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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Biociencias y biotecnología
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Título: Study of mRNA processing, export and cytoplasmic regulation through an Integrative Structural Biology approach.

Resumen de la Memoria:

I have dedicated my career to the study of the structure, dynamics and interactions of several biomacromolecules relevant for a variety of cellular functions. Being initially trained in Nuclear Magnetic Resonance Spectroscopy (NMR), I soon developed a wider view for approaching different projects by the combination of several structural biology techniques with biochemical and cellular experiments to fully complement the results and understand the different biological systems: integrative structural biology. This approach focuses on utilizing and combining the most suitable techniques for the study of each project; as a consequence, it expanded my knowledge not only in the NMR field but in other structural biology techniques (such as X-ray crystallography, small-angle scattering techniques, and recently cryogenic electron microscopy), together with biophysical tools for structural and interaction characterization.

RNA biology has always been my main interest, from RNA transcription to cytoplasmic regulation of messenger RNAs (mRNA); I find the cellular life of this versatile macromolecule fascinating. Its essential role in the transmission of genetic information in the cell (Central Dogma in Molecular Biology: DNA - RNA - proteins) and the capacity the molecule has to perform catalytic reactions and direct regulation mechanisms at different levels make this topic really interesting per se. But RNA biology is also at the center of a variety of diseases, converting the research in this field not only intriguing and exciting but, also, displaying huge potential applicability to contribute to society and human well-being.

I started my career by performing basic research on the study of RNA binding proteins controlling the mRNA export to the cytoplasm and its translation regulation in yeast. Then, I moved to the study of RNA transcription regulation in bacteria. In addition to the research in the RNA field, I have worked on other topics outside my comfort zone, contributing to understanding the role of the human co-chaperone SGTA in controlling protein homeostasis. Recently, I have focused my research on the study of human splicing regulation. mRNA splicing is a fine-tuned and well-controlled process in the cell, in which only small portions of the sequence are linked together to form the correct template for protein translation. In higher eukaryotes, it has developed into a vast regulatory process that enhances protein variability through alternative splicing. My main focus in this field consists of understanding the molecular determinants that direct the regulation of alternative splicing.

Up to now, I have contributed to several works related to the study of essential alternative splicing regulators. For my future steps, the main focus of my line of research is the study of the molecular determinants that direct the different splicing programs. This involves understanding how the splicing events are selected and the way in which these alternative splicing factors modulate the function of the spliceosome. The identification and analysis of structural and regulatory features in alternative splicing have been deemed essential for the design and development of therapies in cases where the regulation fails leading to the apparition of severe disease.

Resumen del Currículum Vitae:

I initiated my career in research while finishing my studies (2007). I was granted a Junior Research Collaborative Fellowship, to work in the antibiotic-resistance surveillance group from Prof. Torres (University of La Rioja), which yielded my contribution to 3 scientific publications.

After finishing my degree in chemistry at the University of La Rioja with the best transcript (2008), I moved to the "Rocasolano" Physical Chemistry Institute (CSIC) in Madrid to conduct my Ph.D. studies. I was awarded one Research Assistant Contract program fellowship from the Community of Madrid to cover my contract for 4 years. The project consisted of the analysis of the structural determinants of the formation of ribonucleoprotein particles in yeasts by NMR and other biophysical techniques, which was the base for my doctoral thesis supervised by Dr. Pérez-Cañadillas. In 2009, I obtained my advanced studies Diploma (similar to Master's) in "Protein Structure and Function" from the University of Zaragoza. During my doctoral studies, I did two short stays at the Institute of Genomic, Biochemistry, and Molecular Biology (IGBMC) in Strasburg, under the supervision of Prof. Séraphin, where I learned molecular biology experiments in yeast that complemented my structural results. These were funded by FEBS and the Instruct platform, and I was awarded the best short-stay prize from FEBS. I defended my thesis in 2013 and got my Ph.D. in biophysics from Autonomous University of Madrid. During my doctoral studies, my contribution to the projects yielded six scientific publications (one first and two co-first authorships).

Once completed my Ph.D., I started a research associate position at King's College London University in the Chemistry Department under the supervision of Prof. Isaacson. During the four years, I became an essential part of the group, for the project I was leading and also for student support. I contributed to the publication of several works in the fields of protein homeostasis and RNA transcription regulation using the integrative structural biology approach (7 scientific papers, including 1 first authorship and 2 co-first authorships; and 1 review).

In 2017, I was awarded a Marie Skłodowska Curie Individual Fellowship (Horizon 2020) to be performed at the Bavarian NMR Center in Munich under the supervision of Prof. Sattler. Since then, I have contributed to several works focused on understanding the molecular mechanism that directs alternative splicing regulation (4 scientific papers, one bibliographic review, and one book chapter). Currently, I am participating in an ERC synergy grant, coordinating the works at Prof. Sattler's group. Moreover, I have also started a subgroup with two Ph.D. students focusing on the field of splicing regulation linked to the early steps of spliceosomal assembly. In this context, I have published my first co-corresponding author paper, and currently, I am also applying for my own funding as principal investigator.

Throughout my international career, I have developed strong skills in project design and grant writing that prove my independence and capacity to fund my ideas, also, I have demonstrated my leadership by successfully supervising students and, lately, managing a small group of researchers in an independent research line. All this experience puts me in an ideal situation to start my own research group.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Biociencias y biotecnología
Nombre: GOMEZ MARTIN, CRISTINA ADORACIÓN
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Título: Listening in on inter-organ communication: computational assesment of EV-associated RNAs
Resumen de la Memoria:

Liquid biopsies, particularly blood-based biopsies, offer a practical and non-invasive alternative to traditional invasive tissue biopsies. Among the different sources of biomarkers in liquid biopsies, extracellular vesicles (EVs) have gained increasing attention. EVs, which carry a range of molecular cargo including RNA, DNA, and proteins, have immense potential for providing insights into cellular and tissue-specific states. My work aims to enhance this potential by studying the RNA content of EVs, including coding and non-coding RNAs, their localization, and modifications, to advance diagnostic tools, particularly in cancer. This research could improve non-invasive monitoring and early detection of diseases.

Some strategic objectives to achieve that would include:

- 1) Determining the RNA localization within EVs.
- 2) Characterizing the RNA content of different EV subsets
- 3) Detection of tissue/Cell type-dependent RNA modification patterns
- 4) Application of the obtained knowledge to liquid biopsies

My research trajectory has been shaped by my bioinformatics expertise and an increasing focus on translational research. Since I joined the Exosomes Research Group at Cancer Center Amsterdam (Amsterdam UMC), my position has allowed me to expand my expertise into a multidisciplinary environment with the potential to develop new wet-lab techniques and innovations. I contributed to groundbreaking work such as the first full-length tRNA sequencing protocol and enhancements in isomiR detection in EVs, published in *Genes & Development* and *Cell Reports Methods* respectively. These projects have positioned me at the intersection of bioinformatics and clinical research, with an ongoing focus on the clinical applications of EVs in liquid biopsies.

More recently, I developed NormSeq, a widely adopted RNA-seq normalization tool with over a thousand users, which addresses critical gaps in RNA-seq data analysis. I also introduced new bioinformatics tools to my group, significantly improving their research capacity. Throughout my career, I have collaborated with international researchers such as Dr. Michail Kotsyfakis (Czech Republic), Dr. Igor Jurak (Croatia), and Dr. Bujun Shu (Australia), resulting in several impactful publications.

As Principal Investigator (PI) of two projects funded by Cancer Center Amsterdam, I have demonstrated leadership and independence in managing complex research initiatives. I have also been actively involved in mentoring early-stage researchers. At Amsterdam UMC, I have supervised several Bachelor's and Master's students, and I have participated in formal teaching activities at Vrije Universiteit Amsterdam and the University of Granada.

My future research agenda will build upon my expertise in bioinformatics and EV biology to integrate multiple layers of RNA and DNA complexity from EVs. Strategic goals include understanding RNA localization within EVs, profiling RNA content of different EV subsets, and identifying tissue- and cell-specific RNA modifications. Ultimately, this work aims to improve the diagnostic potential of EV-based liquid biopsies, providing more accurate, non-invasive tools for disease detection and monitoring, with a focus on cancer.

Resumen del Currículum Vitae:

My academic career has been centred on computational RNA and DNA research, exploring their roles in disease, potential as biomarkers, and detection through advanced sequencing technologies. I hold a Biochemistry degree (2014), a Master's in Genetics (2015), and completed a PhD in Computational Epigenomics and Bioinformatics (2021, summa cum laude) under the supervision of Prof. Oliver and Prof. Hackenberg at the University of Granada. During my PhD, I advanced DNA methylation analysis and small RNA research, co-developing NGSmethDB and geno5mC to explore methylation patterns linked to disease mechanisms. I also contributed to sRNAtoolbox, a microRNA profiling suite adopted by academic and industry leaders, which has achieved 448 citations to date. To enhance software accessibility, I created a Dockerized version of sRNAtoolbox.

As a postdoctoral researcher at You2Yourself B.V., and currently at Amsterdam UMC (Cancer Center Amsterdam), I focus on cancer biomarker discovery and extracellular vesicles (EVs). Highlights include publishing a method to improve EV-isomiR detection in *Cell Reports Methods* (2023) and helping to the development of ALL-tRNAseq, enabling robust tRNA profiling (*Genes & Development*, 2023). Identifying limitations in RNA-seq normalization, I independently led the development of NormSeq, an innovative RNA-seq normalization tool that is been widely used. This achievement underscores my ability to tackle significant challenges autonomously.

Throughout my career, I've collaborated internationally with researchers from Spain, Croatia, and Australia, resulting in 9 publications (2 as first author). I have secured independent funding as principal investigator for two Cancer Center Amsterdam projects totalling around €290,000. The first one focuses on EV-miRNA detection and the second one is about immune monitoring in cancer diagnostics. Additionally, I've contributed to multiple national and EU-funded projects.

My teaching experience includes mentoring undergraduate and master's students at VU University Amsterdam and delivering courses for MSCA ITN and the University of Granada. Passionate about science communication, I am on the Hablando de Ciencia scientific dissemination association board. The outcomes of my research have been disseminated through 22 peer-reviewed articles (7 as first and 1 as last author), including high-impact journals and 3 book chapters, alongside numerous presentations at international conferences and workshops, one of which was as an invited speaker. My work



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

has accumulated 623 citations, with an h-index of 10 (as of January 2024). Several of my publications are in the top 25% of most cited worldwide. In addition to my research contributions, I have served as guest editor, and journal reviewer (Publons tracked).



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Y UNIVERSIDADES



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Biociencias y biotecnología
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Título: Oxytocin and the natural killer gene complex: a conserved mechanism to generate social diversity
Resumen de la Memoria:

The scientific trajectory of Dr. Boender reflects a consistent progression toward understanding how genetic variation shapes brain function and behavior. During his PhD training, he focused on how genetic factors influence feeding behavior, developing expertise in viral-mediated manipulation of neural circuits. This foundation in behavioral genetics sparked his interest in how individual variation in gene expression leads to behavioral diversity.

At the Italian Institute of Technology, his research focus shifted toward glial biology, specifically investigating how astrocytes regulate behavioral flexibility through glutamate signaling. This work revealed the crucial role of non-neuronal cells in shaping brain function, leading to his growing interest in neuron-glia interactions in brain development.

His transition to Emory University marks an important turn towards comparative neuroscience, as he began investigating how variation in oxytocin signaling generates social diversity. At Emory, he studied the prairie vole, a socially monogamous rodent that shows ample variation in mating tactics and other social behaviors. This research led to an unexpected discovery linking oxytocin signaling to the innate immune system through the KLR:CLEC recognition pathway. This finding bridges his previous work on gene-behavior relationships and neuron-glia interactions and suggests a novel mechanism for how genetic variation in oxytocin signaling might influence brain development through microglial activity.

Building on these discoveries, his proposed research program at the Achucarro Basque Institute for Neuroscience will investigate how oxytocin signaling interfaces with the innate immune system to shape neurodevelopmental trajectories. Using genetically diverse mouse strains, he will examine how variation in both oxytocin signaling and the natural killer gene complex influences microglial activity and subsequent neural development. This research represents an integration of his expertise in behavioral genetics, glial biology, and comparative approaches, while venturing into new territory by exploring the role of the immune system in brain development.

The program will specifically investigate whether genetic background influences microglial responses to oxytocin, how strain differences affect KLR:CLEC gene expression patterns, and whether these immune receptors mediate oxytocin's effects on neuron-microglial interactions. This research has the potential to reveal fundamental mechanisms of brain development, which is particularly relevant to understanding individual variation in social behavior and susceptibility to neurodevelopmental disorders.

This trajectory demonstrates how the research interests of Dr. Boender have evolved from studying genetic influences on behavior to investigating complex cellular interactions in brain development, ultimately leading to a novel hypothesis about how oxytocin signaling might shape social diversity through immune mechanisms.

Resumen del Currículum Vitae:

Dr. Boender is a comparative neuroscientist that aims to elucidate the molecular mechanisms that shape individual neurodevelopmental trajectories towards adult sociality. His research investigates how genetic factors, in interaction with the environment, generate social diversity. This work is founded on 1) the use of animal models with substantial genetic and behavioral diversity, 2) the identification of molecular pathways with advanced sequencing approaches, and 3) the development of tools that enable the causal linkage of gene-behavior relations. His current research focuses on how variation in oxytocin signaling links to the innate immune system to shape brain development, utilizing the prairie vole - a rodent model exhibiting human-relevant social behaviors like long-term pair bonding and biparental care. Through this work, he has identified the KLR:CLEC recognition system as a downstream mediator of oxytocin (OXT) signaling, a molecular pathway potentially crucial for microglia-neuron interactions in neural network formation. This may represent an unrecognized mechanism through which variation in OXT receptor (OXTR) signaling shapes brain development in health and disease. Currently, his team uses imaging and ex vivo electrophysiological methods to substantiate this hypothesis.

In 2023, he developed comparative gene editing, a viral-mediated gene editing strategy enabling genetic reduction of neuromodulatory receptor levels across rodent species. These vectors are actively used by >15 labs worldwide (Australia, China, Brazil, Germany, Netherlands and USA), resulting in 3 publications already.

Dr. Boender will start the Laboratory of Comparative Neuroscience at the Achucarro Basque Institute for Neuroscience in March 2025, where he will further develop these research lines, supported by 1) his strong background in neuron-glia interactions, 2) his hands-on experience in advanced sequencing data analysis, and 3) extensive expertise in AAV-mediated tools for neural circuit manipulation.

His scientific output includes 19 peer-reviewed publications (9 as first author), including articles in Science Advances and Biological Psychiatry, garnering >700 citations (h-index: 13). He has delivered 10 talks and seminars and presented 19 posters at (inter)national venues. As PI, he has secured more than €300,000 in research funding and serves as co-I on several collaborative projects utilizing his comparative gene editing strategy. He has supervised 7 (under)graduate students and served on 2 examination committees. His teaching experience spans various life sciences lectures and practicums, alongside regular participation in K-12 outreach activities. He peer-reviews for high-ranking journals including Brain, PloS Genetics, and Progress in Neurobiology, and serves as reviewer for funding bodies.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024
Turno General

The affiliation of Dr. Boender with Emory University is set to continue, which will facilitate internationalization of his research program by connecting trainees with the strong social neuroscience cluster in Atlanta (GSU, Emory, GA Tech). His research program investigates how oxytocin signaling and the innate immune system shape neurodevelopmental trajectories into adult sociality, contributing to our understanding of typical variation and atypical development in conditions like autism spectrum disorders and schizophrenia.



MINISTERIO
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Y UNIVERSIDADES



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Biociencias y biotecnología
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Título: Rooting for Resilience: Iron Dynamics as a Novel Mechanism in Plant Responses to Stress
Resumen de la Memoria:

Throughout my career, I have focused on elucidating the molecular mechanisms underlying plant responses to abiotic stresses. During my PhD, I explored nitrogen-fixing symbiosis in *Phaseolus vulgaris*, identifying key genetic regulators of root nodule formation and strain-specific recognition. My research on the pseudokinase NIPK and its role in symbiosis highlighted the regulatory potential of non-catalytic proteins in transcriptional processes, offering insights into sustainable agriculture and soil health. As a postdoc in Switzerland, I transitioned to studying *Arabidopsis* responses to phosphate (Pi) deficiency, a process which includes a strong inhibition of the root growth to generate a shallow root system better adapted to explore the rich topsoil. This program involves tissue-specific apoplastic Fe accumulation, which generates reactive oxygen species (ROS) that modulate signalling pathways leading to root growth arrest. My work revealed the pivotal role of CYBDOM proteins, including the ferrireductase CRR, in controlling Fe homeostasis under stress. These discoveries reframed Fe from a simple nutrient to a key regulatory element in developmental responses. Building on this, I proposed the concept of an "iron rheostat," a molecular system that regulates Fe redox states through ferrireductases and ferroxidases. This rheostat finely balances ferric (Fe³⁺) and ferrous (Fe²⁺) ions to control stress-induced Fe accumulation and downstream signalling. My recent research demonstrated that disruption of this balance impacts root growth under Pi deficiency and ammonium toxicity, demonstrating the rheostat's critical role in plant resilience.

My proposed research aims to uncover the molecular mechanisms governing the Fe rheostat and its broader role in plant adaptation to stress. I will employ single-cell transcriptomics to map transcriptional networks involved in Fe dynamics and conduct a forward genetic screening to identify novel components. Candidate genes will be studied using loss-of-function mutants that will be characterized at the cellular and molecular level, as well as at systemic level in soil using the multidimensional imaging system GLO-Roots. This holistic approach will link molecular mechanisms to physiological outcomes, offering insights into how root traits enhance resilience under realistic conditions.

The project holds significant potential for advancing crop adaptation strategies, addressing global agricultural challenges through the rational engineering of root systems optimized for nutrient acquisition in degraded soils. By pioneering this research, I aim to transform our understanding of Fe-mediated signalling and its impact on plant resilience.

With extensive teaching experience and a commitment to open science, I have mentored students, organized university-level courses, and ensured my findings are accessible to the scientific community. Supported by international collaborations with leading researchers, the Ramón y Cajal grant will enable me to establish an independent group, advancing knowledge on plant resilience and contributing to food security in the face of environmental challenges.

Resumen del Currículum Vitae:

I am a molecular biologist with solid experience in the molecular mechanisms underlining plant responses to abiotic stresses. I did my PhD at the Root Biology group of the University of La Plata, Argentina (2013-2018), under the supervision of María Eugenia Zanetti. For this, I won a competitive call for doctoral fellowships from the National Scientific Research Council from Argentina (CONICET). During this stage of my career, I studied the signaling pathways and molecular mechanisms required for the establishment of the nitrogen-fixing symbiosis between *Phaseolus vulgaris* (common beans) and rhizobia. Overall, my PhD production includes 10 peer-reviewed publications (6 papers, 2 reviews), 1 book chapter, and 1 science communication article. My results were communicated in national and international conferences including the ASPB meeting of 2014, for which I obtained a travel grant fellowship. In addition, during my whole PhD I also worked as a High School professor teaching Biology, Physics and Chemistry. After completing my PhD, I obtained a Postdoctoral position in Yves Poirier group at the Department of Plant Molecular Biology (DBMV) of the university of Lausanne, Switzerland (2018-2023). During my postdoc I focused on the molecular mechanisms underlying *Arabidopsis thaliana* responses to phosphate deficiency, one of the most limiting factors affecting plant productivity. Altogether, during my Postdoc I published a total of 7 works in peer-reviewed journals (4 papers and 3 reviews) plus 1 paper under revision in Plant Physiology. My most notable contribution was the elucidation of the biological role of members of the previously uncharacterized Cytochrome b561 and DOMON domain (CYBDOM) containing proteins. These novel results had a great impact on the scientific community, as reflected by the selection of my work for oral presentations at international meetings. In addition, my postdoctoral contract was associated with teaching activities (80% research, 20% teaching). For 5 years, I have been responsible for organizing the practical course in "Plant genetics" and have served as teaching assistant in other courses. Currently, I have a Research Assistant position in Yves Poirier group where I am finishing a project aimed at demonstrating the role of CYBDOM proteins in ammonium toxicity responses and generating preliminary data for my own future research lines as an independent researcher.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Biociencias y biotecnología
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Título: The unknown world of RNA-binding proteins in photosynthetic prokaryotes
Resumen de la Memoria:

My scientific career has been focused on the mechanisms of post-transcriptional regulation in cyanobacteria. During my Master's studies I was granted with MECD and JAE-INTRO grants that allowed me to start my research in this topic. The outcome of my master thesis was published in an article and was awarded in a national congress with the best oral communication prize. This helped me to get a FPU fellowship to carry out my PhD Thesis.

The main topic of my PhD Thesis was the identification and characterization of non-coding RNAs in filamentous cyanobacteria. During my PhD, I spent a 3-month stay in the laboratory of Prof. Wolfgang Hess in Germany. There, I acquired advanced skills in programming, Big Data and Bioinformatics. These skills have accompanied me through my career and crystalized in a PhD thesis that involved a synergy between classical Molecular Biology techniques and Bioinformatics. The results of my thesis were presented in national and international congresses and published in 9 papers (4 as first author). Because of this outcome I was granted with the Extraordinary Doctoral Prize by University of Seville.

During my PhD, in addition to my purely scientific work, I regularly taught in the Biochemistry and Biology Grades of the University of Seville (180 hours) and also participated in communication activities for a wider audience. These included visits by secondary school students to my research facility, participation in the dissemination activity "Your dissertation in 3 minutes", or participation in the Seville Science Fair, a communication activity for students and families.

Due to restriction of mobility occasioned by the COVID pandemic I spent a first postdoctoral phase in Spain in which I participated in two projects involving filamentous cyanobacteria. The outcome of this period is published in 6 papers (3 as first author, one of them as corresponding author). In February 2022 I was granted a Humboldt postdoctoral fellowship and moved to Germany to manage my own project about the identification of RNA-binding proteins in cyanobacteria. This project has given me greater maturity, autonomy and leadership, including an application for international funding, managing a research budget and supervising a Master Thesis.

During my Humboldt project I have carried out a global search that identified novel RNA-binding proteins in cyanobacteria. The detailed characterization of some of these proteins will constitute an entirely new line of research that requires ambitious approaches. For these reasons, the main line of research of this proposal is the detailed characterization of RNA-binding proteins that are involved in the regulation of photosynthesis, perhaps not only in cyanobacteria but also in plants, or involved in developmental processes in cyanobacteria. This project will entail the use of cutting edge technologies in cyanobacteria, such as CLIP-seq and RNA-FISH, in addition to the involvement of an international network of scientific collaborators. Finally, the concession of this grant would be the trigger to establish my own line of research on post-transcriptional regulation in photosynthetic organisms.

Resumen del Currículum Vitae:

My background encompasses the fields of Biochemistry, Molecular Biology and Bioinformatics. I graduated in Biochemistry and later specialised in Molecular Biology and Genetics with a Master's Degree.

During my Master's studies, I received a MECD collaboration grant and a JAE-INTRO grant from CSIC, which allowed me to start my research in the field of cyanobacterial microbiology in the laboratory of Dr. Alicia Muro Pastor and Prof. Agustín Vioque Peña at the CSIC and University of Seville. During this period, I attended specialised courses on omic data and computer programming. The experience gained during these two fellowships allowed me to complete my PhD in the same laboratory thanks to an FPU fellowship.

My research career has been focused on the study of the regulatory mechanisms exerted by noncoding RNAs during cell differentiation processes in filamentous cyanobacteria. During my PhD, I spent a short 3-month stay in the laboratory of Prof. Wolfgang Hess (Germany). This stay strengthened my scientific network and improved my knowledge of big data, allowing me to write a thesis with a clear synergy between bioinformatics and classical molecular biology techniques. The results of my thesis were published in 9 papers (4 as first author) and were awarded the Extraordinary Doctoral Prize by University of Seville.

My intent of doing a postdoc abroad were interrupted by the arrival of the COVID pandemic. For this reason, I conducted a first postdoctoral phase in Spain by participating in two projects related to filamentous cyanobacteria. The results of this first postdoctoral phase can be seen in the publication of 6 articles (3 as first author, one of them as corresponding author).

In February 2022 I moved to Germany to work for two and a half years as a Humboldt Postdoctoral Fellow at the University of Freiburg (Germany). I developed my own project on the identification of RNA-binding proteins in cyanobacteria, the results of which have recently been published in Nucleic Acids Research for which I am first and corresponding author. This postdoctoral phase has given me more autonomy and experience as a researcher and has improved my international collaborative networks with other scientists and research centres, including the EMBL in Heidelberg or the University of Tokyo. In November 2024, I was appointed a position as Assistant Professor at the University of Freiburg (Germany), where I currently develop my independent research.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Throughout my career, communicating my results has been a priority. I have adopted the open science strategy. For this reason, I have tried not only to publish my articles in open access journals, but also to deposit my raw data in public databases. Regarding the communication of my results to the scientific community, I have regularly participated in national and international congresses and won prizes for the best oral communication. I have also participated in activities aimed at communicating science to a wider audience, such as the Seville Science Fair. Finally, I have also contributed to the training of young researchers. I have taught 180 hours at the University of Seville, which allowed me to obtain the accreditation of "Profesor Ayudante Doctor" (ANECA), I have supervised Master's thesis and I am currently teaching the "RNA Biology" module of the Bachelor in Biology at the University of Freiburg.



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Y UNIVERSIDADES



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Biociencias y biotecnología
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Título: Spatio-temporal dynamics of developing tissues using quantitative approaches
Resumen de la Memoria:

How do cellular patterns emerge in living organisms? Since my PhD I have been fascinated by this fundamental question in biology. I did a PhD in Physics at the University of Barcelona, where I focused on theoretical aspects of pattern formation in developing plant and animal tissues. My PhD work has led to several findings about how the Notch signalling pathway drives the patterning of two different cell types. For instance, I predicted that competition between Notch signalling sources can trigger regulatory switches in a developmental context, showing that “competition effects” are essential for understanding the topology and function of regulatory networks.

During my postdoc at the University of Cambridge, I focused on plant development. We found a cell-autonomous and stochastic principle in multicellular patterning: fluctuations in the concentration of the protein ATML1 at the single cell level lead to giant cell patterning in the sepal. My modelling contribution was key for deciphering this phenomenon and showed a constructive effect of noise in a developmental context. In my postdoc, I also showed through modelling that noise can explain the variability of seed germination times. Moreover, I developed quantitative image analysis pipelines at subcellular, cellular and tissue levels, and this has enabled us to quantitatively characterise how gene expression in the stem-cell niche at the plant shoot apical meristem responds to environmental cues. I also became an experimentalist by studying regenerating plant cell cultures.

