

## 6 Fully Funded PhD vacancies in Biomaterials Research available at CIC biomaGUNE

Applications are invited for 6 PhD positions in Biomaterials Research funded through the Formación de Programa Investigador (FPI) scheme from the Spanish State Research Agency (AEI) within the María de Maeztu Unit of Excellence research program at CIC biomaGUNE.

CIC biomaGUNE ([www.cicbiomagune.es](http://www.cicbiomagune.es)) is a research center in biomaterials located in Donostia-San Sebastián (Spain), a reference center in understanding how biological systems interact with nanomaterials at the molecular level.

CIC biomaGUNE 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 (cyclotron, radiochemistry lab, 7 and 11Tesla MRI, PET, SPECT, CT and animal facility), one of the biggest preclinical imaging research infrastructures in Europe

We welcome applications from motivated young scientists who wish to get their PhD degree in an international scientific environment in one of our 11 laboratories, carrying out cutting-edge research in the frontiers between chemistry, biology, and biomedicine within a highly collaborative environment. More than 70 doctoral candidates are currently developing their PhD Thesis with us.

Candidates should hold a **degree** in a relevant area of Biomedical Engineering, Chemistry, Biotechnology, Biochemistry, Materials Science or related disciplines and should have completed a **MSc degree** at a time of incorporation (latest possible date September 2024). Therefore, students in their last year of BsC or currently conducting their Master studies are also invited to apply.

### We offer:

- cutting-edge research projects and excellent facilities
- fully-funded PhD positions (4 years)
- tailored support from a thesis advisory committee
- core and optional development opportunities to improve your scientific and transferable skills
- multicultural environment with English as the working language

### How to Apply:

Application deadline: **20 January 2023**.

Only online applications via our online application tool will be accepted. See details under each research project.

## Research projects:

### 1. Effect of multiscale chirality on cellular differentiation

Joint PhD position at Bionanoplasmonics Laboratory led by Prof. Luis Liz-Marzán and the Carbon Nanotechnology Laboratory led by Prof. Maurizio Prato.

Most biologically relevant molecules have chiral structures, which are crucial to their biological activity (one enantiomer may be toxic, the opposite one therapeutic). Although much research has been carried out on the interactions of chiral molecules with living systems, little is known about the effects of inorganic chiral materials. In particular, chirality at the nanoscale is relevant because it matches the dimensions of biomolecules such as proteins, ranging to larger structures such as the cytoskeleton. This thesis will be focused on studying the interactions of cells with chiral nanomaterials at different scales. Both carbon quantum dots and metal nanoparticles can be made with chiral morphologies, while having different dimensions and chemical composition. The study will comprise both types of materials, either separately or within composite structures, as a means to direct the differentiation of various cell lines.

Apply here: <https://www.cicbiomagune.es/job-offer/job-offer-detail?tkn=AKO8I3sdMg>

### 2. Biocatalytic films to spatially organize cell-free biosynthetic pathways.

Joint PhD position at the Biomolecular Nanotechnology Laboratory led by Dr. Aitziber L. Cortajarena and the Heterogeneous Catalysis Laboratory led by Dr. Fernando López Gallego.

The spatial organization underpins the flux control metabolic networks for biosynthetic purposes. Complex enzymatic systems have been spatially organized into cellular nanostructures (lipid bilayers, nano compartments, biofilms...) to more efficiently and selectively perform biosynthetic pathways. However, when enzymes are intended to be organized out of the cell chassis the control of their spatial organization is challenging and new engineering tools are demanded to precisely co-localize in the nanoscale. The PhD project herein offered is inspired by Nature to assemble artificial metalloenzymes and wild enzymes into solid materials to perform new-to-nature biosynthetic pathways *in vitro*. Protein engineering, enzymology, and material sciences will merge in this PhD project to create biocatalytic films able to operate both under conditions and discontinuous modes. To that aim, the PhD student will be trained in cutting-edge characterization techniques such as *operando* fluorescence microscopy and spectroscopy, advanced molecular biology and bioengineering tools and kinetic modeling.

