

Postdoctoral Researcher Positions at the CBGP (UPM-INIA/CSIC)

The Centro de Biotecnología y Genómica de Plantas (CBGP, UPM-INIA) is seeking for the outstanding candidates for **postdoctoral researcher positions – Maria Zembrano** fellowship, NextGenerationEU, Ministerio de Universidades. The selected candidates will apply for a 1, 2, or 3 years stay at CBGP/UPM

Specific candidate's requirements for all offers:

- Postdocs (Spanish or international) with postdoctoral experience in national or international centres distinct from that of PhD for at least 24 months at the deadline date. Candidates must demonstrate that they are hired by a foreign research institution at the application time.
- The start date must be January 1st to August 31st, 2022. Contract of 3 years will only be possible for candidates that start on January 1st, 2022.

TITLE: ROOT CLOCK BASED TRAITS FOR MORE YIELD AND RESILIENCE: TOWARDS A SUSTAINABLE AGRICULTURE

Required qualifications:

- Postdoctoral researcher in plant molecular biology and root development in a prestigious international research center or university.
- Knowledge in tomato transformation and handling.
- Brilliant publication record.

Task to be developed: The root clock is a mechanism described in the model plant *Arabidopsis thaliana* which patterns the root system by determining the branching sites and waving frequency (Moreno-Risueno et al (2010) *Science*). We have recently identified the oscillator of the Root clock (Perianez-Rodriguez et al. (2021) *Science Advances*) as well as additional regulation (unpublished data) which establishes a major function for the Root Clock components in determining root system morphology traits and resilience upon stress. The researcher will assess the function of the Root Clock components in shaping the root system upon stresses such as salinity and phosphate starvation in *Arabidopsis* and tomato. This involves the generation of mutants of the tomato orthologs of the Root Clock components through CRISPR-CAS9 as well as of transcriptional/translational luciferase and fluorescent fusions which will be introgressed through the hairy roots method or others. Moreover, natural variation within available sequences for the Root Clock components will be identified and those variants integrated into *Arabidopsis* or tomato to evaluate the effects in the Root Clock and the root system under standard or stress.

Ref. Moreno-Risueno MA, Van Norman JM, Moreno A, Zhang J, Ahnert SE, Benfey PN. (2010). Oscillating gene expression determines competence for periodic *Arabidopsis* root branching. **Science**. 2010 Sep 10;329(5997):1306-11. doi: 10.1126/science.1191937.

Ref. Perianez-Rodriguez J, Rodriguez M, Marconi M, Bustillo-Avenidaño E, Wachsmann G, Sanchez-Corrienero A, De Gernier H, Cabrera J, Perez-Garcia P, Gude I, Saez A, Serrano-Ron L, Beeckman T, Benfey PN, Rodríguez-Patón A, Del Pozo JC, Wabnik K, Moreno-Risueno MA. (2021) An auxin-regulable oscillatory circuit drives the root clock in Arabidopsis. **Science Advances**. 1;7(1):eabd4722. doi: 10.1126/sciadv.abd4722. Print 2021 Jan.

PI of the Project: Miguel Ángel Moreno Risueño

Group website: <http://www.cbgp.upm.es/index.php/es/lineas-de-investigacion-de-jovenes-investigadores?id=101>

TITLE: EFFECT OF ENVIRONMENTAL CONDITIONS ON THE MOLECULAR NETWORKS CONNECTING PLANT PERCEPTION AND DOWNSTREAM RESPONSES TO ARTHROPOD HERBIVORES

Required qualifications: Candidates should have experience in in vivo biotic assays using herbivores and plants. Experience in molecular biology techniques and bioinformatics analyses is required.

Task to be developed: The candidate will be involved in all the objectives of this project: Objective 1. Building and analysis of molecular networks connecting perception and response to arthropod herbivores. Objective 2. Effect of environment on the molecular networks connecting perception and response to arthropod herbivores. Objective 3. Integration of results to predict molecular consequences of climate change on plant responses to herbivory. The candidate will perform in vivo assays using plants and herbivores, as well as different molecular and bioinformatics analyses.