Since September 2020 I have my research group at the Max Planck Institute for Plant Breeding Research in Cologne, Germany. In my group, we study the multicellular dynamics of different plant developmental processes by combining confocal microscopy of developing plant tissues, quantitative image analysis, theory building and mathematical modelling. We have mainly focused on the multicellular dynamics of two different developmental processes in *A. thaliana*: the emergence of patterns of different cell types in the leaf and sepal epidermis, and the multicellular dynamics at the shoot apical meristem (SAM) during the floral transition. We are also studying other processes, such as the suberisation in the *Arabidopsis* root, and the effect of polyploidy across different scales and organisms. Our work has already led to exciting discoveries. For instance, we found that the pattern of giant cells becomes spatially less random as other cells divided.

In total, my work has led to 23 publications, of which 13 I am first or co-first author, and in 4 I am corresponding or co-corresponding author. We published our work in major journals such as PNAS, Development, Nature Communications and eLife. My work was presented in invited 30 seminars at different institutions, and I have also participated in many conferences and workshops (13 additional invited talks; 6 contributed talks; 17 poster presentations).

My scientific contributions have been recognised at different levels. For instance, I got the first PhD prize among the PhD thesis presented in 2013 at the University of Barcelona, and I was also awarded with the prestigious Herchel Smith Postdoctoral Fellowship. Different prestigious websites like the Node, F1000, Garnet, the University of Cambridge news website and LaVanguardia have disseminated our work to a wider audience.

Resumen del Currículum Vitae:

I obtained my degree in Physics and Master in Biophysics at the University of Barcelona (Spain). At the same institution, I obtained a PhD in Physics with International Mention and Cum Laude (maximal grade). I was awarded the “XIX Premi Claustre de Doctors de la Universitat de Barcelona”, the first prize among the PhD theses defended in 2013 at the University of Barcelona. I complemented my PhD studies with internships at Caltech (USA), Tel Aviv University (Israel), UC Santa Barbara (USA), and the Max Planck Institute for the Physics of Complex Systems (Germany). Afterwards, I started a postdoc at the University of Cambridge, at the Sainsbury Laboratory (UK). Since 2020 I have led my research Group at the Max Planck Institute for Plant Breeding Research in Cologne (MPIPZ), Germany.

In my PhD, I developed theoretical and computational approaches for understanding cellular pattern formation in animal and plant tissues. In my postdoctoral research, I acquired experimental and quantitative image analysis skills to study plant development, and I combined theory and experiments to study plant development. In my current group at the MPIPZ, we employ an integrated experimental and theoretical approach to uncover the dynamics of plant developmental processes, combining microscopy, quantitative image analysis, theory building and modelling. I am co-PI at the Cluster of Excellence on Plant Science since 2022, I am co-PI at the Poliploidy Integration and Innovation Institute since 2024, and I am part of the Morphodynamics group consortium since 2014.

I have 23 publications, of which 13 I am first or co-first author, and in 4 I am corresponding or co-corresponding author. From these 23 publications, 19 are peer-reviewed (13 research articles, 4 book chapters, 1 review, and 1 editorial paper), and the rest are in bioRxiv, excluding other bioRxiv manuscripts that have already also been published in a peer-reviewed journal. I have 818 citations and a h-index of 12 (google Scholar). I have been invited to give 30 seminars in different institutions, and I have also participated in several conferences and workshops (13 additional invited talks; 6 contributed talks; 17 poster presentations).

I have been able to get fellowships and grants (e.g. FI and FPU PhD fellowships, postdoctoral Herchel Smith Fellowship, Polyploidy NSF grant). I have also supported my group members to get their grants (2 Humboldt and 2 Marie Curie Postdoctoral Fellowships). I had access to other third-party funding such as CEPLAS funds (funds were decided via an evaluation committee) and rePlant funds (EU co-fund).



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

To date, I have supervised 3 postdocs, 4 PhD students, 5 master students, and 6 bachelor students. Given my collaborative work, several of these supervisions were co-supervised. I have also been involved in teaching bachelor, master and PhD students. For instance, since 2023 I teach in two bachelor modules at the HHU in Düsseldorf on Quantitative Biology, I have participated in a Master hands-on in Systems Biology (2015-2016) and supervisions of Mathematical Biology at the University of Cambridge (2016-2017).

I have refereed for several journals (frequency in parenthesis): eLife (3), PNAS (3), Development (3), Plos Genetics (2), Plos Computational Biology (4), among others. I was a referee in the Minerva-Weizmann Programme and the French National Research Agency.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Biociencias y biotecnología
Nombre: MALLÉN PONCE, MANUEL JESÚS
Referencia: RYC2024-051248-I
Correo Electrónico: mj_mallen@hotmail.com
Título: Regulation of carbon metabolism and stress response in photosynthetic organisms
Resumen de la Memoria:

My research career began in the Prof. Javier Florencio's lab (University of Sevilla (US)), where I obtained a US predoctoral fellowship to study the role of TrxA, which is essential in all photosynthetic organisms. During my PhD, I identified several cellular processes regulated by TrxA in cyanobacteria. We propose that TrxA acts as a critical regulator orchestrating the transition from anabolic to maintenance metabolism and entry into a dormant state. I also participated in deciphering metabolic plasticity and analysing cyanobacterial blooms. After completing my PhD, I was particularly interested in understanding how carbon signals can be integrated to regulate cell growth and the biotechnological potential of microalgae. This led me to join the Dr José Luis Crespo's lab (IBVF-CSIC) to investigate the TOR kinase, which controls cell growth. We found that the photosynthetic assimilation of CO₂ regulates the TOR signaling pathway, which might have ecological and biotechnological applications in CO₂ mitigation. Evolutionary and metabolic analyses revealed a high conservation of TOR complex, in contrast to regulatory proteins. In parallel, we analysed the redox partner interactions in the ATG8 lipidation system, a hallmark of autophagy, and found that redox-mediated ATG3 activation promotes ATG8 lipidation. In 2022, I obtained a Margarita Salas postdoctoral fellowship in the Dr Stéphane Lemaire's lab (IBPS-CNRS), a leading expert in synthetic biology of microalgae. Using synthetic biology, I made several point mutants to improve CO₂ fixation. In 2022, I obtained a Juan de la Cierva postdoctoral fellowship to return to the IBVF, where I carried on my research into how carbon regulates TOR. Through an international collaboration arising from my previous work, we have identified dihydroxyacetone phosphate as the key metabolite regulating TOR activity. Additionally, we described an active recycling of lipids through lipophagy in an identified microalga by our lab from Río Tinto through a collaboration. In summary, I have participated in 10 research projects and attended conferences, both national and international. I have signed 11 articles as first author in high impact journals (100% Q1), and I am corresponding author of 1 article. In 2023, I received the "Ezequiel Martínez" Award from the Federation of Andalusian Athenaeums on Environment and Climate Change.

During my career, I have developed tools and protocols to analyse photosynthetic metabolism and I have generated an international collaborative network with leading scientists including Drs Stéphane Lemaire and Arthur Grossman (Carnegie Institution). My research has focused on understanding how photosynthetic organisms perceive environmental signals and how this information is translated into physiological responses. However, the complex metabolic regulatory networks in photosynthetic organisms are highly compartmentalized, which is essential for strategies based on subcellular localization for metabolic engineering. Considering my scientific background, I believe that I am an excellent candidate to lead a research line to elucidate the role of cellular compartmentalization in metabolic engineering. My research will mainly focus on the model *Chlamydomonas* and will be translated to other microalgal models with biotechnological potential.

Resumen del Currículum Vitae:

I am a PhD in biochemistry and molecular genetics with experience in the elucidation of signaling pathways and their roles in carbon metabolism, cell growth and stress responses. During my career, I was particularly interested in understanding how carbon signals can be integrated to regulate cell growth and the biotechnological potential of photosynthetic organisms such as cyanobacteria and microalgae. I have used biochemistry, molecular biology, synthetic biology or bioinformatics to unravel the molecular mechanisms by which several signals are integrated through specific post-translational modifications, such as redox or phosphorylation, and regulate carbon metabolism. During my scientific career, I obtained 1 predoctoral fellowship and 2 postdoctoral fellowships, which have allowed me to work in top scientific institutions and research centres. Initially, I did my PhD in the Prof. Javier Florencio's lab (Plant Biochemistry and Molecular Biology Department-University of Sevilla (US)), where I studied the role of the thioredoxin TrxA in cyanobacteria. After finishing my PhD, I joined at the Dr José Luis Crespo's lab (IBVF-CSIC) as postdoctoral researcher to investigate the TOR kinase signaling and autophagy in the microalga *Chlamydomonas reinhardtii*. Subsequently, I obtained a Margarita Salas postdoctoral fellowship to join the Dr Stéphane Lemaire's lab (IBPS-CNRS, Paris). During this period, I made several mutants of Calvin cycle enzymes, identifying potential targets for metabolic engineering. In 2022, I obtained a Juan de la Cierva postdoctoral fellowship to return at the Dr José Luis Crespo's lab (IBVF-CSIC).

I have participated in 10 national and international research projects and attended 21 national and international conferences (8 oral communications). Moreover, I have signed as first-author in 11 articles published in high impact journals and 2 articles as second or third author (100% Q1), and I am the corresponding author of 1 article. As a result of the different stages, I have established an international collaborative network with leading scientists including Dr Arthur Grossman (Carnegie Institution) and Dr Pierre Crozet (CNRS).

I have also participated in several outreach activities such as "Feria de la Ciencia" or CicCartuja PhD talks, where I was co-founder and co-organizer, and I have contributed with national and international newspapers to communicate my scientific advances. Furthermore, I am currently an Institute Board Member of the IBVF representing the IBVF Staff. In 2023, my work on TOR signaling allowed me to receive the "Ezequiel Martínez" Award from the Federation of Andalusian Athenaeums on Environment and Climate Change.

Along my career, I have participated in the teaching plan of the US, where I taught 275 hours distributed in several subjects. I have also supervised the work of a master student, and currently supervise an undergraduate student. I have the accreditation of "Profesor Contratado Doctor" from ANECA. Before starting my scientific career, I worked as project manager of the company Guadimar Educa in the development and coordination of environmental education programs in Doñana (2009-2014). These tasks have allowed me to acquire management, organization and diffusion abilities that will help me in future projects.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Biociencias y biotecnología
Nombre: HERRERA CAMACHO, ANTONIO
Referencia: RYC2024-050560-I
Correo Electrónico: toniherrerac@gmail.com
Título: Deciphering Brain Development: From Molecular Mechanisms to Innovative Technologies
Resumen de la Memoria:

I am a developmental biologist with expertise in molecular and cellular biology, computational biology, and single-cell genomics. My research focuses on understanding the mechanisms governing neural development and their implications for pathological conditions. With 15 years of experience, 21 publications, multiple stays at national and international institutions, and demonstrated leadership and independence, I am an ideal Ramón y Cajal candidate to lead a research group and develop the proposed research line.

My scientific career began at IIBB-CSIC as an IDIBAPS fellow, where I published four papers and contributed significantly to Wnt, Shh, and BMP signaling in neural development. I developed key experimental expertise, such as in ovo electroporation, which I introduced to my group after training at Dr. Martí's lab (IBMB-CSIC).

Following a short postdoctoral stay at CIPF Valencia and an international training stay at OIST (Japan), I secured a Juan de la Cierva fellowship at IBMB-CSIC to focus on beta-catenin's dual role in spinal cord development. This period resulted in nine publications, including one as co-corresponding author, resulting from my co-supervision of a PhD student and further demonstrating my independence and leadership. I also participated in multiple collaborations, including one with Dr. Mayor (UCL, UK).

In 2021, I joined EPFL (Switzerland) as a senior postdoctoral researcher in Prof. La Manno's lab, a leading group in single-cell biology. This experience was pivotal, allowing me to integrate computational biology into my research and become an expert in spatial transcriptomics. My contributions resulted in six publications, including two in Nature Methods. I also collaborated with industry, top research groups, and EPFL core facilities. Further enhancing my international mobility, I conducted a research stay at Jacob Hanna's lab (Weizmann Institute, Israel), specializing in ex utero embryogenesis. This led to a 3RCC grant (as PI) and financial support from CPG-EPFL. I also led technological development collaborations and scientific collaborations with renowned researchers such as Prof. Hanna. My growing independence is further demonstrated by securing a second PI grant (SNSF Spark) and supervising multiple students. Additionally, I have contributed to science outreach, invited talks, and expert evaluations for research agencies and PhD committees.

With this proven track record in high-impact research, international collaborations, and independent project leadership, I am well-positioned to establish and lead a research group. My future laboratory will investigate spatiotemporal mechanisms of human brain development by integrating spatiotemporal transcriptomics and the ex utero rolling system. This research will transition from animal models to human in vitro systems, addressing key gaps in brain development and disease modeling. Using spatiotemporal transcriptomics and CRISPR/Cas9, I will identify critical decision-making nodes in neural fate specification and neurodevelopmental disorders. Additionally, I will refine 3D brain organoid models by incorporating the ex utero rolling system to mimic physiological oxygen environments. These advancements will provide high-impact insights into human brain development and disease, establishing a robust platform for mechanism-based therapeutic interventions.

Resumen del Currículum Vitae:

I am a researcher specializing in developmental biology with a strong background in molecular and cellular biology, as well as advanced omics technologies. With over 15 years of research experience, I have contributed to projects aimed at uncovering the molecular mechanisms underlying brain development, resulting in 21 publications in high-impact journals, including Nature Communications and Nature Methods. By integrating experimental and computational approaches, my interdisciplinary expertise has significantly advanced our understanding of neurodevelopment.

During my PhD as an IDIBAPS fellow, I investigated the molecular mechanisms of embryonic brain development. My research resulted in four publications, including two as first author. My most significant contribution was in Nature Communications, providing novel insights into tumorigenesis. Additionally, I implemented in ovo electroporation of chicken embryos after training in Elisa Martí's lab (IBMB-CSIC), a technique that became central to my PhD supervisor's research. My mentorship of PhD students further contributed to the lab's scientific achievements.

After my PhD, I conducted a postdoctoral stay at CIPF Valencia, contributing to a project on insulin resistance and chronic liver injury. I then secured the competitive Juan de la Cierva fellowship at IBMB-CSIC, where I contributed to nine publications, including three as first author and one as co-corresponding author in leading journals such as Journal of Cell Biology and Development. My research advanced the understanding of beta-catenin's dual functionality in spinal cord development. I also co-supervised Andrea Ochoa's PhD thesis, resulting in a high-impact publication.

In 2021, I joined EPFL as a senior postdoctoral researcher in Prof. Gioele La Manno's lab, gaining expertise in computational and single-cell biology. This period has been highly productive, resulting in six publications, fostering collaborations, and driving technological innovations. I contributed to developing Velocycle, a next-generation RNA velocity model, and Spotiflow, a deep-learning tool for imaging-based spatial transcriptomics. These efforts led to high-impact publications, including two in Nature Methods, and multiple collaborations with industry, research groups, and core facilities. Additionally, I have mentored several students, including Laura La Peña, whose PhD I will co-supervise with Prof. La Manno.

My leadership is evident in securing two independent projects as principal investigator: a 3RCC grant and an SNSF Spark grant, which have fostered collaborations and driven technological development. Additionally, my international stay and ongoing collaboration with Jacob Hanna's lab (Weizmann Institute) have strengthened my position in the field of ex utero embryogenesis.

Beyond research, I actively disseminate scientific knowledge through open-access publications, invited talks, and outreach initiatives. I have also served as an expert evaluator for PhD thesis committees and research agencies.

My scientific and technical expertise is demonstrated through a strong track record of impactful contributions, innovative technological developments, and successful mentorship. My extensive international collaborations and proven leadership in securing competitive funding position me as an excellent candidate to lead a research group.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Biociencias y biotecnología
Nombre: FERNÁNDEZ COSTA, JUAN MANUEL
Referencia: RYC2024-050569-I
Correo Electrónico: jfernandez@ibecbarcelona.eu
Título: Organ-on-chip platforms as preclinical models for Muscular dystrophies
Resumen de la Memoria:

The overarching goal of my scientific career has been to develop biomedical models for muscular dystrophies, focusing on molecular pathogenesis, therapeutic targets, and treatments for these rare diseases. During my PhD at the University of Valencia, I identified altered miRNAs in myotonic dystrophy and highlighted their therapeutic potential. Notably, a treatment strategy based on one of these miRNAs is now in development.

In my postdoctoral research, I developed a *Drosophila* model for LGMD2, which is now used in drug screening efforts. I also helped pioneer therapeutic approaches using antisense oligonucleotides (ASOs) targeting miRNAs. One of these ASO therapies has transitioned to industry and is now in clinical Phase I/IIa, specifically the ArthemIR[®] Trial for Myotonic Dystrophy Type 1 (DM1).

More recently, I focused on tissue engineering and biosensors to create biomimetic models that accelerate drug discovery for muscular dystrophies. This led me to the Institute for Bioengineering of Catalonia (IBEC), where I established my independent research line, leading the muscle team within the Biosensors for Bioengineering Group (B4B). Currently, as a senior researcher at IBEC, we develop muscle-on-a-chip devices using 3D tissue cultures and biosensors.

Throughout my career, I have built national and international collaborations with researchers, clinicians, and industry partners. My ability to secure competitive funding is exemplified by grants awarded by the Medical Research Council (UK), the Spanish Ministry of Science, and AFM Telethon (France). I currently lead five projects as PI and coordinate three others within the B4B muscle team.

I am a member of TREAT-NMD, the European Organ-on-Chip Society, the World Muscle Society, and the Spanish Society for Biochemistry and Molecular Biology. Additionally, I co-founded the Spanish Society for Microphysiological Systems and Organ-on-Chip (SESMOoC), established in November 2024.

A cornerstone of my research has been its translational focus. I have filed two international patents for DM1 treatments, both licensed to companies, with one set to begin clinical trials by the end of 2023—a highlight of my career, where research reaches patients. Reflecting on this translational focus, I became the entrepreneurial scientist for a valorization project funded by Product Call. I also engage with patient associations and collaborate with national and international companies.

My commitment to science communication is shown through participation in talks organized by patient groups and educational outreach, including lectures for high school students on organ-on-chip technology and bioengineering for rare diseases.

My work on organ-on-chip models for muscle diseases has gained significant international recognition. This is evidenced by the best talk award at the World Muscle Society Congress for our Duchenne-on-a-chip research. Additionally, I have been invited to collaborate with leading centers such as the John Walton Muscular Dystrophy Center in Newcastle, UK, and the Institute of Myology in Paris, France. Starting in May, I will spend six months as a visiting researcher at JWMD, sharing my expertise in bioengineering for muscle 3D cultures.

Resumen del Currículum Vitae:

I majored in Biological Sciences at the University of Valencia (BSc, 2005). During my 5th year, I was awarded the Undergraduate Research Collaborator fellowship from the Ministry of Education and Sciences (Spain). In 2005, I started my PhD studies at the University of Valencia under the supervision of Prof. Rubén Artero and funded by a PhD fellowship from Generalitat Valenciana. I received my PhD in Molecular Biology and Genetics from the University of Valencia in 2015 (Excellent Cum Laude). From 2012 to 2015, I have joined the biotech company Valentia Biopharma. In Valentia I work as a I&D&R researcher, my research was focused on developing biomedical models for neuromuscular diseases for drug discovery. After, as a postdoc, I worked at the INCLIVA Research Institute with Dr. Beatriz Llamusi, University of Valencia, under the supervision of Prof. Rubén Artero and the Institute of Bioengineering of Catalonia with Prof. Javier Ramon. In 2017, I wrote a project awarded with a Postdoctoral fellowship from Generalitat Valenciana. I moved to IBEC with a Postdoctoral stay for one year. After my stay, I continued working at IBEC; I started my independent research line, leading the muscle team within the biosensors for bioengineering group (B4B) and becoming a senior researcher in November 2022. My team works on developing muscle-on-a-chip devices using 3D tissue cultures and biosensors to test drugs for muscular dystrophies.

Currently, I am leading 5 projects as PI, including an international project awarded by the prestigious Medical Research Council (UK). Moreover, I am participating in the research team of additional 3 additional collaborative projects. I also led a valorisation project financed by Producte Call (Generalitat de Catalonia) as an entrepreneurial scientist with the objective of funding a spin-off to exploit the sensing technology we are developing in our group. I co-authored 28 peer-reviewed articles (five as corresponding author, including two as last author), and 3 book chapters, and I have filed 2 international patents. I presented my work in 50 scientific congresses: 20 oral contributions (10 invited talks) and 30 posters. Remarkably, I was awarded the Duchenne Research Prize for the best talk at the World Muscle Society annual congress in Halifax, Canada.

Throughout my career, I have been very involved in training new researchers. I am currently the supervisor of three postdocs and three PhD students. Furthermore, I have supervised 7 BSc final projects and 8 master theses. Moreover, I participated in the organization of the IBEC PhD mentoring



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

program, and I played an active role in this program as a mentor of 2 PhD students. I have been a member of the evaluation panel of 7 PhD theses. I am an active Ad Hoc reviewer in high-impact journals and project calls. Regarding institutional responsibilities, I am a board member of the Postdoc Committee, The Human Resources Strategy for Researchers (HRS4R), and the Gender and Diversity Committees at IBEC. I have been a member of the Organization Committee for the III BIST Postdoc Day and the IBEC Neuromuscular Days 2022.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Biociencias y biotecnología
Nombre: LOZANO ELENA, FIDEL
Referencia: RYC2024-049400-I
Correo Electrónico: fidel.lozano.bio@gmail.com
Título: Plant steroids & Molecular glues
Resumen de la Memoria:

My research trajectory has been center on plant biology, beginning with molecular biology and genetics to study plant steroid signaling, particularly brassinosteroids (BRs), with a focus on tissue specificity (e.g., stem cells and vascular tissue). Over time, my approach evolved into a hybrid model combining wet lab experiments with bioinformatics to dissect the effects of BRs and identify new targets and interactors. I later transitioned to the biotechnological application of BRs, integrating pharmaceutical research concepts to explore practical solutions. This eventually led me to engage in technology transfer and entrepreneurship activities.

Currently, my work has shifted towards a biochemical approach for targeting BR receptors, leveraging AI-driven drug design breakthroughs like AlphaFold. Collaborating with chemists has broadened my perspective, allowing me to approach research from a chemical and structural standpoint. While my work initially focused on BRs, I've expanded to other plant hormones and projects beyond plant biology, maintaining a strong applied focus. I also continue to apply bioinformatics, both in research collaborations and as a teacher in two MSc modules.

As an aspiring independent researcher, the research line I aim to develop builds on my current work in Switzerland, which focus on the use of IA-driven technologies for the design of peptides that act as molecular glues - molecules that promote or stabilize protein-protein interactions. I plan to extend this research from short peptides to synthetic small protein adaptors, a more challenging design concept. The idea is that these adaptors generate bifunctional interfaces and act as "molecular glues" for unconventional targets that shows no pockets or grooves in the surfaces. Importantly, these synthetic small protein adaptors are aimed to be encoded by short mRNAs, so eventually these could be delivered into cells, for example via lipid nanoparticles.

Importantly, I plan to expand from only plant biology to biomedicine as well. As initial targets, I would aim for the 14-3-3 protein family, key cellular regulators with multiple interaction partners and with an enormous therapeutic potential. The fact that interactions are already present facilitates the design and offer a natural platform for designing high-affinity binders. This is exemplified by the fungal toxin Fusaricocin, which enhances the affinity of a 14-3-3 protein for a particular target by 100-fold, provoking its over-activation and ultimately, a physiological effect on plants. Parallel to this, I will apply the same concept of small proteins adaptors to the design of Proteolysis Targeted Chimeras (PROTACs). These are based on bringing together a protein of interest and a E3 ubiquitin ligase to promote degradation. The ubiquitin E3 ligases diversity remains largely unexploited, especially regarding tissue-specificity.

In summary I aim to combine my expertise in computational biology, molecular biology, in vitro diagnostics and plant biology for the de novo design of large peptides/miniproteins that function as molecular glues, unlocking and triggering novel therapeutic targets.

Resumen del Currículum Vitae:

I am an early career researcher in the field of plant biotechnology/biochemistry. I earned my PhD in Plant Biotechnology in 2019, by the Autonomous University of Barcelona (cum laude, extraordinary thesis award). I have an hybrid profile combining expertise in bioinformatics and computational biology with skills of molecular biology and biochemistry wet lab. I am an impact-driven person with a strong focus on transference and applied research, although also excited by major scientific challenges. I have tech transference training and some experience on entrepreneurship. I have a total of 8 publications (all first quartile) and 2 filed patents. I also participated and given oral presentations at interantional coferenes. Finally, I have been successful in fund raising, having secured so far a total of ~270 k€ in different projects.

In my current position as Research Associate at the Insitute of Chemistry and Bioanalytics (ICB) in University of Applied Sciences Northwestern Switzerland (FHNW), Muttentz, Switzerland (2023-Present), I am focused on leveraging plant molecular glues, particularly peptides. I utilize cutting-edge AI tools (e.g. AlphaFold) to design peptides that modulate protein-protein interactions (In collaboration with the University of Basel). In the same line, I am also leading a project on peptidic-based Proteolysis Targeting Chimeras (PROTACs), for which I secured CHF 100k funding from the Swiss National Science Foundation. Beyond my core research, I'm also exploring nanoparticle surface modification and have introduced at ICB Plant Cell Suspension Cultures as in vivo testing and protein production platform. I have gained skills in Solid Phase Peptide Synthesis (SPPS), analytical techniques (HPLC-MS, MALDI-TOF) and in biophysics-based techniques to assess protein interactions (e.g. FIDA, SPR, BLI, MST). I also teach in two modules of the MSc in Life Sciences program at FHNW: "Handling and Visualization of Data" and "Modeling and Exploration of Multivariate Data."

In an previous postdoct at the Center for Research in Agricultural Genomics (CRAG), Barcelona, Spain (2019-2022), I was focused on tech transferences activities. I leveraged on my PhD results to develop a high-throughput screening assay for climate stress protection. I played a pivotal role in securing funding for valorization activities, including a first-ever CaixaImpulse grant for an agrotech project, which offered me intensive training in tech transfer and biotech entrepreneurship. I represented our start up project in several startup incubators (Caixa Impulse, Barcelona; Biotope, Ghent; CajaMar Innova, Almeria) while also contributing to academic research to academic publications. All these efforts culminated in a spin-off company, though I chose to stay in academia.

My PhD thesis was also developed at CRAG (2014-2019) and was focused on plant steroid signaling. Under the supervision of Prof. Ana I. Caño-Delgado (An ERC-funded laboratory), I investigated the potential of manipulating brassinosteoids (BRs) perception to improve drought tolerance in plants. My



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

PhD work was marked by international and multidisciplinary collaborations and two research stays at the University of Florida, where I acquired expertise in bioinformatics.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Biociencias y biotecnología

Nombre: MARTIN , ADRIAN

Referencia: RYC2024-049802-I

Correo Electrónico: adrian.martinsegura@protonmail.com

Título: Discovering new molecular mechanisms of aging and age-related diseases through machine learning and AI

Resumen de la Memoria:

My scientific career has always been linked to the molecular alterations of aging and age-related diseases. I started investigating the process of aging on hippocampal neurons. In particular, the insulin receptor functions in the brain and how its alterations affect memory processes, shaping the aging of glutamatergic neurons. I obtained great expertise in biochemistry, molecular and cell biology, and conducting animal studies. Then, during a 5-year postdoctoral period in New York (USA), I expanded my knowledge about aging working on two main projects. The progression of chaperone mediated autophagy (CMA, a highly selective form of autophagy) activity along aging, with a deep characterization in animal models and using public single cell data bases. To do so, I developed advanced skills in biocomputing to perform large scale analysis and generating machine learning models, which has become the core part of my current line of research. Second, the relation between CMA and Parkinson's disease, using animal models, but also moving into human studies, achieving the first characterization of CMA activity on PD idiopathic patients. In addition, I acquired experience in translational science, trying to transfer my studies into potential treatments for this neurodegenerative disease by working on the therapeutic potential of CMA activation.

