

LIST OF SUPERVISORS

2024



UNIVERSIDAD
PABLO DE OLAVIDE
SEVILLA

MSCA-2024-Postdoctoral Fellowships



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SOCIAL SCIENCES & HUMANITIES

JAVIER BRAZO-SAYAVERA

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Department / Institute / Centre

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Brief description of the Centre / Research Group:

The Faculty of Sport Sciences at the University Pablo de Olavide is located in Seville (Spain) and it is a young centre, which is developing a relevant research atmosphere. The Faculty offers a bachelor in sport sciences and postgraduate studies (Master and Doctorate) in the related field. Also, the department of Sports and Computer Science is increasing its research capacity by hiring new staff and the University is supporting new research lines providing resources to its development. Finally, the Faculty of Sport Sciences has been recognized as one of the top five in Spain by the Shanghai ranking (<http://www.shanghairanking.com/Special-Focus-Institution-Ranking/Sport-Science-Schools-and-Departments-2020.html>). In addition, the University has previous experience hosting postdoctoral researchers as well as other international students and staff.

The research line "Movement and Epidemiology in Minors" MOVEM is a project that it is in its first steps but with a relevant background in the field. MOVEM aims to advance in the knowledge on different indicators related to physical activity in children and adolescents to provide insights and tools for a more active and healthier society for them.

Project description:

The conceptual basis of the analyzed indicators has been provided by the international project "Global Matrix" and cover overall physical activity; organized sport and physical activity; active play; active transportation; sedentary behaviours; physical fitness; family and peers; school; community and environment; and government (public policies). The surveillance of these indicators is crucial to understand how the situation is changing. In addition, nowadays we are facing new challenges due to the pandemic, so it is even more relevant to describe the situation to provide solutions and trying to anticipate future consequences.

The current project has three main aims: i) to set up a network of professionals in the field of physical activity surveillance; ii) to build a dataset with information about the indicators in children and youth; and iii) to provide solutions to improve the situation. Results of this project will help the society in three ways: i) strengthening the research capacity in this field; ii) providing relevant insights that could help changing the current situation; iii) implementing solutions at local and medium scale.

Research Area (according to the evaluation panels):

Chemistry	Social Sciences & Humanities	Economic Science	Information Science & Engineering	Environmental Science & Geology	Life Sciences	Mathematics	Physics
No	Yes	No	No	No	Yes	No	No

Applications: Documents to be submitted by applicants and deadlines:

- CV
- Expression of interest+ letter of recommendation



JUAN MANUEL MORENO DÍAZ

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Department / Institute / Centre

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Webpage: <https://www.upo.es/departamento-derecho-privado/es/>

Brief profile of the Centre / Research Group / Lab / PI:

Challenges and opportunities of decarbonisation for industrial relations systems (ELP 2020-2050)

Idea / Project description:

Analyse of international collective bargaining, and, more specifically, international framework agreements in European context.

In specific:

- Sign of agreements evolution in the last 20 years
- Incidence by sectors
- Recent contents (decarbonization measures, digital rights, due diligence, decent work, just transition and others)

Research Area (according to the evaluation panels):

Chemistry	Social Sciences & Humanities	Economic Science	Information Science & Engineering	Environmental Science & Geology	Life Sciences	Mathematics	Physics
No	Yes	No	No	No	No	No	No



ALFONSO GALÁN MUÑOZ

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Department / Institute / Centre

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Webpage: <https://www.upo.es/departamento-derecho-privado/es/>

Brief profile of the Centre / Research Group / Lab / PI:

We are a consolidated researchers' group of jurists and criminologists that are working about the social problems that the disinformation has generated. We have research on this topic for more than four years with some of the most well-known experts on protection of freedom of speech and new technologies, having achieved important results. It is possible to know more about us and find a part of our research results visiting this website: <https://www.upo.es/investiga/analisis-discurso-terrorista/>

Idea / Project description:

The candidate would be integrated and collaborate with us in the development of our project on disinformation in the digital age. Specially, we are interested in applicants who could study the influence that the use of social networks has had in many democratic processes of democratic countries, in order to make proposals of adequate legal measures to prevent the possible manipulation of those processes, respecting the freedom of speech and fundamental rights of citizens.

