Institut de Ciències del Mar

Pg. Marítim de la Barceloneta, 37-49
08032 Barcelona
+34 932 309 500
www.icm.csic.es

INPHINIT INCOMING ICM-CSIC POSITIONS

1. Assessing integrated impacts of cumulative pressures in marine ecosystems

PI: Dr. Marta Coll (mcoll@icm.csic.es)

Project description

Coastal and marine waters are vital for the natural balance of planet Earth and for Human societies. All coastal and marine ecosystem goods and services heavily depend on the level of human and environmental pressures, and their cumulative effects. Ensuing that Good Environmental Status (GES) is achieved in marine ecosystems and support policies at national, European and global levels, is a great societal and policy challenge. Scientific advances are needed to inform and guide marine governance in minimizing human pressures and their impacts on marine biodiversity and ecosystem functioning, while maintaining the sustainable delivery of ecosystem services. This research project will be develop within a big EU project recently started (1st of September 2022), Ges4Seas, and aims at developing an understanding of the mechanisms that determine the cumulative impacts of human activities and climate change. For that, we aim at developing the conceptual framework and the methodologies needed

1. to assess the capacity of marine ecosystems to deliver ecosystem services and how this is linked to GES,
2. to test tipping point and thresholds associated with multiple human activities, and
3. to investigate effects of management measures on mitigating cumulative impacts, while accounting for climate change.

During this project we will work with spatial-temporal datasets of physical, biogeochemical, ecological and socio-economic information to apply advanced marine ecosystem modelling approaches and quantify, assess and forecast the consequences of anthropogenic perturbations on marine life. The project will involve frequent collaboration with international scientific institutions, the participation to highly specialized modelling and data science courses and the attendance to international workshops, conferences and congresses.

Job position description

We are looking for a highly motivated fellow to join our research group located at the Institute of Marine Science (Institut de Ciències del Mar, ICM-CSIC) in Barcelona, Spain (website: https://martacollmarine.science).

The fellow should have knowledge in the fields of marine sciences, biological sciences, environmental sciences or similar, with a strong background in quantitative ecology. Experience with GIS, statistical analyses and programming with R is recommended. The fellow work will include gaining experience with marine ecosystem models (with particular

Pg. Marítim de la Barceloneta, 37-49
08032 Barcelona
+34 932 309 500
www.icm.csic.es

attention to Ecopath with Ecosim (EwE) and Ecospace food web modelling approach) and learning how to deal with big datasets of physical, biogeochemical, ecological and socio-economic information. The possibility to participate in fieldwork and develop novel analytical analyses (stable isotope analyses, metabarcoding environmental DNA analyses, and satellite or radar product analyses) is also available.

The Institute of Marine Science (ICM-CSIC), the fourth largest research institute of the Spanish National Research Council (CSIC) and the largest dedicated to marine research. Under the motto “Ocean Science for a Healthy Planet,” the ICM-CSIC conducts frontier research and foster both knowledge and technology transfer on topics related to ocean and climate interactions, conservation and sustainable use of marine life and ecosystems, and impact mitigation of natural and anthropogenic hazards. In-depth knowledge, determined action, and coordinated management are essential to confronting these global challenges, thereby driving sustainable development of humankind.

Pg. Marítim de la Barceloneta, 37-49
08032 Barcelona
+34 932 309 500
www.icm.csic.es

2. ECOGENOMICS OF UNCULTIVATED PROKARYOTIC SENTINELS OF THE ARCTIC OCEAN

PI: Dr. Silvia G. Acinas (sacinas@icm.csic.es)

