia. *GLIA* **2018**, *66*, 1611-1624

Quintanilla, M; Liz-Marzán, LM. Guiding Rules for Selecting a Nanothermometer. *Nano Today* **2018**, *19*, 126-145

Rodríguez-Pulido, A; Torra, J; Mejías, SH; Cortajarena, AL; Ruiz-González, R; Nonell, S; Flors, C. Fluorescent Flavoprotein Heterodimers: Combining Photostability with Singlet Oxygen Generation. *ChemPhotoChem* **2018**, *2*, 571-574

Iglesias, D; Senokos, E; Alemán, B; Cabana, L; Navío, C; Marcilla, R; Prato, M; Vilatela, JJ; Marchesan, S. Gas-Phase Functionalization of Macroscopic Carbon Nanotube Fiber Assemblies: Reaction Control, Electrochemical Properties, and Use for Flexible Supercapacitors. *ACS Appl. Mater. Interfaces* **2018**, *10*, 5760-5770

Williams, C; Royo, F; Aizpurua-Olaizola, O; Pazos, R; Boons, G; Reichardt, N; Falcon-Perez, JM. Glycosylation of extracellular vesicles: current knowledge, tools and clinical perspectives. *J. Extracell. Vesicles* **2018**, *7*, 1442985

Torres-Salas, P; Bernal, V; López-Gallego, F; Martínez-Crespo, J; Sánchez-Murcia, PA; Barrera, V; Morales-Jiménez, R; García-Sánchez, A; Mañas-Fernández, A; Seoane, JM; Sagrera Polo, M; Miranda, JD; Calvo, J; Huertas, S; Torres, JL; Alcalde-Bascones, A; González-Barrera, S; Gago, F; Morreale, A; González-Barroso, MdM. Engineering Erg10 Thiolase from *Saccharomyces cerevisiae* as a Synthetic Toolkit for the Production of Branched-Chain Alcohols. *Biochemistry* **2018**, *57*, 1338-1348

Benítez-Mateos, AI; Nidetzky, B; Bolivar, JM; López-Gallego, F. Single-Particle Studies to Advance the Characterization of Heterogeneous Biocatalysts. *ChemCatChem* **2018**, *10*, 654-665

Benítez-Mateos, AI; Llarena, I; Sánchez-Iglesias, A; López-Gallego, F. Expanding One-Pot Cell-Free Protein Synthesis and Immobilization for On-Demand Manufacturing of Biomaterials. *ACS Synth. Biol.* **2018**, *7*, 875-884

Carrillo-Carrion, C; Atabakhshi-Kashi, M; Carril, M; Khajeh, K; Parak, WJ. Taking Advantage of Hydrophobic Fluorine Interactions for Self-Assembled Quantum Dots as a Delivery Platform for Enzymes. *Angew. Chem. Int. Ed.* **2018**, *57*, 5033-5036

Fu, F; Wang, Q; Ciganda, R; Martínez-Villacorta, AM; Escobar, A; Moya, S; Fouquet, E; Ruiz, J; Astruc, D. Electron- and Hydride-Reservoir Organometallics as Precursors of Catalytically Efficient Transition Metal Nanoparticles in Water. *Chem. Eur. J.* **2018**, *24*, 6645-6653

Lizal, F; Jedelsky, J; Morgan, K; Bauer, K; Llop, J; Cossio, U; Kassinos, S; Verbanck, S; Ruiz-Cabello, J; Santos, A; Koch, E; Schnabel, C. Experimental methods for flow and aerosol measurements in human airways and their replicas. *Eur. J. Pharm. Sci.* **2018**, *113*, 95-131

Song, X; Tang, W; Gregurec, D; Yate, L; Moya, SE; Wang, G. Layered titanates with fibrous nanotopographic features as reservoir for bioactive ions to enhance osteogenesis. *Appl. Surf. Sci.* **2018**, *436*, 653-661

Segovia, GM; Tuninetti, JS; Moya, S; Picco, AS; Ceolín, MR; Azzaroni, O; Rafti, M. Cysteamine-modified ZIF-8 colloidal building blocks: Direct assembly of nanoparticulate MOF films on gold surfaces via thiol chemistry. *Mater. Today Chem.* **2018**, *8*, 29-35

Gu, H; Ciganda, R; Castel, P; Moya, S; Hernandez, R; Ruiz, J; Astruc, D. Tetrablock Metallopolymer Electrochromes. *Angew. Chem. Int. Ed.* **2018**, *57*, 2204-2208

Kantner, K; Rejman, J; Kraft, KVL; Soliman, MG; Zyuzin, MV; Escudero, A; del Pino, P; Parak, WJ. Laterally and Temporally Controlled Intracellular Staining by Light-Triggered Release of Encapsulated Fluorescent Markers. *Chem. Eur. J.* **2018**, *24*, 2098-2102

da Silva, ES; Gómez-Vallejo, V; López-Gallego, F; Llop, J. Biocatalysis in radiochemistry: Enzymatic incorporation of PET radionuclides into molecules of biomedical interest. *J. Labelled Compd. Radiopharm.* **2018**, *61*, 332-354

Díez-Buitrago, B; Briz, N; Liz-Marzán, LM; Pavlov, V. Biosensing strategies based on enzymatic reactions and nanoparticles. *Analyst* **2018**, *143*, 1727-1734

Laura Soriano, M; Carrillo-Carrion, C; Ruiz-Palomo, C; Valcárcel, M. Cyclodextrin-modified nanodiamond for the sensitive fluorometric determination of doxorubicin in urine based on its differential affinity towards beta/gamma-cyclodextrins. *Microchim. Acta* **2018**, *185*, 115