Research Area (according to the evaluation panels):

Chemistry	Social Sciences & Humanities	Economic Science	Information Science & Engineering	Environmental Science & Geology	Life Sciences	Mathematics	Physics
No	Yes	No	No	No	No	No	No

Applications: Documents to be submitted by applicants and deadlines:

1. Brief CV
2. Short description of the research to be done by the applicant in relation to the proposed project. Two support letters



LIFE SCIENCES

YOUNES SMANI

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Department / Institute / Centre / Lab

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Webpage: http://www.cabd.es/en/research_groups.html

Brief profile of the Centre / Research Group / Lab / PI:

The Andalusian Center of Developmental Biology (CABD), inter-institutional center participated by University Pablo de Olavide, was created on 2003 by virtue of an agreement signed by the UPO, the Junta of Andalusia and the Spanish Scientific Research Council. In 2017 the Department of Gene Regulation and Morphogenesis received a Maria de Maeztu Unit of Excellence award for the 2017-2021 period that has been renewed for the whole CABD during the 2022-2026 period. CABD is a multidisciplinary research center which houses groups studying host pathogen interaction, regulation of gene expression in bacteria, oxidative stress, control of cell cycle in yeast and development of non-vertebrate and vertebrate animals. The CABD houses also service facilities needed for the research carried out at the Center.

The research made by the Smani Lab is focused on the Identification of new therapeutic targets in the outer membrane of the bacteria associated with healthcare-related infections, through the study of host-pathogen interactions in vitro and in animal models. In addition, we are interested in deciphering new antimicrobial resistance mechanisms.

Idea / Project description:

The Gram-negative bacilli (GNB) such as *Acinetobacter baumannii*, *Pseudomonas aeruginosa* and Enterobacterales are highly efficient in acquiring antimicrobial resistance encoded by genomic changes ranging in scale from point mutations, through the assembly of preexisting genetic elements, to the horizontal import of genes from the environment. Compounding the problem of antimicrobial resistance is the immediate threat of a reduction in the discovery and development of new antibiotics, the dangers of which have recently been made clear by the World Health Organization and other European institutions. Consequently, a perfect storm is converging with regard to these infections: increasing antimicrobial resistance with a decreased new drug development. This context is likely the best example of the purported "Post-Antibiotic Era," with relevance even in nonspecialized media. It is clear that effective solutions are urgently needed as stressed by various institutions. Therefore, the development of new antimicrobial strategies requires immediate attention to avoid the ten million deaths that are projected to occur in 2050 as a result of multidrug-resistant bacterial infections. In this context, the development of new antimicrobial therapeutic strategies for use alone or together with one of the scarce but clinically relevant antibiotics, has become exigent.

The structure of our research lines has been focused on acquiring relevant knowledge and skills to the generation and dissemination of new knowledge in the field of microbiology and infectious diseases, in particular, the study of the host-pathogen interactions, the bacterial virulence factors involved in the infectious process and the mechanisms of antimicrobial resistance, with the aim of developing new molecules with antibacterial activity, as well as rapid antimicrobial resistance detection systems.

First, we have studied the host response to bacterial infections, deciphering the molecular and cellular mechanisms involved in host cell death caused by GNB such as *A. baumannii*. We have characterized for the first time a signaling pathway located in the membrane and cytosol of host cells, such as human lung epithelial cells, that regulates the adhesion and invasion of *A. baumannii*



in host cells. We have identified the relationship between the phosphorylcholine (ChoP) present in the outer membrane of this pathogen, the platelet activating factor receptor (PAFR) present in the human lung epithelial cells, and the adherence and entry of *A. baumannii* in these host cells, as a mechanism for colonization and infection by *A. baumannii* [Smani et al. JBC 2012].

Following this work, we have studied whether the outer membrane of *A. baumannii* harbors other adhesins involved in its adherence and invasion in the host. Three adhesins (OmpA, Omp33 and TonB) present in the outer membrane protein of *A. baumannii* were identified to bind to fibronectin, an extracellular matrix protein present in the host, which will allow the development of possible therapeutic approaches in the future to stop the entry of *A. baumannii* into the host and its escape from the immune system response [Smani et al. PloSOne 2012, Smani et al. JID 2013, Sánchez-Encinales et al. JID 2017]. We have demonstrated first how the genes encoding these adhesins are regulated, and we have showed their involvement in the death of human lung epithelial cells.