Project description

The Arctic is under increasing pressure from climate change and growing interests in economic opportunities. Microorganisms are the foundation of the marine food web, as such we need to understand how they adapt and thrive, as well as forecast their fate in a future ocean impacted by anthropogenic change. However, little is known about the ecology, metabolic potential and evolution of microbes in the Arctic Ocean. As part of the *Tara* Oceans Polar Circle expedition, we used genome-resolved metagenomics from pan-Arctic seawater samples collected at various depths and different seasons that resulted in 3,550 metagenomic bins, of which 530 correspond to metagenome assembled genomes (MAGs), building the first Arctic prokaryotic MAGs genome catalogue. This Arctic MAGs catalogue is constituted by 526 different species, of which 83% are novel, with 60% of genomes showing an exclusively polar distribution. We have identified polar sentinel genomes by selecting those MAGs found exclusively in polar metagenomes and highly transcribed within their habitat range category in Arctic samples, as a means to serve as a baseline for future monitoring of the state of the Arctic Ocean (*Royo-Llonch et al 2021, Nature Microbiology*). In order to understand the potential resilience of the Arctic Ocean microbiome is key to perform experimental procedures to characterize the keystone prokaryotes and to comprehend which mechanisms are selected to enhance their resilience in the future warmer polar environment. The aims of this proposal are: 1) To design *in situ hybridization* CARD-FISH probes to visualize and target uncultured keystone polar microbial species and 2) Comparative genomics of polar sentinels genomes by analysis MAGs and Single Amplified Genomes (SAGs) to explore which the evolutionary processes driving their speciation to better understand the molecular mechanisms associated to cold adaptation and resilience under the threat of the global chance.

Job position description

Tara Oceans consortium is an international and multidisciplinary group of scientists from EU (France, Germany, Italy, Belgium, Spain), Canadian and US that are working together since 2009, more than 10 years. Therefore, we have established regular virtual monthly meetings, workshops and stays abroad between different *Tara* coordinators laboratories and being on board on the vessel *Tara* if possible to promote and exchange expertise among laboratories. As I am one of the coordinators of the *Tara* Ocean consortium, the PhD candidate would join to Acinas Lab at the Institute of Marine Sciences and would interact with the whole consortium of *Tara* Oceans. Also, the candidate would belong to the Ecology of Marine Microbes research group (EMM) of the Institute of Marine Sciences; https://www.icm.csic.es/en/research-group/ecology-marine-microbes.

Pg. Marítim de la Barceloneta, 37-49
08032 Barcelona
+34 932 309 500
www.icm.csic.es

The candidate would have the opportunity to interact and spend some time in different labs to enhance her/his training. We are seeking a creative and innovative PhD student to have the motivation to be involved in a multidisciplinary project, combining molecular approaches at the laboratory and bioinformatic programing. Previous experience with molecular biology, R, bioinformatic and good communication skills (also in English) are positively evaluated. The candidate should speak and write fluent in English. However, any prior specific knowledge is less important than strong motivation, enthusiasm for scientific research, and problem-solving skills.

Pg. Marítim de la Barceloneta, 37-49
08032 Barcelona
+34 932 309 500
www.icm.csic.es

3. Long-term changes in surface ocean microbes: combining omics, AI and satellite data (MASAI)

PI: Dr. Ramiro Logares (ramiro.logares@icm.csic.es)

Project description

The log-lab (http://www.log-lab.barcelona) , located in Barcelona, Spain, will host this project. Log-lab's main research lines aim at 1) understanding the structuring and dynamics of microbial communities using ecological theory, 2) disentangling the network of microbial interactions and 3) linking the gene content of genomes, communities and their variation, with ecological function and evolutionary processes. The log-lab is constituted by 10 researchers (2 postdocs (Marie Curie fellow), 5 PhD students, 1 technician, 1 master student, 1 PI). This lab is part of the Ecology of Marine Microbes (EMM) group at the ICM. The supervisor, Dr. Logares, has authored ca. 100 scientific articles including some in high-rank journals (Science, Current Biology, PNAS, etc.) attracting over 5,900 citations. The log-lab has been involved in several large projects including *Malaspina* ,*Tara Oceans* and SINGEK. The EMM (https://emm.icm.csic.es) was established in 1997 at the Institute of Marine Sciences (ICM) in Barcelona, and the overall activity of the group is organized around three main areas: i) Biodiversity and Biogeography, ii) Microbial Activities: from Single Cells to Biogeochemical Cycles, and iii) Genes and Genomes: Function and Evolution (https://emm.icm.csic.es/research/research-lines/). The ICM is a Severo Ochoa center of excellence in Spain, and includes ca. 300 experienced specialists in different fields of oceanographic research (physics, chemistry, geology and biology) that gives the institute a broad vision of the marine ecosystem. The ICM is part of the CSIC (Spanish National Research Council), which is Spain's largest public research institution, and ranks third among Europe's largest research organization. The CSIC plays a key role in scientific and technological policy in Spain and worldwide. The CSIC has 10.940 employees, including 3.764 researchers and 120 institutes.