PI of the Project: Manuel Martínez Muñoz

Group website: <http://www.cbgp.upm.es/index.php/es/interaccion-de-las-plantas-con-el-medio?id=82>

TITLE: METAL HOMEOSTASIS IN PLANT-MICROBE INTERACTIONS

Required qualifications: The selected candidate should be proficient in some of these topics: plant metal homeostasis, protein-protein interactions, plant-microbe interaction Proficiency in English and/or Spanish is required.

Task to be developed: The successful candidate will work in the group Metal Homeostasis at Plant-Microbe Interactions (www.metalsym.com) at Centro de Biotecnología y Genómica de Plantas (UPM-INIA) (www.cbgp.upm.es) in Madrid, Spain. He/she will undertake one of these two projects based on his/her experience:

1. **Intracellular metal trafficking in biological nitrogen fixation:** Nitrogen fixation demands dedicated metal (Fe, Mo, Cu, Zn) delivery pathways. The person joining this project will determine how essential metal nutrients are diverted from the general metal pool and directed to nitrogenase cofactor assembly. Proteomics, protein biochemistry, microscopy, and metal imaging methods will be employed to characterize these pathways in legume nodules (*Medicago truncatula*) and in diazotrophic bacteria (*Sinorhizobium meliloti* and *Azotobacter vinelandii*).
2. **Role of transition metals in plant-pathogen interactions.** Data from our group and others show that plants modulate metal availability at the infection site to fend-off invading microbial pathogens (either through metal starvation or through metal toxicity). The selected candidate will determine how metal-dependent plant immunity is linked to the mainstream immune signalling network, and expand on our work of metal homeostasis at the infection sites. A combination of transcriptomics, physiology, and metal imaging approaches will be used, focusing on Arabidopsis and rice as our model systems.

PI of the Project: Manuel González-Guerrero

Group website: <http://www.cbgp.upm.es/index.php/es/interaccion-de-las-plantas-con-el-medio?id=84>

TITLE: NITROGENASE BIOENGINEERING

Required qualifications: The main criteria for selection will be scientific excellence, experience in the above areas, and a track record of research impact and future projection. Highly motivated and productive scientist to join a recognized research group and boost nitrogen fixation research in one of the following research areas: synthetic biology, mitochondria and/or chloroplast biotechnology, nitrogen metabolism.

Task to be developed: The expectation is that the candidate will develop synergistic research with the host group in eukaryotic nitrogenase engineering. Depending on the candidate's experience and common interests, the tasks will be ascribed to one of these areas:

1. Identification of optimal nif genes for nitrogenase engineering in yeast
2. Nif components engineering in plants (rice, tobacco or Arabidopsis)

PI of the Project: Luis Manuel Rubio Herrero

Group website: <http://www.cbgp.upm.es/index.php/es/interaccion-de-las-plantas-con-el-medio?id=90>

TITLE: DECIPHERING THE STRUCTURAL AND MOLECULAR BASES OF GLYCANS PERCEPTION BY THE INNATE IMMUNE SYSTEM OF PLANTS: FROM GLYCANS RECOGNITION TO MODULATION OF PLANT IMMUNE RESPONSES AND DISEASE RESISTANCE

Required qualifications: Postdoctoral Researcher that preferentially should have expertise in the characterization of plant cell walls composition/structure and/or molecular mechanisms regulating cell wall integrity (CWI) responses. Expertise in the expression of proteins (e.g. Ectodomains of Pattern Recognition Receptors, PRRs) in heterologous systems (insect cells) for glycoligand/receptor binding assays will be very valuable.

Job profile description of the Postdoctoral Researcher: The researcher will use molecular, biochemical and genetic approaches for characterization of the function of plant cell wall composition and CWI in the regulation plant innate immunity and adaptation to abiotic stresses. The Postdoctoral researcher will develop all the technologies and tools required for glycoligand/receptor binding studies and molecular and genetic characterization of the function of PRRs, CWI sensor/receptor in plant response and adaptation to stresses.