Subsequently, we have generated mutant strains deficient in the genes encoding these adhesins and we demonstrated their involvement in the antimicrobial resistance and in bacterial virulence in vitro and in experimental models of murine infection; as well as in infected patients by *A. baumannii* or *Escherichia coli* [Smani et al. JID 2013, Smani et al. AAC 2014, Sánchez-Encinales et al. JID 2017]. Among these three adhesins, we have worked deeply with OmpA, characterizing its gene regulation and role in the pathogenesis of GNB, with the objective to develop and evaluate the therapeutic efficacy of OmpA inhibitors and their derivatives to inhibit the infections caused by OmpA expressing GNB. Moreover, we aimed to decipher how GNB respond to host signals, and which mechanisms used GNB to enter and persist inside host cells. To this end, we studied, using cellular and molecular techniques, the role of endosomes/lysosomes in the intracellular traffic of GNB, in particular *A. baumannii*. First data showed that the transcription factor EB (TFEB), well-known as inducer of the biogenesis of endosomes/lysosomes genes, participated in the entrance and persistence of *A. baumannii* inside human lung epithelial cells [Parra-Millán et al. mSphere 2018]. The next step will be to understand how *A. baumannii* and other GNB regulate the activation of TFEB and whether OmpA is one of the adhesins involved in this process.

Research Area (according to the evaluation panels):

Chemistry	Social Sciences & Humanities	Economic Science	Information Science & Engineering	Environmental Science & Geology	Life Sciences	Mathematics	Physics
No	No	No	No	No	Yes	No	No

Applications: Documents to be submitted by applicants and deadlines:

1. Curriculum vitae
2. Motivation letter
3. Description of research plan
4. Two support letters



JOSÉ ANTONIO SÁNCHEZ ALCÁZAR

Contact Person / Scientist in Charge

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Department / Institute / Centre / Lab

- Name: Fisiología, Anatomía y Biología Celular/Centro Andaluz de Biología del Desarrollo/Laboratorio 210/Universidad Pablo de Olavide
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Webpage(s): <https://sanchezalcazarlab.com/>

Brief profile of the Centre / Research Group / Lab / PI:

The Andalusian Center for Biology of Development, mixed center CSIC-University Pablo de Olavide-Junta de Andalucía, has a wide infrastructure for the realization of projects in the area of biomedicine, including animal facility, cell culture laboratory, proteomics service in collaboration with Laboratory of Mass Spectrometry MALDI-TOF of the UPO, spectrophotometers, HPLC with ultraviolet detector, fluorimeter, luminometers, thermal cyclists, real-time PCR, automatic sequencer, flow cytometry facility, state-of-the-art facility of fluorescence and confocal microscopy including fluorescence microscopy coupled to microinjector for in vivo studies; other equipment include scintillation counters and ultracentrifuge, Seahorse analyzer, precision scales, hybridization ovens, and freezers of various levels. For electron microscopy studies we will use the Microscopy Services of the Technological Research and Innovation Center (C.I.T.I.U.S.) of the University of Seville, the Spanish Centro Nacional de Microscopía Electrónica (www.cnme.es/), and the laboratory and facilities of Dr. José Manuel García Verdugo (University of Valencia). For the screening of active ingredients, we have an automated station for liquid handling (Precision XS, Biotek) and a Polarstar Omega plate reader (BMG Labtech). For electrophysiological assays, we will use the facilities of the Laboratory of Cellular Neuroscience and Plasticity (Universidad Pablo de Olavide), group which is led by Dr. Antonio Rodríguez Moreno specialized in electrophysiological characterization of different models from cultures to the whole animal. In summary, we have adequate basic infrastructure, professional experience and the necessary means to carry out this project. A description of the center, its services and the research group is on its website: www.cabd.es. The CABD has experienced a very considerable quantitative and, especially, qualitative growth during the last decade. Among the achievements achieved, the obtaining of the María de Maeztu seal in two consecutive editions stands out, which identifies us as one of the CSIC institutes of reference in Life Sciences.

For the past 23 years, Dr. Sánchez Alcázar, PI of the project, has been working on the pathophysiology and search for treatments for rare diseases:

- <https://www.ncbi.nlm.nih.gov/pubmed/?term=sanchez+alcazar>
- https://www.researchgate.net/profile/Jose_Sanchez-Alcazar
- <https://sanchezalcazarlab.com/>

Idea / Project description:

Neurodegeneration with brain iron accumulation (NBIA) is a group of rare neurodegenerative disorders characterized by dysfunction of the central nervous system and the accumulation of iron in certain areas of the brain that causes progressive disability in patients. Currently, there are no effective treatments capable of stopping the disease.