Cortelletti, P; Skripka, A; Facciotti, C; Pedroni, M; Caputo, G; Pinna, N; Quintanilla, M; Benayas, A; Vetrone, F; Speghini, A. Tuning the sensitivity of lanthanide-activated NIR nanothermometers in the biological windows. *Nanoscale* **2018**, *10*, 2568-2576

Dirian, K; Bauroth, S; Roth, A; Syrgiannis, Z; Rigodanza, F; Burian, M; Amenitsch, H; Sharapa, DI; Prato, M; Clark, T; Guldi, DM. A water-soluble, bay-functionalized perylene diimide derivative - correlating aggregation and excited state dynamics. *Nanoscale* **2018**, *10*, 2317-2326

Alonso-de Castro, S; Cortajarena, AL; López-Gallego, F; Salassa, L. Bioorthogonal Catalytic Activation of Platinum and Ruthenium Anticancer Complexes by FAD and Flavoproteins. *Angew. Chem. Int. Ed.* **2018**, *57*, 3143-3147

Cadranel, A; Strauss, V; Margraf, JT; Winterfeld, KA; Vogl, C; ?or?evi?, L; Arcudi, F; Hoelzel, H; Jux, N; Prato, M; Guldi, DM. Screening Supramolecular Interactions between Carbon Nanodots and Porphyrins. *J. Am. Chem. Soc.* **2018**, *140*, 904-907

Lutz, L; Corte, DAD; Chen, Y; Batuk, D; Johnson, LR; Abakumov, A; Yate, L; Azaceta, E; Bruce, PG; Tarascon, J; Grimaud, A. The Role of the Electrode Surface in Na-Air Batteries: Insights in Electrochemical Product Formation and Chemical Growth of NaO<sub>2</sub>. *Adv. Energy Mater.* **2018**, *8*, 1701581

Grajales, D; Mateos, JC; Padro, D; Ramos-Cabrera, P; López-Gallego, F. In-flow protein immobilization monitored by magnetic resonance imaging. *J. Biotechnol.* **2018**, *47*, 25-30

Feliu, N; Neher, E; Parak, WJ. Toward an optically controlled brain. *Science* **2018**, *359*, 632-634

Sánchez-Iglesias, A; Claes, N; Solís, DM; Taboada, JM; Bals, S; Liz-Marzán, LM; Grzelczak, M. Reversible Clustering of Gold Nanoparticles under Confinement. *Angew. Chem. Int. Ed.* **2018**, *57*, 3183-3186

López-Álvarez, M; López-Puente, V; Rodríguez-Valencia, C; Angelomé, PC; Liz-Marzán, LM; Serra, J; Pastoriza-Santos, I; González, P. Osteogenic effects of simvastatin-loaded mesoporous titania thin films. *Biomed. Mater.* **2018**, *13*, 025017

García-Cerro, S; Vidal, V; Lantigua, S; Berciano, MT; Lafarga, M; Ramos-Cabrera, P; Padro, D; Rueda, N; Martínez-Cué, C. Cerebellar alterations in a model of Down syndrome: The role of the Dyrk1A gene. *Neurobiol. Dis.* **2018**, *110*, 206-217

## Scientific Output

Vilela, D; Cossío, U; Parmar, J; Martínez-Villacorta, AM; Gómez-Vallejo, V; Llop, J; Sánchez, S. **Medical Imaging for the Tracking of Micromotors.** *ACS Nano* **2018, 12, 1220-1227**

Winckelmans, N; Altantzis, T; Grzelczak, M; Sánchez-Iglesias, A; Liz-Marzán, LM; Bals, S. **Multimode Electron Tomography as a Tool to Characterize the Internal Structure and Morphology of Gold Nanoparticles.** *J. Phys. Chem. C* **2018, 122, 13522-13528**

Zhang, H; Wang, D; Lin, X; Politakos, N; Tuninetti, JS; Moya, SE; Gao, C. **Fabrication of UV responsive micelles-containing multilayers and their influence on cell adhesion.** *Sci. China Chem.* **2018, 61, 54-63**

Amoah, AS; Asuming-Brempong, EK; Obeng, BB; Versteeg, SA; Larbi, IA; Aryeetey, Y; Platts-Mills, TA; Mari, A; Brzezicka, K; Gyan, BA; Mutocheluh, M; Boakye, DA; Reichardt, N; van Ree, R; Hokke, CH; van Diepen, A; Yazdanbakhsh, M. **Identification of dominant anti-glycan IgE responses in school children by glycan microarray.** *J. Allergy Clin. Immunol.* **2018, 141, 1130-1133**

Ramos-Cabrer, P; Padro, D. **MRI in the Study of Animal Models of Stroke.** *Methods Mol. Biol.* **2018, 1718, 377-392**

Bhat, R; García, I; Aznar, E; Arnaiz, B; Martínez-Bisbal, MC; Liz-Marzán, LM; Penadés, S; Martínez-Mañez, R. **Lectin-gated and glycan functionalized mesoporous silica nanocontainers for targeting cancer cells overexpressing Lewis X antigen.** *Nanoscale* **2018, 10, 239-249**

Lenarda, A; Bellini, M; Marchionni, A; Miller, H; Montini, T; Melchionna, M; Vizza, F; Prato, M; Fornasiero, P. **Nanostructured carbon supported Pd-ceria as anode catalysts for anion exchange membrane fuel cells fed with polyalcohols.** *Inorganica Chim. Acta* **2018, 470, 213-220**

Donath, E; Vardanyan, I; Meyer, S; Murray, RA; Moya, SE; Navoyan, Z; Arakelyan, V. **A typical diffusion monitored by flow cytometry: slow diffusion of small molecules in polyelectrolyte multilayers.** *Nanoscale* **2018, 10, 765-772**