Job position description

The surface ocean microbiota is fundamental for the functioning of the Earth system. Omics approaches unveiled a large microbial diversity and allowed to determine the biogeography and seasonal dynamics of marine microbes. Yet, most studies have considered time ranges typically smaller than a decade, limiting our comprehension of how marine microbial communities have changed during longer periods. Today, we do not know whether microbial communities in the ocean are changing as a result of global change. Understanding how microbial communities have changed in the past may provide new knowledge on how they will change in the future. Omics and microscopic data could generate insights on this, but there is limited DNA and microscopic data from the last decades. Yet, there is another untapped resource: satellite images. Past and ongoing satellite missions have generated a vast ocean-surface imagery that goes back at least three decades. The color in these images contains the signal of the main phytoplankton

Pg. Marítim de la Barceloneta, 37-49
08032 Barcelona
+34 932 309 500
www.icm.csic.es

groups, but so far few studies have tried to extract it given the complexity of the needed methods. The long time series of ocean data generated by satellite missions can be exploited using Artificial Intelligence (AI) together with in-situ microbiological data in order to investigate the change in surface microbes during the last decades. Main tasks: **1)** Compiling contemporary omics datasets from the surface ocean that provide information on the taxonomic and metabolic structure of microbial communities, **2)** Identification of long time-series of Multi-spectral satellite Ocean Colour data and modeled physicochemical variables, **3)** Use of Deep Learning (DL) to train and validate a model using omics and imagery datasets, and **4)** Analysis of the imagery database using the trained DL model in order to extract information about the composition of main phytoplankton groups over the last ~30 years from the satellite images, aiming to detect broad changes.

Pg. Marítim de la Barceloneta, 37-49
08032 Barcelona
+34 932 309 500
www.icm.csic.es

4. Marker genes for phagocytosis in non-model marine protists

PI: Prof. Ramon Massana (ramonm@icm.csic.es)

Project description

The Ecology of Marine Microbes (EMM) Research group, based at the Institute of Marine Sciences (ICM-CSIC, Barcelona), integrates scientists from different disciplines and research topics that use complementary tools to address the ecological and functional role of marine microorganisms at different resolutions, from communities to species or ecotypes. I am the responsible of the group, which includes several PIs with complementary expertises in viral, prokaryotic and protistan ecology. In particular, my research is on the ecology of marine heterotrophic protists, with a focus on bacterivorous species that play a pivotal role in microbial food webs. We investigate the species forming these assemblages, their biogeography over global oceanographic scales, and access their genomes through single cell genomics. We are currently constructing hundreds of single cell genomes that will be used to recruit specific genes present and expressed in the environment through metagenomics and metatranscriptomics. We are also conducting gene expression experiments with a few selected cultured heterotrophic protists. We are searching for marker genes of bacterivory, in particular proton pumps, digestive enzymes and rhodopsins, recently found to be very diverse and prevalent in marine uncultured bacterivores.