I returned to Spain in May 2023, to pursue my future career as an independent researcher, studying further the aging molecular mechanisms and what turns them into pathological processes. To do so I was awarded with a Marie Skłodowska-Curie Postdoctoral Fellowship from the European Commission in February 2023. I started my own line of research at Dr. Enrique Carrillo's group, Computational Biology, at IMDEA Food institute in Madrid. Here, I am working on expanding our knowledge of the interactions that occur along aging between the metagenome, our metabolism and nutrition, shaping the aging process and triggering or not the appearance of age-related disorders like neurodegenerative diseases. My projects aim to develop bioinformatic tools using metagenomic and metabolomic data to achieve this task. I am also incorporating machine learning and artificial intelligence to them with the objectives of: I) unveiling unknown connections microbiome-host that could be influencing aging; II) characterizing new molecular pathways that the algorithms could identify and that could become a target for improving the aging process; III) developing nutritional interventions, as a well-known mechanism to influence on metabolism and microbiome, aiming for those identified targets and adapting those interventions to an individual's particular genome/metagenome. This could be achieved thanks to the use of machine learning and its power to integrate large amounts of data, what will help me to lead the pace into the precision nutrition and personalized medicine fields. In this regard I have already led two master students in different projects regarding microbiome, deep learning and Alzheimer's and Parkinson's disease. These objectives are essential to improve not only our lifespan but also our quality of life and of our aging, what in addition could lead to great social and economic changes.

Resumen del Currículum Vitae:

I have 12 years of expertise in scientific research. Along my career, I specialized in the areas of neuronal aging, degeneration, dysregulations of metabolic signaling, biocomputing and deep learning. I have great experience in biochemistry, molecular biology, cellular biology and working with laboratory animals. Nonetheless, I have acquired advanced knowledge in computational biology including machine learning and artificial intelligence techniques. Currently, I have started to grow my own research line on metagenomics, aging and deep learning, publishing already a first author and corresponding publication in Frontiers in Microbiology (Q1) and leading two master projects regarding deep learning models in metagenomics and neurodegeneration. One of these projects will continue as a PhD I will direct. I have also led different projects (clinical assay development with CEI code IMD: PI-064 on Fundación Ramón Areces CIVP21S13338; deep learning goal in TEC-2024/BIO-167 Comunidad de Madrid project) in my current position at IMDEA Food, as well as grown a solid network of international collaborators, participating in two European COST actions (ML4Microbiome, INFOGUT). I spent 5 years (2018-2023) abroad in New York in a postdoctoral stay where I also established a network of collaborations in institutions like Johns Hopkins, Weill Cornell or Columbia University. During these years I have contributed to other 10 peer reviewed publications as a co-author in top journals like, Cell or Neuron. 8 of them in Q1, 3 of them as first author (Nature Aging, Aging Cell, Frontiers in neurology), 1 as a guest editor for an in-focus issue. I have participated in different international conferences: top worldwide bioinformatics conference ISMB (2024 oral communication), EFFoST (2024 poster presentation), JPB Foundation annual meeting in New York (2023-oral communication; 2021-oral communication, 2020-poster presentation); the FEBS3+ 1st Joint Meeting (Barcelona 2017-poster presentation and oral communication). This scientific production originated from the involvement in different projects. Several funded by international institutions (like the European commission, or the NIH and the JPB foundation in USA), others by Spanish institutions: Ministry of economy; BBVA. Nonetheless, I have also peer reviewed for a top journal in the aging field as Aging cell, for the mBio journal, and two years ago I joined the editorial board of the Frontiers in Aging journal.

These accomplishments have been possible by being awarded with different fellowships that helped me to develop my skills. The last one has been the Marie Skłodowska-Curie Postdoctoral Fellowship awarded by the European Commission on 2023, that allowed me to return to Spain at IMDEA Food institute. Previously, during my postdoctoral research at the Albert Einstein College of Medicine in New York, with Dr. Ana Maria Cuervo, I obtained the Fundación Ramón Areces Postdoctoral Fellowship in 2019. To achieve my PhD, under Dr. Carlos Dotti's direction at the CBMSO (2012-2017), I was awarded with a FPU fellowship from Spanish Ministry of Education in 2012. Nonetheless, I had been previously awarded with other prestigious fellowships like the Master's fellowship of Fundación la Caixa in 2011 or the JAE Intro CSIC fellowships for undergraduate students in 2009 and 2010.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Biociencias y biotecnología

Nombre: CABRERA RUBIO, RAUL

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Título: Integrating Omics, Bioinformatics, and Biotechnology to Combat Antibiotic Resistance in Foodborne Pathogens, Develop Probiotic, Prebiotic, and Postbiotic Solutions, and Create Innovative Fermented Products for Consumers

Resumen de la Memoria:

Durante mi carrera investigadora me he especializado en el campo de la metataxonomía, metagenómica, genómica bacteriana, resistencia a antibióticos y microbiología molecular y clásica. Mis investigaciones se centran en el uso de la secuenciación como herramienta de investigación básica en bacteriología, y en sus múltiples aplicaciones, así como microbiología molecular y clásica. En cuanto a investigación básica, he utilizado métodos avanzados de metagenómica y genómica comparativa, para determinar nuevos peligros de patógenos bacterianos, como son la resistencia a antibióticos o patogenicidad, así como posibles bacterias con efecto probiótico o antibacteriano. Además, al estar participando en varios trabajos remarca mi multidisciplinariedad, por trabajar en "wetĺab" y "dryĺab", en temas tan variados como la leche materna, oral, nasofaríngea, comida fermentada, etc., así como en varios huéspedes (Humanos, caballos, ratones, ratas, cerdos, etc.). En cuanto a investigación aplicada, un probiótico asociado contra la caries dental (*S. dentisani*) será comercializado el año próximo, así como la creación de nuevos protocolos de estandarización para la toma de muestras y posterior extracción. Además, he desarrollado y estandarizado herramientas y métodos bioinformáticos para el procesamiento e interpretación de datos metagenómicos y genómicos en contextos de la producción alimentaria. También he identificado marcadores genéticos para el genotipado de patógenos bacterianos y diagnóstico molecular de resistencias a antibióticos.

Este proyecto aborda la creciente amenaza de la resistencia a los antimicrobianos (RAM), que causa millones de muertes anualmente y representa un desafío importante para la salud pública. La RAM se ve agravada por el uso indebido de antibióticos en entornos clínicos, agrícolas y de producción alimentaria. El objetivo del proyecto es explorar los mecanismos que vinculan el microbioma de los alimentos, los genes de resistencia a los antimicrobianos (AMR) y la salud humana mediante un enfoque multidisciplinario, que incluye metagenómica, evolución bacteriana y genómica funcional. Los objetivos incluyen el desarrollo de nuevos métodos para analizar microbiomas alimentarios, investigar los efectos de los antibióticos sobre la RAM e identificar posibles probióticos, prebióticos y postbióticos para combatir patógenos resistentes. El proyecto también busca comprender cómo la RAM se propaga a través de la cadena alimentaria, desarrollar soluciones sostenibles para la gestión de los subproductos de la fermentación y proponer biotecnologías innovadoras para controlar la RAM. Se espera que sus impactos incluyan la mejora de la salud pública, la seguridad alimentaria, el avance del conocimiento científico, el fomento de la innovación y la reducción de los costos sanitarios. Los resultados del proyecto se difundirán a través de publicaciones, conferencias y actividades de divulgación pública, promoviendo además colaboraciones internacionales para maximizar su impacto global.

Resumen del Currículum Vitae:

En mi carrera científica he trabajado en actividades técnicas de laboratorio (wet-lab) empleando los métodos clásicos de microbiología y biología molecular, así como las nuevas herramientas de biotecnología, como la clonación en fósmidos y su posterior cribado contra diversas bacterias, y las últimas técnicas de secuenciación masiva (desde 454-Roche, Illumina, NanoPore, PacBio). Pero también he aprendido las herramientas de bioinformática y análisis de datos (dry-lab), formándome en biología computacional y desarrollando mis propias tuberías de análisis metataxonomicos, metagenomicos, metatranscriptomicos, genómica bacteriana y metabolómica. Por otro lado, también me he especializado en bioestadística y en algoritmos de aprendizaje automático (machine learning) e big data. Todas estas habilidades las he podido aplicar en el estudio del microbioma en varios ambientes dentro del cuerpo humano como fueron la boca, estómago, vías aéreas, leche materna y muestras intestinales. Como investigador, he desarrollado mi trabajo predoctoral en Fisabio, y mi periodo postdoctoral (Diciembre 2014-Octubre 2021) en varios centros: nacional en IATA-CSIC, y también en el extranjero con tres estancias pos-doctorales (NMBU; Noruega y Teagasc, Irlanda). En detalle, en mi periodo en el NMBU me adentre en el estudio de la microbiota infantil, probióticos y el riesgo de enfermedad atópica. Tras este periodo, me incorporé en Irlanda en el equipo de secuenciación donde mejoré y amplí mis habilidades bioinformáticas y bioestadísticas. También tuve la oportunidad de ampliar mis conocimientos en la interacción microbiota-hospedador, realizando trabajos en humanos, y en modelos animales (ratón, caballos y cerdos). En mi segundo contrato en Irlanda participe en un proyecto europeo denominado "Microbiome applications for sustainable food systems" (MASTER). Mi objetivo en el proyecto MASTER fue ayudar en la creación y en la puesta a punto de un protocolo innovador para la extracción de ADN de diferentes medios de producción (carne, helado, queso). Tuvimos la dificultad añadida de la poca biomasa que se podía recuperar de este tipo de muestras (muestras ambientales; producción de la cadena alimentaria tras su limpieza, etc.), consiguiendo un protocolo de muestreo y extracción de ADN completo y adecuado que ha sido publicado en Nature protocols. Mas manuscritos están por llegar. Además, cree mi propia línea de investigación, estudiando la microbiota de la nasofaringe en infantes, y los problemas que se originan de una infección bacteriana o vírica. Llevando esta línea de investigación hasta el día de hoy. Desde Noviembre 2021 estoy incorporado en IATA-CSIC con un contrato de investigadores de excelencia de la GVA, Subvenciones para la contratación de Doctores y Doctoras con experiencia internacional (CDEIGENT), donde estoy desarrollando mi línea de investigación que se centra en la identificación de asociaciones entre posibles patógenos y beneficios de la microbiota en la cadena de producción, alimentos, alimentos fermentados, dieta y salud. Busca el desarrollo y aplicación de estrategias y desarrollo de alimentos funcionales en nutrición y clínica. Siendo una investigación multidisciplinar que incluye áreas como biotecnología, microbiología, ciencia de los alimentos, nutrición, ciencia de datos y biología computacional.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Biociencias y biotecnología
Nombre: ABREU SÁNCHEZ, ISIDRO
Referencia: RYC2024-048786-I
Correo Electrónico: isi.abreu88@gmail.com
Título: LegHeme, Inspiring a heme-biofortification strategy based on legume nodules
Resumen de la Memoria:

There is a common thread linking my initial studies on the essentiality of boron in plants to my current role in developing iron compounds with higher absorption capacity in humans, and the research proposal "LegHeme": a genuine curiosity-driven approach towards understanding nutrient's essentiality in Biology.

I started my PhD working on identifying the protein and glycolipids that make B essential for plants and the rhizobia-legume symbiosis. Later, I became intrigued by the quick and profound effects of boron deficiency on meristem organization and root growth. Was during my first postdoc at the CBGP which I started working on transition metals such as zinc, copper and iron. During this period, I acquired most of the techniques in my repertoire, which spans across biochemistry, molecular genetics, cellular biology and physiology, among other more exotic ones such as X-Ray Fluorescence and Spectroscopy or isotope enrichment. Armed with these skills, I characterized various plant metal transporters essential for the rhizobia-legume symbiosis.

When I moved to Oxford, I firstly worked on a synthetic biology approach to transfer the nitrogen fixation capabilities between bacteria. Fortunately, I was able to secure the Marie Skłodowska Curie Fellowship that allowed me to develop my own research project on bacterial transporters required for the rhizobia-legume symbiosis, followed by a method to quantify protein metalation which was part of an Eric Reid fund for Methodology grant I gained. These projects still revolved around iron homeostasis in the symbiosis but shifted focus to the bacterial partner. Eager to return to research on the legume side, I am leading the production of one iron compound within the Plant Heme project funded by the Bill and Melinda Gates Foundation. This project has highlighted the scale of hidden hunger (micronutrient deficiencies) and equipped me with the concepts and skills required to develop effective solutions for humans. My unique expertise in bacterial and plant metal homeostasis and broad technical repertoire have proved invaluable for this project. In parallel of the above, I am co-principal investigator in a project on low oxygen signalling in nodules, including the supervision of a postdoc.

I aim to develop novel solutions to reduce the prevalence of iron deficiency anaemia worldwide. Since we are what we eat, I want to leverage the deployment of a heme biofortification strategy in plants. In the first discovery phase, I propose to investigate a model plant that has already overcome all the barriers: tissue-specific accumulation of iron and intracellular metal usage. I am talking about the nodules established during the rhizobia legume symbiosis. I will address two fundamental questions: i) How do plants divert iron to sink organs? ii) How do cells decide what cofactor to synthesize and which proteins to metalate? The project expands on skills I have mastered, brings together concepts from different disciplines (microbiology, plant physiology and human nutrition), and has the ambition to abolish iron deficiency in humans. One step at a time, this project will deliver results to fulfil my research ambition: to develop a plant that uses less fertilizers and accumulates iron in edible plant organs in a form tailored to our needs.

Resumen del Currículum Vitae:

Trained as a biologist, I have accumulated 15 years of experience in the field of mineral nutrition. My technical skills range from biochemistry and molecular biology to cell and organism physiology across various models. While my primary focus has been on the rhizobia-legume symbiosis and Arabidopsis, I have also worked on other bacterial groups, arbuscular mycorrhizal fungi, and, most recently, humans.

Based in Madrid for my bachelor, master, PhD and initial postdoctoral position, I was fortunate to visit during that period four other institutions in Spain (IRNASA-CSIC, EEZ-CSIC, EEAD-CSIC, IQFR-CSIC) and four institutions abroad (University of Bonn, IPK-Gatersleben, Swiss Light Source, European Synchrotron Radiation Facility). Since 2020 I am based in Oxford, where I have the pleasure to interact with researchers in a broad range of disciplines.

Throughout my PhD and early postdoctoral positions, I participated in research funded by different agencies at local (Comunidad de Madrid), national (Plan Nacional), and international levels (COST, ERC Starting Grant, Bill and Melinda Gates Foundation). I transitioned into an independent researcher focusing on iron homeostasis in endosymbiotic rhizobia after securing a Marie Skłodowska-Curie Fellowship (European Commission), followed by funding from the Eric Reid for Methodology fund (Biochemical Society, UK). Currently, within the Plant Heme project (Bill and Melinda Gates Foundation) I am responsible for the production of an iron compounds and the coordination of a Phase I clinical study. In parallel, I co-lead a project investigating the low O₂ signalling response in Medicago Nodules, funded by the Biotechnology and Biological Sciences Research Council.

During my career, I have contributed to 26 publications (8 as main author/co-author and two as co-corresponding author), 2 preprints, 2 book chapters as primary author, presented 41 communications at conferences, and I am currently preparing a patent application. Moreover, I have supervised 15 researchers (including undergraduates, master's students, a research assistant, and a postdoc), engaged in teaching activities (over 400 hours), participated in outreach activities, and served as a representative in various institutions I have been affiliated with.

Overall, this abbreviated curriculum vitae showcases my curiosity for science and the diverse skill set I have acquired, my ability to secure funding and deliver results, my aptitude for fostering successful collaborations, and my maturity as an independent researcher and future leader in the iron biology field.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Biomedicina
Nombre: SANZ PERL, YONATAN
Referencia: RYC2024-048802-I
Correo Electrónico: yonisanz@gmail.com
Título: Whole-brain models for designing non-invasive electrical stimulation treatments
Resumen de la Memoria:

I am a computational neuroscientist working at the Centre for Brain and Cognition at Universitat Pompeu Fabra, Barcelona, Spain, as a senior postdoctoral researcher. My research focuses on uncovering the underlying principles that support the collective behavior giving rise to whole-brain function. In particular, I aim to develop empirical and model-based biomarkers for pathological brain states, providing insights into diagnosis, prognosis, and treatment responses using neuroimaging recordings.

My approach combines computational modeling and data analysis through methods such as dynamical systems, statistical physics, non-equilibrium dynamics, and machine learning. During my postdoctoral research and tenure as an assistant professor, I gained extensive experience studying several pathological brain states and the role of computational modeling in understanding them. Specifically, I have worked on neurodegeneration, psychiatric diseases, disorders of consciousness (DOC), and major depressive disorders.

My main research lines include:

□ Whole-brain computational models and their perturbations: We developed whole-brain computational models at the group level to create model-based biomarkers (MBMs) for disorders of consciousness patients. Notably, we demonstrated that in silico perturbations computationally simulated external interventions provide valuable information about the stability and reversibility of consciousness states.

□ Turbulence dynamics in the human brain: We hypothesize that the emergent collective behavior of brain activity is supported by a turbulent regime. Our research demonstrated that model-based and model-free analyses, which yield turbulent measurements from fMRI empirical data, can differentiate global states of consciousness. Specifically, we found that information transfer flow decreases with diminished consciousness levels, such as in DOC or Alzheimer's patients.

□ Non-equilibrium whole-brain dynamics: We investigated how brain dynamics operate far from thermodynamic equilibrium at the macroscopic scale. Our findings revealed that non-equilibrium levels can serve as a signature of consciousness. We developed various methods to quantify the non-equilibrium nature of brain dynamics, explaining the underlying generative mechanisms driving deviations from equilibrium.

□ Low-dimensional brain dynamics representations: We proposed an interdisciplinary framework to generate low-dimensional representations of brain dynamics by combining whole-brain computational modeling with machine learning approaches. By training deep learning architectures, we generated low-dimensional representations of brain states and observed the emergence of a manifold in this space. This manifold maps the sequence of stages while preserving continuity, suggesting that low-dimensional representations effectively capture the signatures of progressively fading wakefulness and disease.

My future research builds on these findings, suggesting that pathological states, such as those observed in stroke patients, and their transitions can be understood through changes in non-equilibrium levels, turbulent dynamics, or trajectories within low-dimensional latent spaces. These approaches hold significant potential for diagnostic and prognostic applications.

Resumen del Currículum Vitae:

I completed my degree and master's in physics at the University of Buenos Aires (UBA) and subsequently earned my PhD with the highest qualification under the supervision of Prof. Dr. Gabriel Mindlin in UBA, financed by a PhD scholarship from CONICET, Argentina. Our research was published in Nature and was selected by the Nature editors as one of the top ten investigations of 2013. It has also been extensively covered.

I then joined Total Austral, an Argentinean affiliate of Total E&P (French Oil & Gas company), as a Senior Geomechanicist. I developed computational models to be implemented in the design of hydraulic fractures for unconventional wells in the Vaca Muerta formation. I also evaluated and implemented machine learning solutions to predict well productivity. Additionally, I led the creation of the Geomechanical lab within the affiliate, securing funding of over \$100,000 to establish the laboratory. During these years, I collaborated with geologists, engineers, and economists to assess the unconventional development as a strategic project for the company.

After that, I was awarded a permanent position as an Assistant Professor in 2019 (currently on leave) to investigate the brain dynamic of different brain states captured by neuroimaging, working with Dr. Tagliazucchi and Dr. Ibañez (6 papers, 3 as the first author). In 2020, I moved to Spain to work with Dr. Deco as a postdoctoral researcher within the Human Brain Project, developing whole-brain models to investigate different brain states (15 published papers, 3 as the first author). Later, I was awarded an MSCA Individual Fellowship to develop model-based biomarkers for patients with disorders of consciousness. This opportunity brought me to Paris, where I worked with Dr. Sitt at the ICM for two years (21 papers, 4 as the first and 1 as a shared last author). In 2023, I returned to Barcelona to rejoin Prof. Deco's lab as a senior postdoctoral researcher under the NEMESIS ERC Synergy Project (11 papers, 2 as the first author).

In summary, I have published 59 articles in international peer-review journals, 14 as the first author and 2 as a senior author in high-impact journals such as Cell Reports, Physical Review Letters, among others. These achievements reflect my ability to conduct high-quality, interdisciplinary, and international research, fostering a cooperative scientific environment and demonstrating independence (only 6 of my publications are co-authored with my PhD advisor). All methodologies and software developed during my research are freely available through my GitHub profile and most of my publications are open-access and included in public repositories as BioRxiv. My research has been featured regularly in newspapers, radio and television in Argentina, Spain and the U.K.

I am regularly invited as a speaker to participate in congresses and workshops, as well as to review articles for international journals. I have supervised and co-supervised students in Argentina, France, and Spain, including: 2 undergraduate students (UBA), 2 TFG (UPF), 4 Master's Final Projects in Brain and Cognition (UPF), 2 PhDs at UBA, 1 at ICM, Paris, and 3 at UPF. I have more than 10 years of teaching experience as a practical applications teacher and teaching assistant in undergraduate and PhD courses in Physics Department, UBA (with positive feedback from the student community).



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Biomedicina
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Título: Innovative Strategies to Overcome Tumor Immunosuppression and Enhance Efficacy of Immunotherapy in Cancer Treatment.

Resumen de la Memoria:

I have built a distinguished scientific trajectory centered on cancer biology, with a particular emphasis on the tumor microenvironment and immunometabolism. My research journey began during my PhD at GENyO, where I developed a strong foundation in the cell and molecular biology of cancer. My early work focused on elucidating the role of the extracellular matrix in tumor biology and vasculogenesis, which laid the groundwork for my future investigations.

During my postdoctoral tenure in Dr. Berta Sánchez-Laorden's laboratory at the Instituto de Neurociencias CSIC-UMH, I honed my skills in leading independent research projects, mentoring students, and implementing advanced techniques such as single-cell RNA sequencing and spatial transcriptomics. My contributions were pivotal in understanding the interactions between tumor cells and their microenvironment, particularly in the context of brain metastasis. I have authored numerous high-impact publications in the field of immunotherapy and targeted therapies for melanoma and brain metastasis.

I have actively engaged in competitive national and international research projects, enhancing my grant writing skills and fostering collaborations with leading experts in cancer research. My commitment to scientific outreach is evident through my involvement in initiatives like "Pint of Science" and "Skype a Scientist," aimed at disseminating scientific knowledge to the public and inspiring future generations of scientists.

Looking ahead, I aim to expand my research into the immunosuppressive mechanisms within tumors and develop innovative CAR-M (Chimeric Antigen Receptor Macrophage) therapies. I envision leveraging my strong foundation in in-vitro and in-vivo cancer models, molecular biology, and next-generation sequencing to address critical challenges in cancer treatment. My research will focus on understanding how the tumor microenvironment influences immune responses and exploring potential therapeutic targets to enhance anti-tumor immunity.

By securing prestigious grants, I plan to establish long-term collaborations with both Spanish and international research teams, ultimately contributing to advancements in cancer therapy and improving patient outcomes. My dedication to fostering the next generation of scientists through mentorship and supervision remains a core aspect of my future endeavors. My vision is to create a collaborative research environment that not only advances scientific knowledge but also translates findings into clinical applications, ultimately benefiting patients facing cancer.

Resumen del Currículum Vitae:

My name is Francisco Javier Rodríguez Baena, a dedicated researcher specializing in the fields of melanoma, brain metastasis, and immunotherapy. I was born on December 29, 1988, and I currently work at the Instituto de Neurociencias CSIC-UMH in Spain, where I have been since October 2017. I hold a Ph.D. in Biomedicine from the University of Granada, which I completed in 2017, as well as a Master's in Biotechnology (2012) and a Degree in Biology (2011).

My scientific journey began during my undergraduate studies in Biology, where I had the opportunity to participate in an Erasmus fellowship at the University of Utrecht in the Netherlands. There, I focused on *Neisseria M.* resistance biofilm formation, which not only led to my first publication but also fueled my passion for research. Under the mentorship of Dr. Rodríguez-Manzanique at GENyO in Granada, I transitioned my academic focus to tumor biology, where I explored the complexities of the extracellular matrix and its role in tumor vasculature development.

Throughout my postdoctoral tenure, I have prioritized mentorship and collaboration, guiding five Ph.D. students in their career development, which has resulted in relevant publications that enhance our understanding of the tumor microenvironment. I have also co-tutored two master's students, further contributing to the academic community. My work has been recognized through invitations to present at nine international congresses, and I was awarded the best oral talk at the ASEICA 2022 congress for my research on melanoma brain metastasis and immunotherapy.

I have been actively involved in outreach activities, organizing science dissemination events and engaging with the local community. I have led the local and national events of Pint of Science in Alicante for three consecutive years since 2021 and participated in the organization of the Brain Awareness Week at the Instituto de Neurociencias from 2018 to 2024. Additionally, I am a member of the council of the [Asociación de Divulgación Científica de Alicante](#), where we organize various outreach activities.

Looking ahead, I aim to expand my research into the immunosuppressive mechanisms within tumors and develop innovative CAR-M (Chimeric Antigen Receptor Macrophage) therapies. I envision leveraging my strong foundation in in-vitro and in-vivo cancer models, molecular biology, and next-generation sequencing to address critical challenges in cancer treatment. My research will focus on understanding how the tumor microenvironment influences immune responses and exploring potential therapeutic targets to enhance anti-tumor immunity.