Aizpurua-Olaizola, O; Sastre Toraño, J; Falcon-Perez, J; Williams, C; Reichardt, N; Boons, G. **Mass spectrometry for glycan biomarker discovery.** *TrAC Trends Anal. Chem.* **2018, 100, 7-14**

Iglesias, D; Giuliani, A; Melchionna, M; Marchesan, S; Criado, A; Nasi, L; Bevilacqua, M; Tavagnacco, C; Vizza, F; Prato, M; Fornasiero, P. **N-Doped Graphitized Carbon Nanohorns as a Forefront Electrocatalyst in Highly Selective O<sub>2</sub> Reduction to H<sub>2</sub>O<sub>2</sub>.** *Chem* **2018, 4, 106-123**

Sulleiro, MV; Quiroga, S; Peña, D; Pérez, D; Guitián, E; Criado, A; Prato, M. **Microwave-induced covalent functionalization of few-layer graphene with arynes under solvent-free conditions.** *Chem. Commun.* **2018, 54, 2086-2089**

Richter, RP; Baranova, NS; Day, AJ; Kwok, JC. **Glycosaminoglycans in extracellular matrix organisation: are concepts from soft matter physics key to understanding the formation of perineuronal nets?** *Curr. Opin. Struct. Biol.* **2018, 50, 65-74**

Erice, O; Labiano, I; Arbelaiz, A; Santos-Laso, A; Munoz-Garrido, P; Jimenez-Agüero, R; Olaizola, P; Caro-Maldonado, A; Martín-Martín, N; Carracedo, A; Lozano, E; Marin, J; O'Rourke, C; Andersen, J; Llop, J; Gómez-Vallejo, V; Padro, D; Martin, A; Marzioni, M; Adorini, L; Trauner, M; Bujanda, L; Perugorria, M; Banales, J. **Differential effects of FXR or TGR5 activation in cholangiocarcinoma progression.** *Biochim. Biophys. Acta Mol. Basis Dis.* **2018, 1864, 1335-1344**

Cagno, V; Andreozzi, P; D'Alicarnasso, M; Jacob Silva, P; Mueller, M; Galloux, M; Le Goffic, R; Jones, ST; Vallino, M; Hodek, J; Weber, J; Sen, S; Janeček, E; Bekdemir, A; Sanavio, B; Martinelli, C; Donalizio, M; Rameix Welti, M; Eleouet, J; Han, Y; Kaiser, L; Vukovic, L; Tapparel, C; Král, P; Krol, S; Lembo, D; Stellacci, F. **Broad-spectrum non-toxic antiviral nanoparticles with a virucidal inhibition mechanism.** *Nat. Mater.* **2018, 17, 195-203**

Strozyk, MS; Jimenez de Aberasturi, D; Liz-Marzán, LM. **Composite Polymer Colloids for SERS-Based Applications.** *Chem. Rec.* **2018, 18, 807-818**



García-Álvarez, R; Hadjidemetriou, M; Sánchez-Iglesias, A; Liz-Marzán, LM; Kostarelos, K. **In vivo** formation of protein corona on gold nanoparticles. The effect of their size and shape. *Nanoscale* **2018**, *10*, 1256-1264

Climont, N; García, I; Marradi, M; Chiodo, F; Miralles, L; Maleno, MJ; Gatell, JM; García, F; Penadés, S; Plana, M. Loading dendritic cells with gold nanoparticles (GNPs) bearing HIV-peptides and mannosides enhance HIV-specific T cell responses. *Nanomed. Nanotechnol. Biol. Med.* **2018**, *14*, 339-351

Barroso, J; Díez-Buitrago, B; Saa, L; Möller, M; Briz, N; Pavlov, V. Specific bioanalytical optical and photoelectrochemical assays for detection of methanol in alcoholic beverages. *Biosens. Bioelectron.* **2018**, *101*, 116-122

Murray, RA; Escobar, A; Bastús, NG; Andreozzi, P; Puentes, V; Moya, SE. Fluorescently labelled nanomaterials in nanosafety research: Practical advice to avoid artefacts and trace unbound dye. *Nanoimpact* **2018**, *9*, 102-113

Py-Daniel, KR; Calvo, J; Infante C., CM; Pires Junior, OR; Moya, SE; Azevedo, RB. UHPLC-MS and MALDI-MS study of aluminum phthalocyanine chloride and development of a bioanalytical method for its quantification in nanoemulsions and biological matrices. *Talanta* **2018**, *179*, 159-166

Salvati, A; Nelissen, I; Haase, A; Åberg, C; Moya, S; Jacobs, A; Alnasser, F; Bewersdorff, T; Deville, S; Luch, A; Dawson, KA. Quantitative measurement of nanoparticle uptake by flow cytometry illustrated by an interlaboratory comparison of the uptake of labelled polystyrene nanoparticles. *Nanoimpact* **2018**, *9*, 42-50

Hamon, C; Liz-Marzán, LM. Colloidal design of plasmonic sensors based on surface enhanced Raman scattering. *J. Colloid Interface Sci.* **2018**, *512*, 834-843

López-Andarias, J; Mejías, SH; Sakurai, T; Matsuda, W; Seki, S; Feixas, F; Osuna, S; Atienza, C; Martín, N; Cortajarena, AL. Toward Bioelectronic Nanomaterials: Photoconductivity in Protein-Porphyrin Hybrids Wrapped around SWCNT. *Adv. Funct. Mater.* **2018**, *28*, 170403

Velasco-Lozano, S; da Silva, ES; Llop, J; López-Gallego, F. Sustainable and Continuous Synthesis of Enantiopure  $\alpha$ -Amino Acids by Using a Versatile Immobilised Multienzyme System. *ChemBioChem* **2018**, *19*, 395-403