Job position description

The main objective of this PhD offer is to identify a few genes involved in phagocytosis that are highly expressed during bacterivory and present across the eukaryotic tree of life. These genes will then be promising targets to study the important biogeochemical process of phagocytosis on marine bacteria (with implications in food webs dynamics, nutrients regeneration, and primary production) through the study of their gene expression. To achieve this objective, the PhD student will be involved in two main tasks. The first task will be to conduct differential gene expression experiments with protist cultures at contrasted physiological states, i.e. when actively phagocytizing bacteria for growth, and during the stationary phase when no bacterivory nor growth occurs. By performing these experiments with species from different eukaryotic supergroups (i.e. bicosoecids, choanoflagellates, euglenozoans), we will identify genes expressed during bacterivory in very distant taxa, thus revealing the core and ancient set of the phagocytosis machinery. The second task will be to construct solid orthologous families and phylogenetic trees for these genes including the widest representation of microbial eukaryotes. So, we will search for orthologous genes in the largest representation of microbial eukaryotic genomes (such as the EukProt database) as well as in novel genomes of uncultured species from our current collection of SAGs (Single Amplified Genomes) retrieved from single cells sampled at the BBMO (Blanes Bay Microbial Observatory). Moreover, these curated phylogenetic trees will

Pg. Marítim de la Barceloneta, 37-49
08032 Barcelona
+34 932 309 500
www.icm.csic.es

be complemented with additional orthologous genes identified in marine metagenomes and metatranscriptomes, in order to capture the complete biodiversity of these functional genes. The final aim of this PhD research will be to propose a few functional genes whose expression is directly related to the critical biogeochemical process of marine bacterivory.

Pg. Marítim de la Barceloneta, 37-49
08032 Barcelona
+34 932 309 500
www.icm.csic.es

5. Physics and chemistry of the phycosphere

PI: Prof. Rafel Simó (rsimo@icm.csic.es)

Project description

The interactions between microalgae and bacteria drive much of the ocean's metabolism and play an important role in climate regulation. These interactions occur mostly in the chemically distinct tiny regions around individual microalgae that we call phycospheres. Within these regions, the metabolic activity of both phytoplankton and bacteria is very high and creates spatial gradients, not just of chemical compounds but also of physical variables such as viscosity.
This project aims to 1) characterize these physical and chemical gradients and 2) understand how their interplay may help microalgae gain control of their environment and create favorable conditions for mutualistic associations with bacteria.
The proposed research tackles a topic that converges with several of the most timely questions in biological oceanography, such as the role of microscale heterogeneities in microbial interactions, the presence and role of gel-like substances in the ocean, or the role of multiple plankton interactions in the ocean's biological carbon pump. It is an interdisciplinary project that draws ideas from fluid mechanics, biomedical sciences, microbial ecology, and biogeochemistry, with the goal of scaling up the findings to better understand what regulates the fluxes of carbon and other essential elements in marine ecosystems. The interdisciplinary nature of this research is reflected not just in its topic, but also in the span of methodologies that will be used, including cutting-edge microrheological and microfluidic techniques, methods for growing, perturbing, observing and tagging microorganisms, and molecular approaches to gene expression.

Job position description

This PhD project aims to characterize the spatial heterogeneity and temporal dynamics of seawater viscosity at the microscale around phytoplankton cells and aggregates, and their biological causes and responses. It will require the use of a diverse set of technical approaches, including microrheology, microfluidics and mRNA-based methods, along with standard microbiological and image analyses techniques. Experience in any of these methodologies is desirable, but we will provide training on all of them as adequate to the candidate's profile and expertise.
The candidate should preferentially hold Bachelor and MSc studies in any of the Environmental Sciences or Engineering (Ocean / Physics / Chemistry / Biology). We seek a motivated student, eager to work across disciplines, who is primarily willing to do

Pg. Marítim de la Barceloneta, 37-49
08032 Barcelona
+34 932 309 500
www.icm.csic.es

laboratory work and data analysis but is ready to participate in oceanographic cruises when opportunities arise.

The ICM-CSIC is an excellent host centre for the project. It provides the laboratory facilities, the access to fieldwork on oceanographic cruises and polar research stations, and, above all, a multidisciplinary work environment with clustering of the relevant expertise. The candidate will join the Simó lab, which is funded by an ongoing Advanced Grant of the European Research Council (ERC) on marine microbial interactions, and has a longstanding research record on ocean biogeochemistry and a consolidated international network of collaborators. She/he will also work closely with the Mediterranean Institute for Advanced Studies (IMEDEA), located in Mallorca, which will provide access to microfluidics manufacturing facilities and expertise.