PI of the Project: Antonio Molina Fernández

Group website: <http://www.cbgp.upm.es/index.php/es/interaccion-de-las-plantas-con-el-medio?id=88>

Title: Structure-function studies of iron-sulfur proteins

Required qualifications: The main criteria for selection will be scientific excellence, experience in iron-sulfur proteins, and a track record of research impact and future projection. Highly motivated and productive scientist to join a recognized research group and boost nitrogenase research in one of the following research areas: chemical and biochemical aspects of iron-molybdenum (FeMo)-cofactor biosynthesis, structure and interactions of FeMo-cofactor biosynthetic proteins.

Task to be developed: The expectation is that the candidate will develop synergistic research with the host group in understanding the mechanism of FeMo-cofactor biosynthesis. Depending on the candidate's experience, the tasks will be ascribed to one of these areas:

- Investigating the synthesis of the iron-sulfur core of FeMo-cofactor.
- Investigating the incorporation of molybdenum into FeMo-cofactor.
- Elucidating structures and interactions of FeMo-cofactor biosynthetic proteins.

PI of the Project: Luis Manuel Rubio Herrero

Group website: <http://www.cbgp.upm.es/index.php/es/interaccion-de-las-plantas-con-el-medio?id=90>

TITLE: POSTDOC POSITION IN YEAST SYNTHETIC BIOLOGY AT @PLANTDYNAMICS LAB

Required qualifications:

- Solid knowledge of state-of-the-arts molecular biology techniques (complex plasmid cloning, working with microorganisms and/or plants)
- A strong experience with epifluorescence live cell imaging techniques
- Excellent knowledge of English both written and spoken
- Experience with image analysis, ImageJ scripting and R or Python programming skills are desired

Task to be developed:

- Design and construct synthetic cell communication protocols in baker's yeast model system
- Perform live cell imaging using lab-on-a-chips environment to study population-level response dynamics in yeast colonies
- Quantify spatial-temporal dynamics of population-level responses, inter-strain dynamics and coordinated behaviour using customized microfluidics platform
- Assist in developing computer models of microbial population dynamics that integrated experimental measurements

PI of the Project: Krzysztof Wabnik

Group website: <http://www.cbgp.upm.es/index.php/es/informacion-cientifica/grupo-de-investigacion-incipiente/krzysztof-wabnik>

TITLE: POSTDOCTORAL POSITION ON COMPUTATIONAL EVOLUTIONARY GENOMICS AND MICROBIOME ECOLOGY

The group of Dr. Jaime Iranzo, studying "Evolutionary dynamics of genomes, viruses, and microbial populations" at the Centre for Plant Biotechnology and Genomics (CBGP, Universidad Politecnica de Madrid, Spain) is seeking to hire a postdoctoral researcher to investigate fundamental aspects of prokaryotic genome evolution and virus-host ecological interactions within human and environmental microbiomes. The initial appointment is for 3 years, with an option to join the faculty of the UPM as an Associate Professor/Lecturer at the end of that period. The gross salary is 48,000 EUR/year plus up to 3,500 EUR relocation costs.

Required qualifications:

We are seeking an experienced and highly motivated postdoctoral researcher with strong quantitative and computational skills, and a background in computational biology, bioinformatics, complex systems, or mathematical modeling. Although not essential, some degree of familiarity with evolutionary genomics and/or population dynamics is desirable. We will positively consider candidates that add to the current set of skills of the lab and are open to collaborate with other computational and experimental groups within the CBGP.

Task to be developed:

The postdoctoral researcher will join a multidisciplinary team of scientists that combine empirical data, computational tools, and mathematical models to study the ecology and evolution of microbial populations. The postdoctoral researcher is expected to develop her/his own line of research and help with supervision of undergraduate and PhD students. The details of the research project will be decided by the postdoctoral researcher and the PI based on common interests and the candidate's area of expertise.

PI of the Project: Jaime Iranzo Sanz

Group website: <http://www.cbgp.upm.es/index.php/es/informacion-cientifica/csbgp/jaime-iranzo>

TITLE: FINDING THE DOOR FOR PLANT VIRUS SEED INVASION: THE CELL WALL AS A LOCK

Required qualifications:

We are looking for a motivated PhD with formation in plant molecular biology and expertise on analyses of gene expression, screening of mutants and/or generation of transgenic lines) and, if possible, on microscopy techniques, with interest to apply these skills in the field of phytopathology. Any previous experience in studying plant-pathogen interactions (particularly of plants and viruses) will be valuable.