Politakos, N; Yate, L; Moya, S. Exploring the wetting properties of diblock copolymer brushes with a hydrophobic block of poly( $^1\text{H}, ^1\text{H}, ^2\text{H}, ^2\text{H}$ -Perfluorodecyl acrylate)-(PPFDA) and a Thermo-responsive block of poly(N-isopropylacrylamide)-(PNiPAM) synthesized by RAFT polymerization. *Nano-Structures & Nano-Objects* **2018**, *16*, 412-419

Smith, KW; Yang, J; Hernandez, T; Swearer, DF; Scarabelli, L; Zhang, H; Zhao, H; Moringo, NA; Chang, W; Liz-Marzán, LM; Ringe, E; Nordlander, P; Link, S. Environmental Symmetry Breaking Promotes Plasmon Mode Splitting in Gold Nanotriangles. *J. Phys. Chem. C* **2018**, *122*, 13259-13266

Aurand, ER; Usmani, S; Medelin, M; Scaini, D; Bosi, S; Rosselli, FB; Donato, S; Tromba, G; Prato, M; Ballerini, L. Nanostructures to Engineer 3D Neural-Interfaces: Directing Axonal Navigation toward Successful Bridging of Spinal Segments. *Adv. Funct. Mater.* **2018**, *28*, 1700550

Velasco-Lozano, S; López-Gallego, F. Wiring step-wise reactions with immobilized multi-enzyme systems. *Biocatal. Biotransform.* **2018**, *36*, 184-19

# Training

## 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 2018, 26 PhD theses were co-directed with the following institutions:

- **POLYMAT**
- **DIPC**
- **CIC bioGUNE**
- **CIC nanoGUNE**
- **IIS BioCruces**
- **IIS BIODONOSTIA**
- **TECNALIA**
- **GAIKER**
- **CIDETEC**
- **Achucarro Basque Center for Neuroscience**

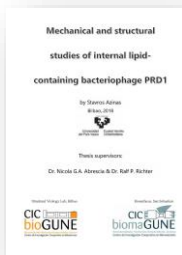
### Industrial PhD Scheme

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

# Training

## PhD THESES

During 2018, 5 students obtained their PhD at CIC biomaGUNE.

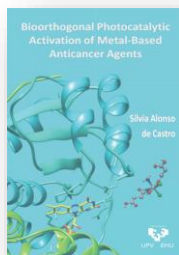


### Stavros Azinas

Mechanical and structural studies of internal lipid-containing bacteriophage PRD1

**Supervisor: Ralf Richter and Nicola G.A. Abrescia**

*Date: 12/06/2018*

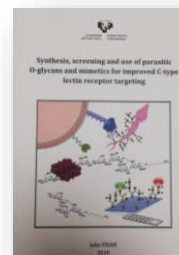


### Silvia Alonso de Castro

Bioorthogonal photocatalytic activation of metal-based anticancer prodrugs

**Supervisor: Luca Salassa**

*Date: 26/10/2018*



### Julie Pham

Synthesis, screening and use of parasitic O-glycans and mimetics for improved C-type lectin receptor targeting

**Supervisors: Niels C. Reichardt and Jesús Jiménez Barbero**

*Date: 21/11/2018*

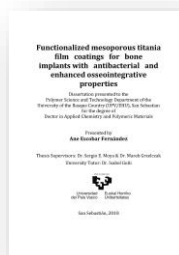


### Unai Cossío

Radiolabelling and preclinical evaluation of nanoparticles as drug delivery systems: Application to infectious pulmonary diseases

**Supervisors: Jordi Llop and Iraida Loinaz**

*Date: 11/12/2018*



### Ane Escobar

Functionalized mesoporous titania film coatings for bone implants with antibacterial and enhanced osseointegrative properties

**Supervisors: Sergio Moya and Marek Grzelczak**

*Date: 14/12/2018*

## 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 2018, our researchers performed **11** secondments at collaborating partners and we hosted **84** 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. CIC biomaGUNE regularly hosts students from the University of the Basque Country, Autonomous University of Barcelona, and University of Navarra.

	2015	2016	2017	2018	TOTAL
Research stays <b>from</b> CIC biomaGUNE	30	30	19	11	<b>90</b>
Research stays <b>to</b> CIC biomaGUNE	59	105	92	84	<b>340</b>
▪ Visiting Professors/Sabbaticals	1	4	1	2	8
▪ Erasmus placements	1	7	7	2	17
▪ Summer placements	2	5	6	6	19
▪ Vocational Training	4	7	5	3	19

# Training

## 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 2018, **45** seminars have been delivered.

### CIC biomaGUNE Seminars

**17/01/2018**

Harnessing the Mycobacterium tuberculosis cell surface's physiology to generate better anti-infective tools

**Rafael Prados-Rosales** - CIC bioGUNE

**25/01/2018**

Multimetallic Nanomaterials by Design

**Sara Skrabalak** - University in Bloomington

**30/01/2018**

From academia to industry and back

**Helmuth Möhwald** - MPI Golm

**01/02/2018**

Biomimetic Nanocomposites

**Nicholas Kotov** - University of Michigan

**09/02/2018**

Career development outside academia. Women in Science day

**Alba Centeno Perez & Africa G. Barrientos** - Graphenea & Midatech Pharma

**15/02/2018**

Development of implantable bone-forming devices: From regenerative medicine to human neoplasia modelling in xenografts

**Ander Abarrategi** - Francis Crick Institute, London

**22/02/2018**

High resolution cryoEM structure of flexible filamentous plant viruses

**Mikel Valle** - CIC bioGUNE

**08/03/2018**

Surface-Enhanced Raman Spectroscopy and Imaging with Molecularly Functionalized Noble Metal Nanoparticles: From Experimental Precision Plasmonics to iSERS Microscopy and Chemical Energy Conversion