In summary, my academic and research experiences have equipped me with a robust skill set and a deep understanding of tumor biology, and I am committed to advancing our knowledge in this critical area while fostering the next generation of scientists.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Biomedicina
Nombre: UKLEJA, MARTA
Referencia: RYC2024-049139-I
Correo Electrónico: ukleja.marta@gmail.com
Título: Structural studies to unravel molecular mechanisms of antibiotic resistance in ESCAPE pathogens
Resumen de la Memoria:

During my Ph.D. training and my first postdoctoral position in Gabriel Waksman's lab, I specialized in cryo-electron microscopy (cryo-EM) to study protein complexes and membrane proteins critical to bacterial pathogenesis. In 2017, I joined Daniel Lopez's lab at CNB-CSIC in the Department of Molecular Infection Biology to integrate my structural biology expertise with the lab's focus on bacterial lipid rafts in the pathogenic *Staphylococcus aureus*. As the sole cryo-EM specialist, I led efforts to establish a structural research component, developing my own projects and implementing structural approaches to address broader biological questions. My primary focus was on the biochemical and structural characterization of lipid raft components to elucidate their role in bacterial infection. In 2018, I was awarded the Marie Curie Individual Fellowship (RaftsStruc), enabling me to conduct groundbreaking research into bacterial lipid rafts. The project aimed to unravel the structure of these microdomains in *S. aureus* and reconstruct them in vitro, focusing on Penicillin-Binding Protein 2a (Pbp2a), a key player in broad-spectrum antibiotic resistance. By understanding how lipid rafts function as organizational platforms, this project provided critical insights into antibiotic resistance mechanisms. The success of this work led to an Extraordinary Extension of the Marie Curie Fellowship in 2020, aimed at retaining talent at CSIC and preparing for future applications to competitive funding programs, such as the European Research Council (ERC). In 2022, I was awarded the 3-year Juan de la Cierva Fellowship, allowing me to further develop my research in Daniel Lopez's lab. This work explores previously unknown aspects of Pbp2a's interaction with key protein partners, such as flotillin (a hallmark of bacterial lipid rafts) and components of the cell wall synthesis machinery. These interactions are central to understanding how Pbp2a enables *S. aureus* to resist β -lactam antibiotics. My aim is to generate a toolbox of methods and preliminary results to support future ERC Starting Grant and Ramón y Cajal applications, enabling me to establish an independent research group. Looking ahead, my primary objective is to study the mechanisms of antibiotic resistance and cell wall synthesis in ESCAPE pathogens, a group of multidrug-resistant bacteria that pose a significant healthcare challenge due to their ability to render antibiotics, particularly β -lactams, ineffective. Resistance emerges through the acquisition of low-affinity PBPs via horizontal gene transfer, allowing bacteria to continue cell wall synthesis despite the presence of antibiotics. My research has shown that Pbp2a from MRSA forms dimers, which are critical for its resistance function. Additionally, Pbp2a interacts with cell wall synthesis machinery, modulating its activity to adapt to antibiotic stress. In my future work, I plan to combine my expertise in cryo-EM with advanced CRISPR-based genetic approaches to investigate β -lactam resistance mechanisms. My goals include characterizing the oligomeric states of low-affinity PBPs, such as Pbp2a from MRSA and Pbp4/Pbp5 from *Enterococcus* species; using CRISPR gene tagging to identify the functional interactions and mechanisms these PBPs employ during cell wall synthesis under antibiotic pressure; and solving high-resolution 3D structures.

Resumen del Currículum Vitae:

I am a highly skilled molecular and structural microbiologist with over a decade of experience in structural biology, protein biochemistry, and microbiology. My research focuses on understanding protein interactions and the assembly of large protein complexes, with applications in bacterial pathogenesis and antibiotic resistance mechanisms. I hold two master's degrees—one in Molecular Biology and another in Organic Chemistry—both earned at the University of Warsaw, and completed her Ph.D. at the Polish Academy of Sciences in Warsaw. My doctoral work, under Prof. Andrzej Dziembowski, elucidated the structure and biochemistry of the CCR4-NOT complex, a critical regulator of mRNA degradation, culminating in multiple publications and international collaborations. My postdoctoral career spans prestigious institutions and groundbreaking research. From 2014 to 2016, she conducted postdoctoral studies at Birkbeck College, London, under Prof. Gabriel Waksman and Prof. Elena Orlova, where I employed cryo-electron microscopy to resolve the structures of bacterial Type IV secretion systems, leading to high-impact publications in *Nature* and *Cell*. Since 2017, I have been a Senior Postdoctoral Researcher at the Spanish National Center for Biotechnology (CNB-CSIC) in Madrid, working in Dr. Daniel Lopez's lab. My current work centers on bacterial membrane microdomains (lipid rafts), including the structural and functional analysis of the FloA-NfeD protein complex and the penicillin-binding protein Pbp2a, which play key roles in *Staphylococcus aureus* pathogenicity and MRSA resistance. Throughout my career, Dr. Ukleja has demonstrated an exceptional ability to secure competitive funding. I have been awarded the prestigious Marie Skłodowska-Curie Individual Fellowship (2018–2020) for her project on bacterial lipid rafts, as well as the Juan de la Cierva Incorporation Fellowship (2022–2025). My work has also received extraordinary MCSIF extension to support her contributions to CSIC and European Research Council calls. In total, I have secured over €400,000 in funding for my research initiatives. I have a robust publication record, with numerous articles in top-tier journals, including *Nature*, *Nature Communications*, *Cell*, and *The EMBO Journal*. My studies have contributed to novel insights into the structural biology of bacterial secretion systems, pilus biogenesis and protein-membrane interactions. My findings have also been showcased at international conferences, including the Gordon Research Conference and EMBO Practical Courses, where I have presented posters, and earned awards for my work. In addition to my research achievements, I have demonstrated strong mentorship and collaboration skills. I have supervised Ph.D. students: Ivan Camilo Acosta Garcia (the defense in 2020) and David Torrens Gonzales (2024–2027) with the project focused on the structure and function of flotilins from different bacterial species. My international collaborations include work with Dr. Felipe Cava's lab at Umeå University on penicillin-binding proteins, which further highlights her interdisciplinary and global research network. I have balanced my scientific success with personal milestones, including maternity leave periods, underscoring her resilience and commitment to advancing my field.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Ciencias de la educación
Nombre: FELTRERO OREJA, ROBERTO
Referencia: RYC2024-049375-I
Correo Electrónico: rfeltrero@fsof.uned.es
Título: Tecnologías cognitivas: transformaciones cognitivas, educativas y sociales derivadas de la innovación disruptiva en tecnologías computacionales

Resumen de la Memoria:

Internacionalización, independencia y liderazgo son las señas de identidad de mi trayectoria investigadora. Mi doctorado en ciencias cognitivas, campo interdisciplinar en sí mismo, y mi especialización en las aplicaciones educativas e investigadoras de las tecnologías digitales y sus modelos de innovación social disruptiva, me han llevado a ser útil en diversos campos de investigación y, por tanto, a tener la posibilidad de conseguir contratos en numerosas instituciones y proyectos de investigación nacionales e internacionales. Desde mis primeras becas para estancias de investigación predoctoral, hasta mis actuales contratos de transferencia con universidades dominicanas o proyectos de investigación europeos, siempre he completado mi trabajo principal con iniciativas independientes que me han conectado con estudios, proyectos y equipos de investigación internacionales. 17 meses de estancias de investigación predoctoral y 67 meses de contratos postdoctorales en 6 instituciones y 4 países diferentes (UNED y CSIC, España; COGS, Reino Unido; UNAM y SCyDC, México; y MESCTY, República Dominicana) atestiguan esta capacidad para desarrollar mi trayectoria investigadora de manera proactiva, independiente y basada en la transferencia de conocimientos a la sociedad.

Los 9 contratos laborales en diferentes programas de formación e investigación en las referidas instituciones y países atestiguan el interés generado por mis investigaciones y la confiabilidad de mi trabajo y mis capacidades (en cada una de las instituciones en las que he trabajado, siempre he sido requerido para repetir experiencia con diferentes modalidades de contrato).

Las diferentes áreas de investigación en las que impacta la innovación disruptiva en tecnologías computacionales me ha llevado a trabajar en instituciones y proyectos de Educación, Filosofía, Ciencias Sociales o Diversidad Funcional y Cultural. Las necesidades de formación de estudiantes, profesores e investigadores en estas nuevas tecnologías siempre me abrieron más posibilidades laborales en el campo educativo y, por ello, mi trayectoria de investigación ha acabado centrándose también en la línea educativa.

Actualmente lidero la línea de investigación en aplicaciones educativas de la inteligencia artificial en el grupo SMEMIU de la UNED en el que trabajo como investigador postdoctoral, trabajando en las aplicaciones educativas de las tecnologías disruptivas (redes neuronales profundas y algoritmos evolutivos) que empecé a conocer en el año 2001 en mis estancias de investigación en la escuela de ciencias cognitivas de la Universidad de Sussex. Mi trayectoria postdoctoral ha sido desafiante, incluyendo un largo periodo de desempleo durante el cual persistí en la investigación. Logré obtener contratos internacionales y, por fin, una beca postdoctoral, interrumpida por mi paternidad. Aunque solicito este programa en el plazo límite permitido, me encuentro en el momento óptimo de madurez para iniciar el proyecto de investigación para el que me he preparado todos estos años, requiriendo solo la oportunidad y financiación necesarias

Resumen del Currículum Vitae:

Roberto Feltrero (1970) is a postdoctoral research associate at UNED. Member of the SMEMIU research group, leading the line on Artificial Intelligence and Big Data for media education. Accredited by ANECA as Permanent Teaching Staff

1. Scientific contributions: author or co-author of 19 indexed journal papers (1 art. JCR Q1, 2 art. JCR Q2; 4 arts. SCOPUS Q1, 1 art. SCOPUS Q2, 1 art. SCOPUS Q3; h-index=3), more than 20 book chapters on SPI Q1 and Q2 editorials (Palgrave Macmillan, King's College, UNAM, UNED, Universitas S.A., Routledge, Springer), 5 edited books. More than 20 contributions to conference proceedings with peer-review. More than 80 contributions (30 invited) presented in national and international conferences. More than 20 research projects (being IP or co-IP at 5 of them) funded by different institutions, with a significant presence in international projects: (4 EU-funded projects, 6 Mexican CONACYT funded projects and 1 Dominican Pedagogical University funded project)

2. Contributions to society:

-Contracts and transfer merits: researcher on 6 transfer projects for improving educational quality (SDG 4), 1 with European Institutions and 5 with Dominican Universities, with a total budget of more than 200.000€. Contract as external researcher writing reports for industry at INREDIS project (CEN-2007-2011). Individual amount: 32.000€. -Founder, CEO and academic leader of Project Heliox (<https://proyctoheliox.org>), a non-profit group of academics devoted to the design of assistant technologies such as HelioxOS, Heliox Access app or LLMtoolkit, funded with more than 15.000€ by national and international projects.

3. Contributions to training and mentoring: Mentored 16 master's theses and 1 doctoral thesis at UNED's Faculty of Education and currently supervising 2 doctoral theses, both set for defence in 2025. As PI on multiple projects, guided grant holders and assistants in creating technological resources, articles, and conference presentations. Led a research group at ISFODOSU (Dominican Republic), mentoring my peers in academic research, resulting in 4 proceedings, 2 indexed articles, and 1 monograph. Delivered over 20 diplomas, courses or seminars in educational technologies and innovation across more than 10 institutions, including UNED, CSIC, and USAL (Spain); UNAM, FQ, IIF, SCyDC, ITSON, and UACH (Mexico); Darmstadt (Germany); and ISFODOSU and INTEC (Dominican Republic).

4. Other contributions: dissemination activities, such as 3 hackathon (as a participant and as a mentor) and 8 interviews in different scientific communication and dissemination media for the promotion of social entrepreneurship and innovation in assistive technologies. Promoting teaching training on AI and Education: design and teaching of lifelong learning courses at UNED, Spain and at ISFODOSU, Dominican Republic, involving students in the design and resolution of educational problems related to AI tools for education. 2022-2025-continue.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Ciencias físicas
Nombre: PÉREZ VIDAL, ROSA MARÍA
Referencia: RYC2024-051373-I
Correo Electrónico: perezvidal@lnl.infn.it
Título: Experimental Nuclear Structure Studies and Instrumentation Developments for AGATA
Resumen de la Memoria:

My research interests are focused on the study of nuclear properties of exotic nuclei with stable and radioactive-ion beams experiments, in particular, using the state-of-the art high-resolution gamma-ray spectroscopy detector, AGATA (Advanced Gamma Tracking Array), hosted at the LNL at the moment. AGATA works on the basis of the technique of gamma-ray energy tracking in electrically segmented high-purity germanium crystals. I have performed nuclear physics experimentation within the AGATA collaboration completing a variety of experimental work at different world-class laboratories (such as GSI in Germany, GANIL in France and LNL in Italy) and being formed in experimentation with heavy ion beams with fusion-fission, fusion-evaporation, elastic, inelastic and multi-nucleon transfer reactions. I have gained experience in the use and analysis of AGATA and complementary detectors (magnetic spectrometers, particle detector arrays) as well as in lifetime techniques, becoming a key person for the AGATA collaboration.

The research lines on nuclear structure studies that will be developed in the course of the grant include: 1) investigation of the seniority symmetry in nuclei with the valence particles in orbitals with $j > 7/2$, 2) study of exotic nuclei in the vicinity of the proton-neutron symmetrical nuclei ($N=Z$), 3) Evolution of collectivity and deformation in exotic nuclei, 4) study of neutron-rich nuclei towards the $N=40$ island of inversion. To accomplish these studies, the research plan will pursue two well definite directions. On one hand, the instrumental development of the AGATA tracking array through my leadership of the AGATA performance team. On the other hand, the experimental activity mainly exploiting the state-of-the AGATA array coupled to the PRISMA large-acceptance magnetic spectrometer or its configuration at Zero Degrees with both stable and radioactive beams at the LNL laboratories (Italy). As well as other world class facilities (for example the most exotic neutron-rich nuclei can only be produced at in-flight facilities such as RIBF in RIKEN (Japan) or FAIR in GSI (Germany)).

Resumen del Currículum Vitae:

During my PhD I have benefit from the Research Training program (FPI fellowship) associated to the High Resolution Gamma Spectroscopy towards AGATA project (FPA2011 - 29854 -C04 -02) funded by MINECO (Spain) and awarded to the bests qualified degree and Master student. The purpose of this project was the experimental study of nuclear structure with gamma spectroscopy methodology applied with the AGATA tracking array. In addition, I obtained grants to support stays of several months in the Laboratories hosting AGATA (3 months at GSI, Germany, in 2014 and 6 months at GANIL, France, during 2015 and 2016; EEBB-I-14-08606, EEBB-I-15-09671, EEBB-I-16-11451 financed by MINECO, Spain). From 2020 up to 2024 I worked as a postdoctoral researcher at the INFN-Laboratori Nazionali di Legnaro (LNL), Italy. In the first 2 years, I have benefited from the INFN fellowship for non-Italian citizens (bando 21383/2019). In the subsequent 2 years, I secured a postdoctoral contract APOSTD2022 type A to conduct my work entirely at LNL (supported by Generalitat Valenciana with grant CIAPOS/2021/114).

Presently, I have a postdoctoral research contract at the Instituto de Física Corpuscular (IFIC) in Spain. My research covers two important aspects of the AGATA project. One aspect is instrumental and related to the performance figures of AGATA and its operation and readiness. In this regard, I have been responsible for the AGATA data preparation and processing during my postdoctoral period at LNL. I coordinated the work of other postdocs (3) and Ph.D. students (6) on AGATA data analysis and the preparation of AGATA software analysis, as well as I train students from abroad in the Analysis schools organized by the AGATA collaboration. Lastly, I have been recently appointed as the new leader for the AGATA performance team by the AGATA Management Board (AMB).

Another aspect is scientific and focused on the nuclear structure experimental lifetime studies using multinucleon-transfer reactions with AGATA coupled to the PRISMA magnetic spectrometer, as well as other reaction mechanisms using complementary detectors. I have been spokesperson of 6 experimental proposals and 2 Letters of Intent at LNL, and 2 experimental proposals in RIKEN (Japan) and JYFL (Finland). Currently, I am a leading spokesperson of 3 experiments performed at LNL in 2024: in March, for nuclear structure studies of the neutron-rich isotopes in the vicinity of $Z=28$; in July, for the assessment of the AGATA performances up to 5 MeV; and in November, the investigation of the shape coexistence and triaxiality in the Cr isotopes towards $N=40$. In 2024 as well, I have been part of the organizing committee of the Nuclear Structure and Dynamics conference. In addition, I have co-tutored 2 bachelor students, 2 master students and nowadays I co-supervise a Ph.D. student. Furthermore, I have participated in 10 projects funded through competitive calls of public entities, I have more than 45 publications and more than 550 citations with an H-index factor of 15 and I have disseminated my research results in 16 workshops and 11 conferences



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Ciencias físicas
Nombre: RIBAS GOMEZ, ALVARO
Referencia: RYC2024-050862-I
Correo Electrónico: alvaroribas87@gmail.com
Título: Towards a comprehensive understanding of planet formation
Resumen de la Memoria:

I am interested in the formation of planetary systems, focusing on protoplanetary disks while also considering the broader picture of stellar formation, debris disks, low-mass objects, and exoplanets.

My research focuses on different aspects of protoplanetary disks and their evolution, both from a statistical point of view and through detailed studies of interesting individual systems that could inform us about how planet formation takes place. I am an expert on radio interferometry with a particular emphasis on ALMA observations, which currently is my main line of research. I also use multiwavelength observations of large disk samples in different star-forming regions and analyze them from a statistical (usually Bayesian) perspective, in combination with detailed radiative transfer models. To aid in this process, I employ machine learning methods to accelerate these models so that they can be applied to large samples. Additionally, I have worked extensively with far-infrared observations from the Herschel Space Observatory and the VLA radio interferometer.

My work has yielded a number of significant results for the planet formation field, including: 1) the most precise estimation of the typical lifetime of protoplanetary disks, a crucial quantity that constrains the time available for planets to form, 2) the statistical confirmation that high-mass stars disperse their disks faster than their low-mass counterparts, which may impact the population of exoplanets that they host, 3) a large-scale study of protoplanetary disks with Herschel, which revealed potential differences in their dust properties among different star-forming regions, 4) the development of the first artificial neural network to model protoplanetary disks and its application to a large disk sample, revealing that previous disk mass measurements are underestimated and that our standard model prescriptions may still be missing important physical processes, 5) an in-depth ALMA study of the only disk which, when observed at very high-angular resolution, shows no discernible substructures, and 6) a novel and much more straightforward interpretation of some crescent-shaped asymmetries in disks which also allows to characterize their vertical structure. All these works have helped the community to better understand disk evolution and its impact in planet formation.

I have authored of 66 peer-reviewed papers (10 as first author) and have led multiple observing proposals (ALMA, VLA, VLT). I am also a member of the SPHERE/VLT DESTINYs and VLA V-SHARDS large programs, of the DUSTBUSTERS MSCA-funded international project, and also collaborate in two large international efforts to study disks in multiple systems and edge-on disks with ALMA and the James Webb Space Telescope.

I am currently, working on high-resolution ALMA surveys of protoplanetary disks in different star-forming regions, and in the future I plan to combine my expertise with large samples, statistics, and radio interferometry to produce a demographic view of disks substructures (rings, gaps, spiral arms), linking them to the population of newborn exoplanets that may be causing them. In parallel, I will also continue to apply machine learning methods to increasingly complex disk models.

Resumen del Currículum Vitae:

My research career began during my undergraduate studies in 2011 with a 6-month Traineeship at the European Space Agency (ESA), where I analyzed Herschel observations of star-forming regions. During my Master's, I returned to ESA for one year, testing software for Herschel data analysis. In 2012, I began my Ph.D. at the Center for Astrobiology (CAB INTA-CSIC), focusing on protoplanetary disk evolution. My work characterized large disk samples, advancing understanding of planet formation processes.

In 2015, I joined Catherine Espaillat's group at Boston University as a postdoctoral researcher, contributing to groundbreaking studies on disks with cavities. In 2018, I was awarded the prestigious ESO Fellowship, where I combined independent research with ALMA operations, gaining extensive expertise in radio interferometry. Since 2022, I have been a research associate at the University of Cambridge, collaborating with Cathie Clarke's group on ALMA observations of disks. My work integrates observational and statistical insights to better characterize planet-forming disks.

I have authored 66 peer-reviewed papers (10 as first author) and led multiple successful ALMA, VLA, and VLT observing proposals. I am actively involved in the DESTINYs and V-SHARDS large programs, the MSCA-funded DUSTBUSTERS project, and I am also part of two international collaborations studying disks in multiple systems and edge-on disks using ALMA and JWST.

Beyond research, I have delivered over 28 talks at conferences and universities (10 invited) and been an invited lecturer for five university courses and three international schools for early-career astronomers. At the University of Cambridge, I was a Teaching Assistant for the Structure and Evolution of Stars undergraduate course. I have supervised three interns, eight Master's students, and co-supervised a Ph.D. student. I served on four NASA review committees (including two JWST cycles), ESO and UK's national funding committees, acted as technical secretary for the 2019 ALMA Proposal Review panel, and organized seven conferences and workshops, including one of the largest conferences on planet formation in recent years, which I also co-chaired.

Finally, outreach is also central to my career and I regularly engage in public observing nights, outreach talks at schools and events organized by research institutions, as well as various media interviews.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024
Turno General

Área Temática: Ciencias matemáticas
Nombre: CHALMOUKIS , NIKOLAOS
Referencia: RYC2024-049656-I
Correo Electrónico: nikoschalm@gmail.com
Título: Academic career of Nikolaos Chalmoukis
Resumen de la Memoria:

The academic career consists of five parts. The first part contains general information. The second part "Scientific and technical contributions" contains a description of my contributions in the lines of research I have been following. The third part "Internationalization and mobility" contains a description of the international dimension of my career, specifically the participation in international grants, research groups, congresses, conferences and workshops and research stays. The fourth part "Independence and leadership" contains a description of my role as principle investigator and team member in various research projects and my experience in student mentorship and evaluation of research. The last part contains a description of the future lines of research I am interested in pursuing.

Resumen del Currículum Vitae:

My CV contains all relevant information concerning my academic career.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Ciencias matemáticas
Nombre: HUANG HUANG, QIAN
Referencia: RYC2024-048848-I
Correo Electrónico: qian.huang@mathematik.uni-stuttgart.de
Título: Structure-preserving moment closure of kinetic equations: Toward a hydrodynamic theory for active matter
Resumen de la Memoria:

I obtained my PhD at Tsinghua University (2012-2017), where I focused on ash formation and deposition in coal combustion. Combining experimental and theoretical approaches, I pioneered the use of kinetic population balance equations in this field and uncovered key mechanisms underlying submicron fly-ash particle formation. This work laid a solid foundation for my later contributions to kinetic theory.

From 2017 to 2019, I conducted postdoctoral research at the Zhou Pei-Yuan Center for Applied Mathematics, Tsinghua University, under the supervision of Prof. Wen-An Yong. During this period, I initiated a systematic study on quadrature-based moment methods for solving kinetic equations. I developed novel analytical techniques to address critical issues, including hyperbolicity, dissipativeness, and realizability of these models. This phase marked the beginning of my long-term commitment to advancing moment closure techniques.

From 2019 to 2024, I served as a Research Assistant Professor in the Department of Energy and Power Engineering at Tsinghua University. I independently established the AI for Energy research direction, applying data-driven methods to optimize power plant operations. I also made significant contributions to my team's exploration of ammonia combustion as a carbon-free energy alternative. In parallel, my continued work on moment methods advanced their theoretical foundations and enabled new applications, including extensions to multidimensional velocity spaces. Most notably, I invented a new Poisson method of moments for kinetic equations with velocity of constant magnitude, which ultimately sparked my strong interest in active particle systems.

In 2024, I joined the University of Stuttgart as a postdoctoral researcher in Prof. Christian Rohde's group, returning to applied mathematics. I contribute to Germany's SPP-2410 project on statistical conservation laws, with the aim of improving our understanding of turbulent flow statistics. This international collaboration has deepened my mathematical expertise and broadened my global academic network.

My career trajectory exemplifies a balance between innovative problem-solving, interdisciplinary collaboration, and applied impact. Building upon this foundation and based at UC3M, my proposed research focuses on developing hydrodynamic theories for the seminal Vicsek model, as no existing theories adequately describe the phase-separation states of the system. The project integrates mathematical analysis, kinetic modeling, and data-driven approaches, structured around three work packages: WP1 to perform particle simulations to generate ground truth data (used to test mechanistic models and train data-driven models); WP2 to further improve and apply the Poisson method to develop new mechanistic hydrodynamic models; and WP3 to incorporate deep neural operators for constructing novel data-driven hydrodynamic models. This endeavor combines high-risk, high-impact scientific exploration with a well-structured, collaborative, and feasible research plan, consolidating my expertise and international connections.

Resumen del Currículum Vitae:

My research has bridged the fields of applied mathematics and engineering, focusing on kinetic equations and their applications in energy systems, clean combustion, and active matter. Integrating mathematical analysis, numerical simulation, AI methods, and experiments, I have published over 60 papers, secured 10 patents, and achieved 770 citations. A complete version of my CV is available on: <https://www.ians.uni-stuttgart.de/institute/team/Huang-00013/>.

1. Scientific Contributions

(1) Kinetic and hydrodynamic modeling: Motivated by the use of kinetic models in combustion (see (2)), I have significantly advanced theoretical and computational understanding of quadrature-based methods of moments for solving kinetic equations. I resolved challenges in hyperbolicity and dissipativeness of several moment closure systems, and developed their extensions to multi-dimensional systems. A novel method (Poisson-EQMOM) has been successfully applied to polar active matter, uncovering new wall-induced bands. Additionally, I am actively advancing research on statistical conservation laws within the German SPP program.

(2) Clean combustion: I pioneered the application of kinetic population balance equations in studying ash formation and deposition in coal combustion, and discovered an influential 'glue effect' where fine particles enhance large particle deposition. I led systematic research on ammonia combustion and proposed novel techniques to reduce nitric oxides emissions.

(3) AI for Energy: I developed AI-based predictive models for early warning of tube overheating risks in thermal power units, and the product is being deployed in real world.

2. Funding

I served as PI for over 10 national and enterprise-funded initiatives.

3. International collaborations and recognition

For applied math (moment closure), I establish wide collaborations with leading experts from Europe and US. Particularly, I recently visited UC3M and University of Vienna to boost connections with the math community of active matter. My combustion research benefited from joint developments of combustors and simulation models with German researchers. My energy research output won the Geneva Invention Exhibition Gold Medal (2023), in which I am the 2nd ranked contributor among 8 team members.

4. Contributions to Society

My research has contributed significantly to technological innovation and its practical application in the energy sector. My work on ammonia combustion has provided feasible pathways for carbon-free power generation. I developed patented solutions to clean combustors and many aspects of safe & efficient operation of thermal power units. They have been adopted by several Chinese energy enterprises. We open sourced our novel Poisson-EQMOM to facilitate studies on active matter.

5. Mentorship and Training



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

During my faculty stay at Tsinghua University, I mentored one master student, who won the National Scholarship (2023) and Excellent Master Thesis Award (2024) and is now pursuing a PhD. I co-taught two undergraduate courses, 'Combustion Theory' and 'Energy Practices', mentoring >10 students in undergraduate research projects. My interdisciplinary research inspired students to transition into advanced fields, such as mathematics at Tsinghua, or continue their graduate studies in energy areas.