Pg. Marítim de la Barceloneta, 37-49
08032 Barcelona
+34 932 309 500
www.icm.csic.es

6. Reconstructing the biogeochemistry variability using satellite imagery, ocean autonomous profiles and a numerical models of the ocean circulation

PI: Dr. Jordi Isern (jiser@icm.csic.es)

Project description

The Northwestern Mediterranean Sea is one of the most exotic seas in the world, in which dramatic events occur (deep water formation, shelf convection and cascading) in a region where currents are strongly influenced by topography. The resulting variability affects the distribution of nutrients, plankton and larvae that, in turn, affect the abundance of fish. Generally speaking, reconstructing the variability of the marine biogeochemistry remains an unresolved challenge due to the lack of data. In the case of the Northwestern Mediterranean the challenge becomes more difficult due to the presence of an active small-scale (submesoscale) ocean circulation processes. This project aims to use state of the art satellite data, in situ measurents and ocean models, combined with big data and data assimilation methods, to improve our knowledge of the variability of the biogeochemistry at scales ranging from hours to decades at the Northwestern Mediterranean Sea. The Physical and Technological Oceanography Group focuses on the study of the physical properties of the ocean, its behavior and role in the climate of the Earth using the principle of fluid mechanics and thermodynamics. It is the largest Spanish physical oceanography department and that with the most extensive scientific production. Its interests focus on the observation (both in situ and remote sensing) and analysis of the ocean physical environment at a broad range of spatio-temporal scales. Its members include physicists, engineers, and oceanographers with complementary skills that work together to further our understanding of the ocean dynamics by combining experimental, numerical and theoretical approaches. The group members are especially committed at mentoring students and offering specialized courses, participating in numerous public outreach activities.

Job position description

The candidate will work within a group with experience in ocean simulation, data analysis and data assimilation at the Institute of Marine Sciences (CSIC). The work will involve working with large data sets distributed by the EU's Copernicus Program (from remote sensing, in-situ observations and numerical models), local administration data about riverine runoff and also configure and run high-resolution models of the ocean circulation coupling ocean dynamics and biogeochemistry. Merging of observations and models will be done with the help of machine learning and data assimilation techniques. Special focus will be placed on the response of the marine system to short-lived, energetic events as the

Pg. Marítim de la Barceloneta, 37-49
08032 Barcelona
+34 932 309 500
www.icm.csic.es

Gloria Storm and the events of deep water formation in the Gulf of Lions. This work will also help to validate the impact of classical and novel schemas of turbulent dispersion in the ocean. A background on mathematics, physics or engineering would be an advantage for the candidate.

Pg. Marítim de la Barceloneta, 37-49
08032 Barcelona
+34 932 309 500
www.icm.csic.es

7. The ocean particle microbiome: exploring a remedy for climate change

PI: Prof. Josep M Gasol (pepgasol@icm.csic.es)

Project description

Global warming caused by anthropogenic CO2 emissions is likely the most relevant threat humanity is facing in the XXI century. The ocean plays a very relevant role in buffering CO2 emissions, by e.g. biological pumps that take up recently-fixed atmospheric CO2 and send it into the deep ocean where carbon may remain sequestered over large time scales. This process is mediated by organic particles produced at the ocean surface which are thus crucial as mediators of the biological carbon pump (BCP). These particles are decomposed by microbial communities while in transit to the deep ocean. The largest project objectives are to advance our understanding of how marine particles are colonized by microbes, how communities on the particles evolve during sinking, how particles affect -and are affected by- the surrounding environment, and what are the cellular and molecular mechanisms involved in particle remineralization. Given this role of ocean particles, and the role of that process in regulating how much carbon the ocean sequesters, the knowledge compiled by the project will be useful to i) understand the genomic and ecological constraints of particle degradation; ii) better quantify the magnitude of the biological carbon pump, and iii) facilitate prediction of ocean carbon sequestration efficiency based on the identity and genomic properties of particle-colonizing microbes. Our ultimate goal would be to test the hypotheses that and that carbon sinking fluxes can be estimated through the comparison of particle-attached surface and deep-ocean microbial communities, and that some combinations of surface ocean microbial (prokaryotes, eukaryotes and fungi) colonizers result in higher sinking rates. Mesocosm manipulation experiments will determine whether the carbon pump can be enhanced by manipulating the particle microbiome.