**Sebastian Schlücker** - University Duisburg-Essen

**20/03/2018**

Optimizing the use of molecular imaging in early drug development

**Mats Bergstrom** - GSK

**22/03/2018**

Sugars, Natural Products and Algal Blooms

**Rob Field** - John Innes Center, Norwich

**13/04/2018**

Role of conformational dynamics in the design of novel function and nanohybrid materials

**Silvia Osuna** - University of Girona & ICREA

**19/04/2018**

Interfacing Nanomaterials with Biology: From CRISPR delivery to Antimicrobials

**Vincent M. Rotello** - University of Massachusetts Amherst

**03/05/2018**

Machine learning in atomistic simulations: from reaction pathways to phase diagrams

**Christoph Dellago** - University of Vienna

**17/05/2018**

Photoswitchable Organometallics

**Zoraida Freixa** - University of the Basque Country (UPV/EHU)

**18/05/2018**

Development of a Myeloid-Specific Targeted Nanotherapy for Immune Pathologies

**Jordi Cano Ochando** - Instituto de Salud Carlos III

**23/05/2018**

New synthetic pharmapolymers for applications in pharmacy and medicine and/or tailor-made polymeric nanoparticles

**Ulrich S. Schubert** - Friedrich-Schiller-Universität Jena

**30/05/2018**

Plasmonics: enhancing Biomedical Diagnostics and Therapeutics

**Naomi Halas** - Rice University

**31/05/2018**

Modular Objects for Nano-Immuno-Oncology

**Patrizio Giacomini** - Regina Elena National Cancer Institute. Rome.

**01/06/2018**

Differences in post-T cell receptor metabolic response of naive versus memory human CD4+ T cells

**Catherine Thornton** - Swansea University

**07/06/2018**

Polymer-based nanoparticle libraries for targeted anti-inflammatory strategies

**Stephanie Schubert** - Friedrich-Schiller-University Jena - Jena Center for Soft Matter (JCSM)

**21/06/2018**

Optoacoustic imaging: clinical and preclinical application in oncology

**Isabel Quirós** - University of Oviedo

**02/07/2018**

Putting Nanomaterials to Work for Biomedical and Energy Research

**Younan Xia** - Georgia Institute of Technology

**03/07/2018**

Investigating the Heterogeneous Nucleation in Nanocrystal Growth with an Isocyanide Probe by Surface-Enhanced Raman Scattering

**Dong Qin** - Georgia Institute of Technology

**09/07/2018**

Multivalent binding in cellular processes: targeting, recognition and activation

**Jure Dobnikar** - University of Cambridge

**24/07/2018**

Understanding in vivo degradation of mesoporous silica therapeutic vectors through in situ ellipsometry

**Elisa Bindini** - Laboratoire de Chimie de la Matière Condensée de Paris (LCMCP), Sorbonne Université.

# Training

**27/07/2018**

Polymer-Assisted Metal Deposition: An Interfacial Chemical Approach for Soft Electrodes and Devices

**Zijian Zheng** - Hong Kong Polytechnic University

**23/08/2018**

Integrating supramolecular chemistry with engineering principles for the design of new functional biomaterials

**Alvaro Mata** - School of Engineering and Materials Science of the Queen Mary University of London

**14/09/2018**

Exploring the Energy Landscape for Protein Folding and Function: The Convergences of Structural Models and Sequence Coevolution Information

**José N. Onuchic** - Rice University

**27/09/2018**

The circle of life of magnetic nanoparticles: Synthesis, aggregation, biomedical applications and biotransformations

**Lucía Gutierrez** - University of Zaragoza

**04/10/2018**

Fast-setting protein- and polysaccharide-based bioinks for tissue engineering, 3D in vitro tissue/tumour models, and biofabrication of patient-specific implants

**Miguel de Oliveira** - University of Minho, Braga, Portugal

**25/10/2018**

Multimodal imaging for the optimisation of cell therapy

**Mangala Srinivas** - Radboud University Medical Center (RadboudUMC)

**31/10/2018**

Dark and bright interlayer plasmons in colloidal nanoparticle multilayers

**Stephanie Reich** - Freie Universität Berlin

**08/11/2018**

Addressing Oncology Questions with Gold Nanostars and SERS

**Laura Fabris** - Rutgers University

**27/11/2018**

Biomaterials with optoregulated functions

**Aránzazu del Campo** - INM-Leibniz Institute for New Materials

**12/12/2018**

Altered glycosylation in Cancer - targeting tumor heterogeneity and therapeutic implications.

**Celso Reis** - Ipatimup Institute of Molecular Pathology and Immunology of the University of Porto

**19/12/2018**

Novel Photonic Architectures by Nanoimprinting Unconventional Materials

**Agustín Mihi** - ICMAB-CSIC



## CIC biomaGUNE PhD Seminars

**16/07/2018**

Mechanical and structural studies of internal lipid-containing bacteriophage PRD1

**Stavros Azinas** - CIC biomaGUNE

**05/11/2018**

Bioorthogonal photocatalytic activation of metal-based anticancer prodrugs

**Silvia Alonso de Castro** - CIC biomaGUNE

**20/11/2018**

Synthesis, screening and use of parasitic O-glycans and mimetics for improved C-type lectin receptor targeting

**Julie Pham** - CIC biomaGUNE

**30/11/2018**

Radiolabelling and preclinical evaluation of nanoparticles as drug delivery systems: Application to infectious pulmonary diseases

**Unai Cossio** - CIC biomaGUNE

**18/12/2018**

Functionalized mesoporous titania film coatings for bone implants with antibacterial and enhanced osseointegrative properties.