6. Other Contributions. I serve as a reviewer for over 15 international journals.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Ciencias matemáticas
Nombre: MORRIS, PATRICK
Referencia: RYC2024-049272-I
Correo Electrónico: pmorrismaths@gmail.com
Título: Topics in extremal combinatorics, random structures and discrete processes
Resumen de la Memoria:

My research focuses on topics at the intersection of extremal and probabilistic combinatorics. My most important contributions have been in pseudorandom graphs, where I recently established a tight condition for the existence of a triangle-factor, solving a famous conjecture of Krivelevich, Sudakov and Szabó from 2004 which had become one of the central problems in this area (single author project, published in JEMS), in Bootstrap Percolation, where over several papers, I have built the theory of the maximum running times of graph bootstrap processes and in the field of Spanning Structures, where my contributions have solved many important open questions and set new research trends. In recent years, my research has focused on an increasingly diverse range of topics, often forging connections between combinatorics and other strands of pure mathematics such as probability theory and number theory as well as topics in computer science. The general aims of my work plan over the next five years are varied and include solving longstanding open problems and conjectures, building theory towards understanding discrete objects and phenomena and developing powerful general methods in the area.

Resumen del Currículum Vitae:

I am currently a postdoctoral researcher at the Univesitat Politècnica de Catalunya (UPC), funded by a Marie Curie fellowship from the European Union. I have 15 journal articles published in very highly regarded general mathematics journals (J. Eur. Math. Soc./JEMS, Bull. Lond. Math. Soc.) and leading specialist journals in both Combinatorics (JCTB, Rand. Struct. Algor., JCTA...) and Probability (Electron. Journ. Probab.) and a further 6 preprints submitted for publication. I also have 7 extended abstracts appearing in peer-reviewed conference proceedings including the leading Computer Science conference SODA (SODA20, SODA21) and one which was awarded the Best Paper Award at the top Latin American Computer Science conference LAGOS 2023. My work has a total of 153 citations (Google Scholar).

I obtained my PhD from the Freie Universität (FU) Berlin in October 2021, supervised by Prof. Tibor Szabó. My thesis received the top grade, summa cum laude (outstanding). Before this, I completed a Master's at FU Berlin and a 4-year Msci course at the University of Bristol. My record in education has been celebrated with several awards. I won the Henry Ronald Hasse prize at the University of Bristol for being the best single honours mathematics student as well as the IMA prize for outstanding achievement. For my PhD thesis, I was awarded the Math + Dissertation Award (2000), one of three cross-institutional annual prizes for mathematics dissertations in Berlin.

I have also been awarded competitive grants and scholarships at every stage of my professional carrer, totally over €380,000, including the highly competitive (between 10% and 18% acceptance rate) Marie Curie postdoctoral grant from the EU, a German Walter Benjamin grant and a Spanish Juan de la Cierva formación grant after being ranked 2nd in mathematics in the 2021 national call.

My work has been disseminated through a total of 54 research talks at leading Combinatorics conferences such as EuroComb and RS&A, competitive CS conferences, invited talks at minisymposia, workshops and other international events, and university seminars. My strong research profile has also led to me being invited to several meetings of experts at leading institutes such as MFO Oberwolfach in Germany (2022) and the Mittag-Leffler Institute in Sweden (2024). I have taken extended research visits (at least 10 days) to many top institutions including MIT in Boston, US (2019), Tel Aviv University in Israel and IST in Austria (2023) and NTU in Taipei and IMPA in Brazil (2024). I have built an extensive professional network with 35 coauthors based in Austria, Brazil, Chile, China, Germany, Israel, the Netherlands, Slovenia, Spain, Taiwan, UK and USA.

I have lectured and/or tutored 14 courses at undergraduate, master's and graduate level and have cosupervised 1 undergraduate thesis and 1 master's thesis. I am currently supervising 1 further master's thesis and a PhD thesis.



AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024
Turno General

Área Temática: Ciencias matemáticas
Nombre: MARTINEZ GARCIA, JESUS
Referencia: RYC2024-049909-I
Correo Electrónico: askateth@gmail.com
Título: Birational geometry, K-stability and moduli spaces
Resumen de la Memoria:

My research has interactions with complex and differential geometry and underpins problems in mathematical physics (more specifically, to M-theory). In my work I use techniques of computational algebra, developing my own software to solve geometric problems. My contributions are in three areas:

- * Moduli spaces.
- * K-stability.
- * The classification of varieties of Fano type.

My ten major contributions include:

1. An upward career trajectory, including 13 research papers in international research journals (8 of them Q1), a 455-pages long research monograph (which has received over 92 citations since publication in 2023), 2 software packages and 4 proceeding papers. In spite of having 24 collaborators with whom I have published, in most of my papers I am the corresponding author.
2. Developing computational capability to describe GIT quotients.
3. Producing the first examples of variations of the K-moduli of log del Pezzo pairs.
4. Determine the K-stability of most Fano threefolds.
5. Providing the most extensive description of the K-moduli of smooth Fano threefolds to date.
6. Proving the existence of cscK metrics on del Pezzo surface and finding obstructions to their existence.
7. Classifying rational Calabi manifolds.
8. Studying pathologies in K-moduli.
9. Giving the only non-trivial examples to day of K-stable Fano manifolds over fields of finite characteristic.
10. Classifying minimal asymptotically log del Pezzo surfaces.

My high-mobility career is highly international and I have held a number of international collaborations supported by international mobility grants. I have worked or studied at 8 different institutions in 4 different countries (Spain, UK, US and Germany). I have received a number of grants to carry out collaboration with international groups.

I have considerable experience in winning and managing research projects, supervising the research of others and organising activities both national and international within my field. Highlights of this include my grant (as PI) by the UK EPSRC with a total budget of 288,584, a programme grant for 119,270 (as co-I) and a number of smaller grants adding up to 52,000. I have supervised one PhD student to completion who has gone on to lead a successful career with fellowships at Cambridge, Tsinghua and Imperial and I am currently supervising two further PhD students. I have supervised over 22 BSc final-year projects and 19 MSc students. I have organised 10 international conferences, and several weekly seminars, as well as the best attended online seminar during the pandemic. I have held the roles of Deputy Director of Research, Director and Deputy Director of PhD studies and Leader of Research Group. I am a regular reviewer of grant applications, research journals and I serve in the Research Grants Committee of the London Mathematical Society (the UK learned society for mathematics). I also serve in the Scientific Committee of the British Mathematical Colloquium.

During the RyC fellowship, I intend to follow lines of research which are radically different from previous work at a technical level. These will be in three directions:

- RO1. Non-reductive computational GIT, variations of GIT and global invariants
- RO2. Classification of Calabi surfaces.
- RO3. K-moduli of non-smoothable Fano surfaces and smooth Fano threefolds.

Resumen del Currículum Vitae:

I have enjoyed an international research career. After degrees at Cambridge and Edinburgh, I held postdocs at Johns Hopkins University (JHU), the Max Planck Institute and Bath. I joined Essex in 2019 as a Lecturer (permanent Assistant Professor) promoting to Senior Lecturer (Associate Professor) in 2022.

My research is in algebraic geometry, with applications to complex geometry and focus on:

1. developing techniques for the explicit description of moduli spaces of varieties,
2. determining the K-stability of Fano varieties and proving the existence of canonical metrics
3. the classification of varieties of Fano type.

Some of my main contributions are:

- 1a) Described the one-dimensional components of the K-moduli of smooth Fano threefolds
- 1b) Provided algorithms and software to solve any reductive GIT problem
- 2) Provided the most extensive classification of K-stable smooth Fano threefolds in three decades and described the rational surfaces accepting a canonical metric in all Kähler classes
- 3) Classified non-factorial nodal Fano threefolds with 1 node and class group of rank 2



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

My research has resulted in 14 research papers in high impact journals (over half of them in Q1 journals), 2 preprints under consideration by Q1 journals, 4 proceedings articles, 2 software packages and one 455-pages research monograph (Cambridge University Press, 92 citations in 2 years). I have 238 citations and 181 in the last 5 years and an h-index of 8.

My research was funded by several small grants and a UK Engineering and Physical Sciences Research Council grant, which I manage as Principal Investigator with a budget of 232,323. I have participated in 2 nationally-funded projects (one as co-PI, one as co-I), 4 internationally founded (3 as co-Principal Investigator, one as postdoc) and 5 locally funded (as PI), all obtained via competitive processes. I received the Seal of Excellence Skłodowska-Curie action in 2018.

My research is internationally-leading, having delivered 27 invited/keynote talks at international conferences, and 36 seminars at prestigious universities. My expertise is requested in research evaluation processes. I serve in the London Mathematical Society (LMS) Research Grants Committee (2023-26), the British Mathematical Colloquium Scientific Committee (2024-now) and I am a grant reviewer for research centres and grants in the UK, Japan and Spain.

I have organised various research activities. From 2020-22, I co-organised the Zoom Algebraic Geometry (ZAG) Seminar, a global online seminar with 2,000 subscribers, over 200 speakers including four Fields medallists and up to 400 attendees per event and I recently finished editing its proceedings (232 submissions, CRC Press, 2025). I organised departmental seminars and co-organised 10 international conferences. To support these conferences, I secured funding from 16 grants totalling over 65,000.

Since 2023 I lead my Research Group Algebra, Geometry and Discrete Mathematics at Essex and I have been Director (2023-24) and Deputy Director (2024-25) of PhD Studies. I mentored two postdocs and I am the sole PhD supervisor of two PhD students. My former PhD student went on to postdocs at Glasgow, Cambridge and is currently a postdoctoral fellow in a joint position held between Tsinghua University and Imperial. In 2024 I was nominated by students to the Essex Supervisory of the Year Award.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Ciencias matemáticas
Nombre: MIRANDA NEIVA, ERIC
Referencia: RYC2024-050687-I
Correo Electrónico: eric.miranda-neiva@college-de-france.fr
Título: An expert in finite element methods for PDEs with moving boundaries and interfaces, working to increase our capabilities to bioengineer new materials and tissues.

Resumen de la Memoria:

My main research field is the numerical approximation of partial differential equations (PDEs) with the Finite Element (FE) method. Throughout my career, I have made outstanding scientific and technical contributions in two main areas: (1) numerical analysis of dynamic interface and mixed-dimensional problems with unfitted methods and (2) fast FE solvers for metal 3D printing processes.

Unfitted (or immersed-boundary) methods are arising as robust techniques to approximate PDEs with complex and deformable geometries. In this area, I have decidedly contributed to establish the Aggregated FE Method (AgFEM) as a standard and increasingly adopted unfitted FE method. I have been the first to formulate and analyse AgFEM for interface elliptic problems, for high-order approximations and on parallel adaptive tree-based meshes. I played a key role in linking AgFEM with the most common approach in unfitted FEs (ghost penalty stabilisation) and proving that only AgFEM is locking-free. All these results have pushed leading authors in the community to examine AgFEM themselves.

Regarding metal 3D printing processes, I led a thorough numerical assessment and experimental validation of time-lumping strategies, a common practice in engineering to speed up printing simulations. I provided exhaustive guidelines to help end-users tune time-lumping parameters. I have also pioneered a fully parallelised simulation workflow for FE models of these processes, which is currently inspiring other parallelisation approaches in the field. This work leveraged forest-of-tree meshes, which are the most scalable approach for parallel adaptive mesh refinement and coarsening. Parallel FE codes atop them have existed for over a decade, yet the correctness of the underlying algorithms had not been rigorously proven, until I helped provide the missing mathematical proofs. As a result, other authors can now reproduce those algorithms with more confidence and understanding.

At CNRS, I am implementing my own research project, FEM4Embryo, with the aim of developing new unfitted FE methods to model the mechanics of living cells and tissues. I am about to finish: (1) a novel and ambitious unfitted FE framework for the numerical approximation of dynamic surface and coupled surface-bulk PDEs and (2) the supervision of a MSc thesis from a mathematical engineering student from Politecnico di Milano.

My main goal in the RyC is to formulate and analyse novel C1-continuous unfitted FE methods for mixed-dimensional PDEs with dynamic interfaces. I plan to apply my new formulation to study curvature-driven processes in cell biology. The bigger picture is that my research eventually contributes to gain better quantitative and mechanistic understanding about the mechanics of living cells and tissues.

Resumen del Currículum Vitae:

I am an MSCA postdoctoral fellow at the Multiscale Physics of Morphogenesis group of Hervé Turlier in Paris (turlierlab.com). I joined Dr Turlier's biophysics team in Nov 2021. The group belongs to the Center for Interdisciplinary Research in Biology (CIRB), a joint research unit of Collège de France and the Centre National de la Recherche Scientifique (CNRS), my current employer.

I hold a double bachelor+master degree in mathematics and civil engineering from the Universitat Politècnica de Catalunya (UPC) and a master's degree on numerical methods in engineering from the UPC and the Centre Internacional de Mètodes Numèrics a l'Enginyeria (CIMNE).

My PhD in Oct 2020 at the UPC centred upon the lack of fast and reliable finite element (FE) methods for digital product design and certification in metal 3D printing processes. It was supervised by CIMNE-UPC full professors Santiago Badia (former ERC StG) and Michele Chiumenti.

After defending my PhD, I stayed for one year at Prof Badia's team, until the lift of COVID-19 mobility restrictions allowed me to grow my career outside Spain. My goal abroad was to move from 3D printing to an application in basic science and to launch my own research line. I have achieved both objectives thanks to my MSCA postdoctoral fellowship, which began in May 2023. My MSCA project's goal is to design new Finite Element (FE) methods to approximate mixed-dimensional PDEs underlying the mechanobiology of living cells.

I built my research career upon contributions to the following scientific and technological areas: (1) fast FE solvers for metal 3D printing processes and (2) numerical analysis of dynamic interface and mixed-dimensional problems with unfitted discretisation methods. I have co-authored a total of 8 research articles; all published in highly-ranked (Q1) peer-reviewed JCR-indexed journals, cited 455 times, with an h-index 8 (Google Scholar 21/1/25).

I have also participated in 4 H2020/Horizon Europe projects and communicated my results in 16 conferences and seminars in Europe, North America and Oceania. Last year, I (led and) organised my 1st international workshop minisymposium and started supervising a master student in mathematical engineering from Politecnico di Milano. My international collaborations include researchers at the Monash Centre for Additive Manufacturing (Melbourne, Australia), the Norwegian University of Science and Technology and biologists at the CIRB. To conclude, I am a main contributor to two open source FE software projects: Gridap and FEMPAR.



AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Ciencias y tecnologías de materiales
Nombre: MARTÍN JIMÉNEZ, DANIEL
Referencia: RYC2024-050455-I
Correo Electrónico: danielmartinjimenez87@gmail.com
Título: Development of advanced atomic force microscopy techniques and their applications in nanotechnology and functional materials for energy

Resumen de la Memoria:

Martín Jiménez (MJ) is an experimental scientist, with a solid background in physics and material science and, in particular, an expert in Atomic Force Microscopy (AFM). His research trajectory is focused on the development of AFM techniques and their applications in surface physics, advanced materials, and nanotechnology. An expertise gained during 13 years of research starting with his PhD in one of the groups worldwide leaders in the field and followed by two postdoctoral stays in Germany and a third one in Spain. His experience in scanning probe microscopies is broad and multidisciplinary, covering the characterization of biological, polymeric, small molecules, mineral, and 2D materials in air, liquid, and ultra-high vacuum (UHV) environments. He has participated in ten research projects (national and international extent), collaborating with active researchers in fields related to theoretical physics, engineering, microelectronics, and organic chemistry. A strong motivation has led him to work in various research fields within surface physics in different countries. In all cases, he has contributed to diverse groups with his specialized expertise and has had to develop new methodologies to meet scientific challenges. He has been involved in managing laboratories, supervising students, establishing international collaborations, and obtaining funding in competitive calls. As a result, he has acquired a high level of independence and increasing responsibilities.

Resumen del Currículum Vitae:

Martín Jiménez (MJ) is an experimental scientist with a solid background in physics and material science. In particular, he is a consolidated expert in Atomic Force Microscopy (AFM), experience acquired during his doctoral studies in the group of Prof. Ricardo Garcia (ICMM-CSIC, Spain) and two postdoctoral positions in the group of Prof. André Schirmeisen (JLU, Germany). In January 2023 he joined the Instituto de Ciencia de Materiales de Barcelona (ICMAB-CSIC, Spain). He has participated as a researcher in ten national and international projects. In addition to Academia, MJ worked in technological knowledge transfer from 2020 to 2021 in the private company TransMIT for the development of cryostats.

MJ is a significant contributor to his co-authored 16 peer-reviewed publications. He is the first author in seven of them, and the second author with the same contribution as the first one in three others. His articles have an important impact on the scientific community as reflected by the 778 accumulated citations (Source: Google Scholar, 31/12/2024).

MJ has presented his work at 21 international conferences, 2 as an invited talk, 10 as oral presentations, and 9 as posters. He was also invited to give 4 seminars at research centers and universities. In 2024 he was involved in the organized a symposium in the XXXIX RSEF biennial of Physics, San Sebastian/Donostia, 15th-19th Jul. 2024. He was also a member of the local organizing committee of the international conference Interface Properties in Organic and Hybrid Electronics, 17th-20th Sep. 2024, Barcelona.

MJ has combined his scientific work with different leading activities and responsibilities. From 2021 to 2022, he managed Innovation Lab, a new research platform at JLU with two new AFMs operating in liquid and a glovebox environment. Since 2023, he has been managing the installation and commissioning of another AFM lab, the Multipurpose (MP)-AFM lab, which will be installed in the ALBA synchrotron facility in 2025. Since 2023, MJ has been the chief representative of the sustainable laboratories section of the ICMAB sustainability committee. In November 2024, he was elected as a member of the governing board of the RSEF Condensed Matter Division (GEFES).

Related to the formation of young researchers, MJ taught AFM in liquid environments to master students at JLU (courses 2017-2018, 2018-2019, and 2021-2022). From May 2021 to January 2023, he supervised in the Innovation Lab three master's projects (Vertiefungsmodul) of students at JLU: M. Wiche, L. P. Kiyani, and L. Kaufer. In 2024 MJ supervised the BSc project of Z. Sun (UAB, Spain). Currently, MJ is supervising the PhD thesis project of G. Atsas (UAB, Spain) and the work of technicians R. Arilla and K. Bustos in the MP-AFM lab.

In competitive calls, MJ was granted in 2022 with the María Zambrano fellowship (funds: 99500 €) at Universidad Autónoma de Madrid and in 2023 with the postdoctoral fellowships - Marie Skłodowska-Curie Actions (funds: 165313 €) at ICMAB.

Committed to Outreach activities for society, MJ has written diverse outreach articles in Revista Española de Física (REF from the RSEF) and the CSIC blog Ciencia ante el Espejo. In December 2024, he was awarded the best contribution to dissemination in the Publications of the REF by the RSEF-BBVA Foundation.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Ciencias y tecnologías medioambientales
Nombre: EEKHOUT, JORIS PETRUS CORNELI
Referencia: RYC2024-050066-I
Correo Electrónico: joriseekhout@gmail.com
Título: The impact of climate change on soil erosion and water security in the Mediterranean Basin
Resumen de la Memoria:

My research focuses on the impact of climate and socio-economic change on hydrology and geomorphology at a range of temporal and spatial scales in Mediterranean catchments. I obtained my PhD degree in Environmental Science from Wageningen University (The Netherlands) in 2014, which focused on the morphodynamics of lowland streams. Currently, I am working as a postdoctoral researcher at CEBAS-CSIC (Spain) and study global change impacts on water security in Mediterranean catchments. To study these processes at large spatial scales, I am actively developing a coupled hydrology-soil erosion model (SPHY) to increase the applicability in Mediterranean environments. Model development included the implementation of (1) a process-based soil erosion model and infiltration excess surface runoff (Eekhout et al., 2018b), (2) an ensemble of process-based soil erosion models (Eekhout et al., 2021), (3) a morphodynamics module (Eekhout et al., 2024b), and (4) an irrigation module (Eekhout et al., 2024a). Model development is performed through a consolidated collaboration with the hydrological consultancy company FutureWater (The Netherlands). This collaboration resulted in the participation as co-PI in 3 technical support contracts and the publication of 3 articles and 3 reports. The SPHY model code is freely available through GitHub, for which I am one of the main contributors.

My research is subdivided into two research lines. In the first research line focusses on the large-scale impact of climate change on water security in Mediterranean catchments. This research line includes several impact assessments in the Segura River catchment (SE Spain) using the SPHY model and focus on (1) the historical impact of climate and land use change (Eekhout et al., 2020), (2) the impact of future climate change on water security (Eekhout et al., 2018a), (3) the effectiveness of Sustainable Land Management as a climate change adaptation strategy (Eekhout & de Vente, 2019), and (4) the impacts of socio-economic scenarios on water security in the Campo de Cartagena (Eekhout et al., 2024a). In contrast to most modelling studies that focus on one indicator (e.g. runoff or soil erosion), I focus on a range of water security indicators (e.g. runoff, reservoir inflow, plant water stress, irrigation water demand, soil erosion, reservoir sedimentation, among others), showing both positive impacts and trade-offs of environmental change.

In the second research line I focus on the impact of climate change on soil erosion. I use the SPHY model to study the methodological aspects of climate change impact assessments, including bias-correction methods (Eekhout & de Vente, 2019), soil erosion model concepts (Eekhout & de Vente, 2020), soil erosion model ensembles (Eekhout et al., 2021) and catchment-scale sediment budgets (Eekhout et al., 2024). The results of these studies were synthesized in a systematic review, in which we collected and analyzed data from over 200 climate change impact studies and generalized the results at a global scale (Eekhout & de Vente, 2022). In addition, based on a questionnaire with input from soil erosion experts, we made recommendations on which methodologies are most robust and suitable to be used in future studies.

Resumen del Currículum Vitae:

The results of my research have been published in 28 peer-reviewed journal articles (D1: 11, Q1: 19), from which 15 as first author (D1: 8, Q1: 12). I gave 23 presentations at international conferences (14 oral and 9 poster presentations). I acted as contributing author for two policy reports: the IPCC Special Report on Climate Change and Land, Chapter 4 Land Degradation (2019) and the United Nations World Water Development Report: Water and Climate Change, Chapter 9 (2020). I have been awarded 2 Juan de la Cierva fellowships: JdC-Formación (2017-2019) and JdC-Incorporación (2022-2025). I am currently acting as work package leader of a European project (LandEX). I am associate editor of Earth Surface Dynamics, for which I edited 3 articles to date. I reviewed over 90 articles in 36 journals (WoS profile). I am currently supervising 2 PhD candidates: Clara Bosch (CEBAS-CSIC, Spain) and Niguse Abebe (Wageningen University, The Netherlands). I supervised 6 MSc thesis projects (1 ongoing), mostly through an international collaboration with Wageningen University (The Netherlands). I am actively involved in the International Association of Hydrological Sciences (IAHS), for which I participated in 1 article, 3 international committees and 6 conference sessions. I am disseminating my research findings through my twitter account and personal website, on which I maintain a blog and regularly update my research output (publications, presentations, projects). I also maintain the group's website and YouTube channel (>15,000 views), for which I directed and edited 8 videos, including the video abstracts of two of my recent publications (SPHY-MMF model and on the impact of global change).



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Ciencias y tecnologías medioambientales
Nombre: BALSEIRO ROMERO, MARÍA
Referencia: RYC2024-049064-I
Correo Electrónico: maria.balseiro.romero@gmail.com
Título: Microbial activity as the key driver of pollutant turnover in soils: unravelling the mechanisms for bioavailability enhancement

Resumen de la Memoria:

My research career is integrated in several fields of environmental sciences and technologies, working specifically on soil science, soil chemistry, and soil bioremediation. I have led and participated in a variety of research activities and have worked in interdisciplinary environments, which set the basis and had a significant impact on my research expertise and the direction that my main and current research line has taken. I developed those activities in a variety of universities and research centres where I where made short stays and long-term contracts and collaborated in research projects and. During my PhD at the University of Santiago de Compostela (USC, Spain) I focused my research activities on understanding the chemical processes influencing pollutant behaviour in soil. During the postdoctoral period at AgroParisTech (France), I studied the complex soil microscale mechanisms as drivers of pollutant degradation, and at the Instituto de Recursos Naturales y Agrobiología de Sevilla (IRNAS-CSIC) within my Marie Curie Project (BIOTAC), I investigated the role of bacterial dispersion on the enhancement of pollutant soil bioavailability and biodegradation.

The research line to be developed during the Ramón y Cajal grant (Microbial activity as the key driver of pollutant turnover in soils: unravelling the mechanisms for bioavailability enhancement) is an integrated study to design innovative and advanced soil bioremediation technologies, based on the enhancement of pollutant biodegradation by the improvement of pollutant bioavailability. The research activities will integrate the exploitation of microscale mechanisms (based on microbial dispersion and chemotaxis, comobilization of immotile microbes, bacterial attachment, the release of extracellular enzymes and the production of biosurfactants) by the application of carefully selected bacterial inoculants, together with suitable amendments, and phytoremediation plants. It is well-known that microbial activity has a key role in pollutant turnover, but most of the mechanisms involved are unknown and sometimes only rely on macroscopic observations. The proposed research will be a powerful tool to unravel the mechanisms that promote pollutant turnover and to select the best actions to improve those hidden microscale processes. They will allow me to develop efficient soil bioremediation strategies to restore soil ecosystem services and reduce the risks in degraded soils.

The research line proposed is highly innovative and will contribute to understanding the underlying processes involved in the behaviour of degrading microorganisms in heterogeneous porous media, with a significant effect on the bioavailability of persistent pollutants in soils and their biodegradation.

Resumen del Currículum Vitae:

My research career was and is focused in several fields of environmental science, with an especial interest in soil science, soil pollution with organic contaminants and the exploitation of microbial mechanisms to enhance soil restoration. I got an academic background in industrial, chemical, and environmental engineering after what I have carried out my PhD at the USC (Spain) (summa cum laude), followed by more than 8 years of postdoctoral experience.

I published 35 scientific documents, including 32 research articles, 1 book chapter, 1 editorial, and 1 book review, 19 of which have open access. I am first author of 17 documents and corresponding author of 17. My publications have been cited 714 times by 644 documents, resulting in a h-index of 13 (Scopus). I also contributed with 36 communications to scientific conferences (22 of them of international scope). I collaborated and still collaborate nowadays with several Universities of Belgium, Canada, China, Ecuador, France, Germany, Portugal, Spain and UK. Indeed, predoctoral stays were carried out at the University of Hasselt (Belgium) and CSIC (Spain); and postdoctoral stays in AgroParisTech (France), the Institut de Chimie des Milieux et des Matériaux de Poitiers (France), the Universidad de las Fuerzas Armadas (ESPE, Ecuador), CSIC (Spain) and the Helmholtz Centre for Environmental Research (UFZ, Germany), what reinforces my international mobility and collaboration capacities.