The overall goal of this project is to find effective personalized treatments using fibroblasts and neuronal cells obtained by direct reprogramming of NBIA patients with mutations in the enzyme pantothenate kinase 2 (PANK2) gene that is essential for the synthesis of coenzyme A (CoA). To this end, we propose the characterization of the pathophysiological mechanisms in fibroblasts and neuronal cells of patients with mutations in the PANK2 gene and the evaluation of the effectiveness of a library of commercial pharmacological compounds in the reversal of these pathological alterations.

Personalized drug screening is based on the hypothesis that different mutations and inter-individual genetic variation can contribute significantly to both disease susceptibility and response to pharmacological treatments. The goal of personalized medicine is to maximize the likelihood of therapeutic efficacy and minimize the risk of drug toxicity for an individual patient.

The objectives of the project are eminently practical and aim to find new effective personalised therapies for patients with NBIA.



Neurodegeneration has a great impact on health due to the aging of the population, its high prevalence and social cost. Among the neurodegenerative diseases, Alzheimer's Disease (AD), Parkinson's Disease (PD), Huntington's Disease (HD) and Amyotrophic Lateral Sclerosis (ALS) stand out due to their high prevalence and severity. Most of these diseases are characterized by a common pathogenic mechanism in which iron accumulation plays an important role. That is why the study of NBIA disorders can be very useful to understand the pathophysiological mechanisms of neurodegenerative diseases with greater prevalence.

Research Area (according to the evaluation panels):

Chemistry	Social Sciences & Humanities	Economic Science	Information Science & Engineering	Environmental Science & Geology	Life Sciences	Mathematics	Physics
No	No	No	No	No	Yes	No	No

Applications: Documents to be submitted by applicants and deadlines:

1. Curriculum vitae.



PIM EDELAAR

Contact Person / Scientist in Charge

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Department / Institute / Centre / Lab

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Webpages: <https://pimedelaar.org> <https://www.researchgate.net/profile/Pim-Edelaar>

Brief profile of the Centre / Research Group / Lab / PI:

The University Pablo de Olavide is a young and research-intensive university. It is home to several ERC projects, and to several CSIC research institutes, incl. a national centre of research excellence. It also hosts the regional centre of excellence in Biodiversity. It consistently ranks in the top of per-capita most productive universities in Spain.

My group is composed of technicians, post-docs, PhD students, MSc students and myself, with a healthy flux of people coming in and continuing elsewhere. We value and promote a collaborative atmosphere, a flat communication structure, flexible hours, and intellectual freedom. My research has been continually funded since 2004.

Idea / Project description:

Our scientific interests centre on the links between individual variation, adaptive population divergence, and evolutionary theory. We have a particular focus on the diverse mechanisms of adaptation and divergence (see Edelaar & Bolnick 2019 Trends in Ecology & Evolution, Edelaar et al. 2023 Biological Reviews, and my book Adaptive Evolution – The Return of the Organism soon appearing with Oxford University Press). A main line of research is how individual choices can facilitate local adaptation, genotype-environment correlation, invasion of novel habitats, and even experimental speciation. We study this in different empirical systems. As examples, we have worked with grasshoppers (manipulating their colour), fruit flies (using optogenetics), zebra finches and tree sparrows (manipulating individualised access to feeders with RFID transponders). We furthermore use individual-based simulation modelling, and causal structure modelling, to understand the evolution and consequences of habitat choice, in the context of other mechanisms to increase performance like phenotypic plasticity, natural selection and niche construction.

For more information (incl. pdfs of published papers): <https://pimedelaar.org>

Anyone interested to develop a personal project (or to collaborate with our projects) within these general contexts, is invited to contact me and discuss options.