**Ane Escobar** - CIC biomaGUNE

## CIC biomaGUNE PhD Trainig

**20/03/2018**

The start-up route to exploit your research results

**Marcos Simón** - CIC biomaGUNE

**20/03/2018**

Life after the PhD: How to apply for grants

**Anna Llanes-Pallàs** - CIC biomaGUNE

**29/05/2018**

Cellular decision making

**Tahereh KashkouiNejad Kouhi** - CIC biomaGUNE

**19/06/2018**

Radiochemistry: the key step in Nuclear Imaging

**Vanessa Gómez-Vallejo** - CIC biomaGUNE

# Training

## 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 2018:

11-13 July 2018

### Immunoshape International Symposium on Glycoimmunology



The *International Symposium on Glycoimmunology* is an international scientific meeting aimed at providing a forum for scientists from chemistry, immunology and glycobiology to discuss recent advances in the understanding and the opportunities for shaping glycan mediated immune responses.

**Keynote lectures** from world leaders addressing major topics in glycoimmunology provided the framework for a large number of **short lectures** and **flash presentations** together with a **poster session** showcasing recent achievements from major European research groups active in the field.

This symposium gave especially younger pre-doctoral and early postdoctoral investigators the opportunity to discuss their research with a large audience of specialists.

The following topics were covered in the program: Glycoconjugate vaccines, Glycan based immunotherapy, Host pathogen interactions, Synthesis of glycan antigens and Glycomimetics.

CIC biomaGUNE Organizers: **Niels Reichardt** and **Cristina Díez**.

8-10 October 2018

### International Workshop on Self-Assembly and Hierarchical Materials in Biomedicine: Drug Delivery, Tissue Engineering, Sensing and Safety Issues



The "*Self assembly and Hierarchical Materials in biomedicine: Drug Delivery, Tissue Engineering, Sensing and Safety Issues*" conference aimed at bringing a comprehensive view in the field of hybrid materials in biomedicine. The conference addressed the design of hierarchical and self assembled materials and their application in drug delivery, sensing and tissue engineering covering from the material science aspects to clinical perspectives.

The program covered: Molecular Self-Assembly, Hybrid Materials, Drug delivery, Sensors, Tissue Engineering, Safety issues.

Keynote and invited lectures were complemented with poster sessions and contributed presentations covering all aspects of the conference. The event attracted >70 researchers from 16 different countries.

CIC biomaGUNE Organizers: **Sergio Moya (chair)**, **Patrizia Andreozzi** and **Julia Cope**

Additionally, our researchers chaired or co-organized a number of international symposia as listed below:

**Wolfgang Parak**, co-organizer of "*Colloidal Nanoparticles for Biomedical Applications*" of the **SPIE Photonics West meeting**, San Francisco, California, USA, 27 January-2 February 2018

**Abraham Martín** and **Mónica Carril**, organizers of the **2<sup>nd</sup> young Spanish ESMI Group Meeting (ySMIN2018)**, Madrid, 26 February 2018.

**Jesús Ruiz-Cabello**, organizer and chair, **2<sup>nd</sup> Meeting of Research in Pulmonary Hypertension**, Madrid, 2 February 2018.

**Luis Liz-Marzán** and **Wolfgang Parak**, co-chairs of the "*Solubility of colloids in different solvents*" symposium at the **255<sup>th</sup> ACS National Meeting**, New Orleans, USA, 18-22 March 2018

**Jordi Llop**, **Pedro Ramos**, **Abraham Martín** and **Jesús Ruiz-Cabello** local organizers of the **European Molecular Imaging Meeting (EMIM)**, San Sebastian, Spain, March 20-23, 2018

**Jesús Ruiz-Cabello**, co-organizer of the **1<sup>st</sup> Spanish Conference on Biomedical applications of nanomaterial (SBAN)**, Madrid, 7-8 June 2018

**Jesús Ruiz-Cabello**, organizer and chair, **Annual Groups meeting of Ciberes**, Madrid, 27-29 June 2018

**Luis Liz-Marzán** and **Wolfgang Parak**, co-chairs of the "*Heating with Colloidal Nanoparticles: Physical Mechanisms and Applications in Life Science*" symposium at the **256<sup>th</sup> ACS National Meeting**, Boston, USA, 19-23 August 2018

**Luis Liz Marzán**, co-chair of the **Beilstein Meeting on Nanomedicine 2018**, Berlin, 16-18 Sept 2018

**Luis Liz-Marzán**, co-organizer of **Conferencia Española de Nanofotónica, CEN2018**, San Sebastian, 3-5 Oct 2018

**Maurizio Prato**, co-organizer, Conference "**Solar driven chemistry: towards new catalytic solutions for a sustainable world**". Roma, Italy, 18-19 Oct 2018

Outreach

One of the strategic objectives of CIC biomaGUNE is the communication and dissemination of knowledge within and beyond the academic community. During **2018** the following outreach events have been organized:

## INTERNATIONAL DAY OF WOMEN AND GIRLS IN SCIENCE

On February 8<sup>th</sup> and 9<sup>th</sup> 2018 **CIC biomaGUNE** in collaboration with the **Materials Physics Center (CFM, CSIC-UPV/EHU)**, **CIC nanoGUNE** and **Donostia International Physics Center (DIPC)** commemorated this day celebrating a series of events that aimed 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 and adolescents. The activities organized included: Activities for **5<sup>th</sup> elementary grade** students, a seminar by two women scientists on **Career development outside academia** who gave their view on switching career from academia to industry, prospects, and outcomes, and finally the participation by **Aitziber L. Cortajarena** on the **Donostia City of Women researchers Colloquium**.



