Las personas beneficiarias son informadas de que la beca, así como el plazo de implementación de cada beca pueden verse suspendidos o anulados en función de cómo se desarrollen los acontecimientos relacionados con la COVID-19, en especial respecto a las medidas que se adopten vinculadas con la declaración de Estado de alarma u otras con repercusión en la movilidad u otro tipo de derechos. Si tales circunstancias no estuvieran clarificadas en su momento, se emitiría con antelación al comienzo de la beca la o las resoluciones que correspondan procediendo a su suspensión o anulación, sin que de las mismas pueda derivar compensación alguna. Las personas beneficiarias tienen que tener en cuenta está circunstancia a los efectos que correspondan.

FICHA DESCRIPTIVA JAE Intro ICU 2021

Modalidades de Becas ofertadas

Becas de introducción a la investigación en el Centro de Excelencia «Severo Ochoa» Instituto de Ciencias del Mar (ICM)

a. Correo electrónico de contacto: projectes-osr@icm.csic.es

b. Plazo de presentación de solicitudes: Desde el día siguiente a la publicación de la ficha descriptiva hasta el día 25 de octubre de 2022.

c. Número de becas: hasta 5

d. Periodo y duración de cada beca: 7 meses consecutivos durante el curso académico 2022/2023, a convenir con el/la investigador responsable (la fecha de inicio será el primer día del mes que se acuerde), siendo el 31 de julio de 2023 la fecha límite para finalizar el periodo de disfrute de la beca.

e. Importe de cada beca, mensualidades y dotación adicional: Importe total 4.200 euros, siete mensualidades de 600 euros, sin dotación adicional.

f. Tiempo máximo semanal de dedicación de las personas beneficiarias de la beca: 20 horas.

g. Requisitos específicos de las personas solicitantes:

   I. Rama de licenciatura o grado: Haber finalizado el Grado o Licenciatura en Ciencias o Ingeniería y no estar en posesión o disposición legal de obtener el título de Doctor.
   II. Nota media del expediente: Acreditar nota media de grado o licenciatura, en escala 0-10 con dos decimales, igual o superior a 7,5.
   III. Máster Universitario Oficial: Durante el curso académico 2022-2023 deberá cursar un Máster Universitario oficial en alguna de las ramas de conocimiento de las ciencias, ciencias de la salud, o ingeniería.

h. Planes de formación ofertados y personal investigador responsable: La persona beneficiaria podrá escoger como personal investigador responsable de forma priorizada hasta tres de los proyectos siguientes:

1. *Plan de formación 1.* ***Effects of sedimentary processes and pollutants on marine sediment microbiome from Barcelona coastal time series***

   Acronym: BSMM - Barcelona Sediment Marine MICROBIOME

   Coastal marine sediments are key ecosystems in which important biological processes take place and supply essential ecosystem services. These marine coastal sediment ecosystems are characterized by remarkable heterogeneity, owning high biodiversity and are subjected to fluctuations in environmental conditions. Thus, these coastal ecosystems are particularly exposed to human activities and prone to be contaminated by different hazards compounds, such organic and inorganic pollutants and they are considered to be a potential sink for microplastics, which mainly derived from the land-based sources. This proposal aims to perform a long-term time series exploration of the Barcelona coastal marine sediment microbiome in relationship with the abiotic and organic components of the sediments. Some specific goals are: i) analyzing the microbial diversity, community structure and dynamics of the Barcelona coastal marine sediment microbiome ii) understand which abiotic components and sedimentary processes are driving the structure of the marine sediment microbiome of the Barcelona coast.

   The student will perform the specific tasks: 1) extract the DNA of more than two years of monthly samples taken from the Barcelona coastal marine sediment, 2) analyses of organic matter content, inorganic and organic pollutants and sediment characteristics and 3) metabarcoding 16S iTAGs sequencing to obtain a first glimpse of the microbial diversity and structure information in close relationship with the sedimentary processes. All together we will describe the interactions between the marine sediment microbiome with their physical and chemical environment aiming to establish microbial bioindicators as sentinels and environmental parameters of the healthy status of the Barcelona coast to improve the knowledge of global changes.

   Requisitos específicos para este proyecto:

   i. Rama de licenciatura o grado: Haber finalizado el Grado o Licenciatura en Ciencias y no estar en posesión o disposición legal de obtener el título de Doctor.
   ii. Nota media del expediente: Acreditar nota media de grado o licenciatura, en escala 0-10 con dos decimales, igual o superior a 7,50.
   iii. Máster Universitario Oficial: Durante el curso académico 2022-2023 deberá cursar un Máster Universitario oficial en alguna de las ramas de conocimiento de las ciencias o ciencias de la salud.

