

The ERC Advanced Grant 2017 awards put Jesús Jiménez Barbero and Luis Liz Marzán, Scientific Directors of CIC bioGUNE and CIC biomaGUNE respectively, among the elite of European research

The European Research Council will provide a total of EUR 4.9 million in funding over the next 5 years for the work being done by the research groups of these two Ikerbasque research professors

ERC Advanced Grants are the most prestigious in Europe, with those awarded a grant being considered as “exceptional leaders in terms of originality and the significance of their research contributions”

The project of Jesús Jiménez Barbero aims to discover the molecular bases of the interactions of sugars on an atomic scale

The project of Luis Liz-Marzán will design materials and methods which enable tumour growth to be studied in controlled environments

(Donostia-San Sebastián, 10 April 2018). The European Research Council (ERC) has awarded two of its prestigious ERC Advanced Grants to Jesús Jiménez Barbero and Luis Liz Marzán, both Ikerbasque research professors and Scientific Directors at CIC bioGUNE and CIC biomaGUNE respectively. In the case of Jesús Jiménez Barbero, the researcher has been awarded a EUR 2.5 million grant over the next 5 years to develop the project entitled “Breaking down the boundaries of molecular recognition of carbohydrates using Nuclear Magnetic Resonance”. The EUR 2.4 million grant awarded to Luis Liz-Marzán will fund the project entitled “Four-dimensional monitoring of tumour growth using surface-enhanced Raman spectroscopy”.

ERC Advanced Grants are the most prestigious in Europe. According to the ERC itself, applicants must be “exceptional leaders in terms of originality and the significance of their research contributions”, which effectively means that only leading experts in their particular fields submit proposals to these calls. Only one of every 10 applications is eventually selected.

The project led by Jesús Jiménez Barbero, Scientific Director at CIC bioGUNE, is focused on developing new application protocols for the well-known technique of Nuclear Magnetic Resonance (NMR), with a view to deciphering, on an atomic scale, key aspects of the molecular recognition of carbohydrates. These substances, also known as glycans, sugars or saccharides, play a key role in practically all biological events related

to health and disease. As Dr. Jiménez Barbero himself explains: “The project requires a multidisciplinary approach. By combining new NMR developments with experimental methods of chemical synthesis and with computational techniques, the project aims to gain a better understanding of the mechanisms behind the exquisite selectivity involved in the interaction between each glycan type and its biomolecular receptors”.

Until now, studies on molecular recognition of sugars using NMR have been exclusively conducted using in vitro protocols. The RECGLYCANMR project will open up new horizons for the use of NMR, enabling these phenomena to be studied within cells and thereby getting closer to the core of the living systems. The Scientific Director of CIC bioGUNE further explains: “The project is aimed at discovering the molecular bases of the interactions of sugars at the atomic level. In turn, this will provide us with innovative information on their chemical biology and will open up new pathways to address the prevention and cure of various diseases associated with sugar recognition, such as inflammation and viral infections”.

The aim of the project of Luis Liz-Marzán, Scientific Director at CIC biomaGUNE, will be to design materials and methods which enable tumour growth to be studied in real time in controlled environments, using custom-designed scaffolds for the tumours. The proposal includes using optical methods which do away with the difficulties inherent to existing methods, particularly in relation to their capacity to observe deeper tissue layers. Luis Liz-Marzán explains: “The proposed technique, known as surface-enhanced Raman spectroscopy (SERS), enables a wide variety of substances to be analysed at very low spatial resolution, even at extremely low concentrations. The effectiveness of SERS can be explained by the use of gold nanoparticles which modify how light is reflected on the molecules, thereby making it easier to identify them”.

Prof. Liz-Marzán’s laboratory in CIC biomaGUNE has extensive experience in designing these nanoparticles and in their application to SERS, including a study on communication between bacteria in a previous ERC Advanced Grant project entitled “Development of plasmonic quorum sensors for understanding bacterial-eukaryotic cell relations”.

The new project proposes the application of this technique to the study of tumour growth, by identifying certain distinctive elements of such tumours such as the expression of characteristic markers, changes in acidity and temperature variations. This will be made possible thanks to a new design of the materials making up the scaffold on which the tumours are going to grow, which will be equipped with SERS sensors to enable a spatial and temporal resolution impossible to achieve with existing methods. Though various diseases can be studied using this technique, the proposal is to focus particularly on breast cancer and melanomas, as their characteristics are more closely aligned to these optical techniques on account of their more superficial nature.

As Prof. Liz-Marzán also points out: “An additional advantage of the proposed method is that it will enable a landmark study to be conducted on tumour growth without recourse to animal testing. We hope the knowledge generated through this project will help to

identify new and more effective drugs for cancer treatment and to avoid the side-effects of current chemotherapy”.

Personal observations

The significant funding awarded by the ERC enables high-risk projects to be taken forward. Without such funding, it would not be possible to conduct these projects of great potential benefit for society at large. The funds awarded will finance the acquisition of new equipment and enable new researchers to be hired and to contribute their talent and enthusiasm to the proposed objectives.