Job position description

The candidate will test the above-mentioned hypotheses by combining field sampling and laboratory experiments, running -omics analyses and microbiome manipulations to determine which are the microbial colonizators of ocean particles and their genomic content. At the same time, she/he will be involved in the determination of the strength of the biological carbon pump and the sinking carbon flux to the deep ocean.
We are searching for a highly motivated candidate that would love to perform interdisciplinary work, combining oceanography, environmental microbiology, bioinformatics, biogeochemistry and ecology, and that would love to participate in large scale oceanic cruises, combining the work in the field with experiments and analyses in the lab and the use of computing tools. The PhD candidate should have a degree in Biology, Microbiology, Bioinformatics, Oceanography, Environmental Studies, or similar. With high

Pg. Marítim de la Barceloneta, 37-49
08032 Barcelona
+34 932 309 500
www.icm.csic.es

or very high English level and good writing abilities. Knowledge of R, statistical tools, as well as bioinformatics is highly desired. The selected candidate will join a dynamic group with several PhD students, postdocs and technicians that has a firm commitment to ensure the best learning experience, including participation in courses and conferences, stays in other laboratories, and other training strategies. The group maintains close contact with national and international researchers in the fields of microbial ecology, molecular ecology, coastal ecology, microbiology, oceanography and biogeochemistry. We are fully committed to the “10 simple rules towards healthier research labs” (http://surl.li/dmnuy).

Pg. Marítim de la Barceloneta, 37-49
08032 Barcelona
+34 932 309 500
www.icm.csic.es

8. The UN Ocean Decade and the EU Mission Oceans and Waters as opportunities for building a new relation with and for people and the ocean

PI: Prof. Josep L. Pelegrí (pelegri@icm.csic.es)

Project description

The last revolutions, industrial and digital, have taken humankind to the verge of collapse. The one-and-a-half century old but still ongoing industrial revolution is introducing so much greenhouse gases into the atmosphere that in a few years our planet will have surpassed the thresholds for a non-return climatic change, with major impacts on the most vulnerable populations. The digital revolution is taking far too many individuals, particularly from the highly industrialized countries, into a growing spiral of action whose outcome is fatigue, discouragement and occupational burnout. In these societies, technology turns into an objective rather than a pathway for enhanced inner wellness.

Humankind desperately needs a new revolution, a collaborative transformation with and for people and nature. This collaborative revolution implies feeling and acting as part of nature rather than its owner, building a real collaboration among people and with nature, with the ocean as a main participant. The collaborative revolution needs expanded cognition – transformative blue education that blends intellectual knowledge and sensory experiences into deep and lasting connections.

The Institut de Ciències del Mar (ICM-CSIC) is deeply committed into building this collaborative revolution, with marine sciences and technologies as key building blocks towards a sustainable society and planet. Marine Social Sciences researchers at ICM-CSIC are participating in national and international projects that are developing tools, methods and strategies for a new relationship with the ocean, from scientific quantitative knowledge into artistic and emotional lasting sustainable connections.