Research Area (according to the evaluation panels):

Chemistry	Social Sciences & Humanities	Economic Science	Information Science & Engineering	Environmental Science & Geology	Life Sciences	Mathematics	Physics
No	No	No	No	No	Yes	No	No

Applications: Documents to be submitted by applicants and deadlines:

- A short description of scientific interests and brief CV;
- No deadline



ACAIMO GONZÁLEZ-REYES

Contact Person / Scientist in Charge

- Name and surname: Acaimo GONZÁLEZ-REYES
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Department / Institute / Centre / Lab

- Name: Andalusian Centre for Developmental Biology (CABD)
- Address: Pablo de Olavide University. Carretera de Utrera Km. 1, 41013 Seville, Spain

Webpages: <https://cabd.es>

Brief profile of the Centre / Research Group / Lab / PI:

The internationally recognized Andalusian Centre for Developmental Biology (CABD) hosts a number of groups with interests on different areas encompassing the fields of Genetics, Cell Biology, Developmental Biology, Biophysics, Bioinformatics, Evolution and Modelling of biological processes. A number of model organisms, ranging from unicellular prokaryotes and eukaryotes to insects, nematodes, vertebrates, cells in culture and organoids are studied at the CABD utilising state-of-the-art equipment and techniques. The CABD has been recognized twice with the "María de Maeztu Unit of Excellence Award" by the Ministry of Science, Innovation and Universities.

The work will be supervised by:

Supervisor:

1. Title: Research Professor (Group Leader, CABD)
2. Full name: Acaimo González-Reyes
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4. http://www.cabd.es/index.php?page=cabd_research_groups&group_id=3&page_id=36&lang=en

Co-Supervisor:

1. Title: Ramón y Cajal researcher (Associate Investigator, CABD)
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4. http://www.cabd.es/index.php?page=cabd_research_groups&group_id=140&page_id=367&lang=en

Idea / Project description:

The homeostasis of many tissues relies on residing stem cells. Throughout life, stem cell pools are dynamic and respond to insults and environmental changes. For example, depleted pools can be replenished and certain physiological or pathological conditions can induce stem cell proliferation. This plasticity is facilitated by intrinsic properties of tissues and to inter-organ communication mechanisms that translate physiological states and environmental cues into molecular signals. Stem cells are located within specialized micro-environments called niches, known to regulate stem cell numbers and behaviour.

The ovary of the fruit fly *Drosophila melanogaster* represents an excellent model to study stem cell biology. The female germline stem cells (GSCs), found in cellular niches, are responsible for the generation of female gametes. GSC proliferation and numbers are closely dependent on the female's age but they are also subject to regulation by organs such as the brain, the gut and the adipose tissue. During ageing, the number of stem cells found in the ovarian niche in the female *Drosophila* decreases. In an effort to identify novel mechanisms involved in stem cell niche ageing, we have recently identified key changes in gene expression and alternative splicing occurring in ovarian niche support cells during the course of ageing. In addition, our research has determined the social interactions that male adults experience can affect the stem cell biology of their gonads and the physiology of the entire organism. We proved that, after sensing the presence of females through pheromones, an activation state is triggered in the two stem cell populations of the testis, increasing their proliferation. These social inputs are transduced to the testis by an inter-organ communication network implicating signals released from the brain and the muscle – Octopamine, homologous to the Noradrenalin of vertebrates, and Egr/TNF α respectively.



The new researcher will make use of the available wealth of data and tools to advance our understanding of the cellular, genetic and molecular mechanisms behind niche homeostasis in *Drosophila* ovaries and testis. The candidate will be part of a collaborative effort between two dynamic and interactive groups at the CABD, a leading centre in Developmental Biology.

Our groups utilize the male and female gonads of the fruit fly *Drosophila melanogaster* to study the biology of stem cells and their relationship with the environment, their physiology and gamete morphogenesis. Techniques commonly used in the laboratory include genetic manipulation of cell populations, confocal microscopy, live imaging, gene expression quantification, transcriptomics, biophysical measurements, machine-learning approaches and behavioural analysis. Within the CABD, we make use of the Genomics and Proteomics Services available in-house.

We are looking for a highly motivated candidate willing to learn new concepts, apply novel experimental approaches and test unconventional ideas. The host laboratory will provide a scientifically vibrant, supportive and friendly environment as well as the necessary infrastructure. The candidate will have the opportunity to present their work at internal and external meetings to improve their communication skills and give visibility to the work. We will also provide the necessary mentoring for the career development of the candidate and for achieving independence and technical mastery.