Task to be developed:

What are we looking for: Virus seed transmission allows long-term (decades) survival and transcontinental dispersion of these major plant pathogens. Because 90% of crops are propagated through seeds, this mode of transmission is of major concern for growers and industry alike. Indeed, millions of euros are spent every year in seed health testing programmes as a way to limit the dispersion of infected seeds. Despite its importance, the molecular basis of virus seed entry into seeds are currently unknown. We have identified several genes involved in the cell wall biogenesis as potential modulators of virus seed transmission rate. The candidate will be involved in analysing the role of these candidate genes in the process of seed transmission by applying molecular tools to identify if their expression correlates with virus seed invasion. The role of the candidate genes will be also validated by studies with knock-out mutants. Finally, we will address how viruses interact with the cell wall using cell imaging techniques.

What do we offer: Our group has strong background in virology and virus evolution. During the development of the project, the candidate will acquire sound knowledge on concepts and techniques related to this area of research. Indeed, the project includes the analysis of how viruses adapt to the differential expression of cell wall genes involved in seed transmission. We are also experts in biostatistics, and the candidate will receive ample formation in this aspect. Overall, we offer a multidisciplinary formation that will complement the background of the selected candidate, resulting in a highly competitive profile.

PI of the Project: Jesús Israel Pagán Muñoz

Group website: <http://www.cbgp.upm.es/index.php/es/informacion-cientifica/grupo-de-investigacion-incipiente/virus-speciation-seed-trasmission>

TITLE: PLANT RESPONSE TO BIOTIC INTERACTIONS: EXPLORING THE EFFECT OF SEED DEFENCE PRIMING ON PLANT DEFENCE-GROWTH TRADE-OFF ESTABLISHED UPON PLANT-PEST INTERACTION

Required qualifications: PhD in Plant Molecular Biology / Plant Physiology, knowledge in statistics and bioinformatics, strong skills in molecular biology techniques (including DNA, RNA and protein handling, PCR, qPCR...), experience on plant-biotic interaction

Task to be developed:

- Design of experiments
- Plant cultivation and arthropod maintenance
- Infestation bioassays
- Plant damage analysis (machine learning, Photoshop, Image J) and study of arthropod performance (development, mortality, fecundity)
- Molecular and biochemical techniques (RNA, DNA and protein isolation, gene cloning, plant transformation...)
- Transcriptomics (qRT-PCR, RNAseq) and metabolomics
- Data integration and statistical analysis
- Results discussion and writing articles

PI of the Project: Estrella Santamaría Fernández

Group website: <http://www.cbgp.upm.es/index.php/es/interaccion-de-las-plantas-con-el-medio?id=82>

TITLE: VASCULAR DEVELOPMENT DURING PLANT ADAPTATION TO HIGH TEMPERATURE AND NUTRITIONAL DEFICIENCIES.

Required qualifications: Postdoctoral experience in molecular and cellular biology in plants

Task to be developed: To carry out transcriptomic and proteomic analyses of vascular cell (using cell sorting) of plants during their adaptation to heat stress and phosphate starvation.

DNA methylation analyses in vascular cells, pericycle and lateral root cap cells in roots of plants grown under heat stress and phosphate starvation.

PI of the Project: Juan Carlos del Pozo Benito/ Elena Caro Bernat

Group website: <http://www.cbgp.upm.es/index.php/es/desarrollo-de-plantas?id=858>

TITLE: MECHANISMS OF FUNGAL EFFECTOR GENE REGULATION DURING PLANT HOST COLONIZATION

Required qualifications: PhD in microbiology or plant science. The researcher needs to have a deep knowledge in plant pathogen-interactions, in molecular biology, confocal microscopy and/or epigenetics. Good oral and written communication skills are also required.