Apply here: <https://www.cicbiomagune.es/job-offer/job-offer-detail?tkn=xGul756nNI>

### 3. Joint PhD position on Alterations of CNS myelin in mice models of Alzheimer's disease using *in vivo* imaging

The PhD project will be carried out between the Radiochemistry and Nuclear Imaging Laboratory led by Dr. Jordi Llop and the Magnetic Resonance Imaging Laboratory led by Dr. Pedro Ramos.

Myelin insulates axons to speed up nerve impulse propagation. In addition, oligodendrocytes, the makers of myelin in the Central Nervous System (CNS), and myelin itself supplies axons with energy substrates to sustain the metabolic demand required for proper neuronal communication. Postmortem studies in AD brains show that myelin is altered, however, it is unknown whether these end-point observations are secondary or primary in the disease process. The aim of the project is to investigate the extent and course of myelin changes in two animal models of AD: the 5xTg-AD and 3xTg-AD mice models which recapitulate the main genetic and histological features of familial AD, namely mutations in the amyloid precursor protein (APP), presenilins and Tau protein. To that end, we will use positron emission tomography (PET), computerized tomography (CT) and magnetic resonance imaging (MRI).

**Apply here:** <https://www.cicbiomagune.es/job-offer/job-offer-detail?tkn=zKy3VXhPTL>

#### **4. Joint PhD position at Molecular and Functional Biomarkers and Hybrid Biofunctional Materials laboratories at CIC biomaGUNE**

The PhD project herein offered is focused on the design of cardiovascular models that include flow conditions whose effects will be analyzed using 4D-flow (4Df) MRI.

3D-printed cell models are currently in the spotlight of medical research being essential tools to obtain relevant information in a preclinical context. 3D models not only recapitulate more realistically cell to cell interactions and intercommunication but also allow the study of dynamic dynamics. Even if significant advances have been made in the production of such 3D models, there is still the need to generate realistic cardiovascular models that include the physical forces and stress factors that cells experience in healthy and pathophysiological conditions. In this sense, it is essential to find approaches to introduce different flows conditions that recreate the realistic blood flow in the different scenarios. Moreover, the characterization of such flow conditions and their derivatized effect is challenging, thus, new engineering tools and imaging techniques are required. 4D-flow (4Df) Magnetic Resonance Imaging (MRI) has emerged as a promising imaging tool to precisely evaluate different “blood” flow parameters.

**Apply here:** <https://www.cicbiomagune.es/job-offer/job-offer-detail?tkn=VoGUTc84sy>

#### **5. Development of sialoglycomimetics by combinatorial synthesis and their evaluation as potential Siglec inhibitors.**

A joint PhD project between the Glycotechnology lab (Niels Reichardt) at CIC biomaGUNE and the Chemical Glycobiology lab CIC bioGUNE (Jesús Jiménez-Barbero) aimed at developing selective inhibitors for sialic acid binding lectins (siglecs) with potential applications in immune therapy is offered. Using a combinatorial synthesis approach a library of sialomimetics will be constructed and screened for selective siglec binders using microarrays, competition assays and STD NMR. Selected compounds will be further evaluated in biological functional assays for their potential as leads in (cancer) immune therapy.

**Apply here:** <https://www.cicbiomagune.es/job-offer/job-offer-detail?tkn=aMw5xtKPrV>

#### **6. Design of strategies for encapsulation of Oncolytic viruses in polymeric matrixes for enhanced therapeutic action.**

The PhD project will be developed in collaboration between the Soft Matter Nanotechnology Lab (Sergio Moya) from CIC biomaGUNE, and the Innovative Polymers Group (David Mecerreyes) from POLYMAT. The PhD student will explore different routes for the encapsulation of Oncolytic viruses in polymer matrixes, synthesizing biodegradable polymer coatings based on nanogels, and engineered polyelectrolytes. Additionally, the PhD student will develop assemblies of virus on colloidal particles applying the Layer by Layer technique in combination with lipid layers.

**Apply here:** <https://www.cicbiomagune.es/job-offer/job-offer-detail?tkn=Uu2vWNpZIM>