Research Area (according to the evaluation panels):

Chemistry	Social Sciences & Humanities	Economic Science	Information Science & Engineering	Environmental Science & Geology	Life Sciences	Mathematics	Physics
No	No	No	No	No	Yes	No	No

Applications: Documents to be submitted by applicants and deadlines:

- CV



MARÍA DOLORES MARTÍN BERMUDO

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Department / Institute / Centre / Lab

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Webpages: <https://cabd.es>

Brief profile of the Centre / Research Group / Lab / PI:

The internationally renowned Andalusian Centre for Developmental Biology (CABD) hosts a number of groups with interests on different areas all-embracing the fields of Genetics, Evolution, Cell and Developmental Biology, Biophysics, Bioinformatics and Modelling of biological processes. A number of model organisms, including unicellular prokaryotes, nematodes, vertebrates, *Drosophila*, cells in culture and organoids are employed at the CABD in combination with up-to-date equipment and techniques. The CABD has been recognized twice with the "María de Maeztu Unit of Excellence Award" by the Ministry of Science, Innovation and Universities.

The work will be supervised by:

Supervisor:

- Title: Research Professor (Group Leader, CABD)
- Full name: María Dolores Martín Bermudo
- Email: mdmarber@upo.es
- <https://www.mblab.es/home>

Idea / Project description:

Epithelial tissue is one of the four main types of body tissue found in organs and cover internal and external structures of our body. It has different structure and functions depending on where it is in our body. Epithelia morphogenesis comprises the various processes by which epithelia contribute to organ formation and body shape. The coordinated and precise cell movement combined with shape changes, proliferation and intercalation of cells, in epithelial sheets facilitate complex morphogenetic processes, from tissue elongation to bending and tube formation, underlying organogenesis. In addition, epithelia cell shape changes and migration are a hallmark of oncogenic transformation. Thus, the control of these processes is not only important for proper epithelia morphogenesis but also for maintaining epithelial integrity in homeostasis and regeneration. The past decade has witnessed remarkable progress in quantitative studies of cell movement and shape fuelled by advances in microscopy, live imaging, image analysis and computational modelling. The resulting toolkit has enabled processes to be quantified and correlated across multiple scales: from the spatio-temporal dynamics of specific molecules within cells; to individual cell shape changes and movement to tissue-scale growth. In *Drosophila*, a diverse range of genetically accessible epithelial tissues exhibit different migratory processes, making them exceptional systems for the study of epithelial cell migration and invasiveness. Outstanding among these epithelial tissues are the follicular epithelium (FE) of the *Drosophila* ovary, the primordium of the wing, the wing imaginal disc, and the larval and adult intestine. Using these tissues, we have been able to identify new regulators of cell migration and metastasis. In addition, we have proven that the tumour microenvironment is necessary to sustain tumour growth and metastatic capacity. At present, we are performing single cell RNA seq to identify factors in the tumour microenvironment triggering tumour growth and metastasis.

The new researcher will make use of the available wealth of data and tools to advance our understanding of the cellular, genetic and molecular mechanisms behind cell migration and invasion. The candidate will be part of the dynamic and interactive groups at the CABD, a leading centre in Developmental and Cell Biology.

Our groups utilize *Drosophila melanogaster* tissues to study the mechanisms underlying cell migration and invasion. However, we are also starting to collaborate with groups using human organoids. Techniques commonly used in the laboratory include genetic manipulation of cell populations, confocal microscopy, live imaging, gene expression quantification, transcriptomics, biophysical



measurements, machine-learning approaches and mathematical modelling. Within the CABD, we make use of the Genomics and Proteomics Services available in-house.

We are looking for a decidedly motivated candidate eager to learn new concepts, apply novel experimental approaches and test unconventional ideas. The host laboratory will provide a scientifically exciting, supportive and friendly environment, as well as the necessary infrastructure. The candidate will have the opportunity to present their work at internal and external meetings to improve their communication skills and give visibility to the work. We will also provide the necessary mentoring for the career development of the candidate and for achieving independence and technical capacity.