## MIKROFOOD – MICROSCOPIC PHOTOGRAPHY EXHIBITION

What does milk or tomato look like on a small scale? Our researchers have tried to capture the complexity of each day's meals through photographs taken under a microscope. The project "Mikro Food": food under the microscope, is born from an idea of **Patrizia Andreozzi** (Soft Matter Nanotechnology Laboratory).

To date, 3 editions of the Photography Exhibition have taken place:

- December 2017 until the January 2018 in Vitoria-Gasteiz,
- February – March 2018 Malandrino Bar
- May-July 2018, Garraxi Restaurant



## PINT OF SCIENCE

This initiative brings Science to local bars, thereby breaking down the barriers that separate science from society.

For the 4<sup>th</sup> consecutive year CIC biomaGUNE researchers took active part in the organization of the Pint of Science event in San Sebastián. The organizing team was led by CIC biomaGUNE's postdoctoral researchers **Susana Carregal** and **Dorleta Jimenez de Aberasturi**.



# Outreach

## 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 mentors accompany students during a period of two months with the aim to:

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

The school whose students receive mentoring from CIC biomaGUNE scientists is: **Deutsche Schule San Alberto Magno**, where 5<sup>th</sup> elementary grade students receive mentoring from the hand of **Irantzu Llarena**.



## SCIENCE, I WANT TO BE A SCIENTIST

**Jordi Llop**, leader of the Radiochemistry and Nuclear Imaging Lab contributed in the book [CIENCIA, y yo quiero ser científico](#) with the chapter - [Y yo quiero ser...Alquimista \(Radioquímico\)](#)

In this chapter, he takes us into the world of the philosopher's stone of the 21<sup>st</sup> century: explaining what a cyclotron is and how it transmutes matter, what radiochemistry consists of and how it can help to understand how we function, when and why we get sick and even how to find a possible cure.



## CIC NETWORK

CIC biomaGUNE is involved in the production of the CIC NETWORK magazine, the science magazine of the Cooperative Research Centers. To date 18 issues have been published, the most recent one in July 2018.



## "Donostia WeekINN" INNOVATION WEEK

In the frame of the Donostia Week INN 2018 and in collaboration with Fomento, CIC biomaGUNE co-organized an activity to bring science closer to society and share scientific knowledge in a funny, entertaining and rigorous way.

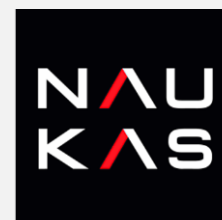
On Thursday, October 25, at 6:30 p.m., in Dabadaba, **Jordi Llop** head of the Radiochemistry & Imaging Laboratory from CIC biomaGUNE, together with researchers from Biodonostia and Polymat discussed about clinical image and early detection of Alzheimer's, the improvement of the recycling of the plastic waste that we generate and will challenge us to ask what we want about health research.

CIC biomaGUNE participated also with guided school visits at the Center complemented with discussions with researchers about research techniques, future technologies, applications and visits to laboratories.



## NAUKAS

**Susana Carregal** and **Dorleta Jiménez de Aberasturi**, CIC biomaGUNE postdoctoral researchers, participate this Saturday 15<sup>th</sup> of September at the NAUKAS Outreach event that will take place in Bilbao. If you wish to enjoy their science with plenty of humor do not miss their talk about Local heating and good vibrations (calentamiento local y buenas vibraciones).



## Bizitza salbatu nahian

Bizitza salbatu nahian is a project promoted by the center Tolosako Inmakulada Lanbide Ikastola with the participation of CIC biomaGUNE and Onkologikoa whose objective is to relieve the stress of oncological patients.

This project aims to inform about the PET test (Positron Emission Tomography, is a non-invasive diagnostic and in vivo research technique, capable of measuring the metabolic activity of the human body that is used in cancer patients). For this purpose, the students of Radiodiagnosis and Nuclear Medicine have recorded a video, where the process of the test is explained in a clear and detailed manner.



Vanessa Gómez-Vallejo Radiochemistry platform manager at CIC biomaGUNE and supervisor of the project from Eneko Galarraga, during the presentation of the initiative at Onkologikoa.

# Outreach

## OPEN DAYS & VISITS

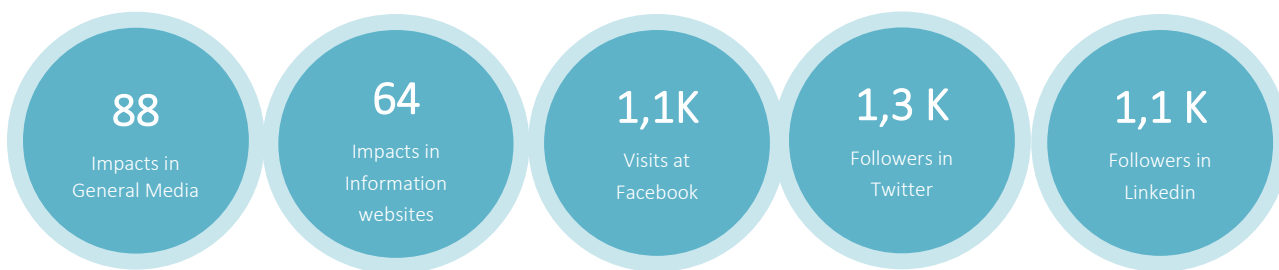
CIC biomaGUNE regularly receives visits from high-school and university students who come to have a closer look at our activity. These visits typically include a lecture about biomaterials in the context of life sciences, an open discussion with CIC biomaGUNE researchers, and a guided tour to six technical 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	TOTAL
Undegraduate and Highschool visits	7	7	12	9	35
Guided Visits at the Molecular Imaging Facility	23	38	40	45	146

## 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








# Facilities

# Facilities










## 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.

				
Electron Microscopy	Mass Spectrometry	Surface Analysis & Fabrication	Colloidal Nanofabrication	Optical Spectroscopy
				