Job position description

It is very encouraging to realize that our society – represented by international bodies and a significant fraction of its population – is experiencing a progressive awareness of the incommensurable value of healthy marine ecosystems. The UN Ocean Decade and the EU Mission Oceans and Waters are clear examples that the current biodiversity, climatic and social crisis can turn into opportunities towards individual and collective transformation and resilience. In order to attain this transformation, humankind urgently needs a revolution based on a deep-awareness of the human-nature connection: this is the collaborative revolution, with and for people and nature, with the ocean as an essential participant

Pg. Marítim de la Barceloneta, 37-49
08032 Barcelona
+34 932 309 500
www.icm.csic.es

Intellectual cognition of the functioning and fundamental importance of the ocean in our lives – from its role on climate and particularly the hydrological cycle to the concepts of fluid brain, life as a process, enaction, symbiogenesis and epigenetics – is necessary but not sufficient. To establish lasting connections, we require expanded cognition: improved knowledge of the ocean system has to come together with a continued sensory experience of the oceans. This can be attained with seagoing activities and aided through the innovative combination of arts and sciences.

The challenge is to develop enactive interfaces – methods, tools and strategies – that can translate this expanded cognition to society, particularly to the school system, the youth networks and stakeholders. The proposed position will explore how to blend scientific, artistic and social methodologies towards strong and lasting connections with and for people and the oceans. The candidate should be a highly motivated individual that accepts the risk of the unique challenge of blending marine and social cognitive and sensory knowledge to build these transformative enactive interfaces.

Pg. Marítim de la Barceloneta, 37-49
08032 Barcelona
+34 932 309 500
www.icm.csic.es

9. Tracing molecular evolution in the ocean one atom at the time

PI: Dr. Francesco Colizzi (fcolizzi@icm.csic.es)

Project description

Molecular adaptation processes in the Ocean remain difficult to track. This project pursues the investigation of molecular evolution and adaptation processes in the Ocean by supporting classical population genetics studies with structure modelling, deep learning, and advanced biomolecular dynamics simulations at the sub-nanoscale (Bonomi M, et al. Nature Methods 2019). This combination will offer new knowledge for the understanding of the molecular foundations underlying the biochemical and physiological processes that have enabled organisms to proliferate into new adaptive zones (see for example the case of myoglobin described by Mirceta S, et al. Science, 2013). In the long-term, we aim to translate such understanding into rules supporting the molecular design of improved materials and biocatalysts.
We are a young and ambitious team that, with computer simulations as core technology, pursues highly interdisciplinary molecular research that ranges from drug discovery, molecular evolution, to plastic-degrading enzymes. We develop and apply molecular simulations approaches to impulse a paradigm shift in marine sciences based on the 3D and 4D (the 4th dimension being time) representation of biomolecular processes in the Ocean. We have tight collaborations with experimental groups at ICM and abroad, and we are embedded in the ICM-CSIC group "Ecology of Marine Microbes (EMM)" with excellent interdisciplinary expertise and infrastructures.

Job position description

We are seeking a creative and innovative PhD student to join the newly-established research team in Molecular Simulations (the "Molecular Ocean Lab") at the ICM-CSIC. We are looking for highly motivated and independent thinkers interested in molecular structures & simulations, computational chemistry, protein evolution, biophysics, molecular biology, bioinformatics, and an overall curiosity for the Ocean. Computer literacy and previous experience with molecular simulations, and good communication skills are welcome. However, any prior specific knowledge is less important than strong motivation, enthusiasm for scientific research, can-do attitude, and problem-solving skills.
The student will be integrated in a large and international research group, the EMM at ICM-CSIC of which the "Molecular Ocean Lab" is part of, with a strong presence of marine scientists, biogeochemists, microbiologists, bioinformaticians, mathematicians, but also molecular biologist and chemists, with excellent computer facilities and experimental support. On top of that, the Institut de Ciències del Mar (ICM) of the Spanish National Research Council (CSIC) is an excellent marine research Center that offers a perfect human and scientific environment to develop this project.