My potential for leadership is proven by the fact that I was granted numerous scholarships, including one of the most prestigious and highly competitive European postdoctoral grants, Marie Curie Individual Fellowship 2019, that I developed at IRNAS-CSIC (Spain) (January 2021-December 2022), where I led the associated research line. I also got a Spanish Government fellowship for carrying out the doctoral thesis, a Galician Government Postdoctoral fellowship for a 2-years postdoctoral stay, project that I led, and a Santander Bank fellowship, for a 2-months postdoctoral stay. I have a wide teaching and student training experience, both through the impartment of seminars and lectures, and the supervision of students. I was involved in teaching activities of the Department of Soil Science of USC (Spain) during the course 2019/2020, and during my stay at ESPE (Ecuador). I have imparted 7 seminars in quality of invited speaker and experienced researcher. I have also supervised a PhD student at USC and of 5 MSc students of different Universities of France and Spain. In addition to the 2 projects of which I was the scientific leader (Marie Curie and Xunta de Galicia), I was proactively involved in 4 international projects, 2 national projects (Spain), 4 regional projects and in 1 industrial innovation project (with a substantial contribution to knowledge transfer of research and technology).

In conclusion, my capacity for independent thinking, scientific research leading, communication skills, supervision and mentoring, make me an excellent candidate to lead my own research line and become a research group leader in the coming future.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Ciencias y tecnologías medioambientales
Nombre: MARTÍNEZ LÓPEZ, JAVIER
Referencia: RYC2024-049255-I
Correo Electrónico: javier.martinez@ugr.es
Título: Study of the effects of global change on biodiversity and ecosystem functions and services in protected areas by means of remote sensing and modelling

Resumen de la Memoria:

My main research topic focuses on assessing the impacts of global change and the effectiveness of landscape restoration and conservation measures to protect biodiversity, ecosystem functions and services in protected areas (PA). During my career, I have developed several models and remote sensing techniques in relation to wetland plant communities mapping, species interactions, ecosystem functional attributes assessment, ecosystem service modelling, socio-ecological systems analysis and participatory modelling. From 2004 until early 2006 I worked at the Ecology and Hydrology Department (EHD-UMU) in several R&D projects. In 2006/2007 I worked as a project manager at the University of Bremerhaven (Germany). In September 2007 I started my PhD thesis at EHD-UMU, where I studied the ecological status of semiarid wetlands affected by agricultural intensification using remote sensing and modelling, with a MEC-FPI fellowship and received my PhD degree in 2014 (Sobresaliente Cum Laude). During my doctorate, I spent 6 months at other research centers in USA (Kenyon College), Chile (University of Concepción) and France (Tour du Valat). From 2013 until 2015 I worked as a Scientific Project Officer at the Joint Research Centre - European Commission (JRC) in Ispra (Italy), where I developed models of functional habitat types in PAs globally for the Digital Observatory for Protected Areas. I then worked for 3 years at the Basque Centre for Climate Change (BC3) in Bilbao, where I was responsible for the AQUACROSS (H2020) project and for the development of terrestrial and aquatic ecosystem service models. In 2018, I started working at the Soil and Water Conservation group at CEBAS-CSIC in Murcia for the COASTAL (H2020) project, developing socio-ecological dynamic models of coastal-rural interactions to support PA management. During 2020/2021, I was also appointed as an expert consultant for the JRC developing indicators for quantifying the irreplaceability of terrestrial habitats in PAs globally. In 2021, I started working at the University of Granada (UGR) for the SmartEcoMountains Lifewatch-ERIC project developing remote sensing and modelling tools to monitor terrestrial and freshwater ecosystems in Sierra Nevada PA. From January 2022 until December 2023 I enjoyed a María Zambrano postdoctoral researcher at the Ecology Department of UGR and my work focuses on mapping and characterizing ecosystem functional types in high-mountain PAs through remote sensing and modelling. In January 2024 I started a Plan Propio tenure track postdoctoral and lecturer position at the Universidad de Granada. My current and future research lines are highly interdisciplinary, involving methods from several disciplines, such as Ecology, Remote Sensing and Artificial Intelligence (AI), etc. My overall research objective is to investigate how global change affects ecosystem functioning and services through a combination of novel techniques based on remote sensing and field sensor networks, modelling, AI and citizen science. More specifically, I would like to strengthen and develop new lines of basic and applied research in relation to (a) Mediterranean ecosystem functioning; (b) assessment of ecosystem services and (c) development of applied tools based on remote sensing and modeling to improve the conservation and management of protected areas.

Resumen del Currículum Vitae:

- (1) Publications:
Nr: 76 (47 articles in 31 journals; 2 books; 10 book chapters and 17 scientific-technical reports)
SCI journal articles: 41 (Q1: 75%; First, corresponding or last author: 36%; Without PhD supervisors: 85%; International collaborations: 90%)
High impact factor journals (IF>6): e.g., Science; Science Advances; Global Environmental Change; Environmental Research Letters; Journal of Environmental Management, Landscape and Urban Planning, etc.
Citations: Google Scholar (2474; h-index=24); Scopus (1237; h-index=19)
Average number of citations/year (last 5 years): 179 (Google Scholar); 56 (Scopus)
Co-authors: 190 researchers from 30 institutions and 20 countries
United Nations and European Commission global reports: 4
- (2) Conference presentations: 59 (8 national; 51 international; 11 as invited speaker)
- (3) Organization of R&D activities:
Conferences and workshops: 13 (6 national; 7 international)
Dissemination activities: 17 (13 national; 4 international), including a publication in The Conversation
Outreach: > 30 news items in which my projects have been highlighted by public media
- (4) Expertise in programming languages: Python, R, Java and Google Earth Engine (JavaScript)
- (5) Software development: (co)author of 11 open-source licenses
- (6) Journal Editorial and Reviewer work: Member of 6 editorial boards (Wetlands Ecology and Management; Journal of Remote Sensing; Land; Nature Conservation; Rethinking Ecology; One Ecosystem); Guest editor of 2 Special Issues; 34 manuscripts reviewed for 18 SCI journals
- (7) Grants received: 9 (among others: Plan Propio UGR, María Zambrano, MEC-FPI fellowship; German Academic Exchange Service - DAAD; Leonardo da Vinci II; ERASMUS)
- (8) University accreditation (ANECA): universidad privada, profesor ayudante doctor, profesor contratado doctor
- (9) Courses and seminars/workshops attended: 26 (15 national; 11 international)
- (10) Teaching: 15 lectures (10 national; 5 international)
- (11) PhD committees membership: 1 as external reviewer, 4 exam committee member (University of Granada, Alcalá de Henares, Politécnica de Madrid and Murcia)
- (12) Student supervision: 9 national and international students (1 Trainee; 2 MSc; 1BSc; 5 PhDs - The supervision of an FPI PhD student will start in February 2025 as part of the last funded project)
- (13) Project participation: 35 (18 national; 17 international)



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Competitive calls: 26 (9 EC-EU; 1 UNCCD; 2 AECID; 1 F. Biodiversidad; 8 MINECO; 2 FEDER; 1 ESA; 1 NERC): 2 as Principal Investigator

Non-competitive contracts: 9 (2 as Principal Investigator)

Management Committee member: 2 (PESFOR-W/CA15206 and SMILES/CA21158 COST Actions)

Working Group co-leader: WG2 - Ecosystem Services of Small-medium islands (SMILES/CA21158 COST Action)

(14) Project evaluation:

24 projects proposals for the Portuguese public funding agency for R&D (FCT) 2019 and 2020 Calls

1 project proposal for the Biodiversa+ 2022 Call

1 project proposal for the Austrian Development Cooperation Call

(15) Scientific career:

Predoctoral experience: 10 years (7 national; 3 international)

Postdoctoral experience: > 8 years (6 national; 3 international)

(16) Recognitions: 13 distinguished researcher certificate



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Ciencias y tecnologías medioambientales
Nombre: PERUJO BUXEDA, NURIA
Referencia: RYC2024-050286-I
Correo Electrónico: nuria.perujo.buxeda@gmail.com
Título: Microbial biofilms, biogeochemical processes and water quality

Resumen de la Memoria:

My research focuses on understanding the intricate relationship between microbial biofilms and water quality in freshwater ecosystems. My primary aim is to (i) link processes at the water-sediment interface, (ii) unravel microbial mechanisms driving water quality challenges, and (iii) develop microbial indicators to assess ecosystem stress and prevent degradation.

During my PhD at Universitat Politècnica de Catalunya (UPC, Spain, 2018), I explored the role of biofilms in regulating biogeochemical processes and their influence on water quality. My work quantified biofilm-mediated removal of dissolved organic carbon and phosphorus through benthic assimilation processes. I collaborated with TRARGISA to investigate filtration systems for wastewater treatment, leading to first-author publications in top-tier journals like Environmental Science and Technology. Motivated by the need to better understand microbial processes under environmental stress, I developed a statistical approach for analyzing microbial functional diversity with the University of Girona, resulting in an open-access method published in Ecological Indicators. Using this method, I linked flow conditions to shifts in microbial metabolic profiles, showing how biofilm activity responds to hydrological changes. During my postdoctoral stage at the Catalan Institute for Water Research (ICRA, Spain), I advanced frameworks for integrating temporal and spatial stressor impacts on aquatic ecosystems. I led an updated DPSIR model published in Science of the Total Environment and I collaborated on a Biological Reviews study that highlighted biodiversity loss due to extreme hydrological events.

In 2021, I joined the Helmholtz Centre for Environmental Research (UFZ, Germany) to deepen my focus on biofilm-mediated phosphorus (P) cycling and internal eutrophication. Through my DFG-funded project FLUPHOS (€240k, 2023–2026), I identified microbial P entrapment ratios as potential indicators of river self-purification saturation. Additionally, in the UFZ-funded P-SPACE(II) project (€150k, 2022–2025), I revealed the critical role of DOM quality and microbial activity in regulating P release risks. These projects underscore my ability to link microbial biofilm functioning to critical biogeochemical processes. These findings are published in Science of the Total Environment (1st and senior author).

Building on this expertise, I aim to develop microbial indicators for predicting and mitigating internal eutrophication under climate change. I focus on mechanisms of P entrapment in biofilms (intracellular vs. extracellular) and their implications for sediment-water interface dynamics. My research highlights the potential of biofilm-mediated P accumulation as a warning signal for ecosystem imbalances. My research aligns with EU policy goals (e.g., Water Framework Directive, zero pollution vision) and SDGs 6 (Clean Water) and 13 (Climate Action). By partnering with water management entities (e.g., ACA, ATL), my research aims to deliver tools for early eutrophication detection and sustainable water quality management, ensuring societal and environmental benefits.

Resumen del Currículum Vitae:

I am a postdoctoral researcher in the Department of River Ecology at the Helmholtz Centre for Environmental Research (UFZ, Germany). My research links biofilm functioning to aquatic biogeochemical processes to address critical ecosystem challenges, including reductions in river self-purification capacity and phosphorus release from sediments (internal eutrophication). At UFZ, I have established an independent research line on microbial phosphorus dynamics, securing over €390k in competitive funding as PI and leading a research team.

I am currently the Principal Investigator (PI) of three active projects in Germany: FLUPHOS (DFG-funded, €240k, 2023–2026), P-SPACE(II) (UFZ-funded, €150k, 2022–2025), and REMIC. With FLUPHOS won in a highly competitive international call (26.3% success rate). Through the AQUACOSM-plus Transnational Access grant, I developed REMIC in collaboration with Uppsala University (Sweden). My leadership extends to coordinating AssessStress at UFZ and serving on the P-SPACE doctoral network. Throughout my research career I have participated in >15 research projects, including European-funded initiatives such as ERA-Net Cofund and EU-Life.

I have published 18 peer-reviewed articles (72% as first, second, or senior author) and a book chapter, with 41.7% of my articles ranked among the top 25% most-cited worldwide (Scopus, 2019–2023) and 91.7% published in top-quartile journals (SJR). In 2024, despite maternity leave, I published 6 articles, achieving a 65% increase in citations compared to 2023. My research network includes 125 co-authors from 17 departments, 12 institutions, and 7 countries. My research has been also presented at 15 international conferences since 2022, with 6 as a senior author and 6 as a first or second author.

My research extends beyond academia through industrial collaborations, including contracts with CETAQUA and ITRAM Higiene on biofilm formation and persistence in industrial effluents. Notably, I obtained the LLAVOR Knowledge Transfer grant (AGAUR, 2020) to develop a TRL-4 kit for bacterial quantification in clean-in-place systems. My work also impacts end users such as ACA (EESAM project), ESAMUR (with the University of Murcia), and TRARGISA.

I am actively involved in mentoring, currently supervising 3 PhD students at UFZ (M.M., S.W., A.G.). I also supervised 2 BSc thesis at UdG (Spain) and UFZ (Germany), 2 research assistants, and 1 visiting PhD student. Additionally, I have tutored 6 PhD students, an MSc student, and ecological volunteers. My teaching includes courses in Ecology and Advanced Biodiversity at UdG (Spain) and TU Dresden (Germany). I also serve on selection committees for researchers, review for international journals, and am the social media editor for Hydrobiologia.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

My leadership in the scientific community includes organizing and chairing sessions on microbial biofilms (e.g., SIL 2022, ASLO 2023), co-organizing the 14th Water Research Horizon Conference (Leipzig, 2024), and serving on UFZ's Freshwater Resources Research Unit steering committee. I am a member of AIL and the AQUACOSM-plus Early Career Researcher Network, and I actively engage in outreach activities, including Pint of Science and science podcasts.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Ciencias y tecnologías químicas
Nombre: GINER SANZ, JUAN JOSÉ
Referencia: RYC2024-051041-I
Correo Electrónico: juagisan@etsii.upv.es
Título: Electrochemistry: from fundamentals to energy and environmental applications (EFe2)
Resumen de la Memoria:

As of today, I have authored 30 publications in international high impact journals, 24 as first and/or corresponding author; and have presented 41 conference presentations (27 oral), 35 of which in international conferences. Although I have worked in several areas of electrochemistry, my work has had a greater impact in 3 research lines: A) Modelling of Proton-Exchange Membrane (PEM) fuel cells (FCs); B) Optimization and validation of Electrochemical Impedance Spectroscopy (EIS) measurements; C) Optimization of ammonia quantification methods for nitrogen electroreduction experiments; and recently, D) Recycling of spent Li-ion batteries.

Regarding internationalization and mobility, during my academic career, I have displayed a significant mobility, performing research stays in international and national research centers: a 1-year stay at Cranfield University (UK), a 3-month stay at the Institute for Research and Technology Transfer (USA), a 1-year research stay at the Massachusetts Institute of Technology (USA), and a 1-year research stay at the Instituto de Tecnología Cerámica (Spain). In these recent years, I have not only been an active outgoer, and I have hosted 8 international students. As a part of the IEC group, I maintain active links with several national and international research groups through 3 research networks: E3TECH, RECMET and AQUAMEMTEC.

Regarding independence and leadership, a first evidence of my independence and leadership is that in the majority of the works I have been involved, I have been the lead author, as shown by the fact that I am the first and/or corresponding author of 24 of my 30 publications (i.e. around 80%). I have obtained nearly 315k€ in competitive calls, with which I have funded pretty much my entire academic career (i.e. time wise, I have funded nearly 90% of my career with funds that I have obtained in competitive calls). I am the principal investigator (PI) of 1 project obtained in a competitive call. Moreover, during my academic career, I have created and lead 5 new research lines in the groups where I have worked. I have been actively involved in mentoring activities, at all academic levels (i.e. Bachelor, Master, and Doctoral): 19 Final Degree Projects (TFGs), 16 Master's Final Thesis (TFMs), and I am currently supervising 3 doctoral thesis. Finally, from a teaching perspective, I have taught more than 650 hours at Bachelor and Master's levels in engineering courses.

During my academic career, I have received two research awards: the Mike Sanderson's Price in Process Systems Technology and the 2018 Extraordinary Doctoral Thesis Award.

To finish, I have always been committed with Open Science. For this reason, I have made publicly available the author's version of all my works in the UPV institutional repository. In recent years, we have published 7 works under a Creative Commons license. In addition, I have participated in several scientific divulgation activities.

My research line is titled: "Electrochemistry: from fundamentals to energy and environmental applications".

Resumen del Currículum Vitae:

I obtained my Chemical Engineering Degree (5 year program) from Universitat Politècnica de València (UPV) in 2011. I then obtained a MSc. in Process Systems Engineering from Cranfield University and a MSc. in Nuclear Safety from UPV. During my stay at Cranfield University, I worked on a novel wave-energy-based microalgae cultivation system, for offshore biodiesel production. After that, I moved to my current main research line: electrochemistry for energy applications. Within this line, I started focusing on PEM fuel cells, and on electrochemical impedance spectroscopy; and recently, I have moved to batteries and redox flow batteries.

I obtained my PhD from UPV in 2017, under the supervision of Prof. Pérez-Herranz and Dr. Ortega Navarro, funded by a UPV excellence fellowship and a Vali+d predoctoral grant that I obtained in competitive calls. During my doctoral studies, I performed a research stay at the Institute for Research and Technology Transfer (IRTT, New York, USA) under the supervision of Prof. Tawfik, funded by a Vali+d predoctoral mobility grant that I obtained in a competitive call.

In 2018, I obtained an APOSTD postdoctoral fellowship for pursuing my postdoctoral research in RFBs and other advanced batteries. In the frame of this postdoctoral fellowship, in October 2018, I joined as a postdoctoral fellow the Massachusetts Institute of Technology (MIT, Cambridge, USA), the best University in the World. At MIT, I worked under the supervision of Prof. Shao-Horn, one of the most influential scientists in her field according to the Clarivate Analytics' Highly Cited Researchers (HCR) list. At present, I maintain an active and fruitful collaboration with Prof. Shao-Horn.

In 2020, I obtained a UPV postdoctoral fellowship, and in 2022, I obtained a Juan de la Cierva Incorporación fellowship. In late 2022, I joined the group of Prof. Sergio Mestre Beltrán at the Universitat Jaume I (UJI, Castellón, Spain), for a 1-year research stay.

To date, I have authored 30 publications in international high impact journals, 24 as first and/or corresponding author; and have presented 41 conference presentations (27 oral), 35 of which in international conferences. I received the 2011 Mike Sanderson's prize in Process Systems Engineering and the 2018 extraordinary doctorate award. Additionally, I have obtained nearly 315 k€ in competitive call fellowships; and have been involved in 9 research projects, 1 of which as Principal Investigator (PI). Finally, I have participated in several scientific divulgation activities.



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Y UNIVERSIDADES



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024
Turno General

From a teaching perspective, I have taught more than 650 hours at Bachelor and Master's levels in engineering courses at UPV. I have mentored 19 Final Degree Projects and 16 Master's Final Thesis, and I have hosted 8 international students from the ERASMUS+ program. In addition, I am currently supervising 3 PhD students. Moreover, I supervise the trainee researchers hired in the projects of IEC-UPV group in which I participate.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Derecho
Nombre: CORCODEL , VERONICA
Referencia: RYC2024-051393-I
Correo Electrónico: veronica.corcodel@novalaw.unl.pt
Título: Assistant Professor in International and European Law
Resumen de la Memoria:

My academic career is defined by significant contributions to migration and refugee studies, comparative legal thought, and critical approaches to law. With numerous publications in Q1 journals, including the European Journal of Migration and Law and the European Journal of Risk Regulation, and academic presses such as Cambridge University Press. I have successfully led competitive research projects, such as an FCT-funded study on Portugal's Cold War accession to the Refugee Convention, and a research-based Jean Monnet Module on Key Fundamental Rights Issues in the Eu. I am also the author of a monograph published with Edward Elgar.

Currently, I am also developing innovative research on Cold War Constitutionalism. Within this work, conducted in collaboration with a leading figure in comparative constitutional law, I have conceptualized the theoretical framework of 'critical Cold War legality.'

Looking ahead, my research agenda focuses on two primary lines of investigation. The first carries forward my work on decolonial perspectives on EU migration and asylum law, for which I have set a research agenda in a recently published article. I aim to produce four articles on topics such as the negotiations and debates surrounding the 1985 Schengen Agreement and its 1990 Implementing Convention, the construction of economic migrants in EU law, the EU's partnerships with African and Middle Eastern countries, and the 'crisis' regimes under the New Pact on Migration and Asylum. These studies will illuminate intersections of race, gender, and other colonial epistemic formation within EU law and are intended for leading journals, including the International Journal of Refugee Law and European Journal of International Law.

The second area investigates Cold War legalities and decolonization. I plan to examine two countries from Latin America, two from Africa, and two from Asia, resulting in at least six articles, each dedicated to a specific former European colony. These articles will be published in international peer-reviewed journals, such as the European Journal of International Law, Third World Quarterly. The starting point for this research will be the submission of an ERC Consolidator Grant proposal.

My research has been presented at over 40 international conferences, including the Refugee Law Initiative annual conference, the events organized by the Harvard Law School's Institute of Global Law and Policy, and the Critical Legal Conference.

In addition to research, I have demonstrated leadership in teaching, mentoring, and knowledge transfer.

Resumen del Currículum Vitae:

I am a tenured Assistant Professor of International and European Law at NOVA School of Law (Portugal) with a PhD from Sciences Po Law School (2015). My research focuses on migration and asylum law, comparative legal studies, and critical approaches to law. My work has been published in leading peer-reviewed journals such as the European Journal of Migration and Law and European Journal of Risk Regulation, and with renowned academic presses like Cambridge University Press.

My academic path includes prestigious fellowships, such as the Max Weber Fellowship at the European University Institute and a postdoctoral fellowship at Sciences Po Law School. I am currently leading two research projects, funded on a highly competitive basis by the Portuguese Foundation for Science and Technology and the European Commission respectively. These projects involve international collaborations with leading scholars and organizations, producing academic outputs such as articles, conferences, a special journal issue, and an edited book.

My research has been presented at over 40 international conferences, including the Harvard Institute for Global Law and Policy, the Law and Society Association, and the Critical Legal Conference.

In addition to research, I have extensive teaching experience, having independently designed and delivered courses in EU migration and asylum law, public international law, and comparative law across institutions in Portugal, France, and Ireland. I have supervised 16 master's theses, participated in PhD evaluations, and directed clinical programs fostering academic and civil society collaboration. At NOVA, I lead the Refugee and Migration Clinic, where students engage in pro bono cases, policy briefs (in partnership with the Refugee Law Initiative), and blog contributions published on the clinic's website and edited by me.

Beyond academia, I contribute to public discourse, with publications in Público and Moldovan platforms addressing migration and development. These efforts reflect my dedication to bridging academia and practice while promoting knowledge transfer to broader audiences.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Economía
Nombre: PALGUTA, JAN
Referencia: RYC2024-050312-I
Correo Electrónico: jan.palguta@cunef.edu
Título: Regulation, taxation and the behavior of firms and public officials
Resumen de la Memoria:

I am an applied economist with research focus in public economics and political economy. My research has been published in prestigious economics journals, namely the American Economic Journal: Economic Policy (x2) (2017, 2024), Journal of Population Economics (2022), European Economic Review (2019), Journal of Comparative Economics (2021), and Urban Studies (2018).

In these contributions, I evaluate the impacts of public policies, typically regulation, taxation and remuneration, on the behavior of public officials, politicians and firms. For example, my work on public contracting (AEJ: Policy 2017) has been the first to describe how public officials manipulate the value of public contracts to avoid regulatory thresholds that restrict their autonomy. In subsequent work (EER, 2019), I provide evidence how also politicians adjust public contracts once their bargaining power shrinks in legislatures. In my next paper (J. of Comp. Econ., 2021), I show how higher wages for politicians encourage additional candidacy, improve electoral selection and shape re-election chances. During the Covid-19 pandemic, I published new evidence on how large-scale in-person elections significantly accelerate the viral spread (J. of Population Econ., 2022). In my most recent research in business taxation (AEJ: Policy 2024), I provide evidence on how businesses respond to tax schemes that prescribe minimum amounts of tax that firms have to annually pay.

My research has been presented at some of the world leading universities and influential conferences in public economics. I highlight presentations of my work at Harvard, Boston U., ZEW Mannheim and Madrid Public Economics Workshop.

As a Slovak national, I have a very international education and work trajectory. Already for undergraduate studies I moved to Czechia and visited the University of Edinburgh within the Erasmus exchange program. Later I completed my PhD in economics at CERGE-EI which is a U.S.-style doctoral program. During the PhD, I visited the Stockholm School of Economics and spent two months as an intern at the Slovak Ministry of Finance. After PhD, I relocated to Spain to become a visiting professor at Carlos III and later an assistant professor at CUNEF.

During my career, I have participated in many national and international grants, both as a principal investigator and a research team member. These grants include those from the Spanish Ministry of Science, Innovation and Universities, the Czech Ministry of Education, Youth and Sports, Charles University, and the Czech Technological Agency (see section C.3). I describe my contribution to these grants and other merits related to training, mentoring and supervision of younger scholars.

In my future research, I aim to address new research questions of a broad international interest. I aim to benefit from my accumulated knowledge of the state-of-the-art empirical methods, the knowledge of gaps in the relevant literature, the knowledge of the institutional backgrounds from my prior work and access to rich administrative data, such as from tax returns, procurement, and public health records.

I organize the overview of my future research along three lines: 1. research in business taxation, 2. research on the role of politicians' wages on public service provision, and 3. research on the long-term determinants of a broad collective action.

Resumen del Currículum Vitae:

I am an applied micro-economist. In my research agenda, I analyze the impacts of public policies, namely regulation and taxation, on the behavior of public officials, politicians and firms. Currently, I am an assistant professor of economics (tenure-track) at CUNEF. Previously, I was a visiting professor at University Carlos III of Madrid, and a researcher at Stockholm School of Economics. I did my PhD in Economics at CERGE-EI, in Prague.

My work has been published in high-quality economics journals, including the American Economic Journal: Economic Policy (x2) (2017, 2024), the Journal of Population Economics (2022), the Journal of Comparative Economics (2021), European Economic Review (2019), and Urban Studies (2018). It has received a large number of high-impact citations, including by general-interest outlets, such as Nature Human Behavior, and top economics and political science journals, such as the Journal of the European Economic Association, AEJ: Applied, Journal of Politics, Journal of Health Economics, European Economic Review, and many other. As of January 2025, my Google Scholar account counts around 370 citations of my work.

My research has been presented at some of the world leading universities, including Boston, Harvard (x2), Northeastern, Oxford, Wisconsin - Madison, and influential conferences in public economics, such as CEPR, IIPF, ZEW, and other. In producing and presenting research, I count on a rich network of coauthors, including those from Utah State U., U. of Notre Dame, World Bank, U. of Oslo, U. of Milan (La Statale), CERGE-EI and Charles University.

I have participated in many national and international research grants, acting both as a principal investigator and research team member. These grants include those awarded by the Spanish Ministry of Science, Innovation and Universities, the Czech Ministry of Education, Youth and Sports, Charles University, and the Czech Technological Agency (see section C.3).

My research arguably generates contributions beyond academia. When possible, I presented my results to policymakers at key institutions in the affected countries, including the National Economic Council, Supreme Audit Office and the Institute of Health Information and Statistics in Czechia, or the Ministry of Finance in Slovakia.