Tasks: The postdoctoral researcher will investigate the molecular mechanisms that govern the regulation of effector genes in fungal plant pathogens. The success of a pathogen in colonizing a host is determined by the production of virulence factors that will interfere with the immune system and development of the host. These virulence factors frequently have a very specific function and, thus, are only required at certain stages of the infection. Accordingly, virulence genes are tightly regulated, and their expression patterns are characterized by a strong induction of expression in certain stages of the infection. Therefore, dynamic changes in transcription are key for the success of pathogens in colonizing their hosts. The regulatory mechanisms involved in regulation of virulence genes remain largely undetermined. The fungal pathogen *Zymoseptoria tritici* is the most damaging pathogen of wheat in Europe. It is estimated that the yield loss produced by this pathogen is of around 50%. Despite the importance of this pathogen, *Z. tritici* has been relatively understudied and little is known about how it detects and colonizes its host. This lack of knowledge on the pathosystem restricts our capacity to control the disease in a more efficient way. In our group, we aim to determine the key molecular components involved in wheat colonization by *Z. tritici*. The objectives that will be addressed in the project are:

1. Determine the molecular signals that are perceived by the pathogen during host colonization that induce virulence genes.
2. Elucidate the mechanisms by which pathogens activate the infection machinery, with a focus on virulence factors. The research will aim to determine the role of transcription factors and chromatin dynamics in regulation of virulence genes.
3. Identification of host molecular targets of fungal virulence factors. Investigate the function of previously identified effectors and how they facilitate host colonization.

The researcher will design and conduct experiments to accomplish the project objectives, including chromatin immunoprecipitation, RNA sequencing, infection experiments and confocal microscopy. The researcher will be involved in writing manuscripts and will attend conferences. Supervision of students and participation in soft-skill courses will be possible. The researcher will be encouraged and supported to conduct his/her own independent research.

PI of the Project: Andrea Sánchez Vallet

Group website: <http://www.cbgp.upm.es/index.php/es/informacion-cientifica/interaccion-de-las-plantas-con-el-medio-ipm/andrea-sanchez-vallet>

TITLE: EVALUATION OF GENOMIC ASSISTED BREEDING TOOLS IN A PUBLIC WHEAT BREEDING PROGRAM

Required qualifications: PhD in any of the following expertise: plant breeding, quantitative genetics, statistics, mathematics.

Task to be developed:

- Determine the best filial generation to apply Genomic selection.
- Optimize training population for the implementation of GS in the breeding program.
- Evaluation of GS schemes and apply general benchmark guidelines for implementation of GS.
- Perform machine learning and other statistical approaches to evaluate accuracy of selection.
- Mentor and assist, as appropriate and as directed, the research graduate students in our group, School and Institute.

PI of the Project: Julio Isidro Sánchez

Group website: <http://www.cbgp.upm.es/index.php/es/informacion-cientifica/csbgp/julio-isidro-sanchez>

OFFER DETAILS:

Expected duration of the contract: 1, 2, or 3 years

Gross salary per month: 4,000 euros/month (12 payments) and one time 3,500 euros installation cost payment

Start date: 1st January 2022 – 31st August 2022

APPLICATION INSTRUCTIONS AND ADDITIONAL INFORMATION:

Application deadline: 14th July 2021

Send to humanresources.cbgp@upm.es a detailed **CV** in pdf format and a copy of the **PhD diploma**. You must indicate **“Margarita Salas CBGP”** in the subject of the email message and **the title of the chosen topic**.

For any further information contact: humanresources.cbgp@upm.es

Additional information:

https://www.upm.es/sfs/Rectorado/Vicerrectorado%20de%20Investigacion/Servicio%20de%20Investigacion/Ayudas_y_Convocatorias/Convocatorias_Nacionales/proyectos20172020/Convocatoria%20UPM%202021%20Recualificaci%C3%B3n.pdf

About the CBGP: The mission of the CBGP (UPM-INIA) is to carry out fundamental and strategic research in plant science and in microorganisms interacting with plants. The research is focused in understanding important biological process such as plant development, the interaction of plants with the environment and the mechanisms of plant nutrition. In addition, the CBGP is interested in developing and using computational biology tools to achieve its goals. The acquired knowledge is used to tackle major problems of the agriculture and forestry, and to develop novel technological solutions. CBGP (UPM-INIA) also has an educational role and is a reference center for training scientists and Master's and Bachelor-level students, in plant biotechnology and genomics. The CBGP (UPM-INIA) is a research institute recognized with the seal “Severo Ochoa (SO) Center of Excellence”.