Pg. Marítim de la Barceloneta, 37-49
08032 Barcelona
+34 932 309 500
www.icm.csic.es

10. UCYNELLE: Bridging the evolutionary gap between unicellular endosymbiotic cyanobacteria and organelles

PI: Dr. Francisco Miguel Cornejo Castillo (fmcornejo@icm.csic.es)

Project description

The evolution from prokaryotes to eukaryotes was possible due to the establishment of endosymbiotic relationships between microorganisms, yet the mechanisms behind are difficult to address since they happened millions of years ago. A marine cyanobacterium called UCYN-A was recently found to have intriguing parallelisms with the evolution of organelles in eukaryotic cells. UCYN-A lives in obligate symbiosis with algae and, since they established their symbiotic relationship 100 million years ago, UCYN-A has experienced genome rearrangements, including a dramatic reduction of genes, in a similar way to what it could have happened with the cyanobacterial cells that gave rise to chloroplasts. Furthermore, UCYN-A has the ability to transform dinitrogen gas into nutrients, and its algal host takes advantage of it due to the fact that no eukaryotes are able to perform this chemical reaction. Therefore, this peculiar symbiosis may be seen as a model to study the acquisition of new organelle-derived functions in eukaryotes. Therefore, the main goal of this project (UCYNELLE) is to provide new insights on organelle evolution through the study of extant marine microbial symbioses.

Within the Institut de Ciències del Mar (ICM, Barcelona, Spain, https://icm.csic.es), the candidate will belong the CSIC Research group “Ecology and genomics of marine microorganisms (EGMM)”, which is dedicated to the study of marine microorganisms from different perspectives. It was created in 1997 as a “Grup de Recerca Consolidat,” a tool of the Catalan Government to distribute research funds to groups based on their scientific excellence, and today is also a Research Group of the CSIC (Group Code: 642331). The group received the qualification “A-Grupo Excelente” in the last evaluation of the CSIC.

Job position description

The UCYNELLE project seeks to shed light on the mechanisms underlying organelle evolution through the study of the obligate symbiotic partnership between an unusual group of marine unicellular cyanobacteria (UCYN-A) and a group of single-celled unicellular algal closely related to the haptophyte Braarudosphaera bigelowi from an ecological, evolutionary and metabolic perspective.

The PhD candidate will carry out a multidisciplinary project that includes field and laboratory work and the use of a wide spectrum of techniques, going from bioinformatics to analyze

Pg. Marítim de la Barceloneta, 37-49
08032 Barcelona
+34 932 309 500
www.icm.csic.es

omics data, molecular biology (PCR, qPCR) and microscopy approaches (CARD-FISH, immunolabeling) to try to get gain insights of the ecology and evolution of recently discovered marine planktonic nitrogen-fixing symbioses. Research stays in worldwide recognized institutions are envisioned.

The candidate would work under the direct supervision of Dr. Francisco M. Cornejo Castillo (PI of the UCYNELLE project) and would join the Ecology and Genomics of Marine Microorganisms (EGMM) research group (https://emm.icm.csic.es) at the Institut de Ciències del Mar (ICM, Barcelona, Spain, https://icm.csic.es). The EGMM group conducts leading research on the diversity, ecology, functioning, biogeography and evolution of marine microorganisms, mostly through a combination of high-throughput sequencing approaches, single-cell genomics, microscopy, single-cell activity techniques, culturing and bulk activity assays. Therefore, besides the training needed for accomplishing the tasks of the project, the candidate will be integrated in a multidisciplinary team of master students, PhD candidates, post-docs and senior scientists, which will provide a great opportunity to acquire multiple research skills and knowledge on marine microbial ecology and oceanography.

Pg. Marítim de la Barceloneta, 37-49
08032 Barcelona
+34 932 309 500
www.icm.csic.es

INCOMING INPHINIT Fellowship Programme 2023:

35 fellowships for early-stage researchers of any nationality to pursue their PhD studies in the best Spanish and Portuguese research centres and units with excellence distinction. This frame is addressed exclusively to PhD research projects on STEM disciplines: life sciences and health, experimental sciences, physics, chemistry and mathematics.

- *STEM disciplines (life sciences and health, experimental sciences, physics, chemistry and mathematics).*
- *Maximum duration: 3 years.*
- *Funding to cover labour costs, research costs and doctoral tuition fees.*
- *Training programme in transversal skills.*

You can find more information and all details for apply here in the programme website. All applications should be made through the mentioned platform before 25 January 2023, at 2 pm Peninsular Spain.