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Y UNIVERSIDADES



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

I have been granted numerous prizes and scholarships, including a scholarship by the Community of Madrid for attracting talented scholars (TALENTO), a postdoctoral fellowship by the Czech Academy of Sciences, and Charles University mobility scholarship to visit the Stockholm School of Economics. In 2015, I was named the Economist of the Year by the Czech Economic Society and awarded the prize for the best paper presented at the Slovak Economic Association Meeting. For my master thesis, I obtained an Honorable mention for economists younger than 25.

Regarding service to the profession, I have been a referee for high-quality journals, including the Review of Econ. and Statistics, AEJ: Policy, J. of Applied Econometrics, J. of Population Economics, as well as a referee for multiple applications to granting agencies. In 2024, I have been a member of the scientific committee for the Simposio of Spanish Economic Association. At CUNEF, I supervised multiple undergraduate theses. I was a letter writer for several students that applied for doctoral programs and research internships.



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Y UNIVERSIDADES



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Energía y transporte
Nombre: BERNADET, LUCILE
Referencia: RYC2024-049668-I
Correo Electrónico: lucile.bernadet@gmail.com
Título: Investigadora líder en celdas de óxidos sólidos para la producción de hidrógeno y el almacenamiento de electricidad

Resumen de la Memoria:

During the Ramón y Cajal grant execution time, I aim to continue the trajectory I have been taking for the past year: produce high-quality research and innovative concepts in the solid oxide cells field that can be transferred to the industry. For this purpose, I plan to develop two main research lines focusing on 1) the development of innovative Solid Oxide Cells and stacks for efficient hydrogen technologies together with Spanish and European industrial partners and 2) novel routes for efficient production of sustainable fuels for maritime and aerospace applications using high-temperature co-electrolysis of CO₂ and water.

The first topic will focus on developing conventional and disruptive SOC concepts to overcome specific power and durability issues. More specifically, I will develop unexplored advanced materials like high-entropy oxides and novel fabrication techniques like 3D printing to generate a new family of Solid Oxide Cells technology. This activity will represent a significant contribution from the scientific point of view and boost an emerging market that does not have relevant industrial players in Spain (and only a few at the EU level).

The second topic will focus on the co-electrolysis operation mode of high-temperature electrolyzers, which still requires strong research efforts to improve performance and durability, especially under pressurised conditions. Therefore, the focus will be on finding optimal materials and operating conditions. Moreover, the main innovation proposed is the use of 3D-printed enabled architectures able to operate under pressure and the use of high-throughput strategies coupled to machine learning to reduce the sensitivity of electrode materials to poisoning. The impact of such activity is anticipated to be very high when considering the expected demand for synthetic fuels in the coming years, together with the need for massive CO₂ abatement.

Resumen del Currículum Vitae:

I received a master's degree as an engineer specialising in energy storage and conversion from the Graduate School of Chemistry, Physics, and Biology of Bordeaux (ENSCBP, France) in 2013, followed by a PhD in Material Science from the University of Bordeaux in 2016. My research was conducted in parallel between the two main French research organisms, the CNRS-ICMCB (Bordeaux, FR) and the CEA-LITEN (Grenoble, FR). In 2017, I joined the Catalonia Institute for Energy Research IREC (Barcelona, ES) as a post-doctoral researcher and Tenure-track researcher (June 2021) in the Nanoionics and Fuel Cells group led by ICREA Prof. Albert Tarancón.

From my PhD thesis, my research focuses on high-temperature solid oxide cell (SOC) technology (SOFC/SOEC) for hydrogen and synthetic fuel production and electricity storage from renewable sources. My strong expertise in the topic results from 10 years of experience working from the material to system prototype scale, including experimental and modelling studies, giving me a complete vision of the technology and its problematics. I am now responsible for the large area SOC and stack electrochemical characterisation, designing test benches and coordinating the experimental activities of the different research lines and projects involved.

My research career is strongly linked to collaboration with other institutions and industrial partners through research projects. I have been involved in 7 European, 7 national, and 5 regional projects. The experience gained over the years resulted in coordinating one national coordinated project with a 1.2 M€ budget and being the PI of one industrial project with a 1.2 M€ budget. I was also the lead of 3 work packages in two European Projects and a big coordinated Spanish action.

As a result of this activity, I have co-authored 19 peer-reviewed publications, 6 as first author, in reputed journals in the energy field (15 papers in Q1), one book chapter and 5 published proceedings. Those works have been cited more than 400 times (h-index = 10). Moreover, I co-authored more than 30 participations in the most prestigious international conferences related to the materials, SOC and hydrogen fields, including 6 orals and one invited talk as first author and presenter, and 8 posters. I was also invited to lecture at an international summer school (POI 2024). Furthermore, I have been intensely involved in outreach, connecting my research to society, especially regarding youths and women.

Beyond scientific production outputs, I have dedicated many efforts to generating an impact in the industry through technology transfer actions. I have been leading the technology transfer process of a complete fabrication method of SOC stacks towards two Spanish companies. Moreover, I have been collaborating for several years with a worldwide leading industrial player in the field of SOC technology, as well as developing technology for Spanish players. This activity represents a total amount of 1.2 M€ of industrial contracts. In addition, I am a co-author of one EU patent.

Finally, an important part of my activities is dedicated to training a new generation of researchers. I have supervised 3 bachelor's, 9 master's, and 2 PhD students and acted as a tutor in 2 other PhD theses.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Energía y transporte
Nombre: ORTEGA DELGADO, BARTOLOMÉ
Referencia: RYC2024-050081-I
Correo Electrónico: ortega-bartolome@us.es
Título: Innovative Solar Desalination Technologies Integrating Thermal Energy Storage for Sustainable Water and Electricity Production within a Circular Economy Framework

Resumen de la Memoria:

His research activities started in 2012 when he was awarded a FPI research fellowship by CIEMAT for completing a doctorate program within the Solar Desalination Unit at Plataforma Solar de Almería. The topic was the integration between solar thermal power plants and desalination processes (CSP+D). During the doctorate he had the opportunity of presenting the latest advances of his work in international conferences: EuroMed, SolLab, and SolarPACES and participated in STAGE-STE (FP7) and RED-HeatToPower (H2020 EU) projects. The applicant has collaborated with researchers from other institutions, as University of Bergamo (Italy), University of Palermo (Italy), and CEA (France). During the postdoctoral period he obtained a 2-year postdoctoral contract at University of Palermo (Italy) framed within the EU project RED-HtP, developing simulations tools for the closed-loop RED heat engine system. He co-supervised three Final Degree Projects regarding efficient membrane desalination processes. He participated in 2 international conferences in this period: SDEWES and EDS. In 2020, he was awarded a 2-year contract at the University of Almería to work as postdoctoral researcher within the H2020-EU Project SOLWARIS, focused in developing a dynamic model for simulating a multi-effect distillation unit integrated in a real CSP plant. In 2021 he obtained a 3-year postdoc contract granted by Junta de Andalucía within PAIDI R&D programme. Since then, he has participated in SOLTERMIN (National Plan), QATAR-FO (International) and EERES4WATER (EU) projects. Since 2024 he is the Project Manager of ISOP project (MSCA-DN, HE). He was recently awarded a 4-year contract under "Contratos de Acceso al Sistema Español de Ciencia, Tecnología e Innovación para el Desarrollo del Programa Propio de I+D+i de la Universidad de Sevilla".

The applicant has participated in two contracts for technology transfer with private companies and in 11 R&D projects (55 M€). He has contributed to dissemination activities with presentations in 13 international conferences, 5 seminars, 1 workshop, participation in the 2022 & 2023 European Researchers' Night, and in a research dissemination project funded by Fecyt (SOL-prendete). He has been co-responsible of social media (LinkedIn) and website of ISOP. He co-authored 20 scientific articles in JCR journals, of which 14 (70%) are ranked within quartile Q1, and 13 (65%) in D1, being the first author in 10 articles (50%). He has an h-index of 13 in Scopus (505 citations) and 13 in Google Scholar (595 cit.).

His main research lines are related to the energy-water-food nexus, particularly solar desalination systems, including the integration of desalination processes into concentrating solar power plants for the combined production of water and electricity. The lines of research to be developed by the applicant, which would mark a significant advance in his research career, includes: i) Advanced CSP+D schemes based on Brayton cycles with valorization of waste streams; ii) Reduction of operating costs of thermal and membrane desalination technologies; iii) FO-MED system for brine concentration and mineral recovery (zero liquid discharge); iv) CSP+D with variable nozzle thermocompressor; v) ED-RED technology for energy storage; vi) RED-MED technology for peak power supply.

Resumen del Currículum Vitae:

The candidate has been a member of Solar Desalination research group at PSA-CIEMAT (2012-16), Solar Desalination group (TEP026) (Andalusian R&D, 2017-), Innovazione Industriale e Digitale (DIID) dept. at the University of Palermo (Unipa)(Italy, 2017-19), CIESOL (University of Almería, UAL, 2020-), Solar Thermal Applications at PSA-CIEMAT (2021-23), and Energy Dept. at University of Seville, USE (2024-). He has contributed to the generation of knowledge and research on the water-energy nexus performing modelling and simulation activities. He co-authored 20 scientific articles in JCR journals, of which 14 (70%) are ranked within quartile Q1, with 13 (65%) in D1, being the first author in 10 articles (50%). He has contributed to 13 international conferences and 1 book chapter, having an h-index of 13 in Scopus (505 cit.) and 13 in Google Scholar (595 cit.). He is Guest Editor of a Special Issue of Processes journal (JCR, Q2). He is also regular reviewer of JCR journals of high impact (Desalination, Energy, Energy Conversion and Management). Currently, he is the Project Manager of ISOP project (MSCA-DN, EU), and was recently awarded a 4-year contract under "Contratos de Acceso al Sistema Español de Ciencia, Tecnología e Innovación para el Desarrollo del Programa Propio de I+D+i de la Universidad de Sevilla" (01/03/2025).

Regarding his contribution to society with technological development, he has been involved in 8 EU/international R&D projects (55.3 M€), and 3 national R&D projects (372 k€). He has been involved in two contracts of transfer of knowledge with private companies. He has participated in an H2020-EU project (SOLWARIS) within the topic "Near-to-market solutions for reducing the water consumption of CSP Plants" with TRL7, collaborating with a private company. He has work in innovation activities within the programs H2020 "New knowledge and technologies" and "Enabling the transition towards a green economy and society through eco-innovation", and within the Eeres4water and Qatar-FO projects; and MSCA program within Excellence Science in ISOP (Doctoral Network). His dissemination activities comprise 13 international conferences, 5 seminars, 1 workshop, participation in the 2022-23 European Researchers' Nights, in a research dissemination project funded by Fecyt (SOL-prendete), a science dissemination course (CIEMAT) and ISOP social media management (LinkedIn, website).

Concerning mentoring and training activities, the candidate has been cotutor of 3 Final Degree Projects at USE and a Master thesis at the University of Almería. He has tutored a stay (3 months) of a predoctoral student from the University of Gabes (Tunisia) at PSA in 2023. During his 2-year stay at the University of Palermo (Unipa), he supervised the work of a predoctoral student from CEA (France) (article D1) and trained a predoctoral student from DLR (article D1). He has also collaborated with international researchers from CEA (France) in SFERA-III, University of Palermo (Italy) in RED-HtP, University of Technology Sydney (Australia) in Qatar-FO, DLR (Germany) in Zero Brine, WIP (Germany) and Rcreation (Greece) in RED-HtP project. He worked with predoctoral students from Univ. of Bergamo (Italy), CEA, DLR, and Unipa. Awards received: "Premio Proa 2023 al Conocimiento Azul" to Solar Thermal Applications group at PSA from Maritime-Marine Cluster of Andalusia (CMMMA).



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Estudios del pasado: historia y arqueología
Nombre: SPECIALE, CLAUDIA
Referencia: RYC2024-050033-I
Correo Electrónico: cspeciale@iphes.cat
Título: Island Archaeobotany: theory and case studies
Resumen de la Memoria:

Research line A: Island strategies: the management of resources

Research line B: Island constraints: paleoenvironment & climate reconstruction

Research line C: Island conservation: biocultural diversity

Research line D: Island significance: the role of islands in the spread of domestic species

My research program focuses on the investigation of the human-environment relationship on islands, with the wider aim to elaborate a theoretical framework in Island Archaeobotany. Are people behaving differently on islands than on the mainland? Are human communities adapting to peculiarities and constraints of these limited environments? And can islands be used as case studies to understand the relationship between humans and plants easier?

The main case studies considered will be Sicily and the small islands around, characterized by an occupation from at least the 6th mill. BCE and often abandoned and re-occupied throughout millennia. The analysis will focus on the human occupation pattern with new excavations, the characterization of the archaeobotanical assemblage (carpological and anthracological remains) for the reconstruction of paleoeconomy, paleovegetation and wood management (line A), and the analysis of stable isotopes to reconstruct climatic shifts (line B). Also, data on the traditional use of plant resources will be collected, to identify specific behavior in the management of the plants or exploitation of peculiar resources like seaweed and driftwood (line C). Finally, the islands between Sicily and Tunisia will be analyzed to determine if they were steppingstones in the spread of domestic species during the Neolithic and to explore the potential pre- Middle Neolithic occupation phases that could go back to the Mesolithic/Early Neolithic for the exploitation of obsidian (line D).

The scientific network built over the years will help compare the Sicilian islands with other case studies, such as Canary islands, Balearic islands and central Pacific islands. Finally, a special importance will be given to Open science and the spread of the results.

In the immediate next years, I am planning to finalize the publication of the investigations on Ustica island with a paper for a high impact journal like PLOS One. Furthermore, I am planning to prepare a theoretical paper on Island Archaeobotany, to be submitted for the Journal of Island and Coastal Archaeology. I am exploring the potentiality of use of stable carbon isotope analysis on wood charcoal for the reconstruction of the rainfall regimes, adding to the case study of Pantelleria (that will be published during 2025). For the research line C, I would like to further develop the investigation on the exploitation of wood resources on the small islands to understand through some ethnographical research the traditional management of the resources and involve the inhabitants in a Citizen Science project. Finally, especially with the re-submission of the StG ERC project [Farm-Edge](#), I added the research line D on the Neolithization of the Central Mediterranean. I would like to explore with the most interdisciplinary approach the human-plant interaction in Sicily, Southern Italy and Northern Africa in the late Pleistocene-Early Holocene, where in particular the islands of Lampedusa and Pantelleria played a crucial role. I envisage the development of new field activities in these contexts.

Resumen del Currículum Vitae:

My main interests are the understanding of human-nature relationships throughout prehistory and the diachronic exploitation of bioresources by human communities. My investigations have a focus on the small islands of the Mediterranean and the potential adaptation to the variation in climatic conditions and/or the management strategies in the areas with limited resources.

My main expertises are field archaeology and archaeobotany of vegetal macroremains; I am now developing my skills in stable isotope analysis and statistical analyses.

I have been collaborating in international projects of research in Italy, France, Spain, Sweden and Cyprus and been responsible for the archaeobotanical analysis of more than 30 archaeological sites that span from the Paleolithic to the Middle Ages. I am leading a multidisciplinary project MSCA-COFUND on small islands around Sicily called SILVA, within the Unit of Archaeobotany and the supervision of E. Allué (IPHES, Tarragona), co-supervisors I. Bentaleb (ISEM, Montpellier), J. Voltas (University of Lleida). This project is taking me to lead archaeological fieldwork in new sites (Lampedusa, Alicudi, Lipari) in agreement with the regional authorities.

I have experience within an ERC-StG grant as responsible for the carpological analyses at Las Palmas de Gran Canaria and I was the responsible for the collection and elaboration of the archaeobotanical data of the ERC-Synergy COREX project, guided by K. Kristiansen (Un. of Gothenburg). I have been responsible for the paleoenvironmental reconstruction of the small islands of the Southern Tyrrhenian within an multidisciplinary project at the National Institute of Geophysics and Volcanology (Naples, Italy). Finally, I developed my PhD at Univ of Salento, Italy (supervisor prof G Fiorentino) on carrying capacity evaluation of the Aeolian islands starting from the archaeobotanical data.

I have a great interest in Open Access and public dissemination, so I have taken part in several activities of involvement of the public in archaeological knowledge. I have organized 9 International sessions/conferences and taken part in several National and International congresses, where I have 35 Oral presentations and 20 Posters. I have published in Env Archaeology, Veg Hist and Archaeobotany, Open Arch, Sustainability both as first author than co-author and I published the monography of my PhD thesis with BAR series.

I foster students and I am particularly interested in helping young researchers to develop their careers. I have been tutoring several students (Erasmus trainees, students for the Master [Chrono-Environment and Palaeoecology](#), Master at Gothenburg University in Biodiversity, Bachelor thesis in Archaeology at University of Palermo) and I have been contracted to give classes of Archaeobotany to Bachelor, Master and Post-Master students at University of Palermo, Chieti, Milano, Gothenburg (2020-2024).

I have been editor for many journals: J of Island and Coastal Archaeology, Frontiers in Env Arch, Hum Ecology; Recommender for PCI Archaeology; Guest reviewer for J of Arch Sciences: Reports. I am member of several national and international organizations such as EAA, AEA, IWGP, Italian National



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024
Turno General

Institute for Pre- and Protohistory, Catalan Association of Bioarchaeology (ACBA). I received the ASN Italian National Habilitation for Associate Professorship in 2023.



AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Mente, lenguaje y pensamiento
Nombre: HØFFDING, SIMON
Referencia: RYC2024-049860-I
Correo Electrónico: shoffding@gmail.com
Título: Interdisciplinary inquiries in mind and music

Resumen de la Memoria:

I am a world leading philosopher of phenomenology, empirical aesthetics, and cognitive science focusing on how musical performance and listening can enlighten our understanding of the mind, embodied subjectivity, and intersubjectivity. I pursue these topics by developing new methods that break down disciplinary boundaries between philosophy, qualitative research methods, and quantitative experimental research. This research focuses on open data and citizen science and hence further breaks down walls between the University and our citizenry.

My contributions cover five main dimensions (A-E):

A) Methodology: integrating phenomenology and qualitative research methods

1: Høffding, S. & Martiny, K. (2016) (both first author) "Framing a Phenomenological Interview: What, Why, and How" Phenomenology and the Cognitive Sciences. Vol. 15:539-564. <https://doi.org/10.1007/s11097-015-9433-z>

B) Musical absorption in phenomenology, philosophy of mind, social ontology, cognitive science, and music psychology

2: Høffding, S. (2019) A Phenomenology of Musical Absorption. Palgrave Macmillan

3: Høffding, S. & Montero, B. (2020) (both first author) "Not Being There: An Analysis of Expertise-Induced Amnesia." Mind & Language. Vol. 35(5): 621-640. <https://doi.org/10.1111/mila.12260>

4: Salice, A., Høffding, S., Gallagher, S. (2019) "Putting Plural Pre-reflective Self-awareness into Practice" Topoi. Vol. 38 (1): 197-209. <https://doi.org/10.1007/s11245-017-9451-2>

5: Høffding, S. & Satne, G. (2021) "Interactive expertise in solo and joint musical performance." Synthese. Vol. 198: 427-445. <https://doi.org/10.1007/s11229-019-02339-x>

6: Høffding, S., Nielsen, N., & Laeng, B. (2024) Mind surfing: attention in musical absorption. Cognitive Systems Research. Vol. 83 (101180): 1-11. <https://doi.org/10.1016/j.cogsys.2023.101180>

C) Empirical aesthetics

7: Høffding, S., Houlberg, M., & Roald, T. (2019) "Participation and Receptivity in the Art Museum" a Phenomenological Exposition. Curator: The Museum Journal. <https://doi.org/10.1111/cura.12344>

D) Improvisation

8: Høffding, S., Snekkestad, T., & Stige, B. (2024) Enactivist Music Therapy: Toward theoretical innovation and integration. Nordic Journal of Music Therapy. <https://doi.org/10.1080/08098131.2023.2268707>

E) Concert research

9: Høffding, S., Hansen, N.C., & Jensenius, A.R. (2024) (Eds) "MusicLab Copenhagen: A research concert with the Danish String Quartet." Special collection of Music & Science. <https://doi.org/10.1177/20592043241294161>

For my Ramon y Cajal, I will take my research in a new direction and translate my previous 10 years of work on music and consciousness into the domain of individual and collective mental health. I will do so in three main steps: 1) guest-editing a special issue of Journal of Consciousness Studies on "Multidisciplinary Developments in Music, Consciousness and Mental Health"; 2) Writing a monograph for OUP or MIT press on How Music Heals: An Integrated, Scientific Account; 3) Obtaining ERC funding (consolidator grant and MSCA Initial Training Network). While pursuing these steps, I expect to keep publishing 3-5 chapters and articles a year while continuing my conference activities.

Resumen del Currículum Vitae:

I am a world leading philosopher of phenomenology, empirical aesthetics, and cognitive science. After completing my PhD thesis at the Center for Subjectivity Research, supervised by Prof. Dan Zahavi, I pursued three post-doctoral positions for 5 years in Denmark and Norway in cognitive science, psychology, and music cognition, to then become associate professor at The University of Southern Denmark.

I have authored 2 monographs, 4 edited volumes and special issues, 9 book chapters, and 33 peer reviewed journal articles (19 open access) in music-related phenomenology, philosophy of mind, and cognitive science as well as in mixed methods integrating phenomenology, qualitative research, and physiological experiments. 8 of these articles are in four different top-10 philosophy journals (based on Google scholar): Synthese (2), Topoi (1), Mind & Language (1) Phenomenology and the Cognitive Sciences (4). I have spearheaded original lines of research on 1) the nature of musical absorption (my monograph has 140 citations), 2) the phenomenological interview (with the world's most cited article in the field (469 citations), and 3) concert research. I have PI'd concert research (published as a special collection in Music & Science) with one of the world's most famous chamber ensembles, an interdisciplinary team of 28 researchers, and an audience of over 100 people. I have raised 242.000€ for my own research projects and various research groups (not counting funding for my own PhD, Post Doc, Associate Professor and researcher positions), given over 140 talks in 4 continents,



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Turno General

produced 2 documentaries, been featured in 3 podcasts, several radio transmissions and dozens of newspaper and journal article, and won 2 distinguished research and science dissemination awards.



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Turno General

Área Temática: Producción industrial, ingeniería civil e ingenierías para la sociedad

Nombre: VELA MARTÍN, ALBERTO

Referencia: RYC2024-049663-I

Correo Electrónico: alvelam@ing.uc3m.es

Título: Turbulence dynamics and modelling

Resumen de la Memoria:

The candidate has made fundamental contributions in various areas of fluid mechanics, turbulence and modelling, as detailed below:

Breakup of Drops and Bubbles in Turbulence: In an article published in Science Advances (2022), he demonstrated that the breakup of drops in turbulence is a memoryless process, challenging classical paradigms and providing tools to model fragmentation processes in multiphase systems. This work was based on over 30,000 numerical simulations performed using a GPU code he developed.

Dynamics of the Energy Cascade in Turbulence: During his PhD, the researcher co-authored an article in Science (2017) that empirically verified the spatial and scale locality of energy transfer in turbulence. This work solidified the phenomenological foundations of classical turbulence theory.

In subsequent works published in Journal of Fluid Mechanics (2021, 2022), he explored the mechanisms of intense vorticity formation and extreme events, demonstrating that the dynamics of these phenomena are intrinsically linked to the energy cascade.

Subgrid-Scale Modeling and Large Eddy Simulations (LES): the researcher published advances on eliminating inverse energy transfer in LES models by introducing a gauge theory-based framework (Journal of Fluid Mechanics, 2022). This approach has implications for the development of more accurate models for wall-bounded turbulent flows.

Periodic Dynamics and Invariance in Turbulent Systems: the researcher collaborated with researchers from Canada and Japan to identify periodic orbits in turbulence, establishing new tools for representing high-dimensional chaotic systems (Physical Review Letters, 2019).

Contributions to Cavitation Modeling: In collaboration with researchers from Brazil and the United States, the researcher developed predictive models for cavitation inception in isotropic flows, identifying the influence of extreme pressure and vorticity events on bubble formation (Physics of Fluids, 2020, 2022).

In conclusion, the researcher combines deep theoretical knowledge with technical skills and leadership, positioning himself as a reference in the field of fluid mechanics and turbulence. His career demonstrates a balance between fundamental research and applied innovation, with a strong impact on the international scientific community.

Future lines of research:

With the support of the Ramón y Cajal grant, the researcher plans to establish an international research group at Universidad Carlos III de Madrid, focusing on three main lines of investigation:

Energy Cascade in Turbulence: Study the origin of intermittency and extreme events in turbulence, with potential applications in renewable energy and cavitation control. Additionally, develop LES models based on gauge theory for wall-bounded flows.

Breakup of Drops and Bubbles: Extend his research to bubbles by developing new GPU codes to simulate immiscible binary mixtures. This line has applications in industries such as food and pharmaceuticals.

Predictive Models Considering Uncertainty: Integrate machine learning and data-driven methods to improve predictive turbulence models, addressing uncertainties in the initial conditions and the parameters.

Resumen del Currículum Vitae:

In 2014, I graduated in Aerospace Engineering at the Escuela Politécnica de Madrid (UPM). The same year, I started a PhD position in the research group of Prof. Jiménez within an ERC Advanced grant.

In 2019, I completed my PhD thesis on the topic of the energy cascade; I studied this process from the point of view of non-equilibrium thermodynamics, with focus on statistical irreversibility. During my PhD, I extended my research by collaborating with members of my research group and other international groups; from Japan) and Canada to study invariant solutions in isotropic turbulence; and from USA and Brasil to study cavitation inception. These research lines led to publications in high-impact journals (Science, Phys. Rev. Lett., J. Fluid Mech. and Phys. Fluids). In this time, I also attended multiple international conferences in USA and Europe.



AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

In 2019, after I completed my PhD, I obtained a David Crighton Research Fellowship to visit the Cambridge University. There, I applied my knowledge on turbulent flows and high-performance computing (GPUs) to study transition in visco-elastic flows. I intend to continue this research line through this grant.

In 2020, I started a post-doctoral position in the University of Bremen (Germany) with Prof. Marc Avila, with whom I started a new research line on drop breakup in turbulence. This research project, which is still ongoing, lead to publications in Sci. Advances and J. Fluid Mech. In this time, I continued my research on the energy cascade independently, publishing 3 single-author papers in J. Fluid Mech., and starting a research line on predictability. During my postdoct, I have been invited to present my independent research at the Max Planck institute (Hamburg) and KIT (Karlsruhe).

In 2023, I started a visiting professor position at Unversidad Carlos III, where I am currently starting my own research line on the predictability of extreme events in turbulence and on transient mixing. These investigations have led to a paper in J. Fluid Mech. and two papers in Phys. Rev. Fluids as a single author. I am currently co-tutoring a PhD student on the topic of extreme mixing events in isotropic turbulence.

In 2023, I spent four months on paternity leave.

