Institut de Ciències del Mar

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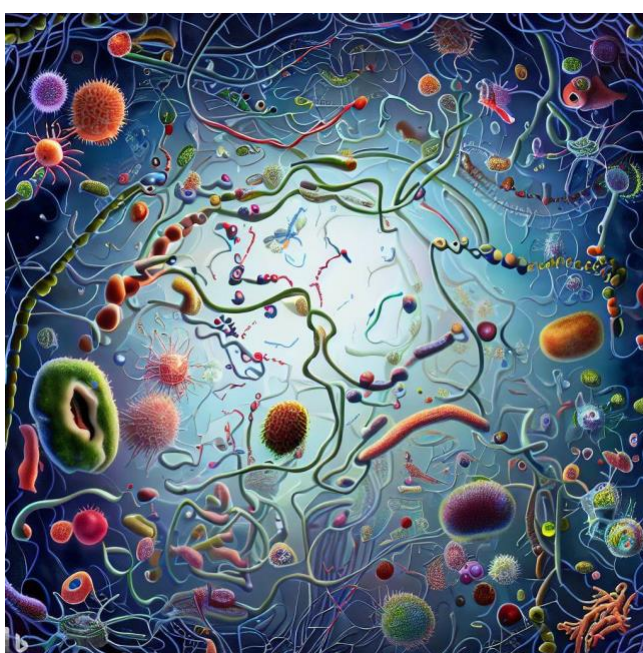+34 932 309 500
www.icm.csic.es

PhD candidate position opening:

Metabolic interactions in the ocean microbiome

Location: Institute of Marine Sciences (ICM), CSIC, Barcelona, Spain

(https://www.icm.csic.es/en)

Project framework for the position:

Project title: ***Interrogating the metabolic interactome of marine microbes*** *(MAORI,* PID2022-136281NB-I00).

MINISTERIO DE CIENCIA E INNOVACIÓN

CSIC
Consejo Superior de Investigaciones Científicas

EXCELENCIA SEVERO OCHOA

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The MAORI project aims to fill a significant knowledge gap in understanding microbial interactions in the ocean, which are crucial for the functioning of this ecosystem and form the base of food webs. Utilizing state-of-the-art molecular and computational techniques, large omics datasets, and innovative experiments, MAORI seeks to advance our understanding of metabolic interactions among ocean microbes.

The project will leverage extensive omics datasets, including samples from the LTER Blanes Bay Microbial Observatory in Spain and the SOLA marine station in France, as well as global oceanographic campaigns like MALASPINA and TARA Oceans. Cutting-edge methods such as PacBio long-read DNA sequencing, new metabolic modeling approaches, and Empirical Dynamic Modeling (EDM) will be employed.

MAORI has four main objectives:

- Spatiotemporal Analysis: To study how community-level metabolic interaction networks in the ocean change across space and time.

- Causality Determination: To use EDM to identify the strength and influence of potential interactions among marine microbes over time.

- Cooperation and Competition: To investigate these aspects among co-occurring ocean microbes using species-level metabolic models that predict metabolite exchange and cross-feeding.

- Experimental Validation: To validate predicted metabolic interactions through experiments involving co-culturing, measurement of extracellular metabolites, gene expression, and Stable-Isotope Probing (SIP).

The project is expected to significantly contribute to our understanding of microbial interactions in the ocean, with implications for understanding the effects of ocean warming on ecosystem function.

About Us:

We (log-lab; https://www.log-lab.barcelona/) are located at the Institute of Marine Sciences (ICM), CSIC, in Barcelona. Our main research lines aim at 1) understanding the structuring, evolution, and dynamics of natural microbial communities and populations using ecological theory, 2) disentangling the network of microbial interactions in ecosystems, and 3) linking the gene content of genomes, communities, and their variation, with ecological function and evolutionary processes. The CSIC is the largest public research institution in Spain embracing

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121 research institutes, and ranks third among Europe's largest research organisations. The Institute of Marine Sciences (ICM-CSIC) is the country's largest centre (~314 research staff) for multidisciplinary Marine Science, with a leading role in Southern Europe and the Mediterranean region. In 2020, the ICM received accreditation from the Severo Ochoa Excellence program, the highest national recognition of scientific excellence and leadership in Spain. Under the motto "Marine Research for a healthy planet", the ICM has a highly interdisciplinary character, with the ability to broadly address numerous questions and challenges related to marine sciences and technologies. A total of 30 doctoral theses were completed during the academic years 2020- 2022.

Key Responsibilities:

- Conduct multi-omics analyses (metagenomics and metatranscriptomics) to study microbial communities and their interactions.
- Apply and develop computational models to analyze microbial metabolic interactions and predict metabolite exchange and cross-feeding.
- Utilize Empirical Dynamic Modeling (EDM) to identify causal relationships.
- Collaborate with interdisciplinary teams and external partners.
- Publish research findings in peer-reviewed journals and present at international conferences.
- Write a PhD thesis

Qualifications:
- Degree in Bioinformatics, Microbiology, Ecology, or a related field.
- Programming skills (Python, R, Bash).
- Experience with multi-omics data analysis is a plus.
- Written and oral communication skills in English.

What We Offer:
- A 4-year employment contract that includes payment of social security contributions.

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- A stimulating research environment with state-of-the-art facilities, next to the sea.
- Comprehensive training and mentorship from leading experts in the field.
- Opportunities for international collaborations and conferences.

Planned training program:

The candidate may be enrolled in the Doctorate Programme in Marine Sciences at the Polytechnic University of Catalunya and the University of Barcelona. They will participate in national and international courses, such as the one in metabarcoding at the University of Oslo, where the PI (R. Logares) has taught since 2009, the Margalef Summer Colloquia (Barcelona, Spain), and the Workshop on Computational Microbial Ecogenomics (EBAME) in Brest, France. They will also participate in international conferences, such as ASLO, ISME, SAME, and Gordon, to present results and broaden their network of contacts. They will visit international laboratories of renowned researchers that are part of MAORI. They will conduct a stay at the Observatoire Océanologique de Banyuls sur Mer (CNRS, France) to learn about microbial dynamics in the ocean. They will also visit the University of Nantes, France, to train in metabolic modeling. They will visit the Institute of Oceanography, National Taiwan University, to get training in Empirical Dynamic Modelling and causality analyses.

Application Process:

Interested candidates should submit the following

-Cover Letter

-Curriculum Vitae

-Statement of Research Interests

-Contact information for two references

to: ramiro.logares@icm.csic.es

Do not hesitate to reach out if you have questions

Deadline for Application:

- Until the position is filled

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