### CIC biomaGUNE Technological Platforms & Molecular Imaging Facility

				
Nuclear Magnetic Resonance	Radiochemistry	Magnetic Resonance Imaging	Nuclear Imaging	Animal House
				

## 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 system has been acquired within 2018 and will be installed at the beginning of 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 [<sup>18</sup>F] F, [<sup>18</sup>F] F<sub>2</sub>, [<sup>13</sup>N]-NH<sub>4</sub><sup>+</sup>, [<sup>15</sup>O]-O<sub>2</sub> [<sup>11</sup>C]-CO<sub>2</sub> and [<sup>11</sup>C]-CH<sub>4</sub>. It also has a solid target for the production of <sup>89</sup>Zr and <sup>64</sup>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 [<sup>11</sup>C] CH<sub>3</sub>I / [<sup>11</sup>C] CH<sub>3</sub>OTf from [<sup>11</sup>C] CO<sub>2</sub> / [<sup>11</sup>C] CH<sub>4</sub>, and subsequent methylation reaction
- <sup>18</sup>F-fluorination by nucleophilic and electrophilic substitution
- Radiotracer synthesis using microfluidics technology
- Chelation reactions using radiometals (<sup>68</sup>Ga, <sup>67</sup>Ga, <sup>64</sup>Cu, <sup>89</sup>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.

# Facilities

**Pre-Clinical Image Analytics:** The Image Analytics service takes care of processing all the outcoming 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.

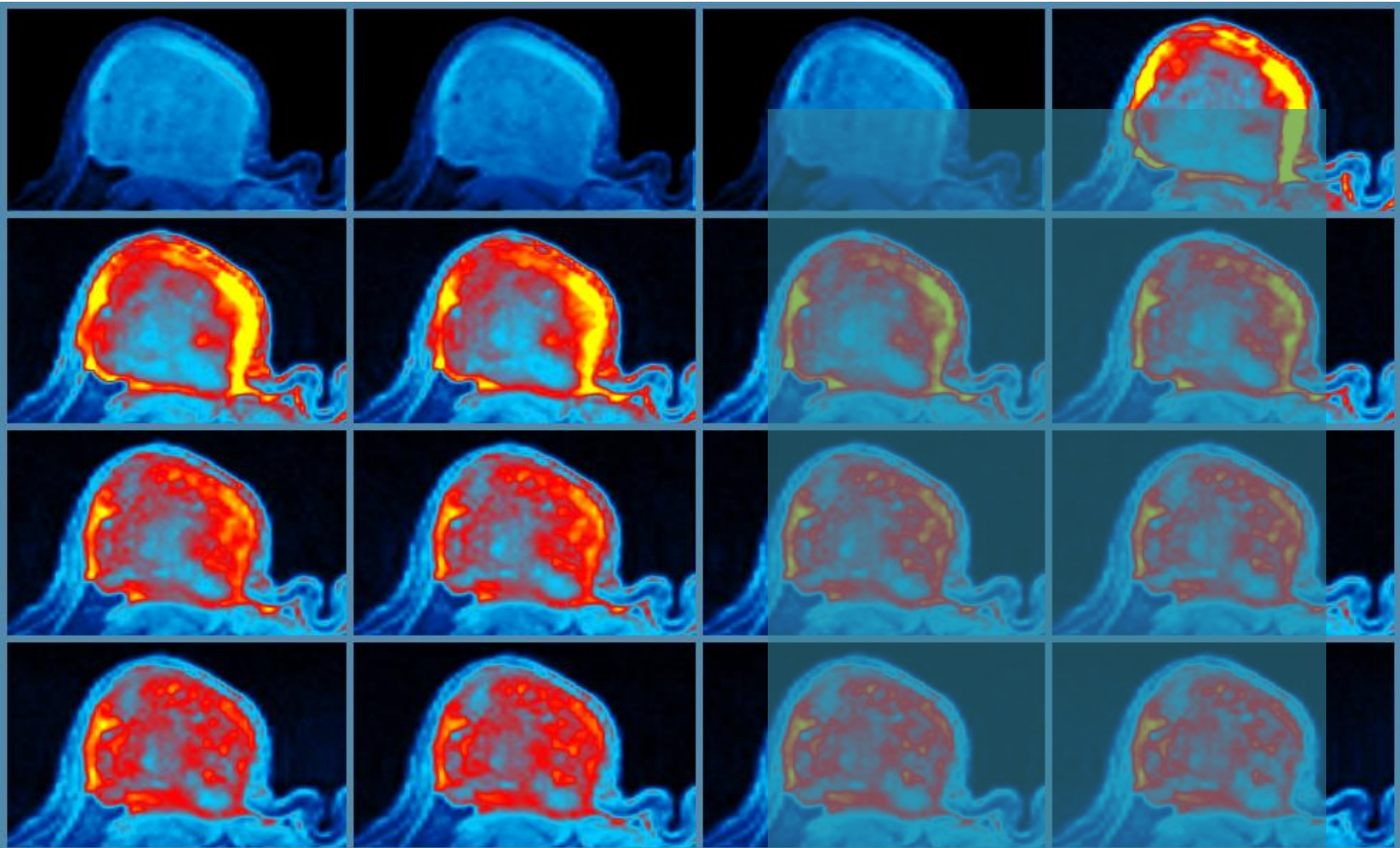
**Surface analysis and Fabrication – XPS, 3 x AFM, sputtering:** Focuses on the analysis of materials at the surface level, including spectroscopic and

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.





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**CICbiomaGUNE**  
CENTER FOR COOPERATIVE RESEARCH IN BIOMATERIALS



EXCELENCIA  
MARÍA  
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2018 - 2022