Research Area (according to the evaluation panels):

Chemistry	Social Sciences & Humanities	Economic Science	Information Science & Engineering	Environmental Science & Geology	Life Sciences	Mathematics	Physics
No	No	No	No	No	Yes	No	No

Applications: Documents to be submitted by applicants and deadlines:

- CV



PHYSICS

JORGE SEGOVIA

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Department / Institute / Centre

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Brief description of the Centre / Research Group:

We are investigating the fundamental Green's functions in the gauge sector of Quantum Chromodynamics (QCD), by applying both Dyson-Schwinger equations and lattice-regularized QCD and capitalizing also on the inter-comparison of their results and on their mutual feedback. In particular, we study the correlation functions of two and three gluon fields, of two "ghost" fields, and of two ghosts and one gluon; and pay therewith a central attention to the analysis of the strong running coupling constant, the dynamical generation of a running mass for the gluon, and the implications in the dynamical chiral symmetry breaking.

On a different page, a non-perturbative solution of the Dyson-schwinger equations combined with covariant bound-state equations such as the Bethe-Salpeter and Faddeev equations enables the study of, e.g., hadrons as composites of dressed-quarks and dressed-gluons, the phenomena of confinement and Dynamical Chiral Symmetry Breaking, and therefrom an articulation of any connection between them. We are currently analyzing the electromagnetic elastic and transition form factors of nucleon resonances which will be tested in the near future at Jefferson Lab after completion of the 12 GeV2 upgrade.

Finally, we are developing a variety of QCD based phenomenological quark models and sophisticated computational techniques in order to study tetra-, penta-, hexa- and multi-quark systems without assuming any particular clustering between the valence quarks. Moreover, most of the XYZ exotic states discovered until now belong to the heavy quark sectors and then a non-relativistic dynamics of quarks can be justified. Therefore, we will assume that multi-quark systems can be described as collections of point-like particles whose dynamics are dictated by a non-relativistic Hamiltonian involving two- and three-body potentials.

Project description:

The applicant must choose between one of the research lines explained above:

- Interplay between lattice-regularized QCD and Dyson-Schwinger equations to explore the gauge sector of QCD.
- Studies of hadronic bound states: wave functions, parton distributions and form factors, within the continuum Schwinger-functions formalism
- Variational and Monte Carlo calculations of the ground and excited states of multiquark systems.

Research Area (according to the evaluation panels):

Chemistry	Social Sciences & Humanities	Economic Science	Information Science & Engineering	Environmental Science & Geology	Life Sciences	Mathematics	Physics
No	No	No	No	No	No	No	Yes

Applications: Documents to be submitted by applicants and deadlines:

- Curriculum vitae
- Brief description of his/her research interest
- No deadline



INFORMATION SCIENCE & ENGINEERING

MIGUEL GARCÍA TORRES

Contact Person / Scientist in Charge

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Department / Institute / Centre

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Webpage: <https://datalab.upo.es>

Brief description of the Centre / Research Group:

The Data Science & Big Data research lab is focused on core data science and big data research as well as on application areas where data science and big data can assist in providing useful insights for decision making. The group is involved in national and international projects about bioinformatics, astrostatistics, and medical imaging. We develop methods and workflows to address real-world problems.

Project description:

The electric energy needs are constantly growing. It is estimated that such demand will increment from 549 quadrillion British thermal unit (Btu), registered in 2012, to 629 quadrillion Btu in 2020. A further increment of 48% is estimated by 2040.

The accurate estimation of energy demand provides several benefits. The economic benefits are evident because this would allow us to allocate only the right amount of resources that are needed in order to produce the amount of energy actually needed to face the actual demand. There are also environmental aspects to consider, since, by producing only the right amount of energy required, the emission of CO₂ would be reduced as well. In fact, energy efficiency is another relevant goal pursued with these kinds of approaches since the accurate forecasting of electricity demand in public buildings or in industrial plants usually leads to energy savings.

Despite the advances on energy efficiency, it is still very difficult to understand how such models operate in practice. Therefore, it is hard for experts to trust and justify decisions and recommendations made by analytical models. To address this issue Explainable Artificial Intelligence (XAI) techniques have been developed to improve the explainability of machine learning models, such that their output can be better understood.

The main objective of the project is to use explainable strategies to design and develop analytical models for analyzing energy consumption data from real-life scenarios.

Research Area (according to the evaluation panels):

Chemistry	Social Sciences & Humanities	Economic Science	Information Science & Engineering	Environmental Science & Geology	Life Sciences	Mathematics	Physics
No	No	No	Yes	No	No	No	No

Applications: Documents to be submitted by applicants and deadlines:

- Brief CV
- A short description