“The fact that these two projects have been selected for funding is an important distinction for our personal work and that of all those who have collaborated with us in recent years”, Jesús Jiménez Barbero and Luis Liz-Marzán explain. They add: “As Scientific Directors at CIC bioGUNE and CIC biomaGUNE, the simultaneous success of our applications in this highly competitive call also provides international recognition for the efforts being made by the Basque Government since the start of the century to continuously improve the level of research activity in the Basque Country, especially in the field of life sciences. What’s more, both of us are Ikerbasque research professors, a fact which provides prestige to the work being done by this Foundation focused on attracting research talent to the Basque Country”.

In short, the successful grant applications of these two projects significantly raises the geographical, social and scientific profile of the two bioscience Cooperative Research Centres (CIC bioGUNE and CIC biomaGUNE), both led by Jose María Mato, and of the research being carried out in the Basque Country.

Jesús Jiménez Barbero

Jesús Jiménez Barbero is an Ikerbasque Research Professor and has been the Scientific Director of CIC bioGUNE since November 2014. Prof. Jiménez Barbero, former President of the Spanish Royal Society of Chemistry (2012-2017), attained his PhD from the Autonomous University of Madrid in 1987, and later continued his post-doctorate research at the University of Zürich (Switzerland), the National Institute for Medical Research, Mill Hill (United Kingdom) and Carnegie Mellon University, Pittsburgh (United States) between 1988 and 1992. In 1996, he was appointed Senior Scientific Researcher at the Institute of Organic Chemistry of the Spanish National Research Council (CSIC) and, in 2002, moved to the Centre for Biological Research (CIB-CSIC) as a Research Professor, where he was in charge of the Chemical and Physical Biology Department until his move to CIC bioGUNE. Apart from holding various visiting professorships at different European universities, Prof. Jiménez Barbero has received several awards, including the Janssen-Cilag Prize in Organic Chemistry (2003), the Bruker NMR Prize of the Spanish Royal Society of Chemistry (2008), the Gamboa-Winkler Prize of the Hungarian Society of Chemistry (2017) and the stand-out International Whistler Award in Carbohydrate Chemistry and Biochemistry (2010). He is also a ChemPubSoc Europe Fellow (2016) and member of the European Academy of Sciences (2017).

The research career of Prof. Jiménez Barbero is focused on a multidisciplinary approach combining methods of organic synthesis, biophysics, biochemistry, molecular biology and, above all, NMR spectroscopy, to study molecular recognition phenomena involving carbohydrates and closely linked to processes of interest in biomedicine, particularly those related to infection, inflammation and cancer.

Luis Liz Marzán

Luis Liz-Marzán is the Scientific Director of CIC biomAGUNE and has been an Ikerbasque Research Professor since September 2012. He is a researcher of international renown in the field of nanoparticle synthesis and assembly, the development of nanoparticle-based sensing and diagnostic tools, and nanoplasmonics (the study of optical phenomena at nano-scale). Prof. Liz-Marzán has been included in the Thomson Reuters Highly Cited Researcher list in both Chemistry and Materials Science for the last four years.

A Doctor in Chemistry from the University of Santiago de Compostela (Spain), Luis Liz-Marzán continued his post-doctorate research in the Van't Hoff Laboratory of the University of Utrecht (Holland). Stand-out scientific achievements and recognition for Prof Liz-Marzán's work include the Humboldt Research Award (2010), the DuPont Award for Science (2010), the Burdinola Research Award (2011), the ECIS-Rhodia Prize (2013), Medal of the Spanish Royal Society of Chemistry (2014), the Jaime I Award in Basic Research (2015) and the Blaise Pascal Medal of the European Academy of Sciences. Prof. Liz-Marzán is Professor at the University of Vigo (on leave of absence), and has been a visiting professor in various universities and research institutions worldwide. He is also a member of the Royal Spanish Academy of Sciences.

About the ERC Advanced Grants

Of the EU support programmes for scientific initiatives of international impact, the ERC Advanced Grants are the calls of greatest financial support as they are designed for frontier research projects, in any scientific field, on the leading edge of knowledge. Through these programmes, it is hoped that funded research will not only bring about scientific and technological results, but also pave the way for groundbreaking areas of research which may ultimately generate new ideas to drive innovation and entrepreneurial inventiveness and to address social challenges. In fact, one of the mottos associated with these projects is "high risk-high gain".

About CIC bioGUNE

The Centre for Cooperative Research in Biosciences (CIC bioGUNE), located in the Bizkaia Technology Park, is a biomedical research organisation conducting cutting-edge research at the interface between structural, molecular and cell biology, with a particular focus on generating knowledge on the molecular bases of disease, for use in the development of new diagnostic methods and advanced therapies. CIC bioGUNE has been accredited as a "Severo Ochoa Centre of Excellence", the highest level of recognition for centres of excellence in Spain.



About CIC biomaterialGUNE

The Centre for Cooperative Research in Biomaterials (CIC biomaterialGUNE), located in the Donostia-San Sebastián Technology Park, conducts cutting-edge research at the interface between Chemistry, Biology and Physics, and particularly on the properties of molecular level biological nanostructures and their biomedical applications.