The 5 most relevant contributions in my research trajectory are the following:

- 1) Vela-Martín, A., & Avila, M. (2022). Memoryless drop breakup in turbulence. Science Advances, 8(50), eabp9561.
- 2) Article: Cardesa, J. I., Vela-Martín, A., & Jiménez, J. (2017). The turbulent cascade in five dimensions. Science, 357(6353), 782-784.
- 3) Article: Vela-Martín, A. (2021). The synchronisation of intense vorticity in isotropic turbulence. Journal of Fluid Mechanics, 913, R8.
- 4) Article: Vela-Martín, A. (2022). The energy cascade as the origin of intense events in small-scale turbulence. Journal of Fluid Mechanics, 937, A13.
- 5) Article: Vela-Martín, A. (2022). Subgrid-scale models of isotropic turbulence need not produce energy backscatter. Journal of Fluid Mechanics, 937, A14.

I have co-tutored five Bachelor theses and one Master Thesis, and I am currently tutoring a PhD student. I am a regular reviewer for the Journal of Fluid Mechanics, and I have also reviewed papers for Physical Review Letters and Nature Communications. I have been part of the evaluation committee of PhD thesis in Germany (ZARM, University of Bremen) and France.



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Producción industrial, ingeniería civil e ingenierías para la sociedad
Nombre: MUÑOZ IBÁÑEZ, ANDREA
Referencia: RYC2024-049060-I
Correo Electrónico: andrea.munoz.ibanez@gmail.com
Título: Rock-fluid interactions for sustainable subsurface energy: from CO₂ storage to geologic H₂
Resumen de la Memoria:

My research bridges the fields of rock fracture mechanics and coupled hydro-chemo-mechanical processes, particularly within the energy sector. With a strong focus on sustainability, I strive to address critical challenges in clean energy and carbon storage, combining innovative experimental techniques with practical applications to advance energy solutions.

As a Ph.D. student (2016-2020) at the Universidade da Coruña (UDC), I developed the pCT test for mode I rock fracture toughness in collaboration with REPSOL S.A. This innovative method, recognized by its efficacy in pure tensile conditions, has been applied to industrial projects, such as evaluating a nuclear waste storage site in Forsmark (Sweden) and the foundations of a thermosolar plant (USA). Recent advancements, including a simplified pCT apparatus and a portable high-pressure and temperature testing device, further extended its applicability to real-field applications. More recently, we have leveraged the pCT method to study chemo-mechanical interactions, yielding significant implications for the geo-energy sector. These developments resulted in 5 high-impact publications (with 1 additional manuscript under review), 7 conference proceedings, 10 conference presentations, 3 invited talks, 3 industry reports and ongoing research with a Ph.D. student. They also laid the foundation for the PTENAZ project (MCIN/AEI). Looking ahead, I aim to propose the pCT test as a suggested method by the International Society for Rock Mechanics.

In my postdoctoral role at the Universidade de Vigo (2022), I expanded my expertise to include size effects on rock properties such as tensile strength and fracture toughness, in collaboration with UDC and CEDEX (1 publication). I also contributed to hydraulic fracturing research through a collaborative project with Repsol S.A. designing a true triaxial hydraulic fracturing frame and co-supervising a Ph.D. candidate (1 publication; 2 conference proceedings).

My work on CO₂ storage began during a research stay at the National Oceanography Centre (2018; UK), where I studied CO₂ behavior in fractured rock reservoirs. This project, funded by NERC, yielded 2 publications and 3 conference presentations. My participation in the IEAGHG Summer School (2018; Norway) deepened my understanding on this technology. Later, as a Postdoctoral Fellow at KAUST (2022-2023; Saudi Arabia), I explored fracture types in mafic rocks and their role in carbon storage (1 publication under review). Currently, I lead the GEOMIMIC project under the prestigious Marie Curie Postdoctoral Fellowship at the Georgia Tech (USA) where I have furthered my independent research on carbon mineralization in fractured mafic rocks and contributed to other geo-energy projects related to hydrogen storage and reservoir fracture sealing (3 publications in preparation), establishing the groundwork for safe and efficient energy solutions.

Building on these experiences, I aim to establish my own research line focused on rock-fluid interactions under relevant high-pressure, high-temperature field conditions, with an emphasis on enhancing fostering collaborations with colleagues in Spain, UK and USA. This research aligns directly with the EU Green Deal's climate neutrality goals, Spain's national decarbonization strategy and Galicia's RIS3 framework.

Resumen del Currículum Vitae:

I obtained a PhD in Civil Engineering (2020; Cum Laude, International Mention; Extraordinary PhD Award) from the Universidade da Coruña (UDC), where I specialized in fracture mechanics. My research led to the development of an innovative testing method for measuring rock fracture toughness, in collaboration with REPSOL S.A. I have worked in 6 prestigious institutes across 4 counties and have secured independent funding at nearly every stage of my scientific career. Currently, as a Marie Curie Postdoctoral Fellow at Georgia Institute of Technology (GT; USA), I lead the project GEOMIMIC, focusing on carbon mineralization in fractured mafic rocks.

My primary contributions lie in rock fracture mechanics and geo-energy. I am the first author on 52% of my contributions, and have served as the corresponding author also on half of them. Among my journal articles, 86% are published in Q1 journals, (50% in D1 journals), which underscores the consistent high quality and impact of my research. My work has been recognized with 5 invitations to present at esteemed institutions (e.g., The University of Utah) and participation in scientific committees (EUROCK 2024). Additionally, I am Associated Editor for the Q1 journal Geophysics, a reviewer for high-impact journals (e.g., Sci. Rep. and Rock Mech. Rock Eng.) and have served on an international PhD committee. As Principal Investigator and Co-PI, I have secured 302,211€ in funding from international entities.

I actively enhance my expertise in innovation management and knowledge transfer through courses and prior experience as an R&D&I consultant. I am committed to open science, ensuring my publications and data are publicly available. My dissemination efforts include presentations at industry-focused events (e.g., Geosystems Fall Symposium, GT), seminars (e.g., Axencia Galega de Innovación) and family-oriented initiatives (e.g., NOC Open Day, UK). I am deeply committed to promoting diversity in STEM, particularly encouraging girls and women, and I serve as a member of the Equality Commission of CITEEC (UDC).

The main scientific achievements during my career are the following:

☐ Authored 27 publications (1 more under review) including papers in high-impact journals and conference proceedings. Citations (2019-2025; Google Scholar)=274. h-index= 9.

☐ Presented at 12 international conferences (12 oral, 4 posters) and co-authored 18 additional contributions .



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AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

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|---|--|
| 2 | Over 3 years of international research experience, including postdoctoral positions at KAUST (Saudi Arabia) and GT (USA), and research stays during PhD at NOC (UK), Colorado School of Mines (USA), Brno University of Technology (Czech Republic) and Ruhr Universität Bochum (Germany). |
| 2 | Contributed to 4 funded projects and over 15 R&D contracts with industry partners (including REPSOL S.A., Sener Energia and Cobra Thermosolar Plants), serving as PI and co-PI in two of them. |
| 2 | Proven capacity to secure funding from international (Marie Curie Postdoctoral Fellowship) and national (Margarita Salas Fellowship from the Spanish Ministry of Universities, PhD fellowship from Xunta de Galicia, and Research Support Staff Grant from UDC) competitive calls. |
| 2 | Co-organized the 6th International Workshop on Rock Physics, where I also chaired a session. |



AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Tecnologías de la información y de las comunicaciones
Nombre: CASAMITJANA DÍAZ, ADRIÀ
Referencia: RYC2024-050753-I
Correo Electrónico: acasamitjana91@gmail.com
Título: Computational modelling of brain MRI
Resumen de la Memoria:

During my academic career my main goal has always been the use of advanced image processing techniques to study biological conditions in general and, more specifically, the brain. Nonetheless, my interests have been evolving and widening according to different findings, opportunities and challenges found in these studies. Broadly, my main lines of research can be split into three different focuses: (i) early stages of Alzheimer's disease, (ii) brain atlas and segmentation and, more broadly, (iii) medical image analysis methods.

My postdoctoral research has been carried out partly in international centers (University College London [UCL], UK) and partly in national centers (Universitat de Barcelona [UB] and Universitat de Girona [UdG]), all different from my home university (Universitat Politècnica de Catalunya [UPC]). During my stay at UCL, I enrolled the research team of a multidisciplinary EU ERC Starting grant on building next generation computational tools for medical imaging analysis. This allowed me to engage in currently on-going international collaborations (UCL, Martinos Center in Harvard Medical School) and to organize international workshops and challenges. I started my independent research during my national stay, where I won to competitive projects to carry out my research in different labs. That allowed me to extend my network of on-going collaborators (Hospital Clínic, UB, Hospital Josep Trueta), to join other national projects and to supervise and mentor students at different levels of their careers. I have published my work in major journals and conferences of my field, to which I also enrolled as a reviewer. During this time, I have taught at undergraduate and post-graduate levels. Currently, I am supervising 2 PhD students, 2 master students and I am the coordinator of two courses (1 master and 1 undergraduate).

During the next few years I plan to both extend upon previous work on imaging biomarkers and explore new related topics. The main goal is to develop and test robust AI and automatic methods for medical image analysis that could improve diagnostic and prognostic frameworks as well as treatment planning. The use of advanced techniques, such as self-supervised learning and image synthesis will be central in the development of this project with clear focus on the transferability of the methodology and results to clinical practice. The four main pillars of the project will be: (i) development of joint multimodal and longitudinal brain image processing pipeline; (ii) usage the underexploited NextBrain atlas and segmentation method for cross-sectional and longitudinal analysis of dementia-related diseases; (iii) improvement of brain age prediction methods and discovery of the cross-relationship to other biological factors; and (iv) adaptation and extension of brain image segmentation methods beyond MRI and the brain, with applicability in radiotherapy. This project will benefit from previous and new collaborations with clinical partners to improve clinical translation of the results and methodology. The datasets used in this project will be from public repositories (ADNI, AIBL, PPMI, CamCAN, and others) and from clinical collaborators (PROJ1, PROJ3, and others).

Resumen del Currículum Vitae:

Telecommunications engineer (2015) and PhD cum laude in Signal processing at Universitat Politècnica de Catalunya (UPC) in 2019, selected as outstanding thesis by the doctoral school. I am a current member of the Computer Science and Robotics Institute (VICOROB) at Universitat de Girona (UdG) as a postdoctoral researcher. I obtained a FPU grant accompanied by a mobility grant (6 months, University College London) during my PhD studies. Then, I did several postdoctoral stays to prestigious institutions: one international, at University College London, UCL, (2019-2022) and another national, at Universitat de Barcelona, UB, (2022-2023).

During the postdoctoral period, I have been the principal investigator (PI) of two competitive projects: "Longitudinal biomarkers on brain MRI images" (2024-2026, financed by UdG) and "Multimodal brain imaging biomarkers for dementia studies" (2022-2023, financed by the Spanish Ministry). Moreover, I have been part of the research team in 5 competitive projects, 4 national (financed by Generalitat de Catalunya and the Spanish Ministry) and one international (ERC Starting Grant). Altogether, with a total of 2.391.315€. Current active collaborations comprise entities at different levels: from hospitals (i) Radiotherapy department at Hospital Clínic, Barcelona, Spain; (ii) Nuclear Medicine department at Hospital Josep Trueta, Girona, Spain; to national universities (iii) UB, Barcelona, Spain; and international research centres (iv) Athinoula A. Martinos Center, Boston, USA.

My research focuses on developing AI and, in general, computational analysis tools for medical image processing to advance on the diagnosis and treatment of diseases. Most of my work is applied to human brain studies framed within two research lines, namely, studies of the elderly brain (normal aging, dementia-related diseases) and other types of biological conditions, such as brain tumors or stroke. I have published my work in 35 publications. 17 journals with a mean impact factor of 6.9, 11 of them in indexed journals (JCR) and 4 in medical abstracts published also in JCR journals and 2 in non-indexed journals. All the indexed journals are in Q1 (80%) or Q2 (20%), with 9 publications in top-10% journals of the field. I have also published 18 articles in peer-reviewed conferences and workshops, many of them in well-known international conferences (MICCAI, ISBI, NeurIPS, etc.). A total of 13 publications are joint publications with international research collaborations. In 17 publications I am the first and/or corresponding author. According to Scopus, my h-index is 9 (>500 citations) while in Google Scholar, my h-index is 13 (>3000 citations). I am currently supervising 2 PhD students with competitive grants and 2 master theses. I have also supervised 5 undergraduates and 3 other master students.

During my career, I have participated in the organization of international activities, such as challenges (RnR-ExM, during the ISBI conference 2023) and workshops (SASHIMI, during MICCAI conference 2024). Currently, we have submitted our proposals for the 2025th edition of SASHIMI and TopBRAIN, a new challenge on topological brain segmentation to which I got involved. I am also a reviewer of numerous indexed journals and international conferences.



AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Tecnologías de la información y de las comunicaciones
Nombre: RUSCA, DAVIDE
Referencia: RYC2024-050943-I
Correo Electrónico: davide.rusca.92@gmail.com
Título: Implementation of Quantum Technologies for secure communications
Resumen de la Memoria:

The lines of research that I will pursue is going to be mainly in three different aspects of quantum technologies:

Quantum Key Distribution of Fiber:

In my previous group, the focus for Quantum Key Distribution (QKD) was to achieve the highest performance in terms of both distance and repetition rate. However, pushing the devices to the state-of-the-art of electro-optical modulation revealed a series of imperfections. Both stochastic noise and correlation manifested in each active component at the source and at the receiver. The main goal of our development is to characterize these imperfections and implement a quantum key distribution protocol where the security proof considers all the imperfections, taking them into account. This way, we ensure a match between experiment and theory.

Moreover, we plan to slightly modify the protocol previously used in the lab in Geneva. There, the time bins were chosen to be half the size of the qubit, resulting in the overlap of the time bins in the unbalanced interferometer at Bob. This configuration guarantees the highest speed possible but is more prone to mask possible preparation imperfections. By avoiding the overlap of consecutive time bins, we aim to simplify the security proof and allow for a slower but more secure protocol.

Quantum Random Number Generation:

In my PhD and postdoc, I worked with various implementations of self-testing quantum random number generators. However, each experiment posed some form of complexity or had associated high costs that hindered potential commercialization.

In the spirit of simplifying the experiment, we initiated a new version of the Quantum Random Number Generator (QRNG). Instead of modulating the signal with an expensive phase modulator, we employed two lasers, where one functions as the signal by being gain-switched, and the other serves as the local oscillator. To retain the phase, we seed one laser with the other.

Furthermore, in collaboration with the University of Geneva and the Fraunhofer Institute in Berlin, we are actively working on implementing the protocol on integrated photonics.

Quantum Key Distribution and direct messaging in space:

In Vigo, since the creation of VQCC we have been exploring the possibility of installing an optical ground station in Vigo, and finally the tender for an 80 cm telescope has been launched.

Following the space development of the Vigo Quantum Communications Center, we have decided to pursue a space implementation of our protocol. In particular, in collaboration with Prof. Emmanuel Zambrini from the University of Lisbon, we are developing a payload for a nanosatellite (Mendes et al., 2023). This payload not only accommodates the simplified BB84 protocol but also includes a novel quantum direct communication scheme developed by Angeles Vazquez-Castro (Vázquez-Castro et al., 2021), in which I have also collaborated.

Resumen del Currículum Vitae:

I started my scientific and academic career early, at the end of my master's studies. During my master's thesis, I worked in the highly experimental field of micromachining on silica with a femtosecond laser. I immediately showed interest not only in the fabrication process but also in modeling the interference effects of light entering the waveguides. It was the first time that one of my ideas, written on a piece of paper (interference fringes on the far-field behavior concerning the refractive index of the integrated waveguides), was successfully replicated in my experiment.

The nature of moving between theory and experiment has been my distinctive characteristic ever since. This became even more apparent when I joined the group of Prof. Hugo Zbinden in Geneva. In this setting, I fulfilled the group's need for a theoretician to provide security proofs tailored to the experiments. However, my approach to theory has never disregarded the practical issues of experiments. Working almost independently, without a prominent figure in security proofs in Geneva, I quickly demonstrated my independence, thanks in part to the support of very brilliant experimentalists such as Alberto Boaron, Fadri Grünenfelder, and Anthony Martin. They inspired me to strive for practical solutions.

However, I never really wanted to quit experimental work, which I still consider to be my most prominent calling. So, I insisted on having a line of my own for experiments, and I managed to get the QRNG (Quantum Random Number Generator) line. With numerous works resulting in papers, as well as outreach dissemination and lab experiments for students, I was appointed quite soon as the responsible for this line of research, initially under my postdoc Anthony Martin and later independently by Professor Zbinden.

My work in both the theory of Quantum Key Distribution (QKD) and experimental Quantum Random Number Generation (QRNG) allowed me to initiate numerous collaborations around the world. Thanks to these collaborations, protocols such as the 1-Deputy BB84 and the self-testing QRNG are now commonly used in the community and even commercially. Now that I am in Vigo, I have gained the complete trust of both Prof. Hugo Zbinden and Prof. Marcus Curty to act independently in the creation of a new Quantum Technology group.



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Turno General

Given the highly applied nature of my research, constant dialogue with industry is only natural. During my long stay in Geneva, Switzerland, my main interlocutor has always been IDQuantique. Not only have I talked and exchanged results with the company multiple times, but I have also been employed as a part-time consultant for an extended period during my postdoc.

Finally, I have always had a particular interest not only in researching new results but also in passing on such results to the next generation. I have always loved to teach, and I continued to do so during my stay in Geneva. I now continue this passion in the Galician Master in Quantum Communication since my move to Vigo. Furthermore, with increasing responsibilities, I have had more people to manage under me. The first person for whom I had almost full responsibility was Evangelia Asproptomiti in her master's work. . Now in Vigo, I have full responsibility as the sole supervisor for two Ph.D. students.



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Turno General

Área Temática: Tecnologías de la información y de las comunicaciones
Nombre: MASVIDAL CODINA, EDUARD
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Título: Advanced Nanoelectronic Neurotechnologies
Resumen de la Memoria:

Advanced Nanoelectronic Neurotechnologies

Our bodies contain a network of neural cells (brain and nerves) that transfer information electrically, acting as a fundamental communicating system in our bodies that serves a pivotal role in our sensory, cognitive and motor abilities. Having the ability to monitor and modulate the nervous system with high precision is key for the treatment of a multitude of diseases and injuries. These capabilities have been long exploited by the MedTech industry to develop bioelectronic recording and stimulation devices that have been vital to human health and have improved our quality of life, such as pacemakers and cochlear and deep brain stimulation implants, to name the most successful examples. More than 1 million people are implanted yearly world-wide. However, current commercial devices face several limitations such as rigidity of the used materials and low number of active sites, which limits their operational life (often requiring reimplantation) and hampers their applicability to more complex medical conditions.

My research career is focused on developing advanced neuroelectronic devices that benefit from the high-resolution fabrication processes of the microelectronics industry and the unique material properties of 2D nanomaterials. I have pioneered the development of flexible microfabricated neural interfaces based on graphene resulting in devices that are gold-standard for DC-coupled electrophysiology recording, and that allow high-precision neural stimulation.

The RyC line of research to be developed fits in the nano-neurotechnology field and can be structured in five main lines of action towards next-generation neural interfaces: i) Improved stability and conformability; ii) High-performance; iii) Higher resolution, iv) Multimodal interfaces and v) In vivo validation and clinical translation. My research line is expected to lead further scientific insights, formation of young researchers, intellectual property protection activities and technology-transfer to existing companies or creation of new ones, and ultimately, to the benefit to health and quality of life of people suffering from neuro-related brain diseases, injuries, and disabilities.

Resumen del Currículum Vitae:

I am a Senior Postdoctoral Researcher with over 10 year (3.5 after PhD) expertise in the fields of microfabrication, nanomaterials and pre-clinical neurotechnologies. My research focuses on the use of the unique properties of nanomaterials in combination with the high-resolution capabilities of clean-room microfabrication, applied towards the development of advanced neural interfaces. My main scientific achievements are: i) pioneering the development of a novel generation of flexible neuroelectronic interfaces based on graphene that allows unprecedented recording quality of neural signals such as brain tsunamis, important for the diagnosis and treatment of brain injury, stroke or epilepsy; and ii) optimization and pre-clinical validation of a high-precision neuromodulation technology based on nanoporous graphene allowing improved motor rehabilitation for Parkinson's disease or spinal cord injuries, and vision restoration through retinal implants. The scientific relevance of the research is evidenced by high-impact publications (19 in total: 1 Nature Materials, 2 Nature Nanotechnology, among others) and awards (PIONER from Generalitat de Catalunya, EMBO, Boehringer Ingelheim, etc.). My research has also raised industrial interests, evidenced by the innovation and tech-transfer activities (3 patents and 1 industrial secret), licensed to international med-tech companies and start-ups.

I am currently Senior Researcher at the Advanced Electronic Materials and Devices (AEMD) group at the Catalan Institute of Nanoscience and Nanotechnology (ICN2), I am associate researcher of the GBIO group of CIBER-BBN and associate researcher of the Neuroscience Institute (INc) at Universitat Autònoma de Barcelona (UAB). I collaborate with world-leading researchers at national (CSIC, ICFO, IFAE, Hospital Clinic, etc.), international institutions (imec, Fraunhofer, University College London, Paris Vision Institute, etc.) and with leading med-tech industrial partners such as gtec, MultiChannel Systems or Boston Scientific.

I have a leading research role as evidenced by being work package leader in several international projects (Minigraph and Rescuegraph), and I have experience as Principal Investigator in national projects. Moreover, I am director of 3 PhD students in Material Science and Electronic Engineering fields. My research has appeared in leading Spanish newspapers (el Mundo, ABC, La Vanguardia) and TV. And I have contributed to the creation of several datasets, scientific simulation routines and libraries deposited in open-access repositories (Zenodo or CORA).

I act periodically as Reviewer for different scientific journals, and I am organizer of national and international congresses. I am founder of an NGO about Nanoscience and Nanotechnology (SCN2) and have acted as Member of the Governing Board through which I organize events for the transfer of knowledge to the society.



AYUDAS RAMÓN Y CAJAL – CONVOCATORIA 2024

Turno General

Área Temática: Tecnologías de la información y de las comunicaciones

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Título: IRUROZKI_RYC

Resumen de la Memoria:

Dr. Irurozki's research is at the intersection of artificial intelligence (AI), machine learning (ML), and optimization, with a focus on discrete spaces such as permutations and rankings. Permutations represent preferences over n items and find applications across diverse domains, including logistics and biology. They are studied both as rankings and as products of cycles in combinatorics and optimization. Her work emphasizes tailoring statistical and optimization frameworks to leverage the unique combinatorial properties of permutation spaces, moving beyond traditional methods in $\mathbb{R}^n$ that are inefficient or inapplicable in these contexts.

Her research contributions have been published in top-tier venues such as NeurIPS, ICML, AISTATS, and Q1 journals such as Bernoulli, Journal of Statistical Software and IEEE TEC, with a notable focus on ranking models like the Mallows Model (MM) and its generalizations (GMM). A cornerstone problem in her work is the estimation of medians and other statistical properties of permutations under these models. Her innovations include robust methods for handling noisy and heterogeneous ranking data, with key applications in areas like natural language processing (NLP).

Dr. Irurozki's commitment to open science is evident in her contributions to publicly available benchmarks and tools including all code, results and papers. Notably, she contributed to an NLP benchmark containing over 131 million scores, setting a new standard for benchmarking practices. Her work in this area has been implemented in the World Machine Translation Metrics Shared Task (2022) and published in prestigious venues.

Collaboration is a cornerstone of her research. Dr. Irurozki has established international partnerships, working with institutions like CentraleSupélec, Nokia Bell Labs, University of Coimbra, and the University of Manchester. Her research has been supported by multiple grants and projects, including COST Actions and bilateral collaborations. She has also contributed to industrial applications, such as optimization algorithms demonstrating the practical relevance of her work.

Dr. Irurozki's contributions encompass a wide range of applications, from statistics and machine learning to combinatorial optimization. In the realm of statistics and ML, key contributions include characterizing the convergence properties and sample complexity of estimation algorithms, as well as adapting depth functions to ranking data. In combinatorial optimization, she investigates convergence properties, develops efficient algorithms with reduced computational complexity, and designs methods requiring a minimal number of evaluations to achieve high performance.

She has also supervised impactful PhD research, leading to innovations in ranking depth functions and efficient optimization methods for ranking data. Her mentoring has fostered new researchers, such as Dr. Etor Arza, now a postdoctoral fellow in Norway, and contributed to cutting-edge work in ranking models.

In recognition of her contributions, Dr. Irurozki's work has received significant citations and has been presented at leading conferences. Her research has also been featured in applied contexts, and has contributions in telecommunications networks, further highlighting the interdisciplinary impact of her work.

Resumen del Currículum Vitae:

Dr. Irurozki's research focuses on artificial intelligence (AI), machine learning (ML), and optimization in discrete spaces, with a particular emphasis on permutations and rankings. Her work addresses fundamental challenges in modeling, analyzing, and optimizing discrete structures, which are pivotal in fields such as social choice theory, logistics, and bioinformatics. She has made significant contributions to statistical problems in ranking for ML and optimization, bridging gaps between theory and practical applications.

Dr. Irurozki has a strong publication record, with 10 papers in first-quartile journals and 15 contributions to top-tier international conferences, including NeurIPS, ICML, and AISTATS. Her impactful work has garnered 719 citations and she holds an h-index of 11 and an i10-index of 14.

Dr. Irurozki has cultivated active international collaborations with academic institutions in the UK, France, Spain, and Portugal, as well as industry leaders such as Nokia Bell Labs. These collaborations have facilitated interdisciplinary research and applications of her work in real-world scenarios.

Dr. Irurozki has benefited from a career path through prestigious institutions. She obtained her Ph.D. from the University of the Basque Country (UPV/EHU) in 2014. She held a postdoctoral position at UPV/EHU from 2015 to 2017, followed by a fellowship at the Severo Ochoa Center, BCAM, from 2017 to 2020. Since 2020, she has been an Associate Professor at Télécom Paris, Institute Polytechnique de Paris (IPP), ranked 46th in the QS World University Rankings and 36th in "Computer Science and Information Systems."

Dr. Irurozki has participated in multiple high-impact international projects funded through Basque, Spanish, French, and European programs. These projects address cutting-edge challenges in AI, ML, and optimization, both academic (for example in IPP) and as industrial collaborations (in collaboration with Nokia - Bell Labs).



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Turno General

She has demonstrated a strong commitment to technology transfer. At BCAM, she led the Cybersecurity Lab and was actively involved in the transfer unit, working on applied research projects with companies in manufacturing and services. Her expertise has been instrumental in bridging the gap between theoretical research and practical applications.

Dr. Irurozki has received the Extraordinary Doctorate Prize from UPV/EHU. She is deeply committed to open science, ensuring that her research papers, results, and code are made accessible through open repositories. Notably, this includes her significant contribution to the NLP benchmark, a resource containing over 131 million scores—an order of magnitude larger than existing benchmarks.