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

2. *Plan de formación 2.* ***Reconstructing the history of marine animal diversity over the last 500 million years using fossil data and a state-of-the-art diversification model***

Our group has recently published a regional diversification model (https://github.com/CarmenGarciaComas/INDITEK) that allows us to recreate a 500 million-year history of animal diversity. The model estimates diversity anywhere in the global ocean and at any time using three variables: time, seawater temperature and food. You can see the publication here: https://www.nature.com/articles/s41586-022-04932-6. We are looking for a motivated student interested in data analysis and/or modelling to receive training in the use of the model and perform comparisons between fossil data (https://paleobiodb.org/#/) and model outputs. Our team is in contact with paleobiologists who lead this type of study worldwide. You will learn about data analysis and biodiversity modelling and have the opportunity to exchange ideas on all these topics with the members of our research team (https://oceanglobe.org/people/) through seminar series and weekly meetings. The main tasks to be carried out include running model simulations, extracting model results and comparing them with fossil data. For that, you will need basic knowledge of matlab and/or R.

Responsable: Pedro Cermeño (pedrocermeno@icm.csic.es)

3. *Plan de formación 3.* ***High-frequency ocean variability and the paradox of the plankton***

Oceanic phytoplankton are a group of photosynthetic species competing for the same nutrients. Competitive exclusion should therefore lead to the local extinction of all phytoplankton species except the best competitor for the limiting nutrient. However, total exclusion is not observed in nature. Indeed, water samples contain hundreds of different phytoplankton species: this is the "paradox of the plankton".

Several processes have been hypothesized to explain the observed phytoplankton diversity, including rapid evolution, predator specialization, and high-frequency spatial and temporal variability in physical drivers, such as temperature, solar irradiance and nutrient inputs. In this project, we will test the hypothesis that the meso- and submeso-scale variability in temperature and vertical mixing mitigate competitive exclusion and promote diversity.

This project will combine the efforts of three research groups of the ICM: The Plankton Ecology and Ocean Health group; the Marine Biogeochemistry, Atmosphere and Climate group; and the Physical and Technological Oceanography group. A trait-based eco-evolutionary phytoplankton model (SPEAD, Simulating Plankton Evolution with Adaptive dynamics) will be used. Members of the Plankton Ecology group have already tested SPEAD at the Sargasso Sea. Within this project, SPEAD will be implemented using the environmental conditions of the Northwestern Mediterranean Sea. The conditions of the Mediterranean Sea will be retrieved from both the analysis of the Copernicus Marine Services and from the model simulations being used by the members of the Physical oceanography group. As such, this project will contribute to the projects GOMMA'21 (PID2020-119803GB-I00) and DEMON (PID2021-123457OB-C21).

We will engage in a cost-effective study that will pave the way from a 1D (vertical) control simulation towards a set of more comprehensive 3D simulations that will be able to fully assess the impact of fine scale turbulence on phytoplankton diversity. The candidate will work with scientists from the Marine Biogeochemistry (Guillaume Le Gland), Plankton Ecology (Pedro Cermeño and Sergio Vallina) and Physical

Oceanography (Joaquim Ballabrera and Jordi Isern) research groups at ICM and will develop unique skills in numerical modeling, data analysis and visualization, and the processing of data provided by Operational Oceanography centers. It is expected that the results of the project will be published in high-impact scientific journals and that the candidate will be part of the list of authors of these publications.

Responsable: Guillaume Le Gland (legland@icm.csic.es)

4. *Plan de formación 4.* ***Long-term changes in surface ocean microbes: combining omics, AI and satellite data (MASAI)***

The surface ocean microbiota is fundamental for the functioning of the Earth system, being involved in a wide array of biochemical functions and representing the basis of marine food webs. During the last 15 years, omics approaches unveiled a large microbial diversity and allowed to determine the biogeography and seasonal dynamics of marine microbes. Yet, most studies so far have considered time ranges typically smaller than a decade, limiting our comprehension of how marine microbial communities have changed during longer periods (e.g., the last 50 years). Today, we do not know whether microbial communities in the ocean are changing as a result of global change, and at which rate. 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 one main problem: there is limited DNA and microscopic data from the last decades to investigate long-term trends. 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 groups, but so far few studies have tried to extract it given the complexity of the needed methods, which require a cross-disciplinary approach. The long time series of ocean data generated by satellite missions can be exploited using Artificial Intelligence (AI) techniques together with in-situ microbiological data in order to investigate the change in surface microbes during the last decades.

The main tasks within this project are: 1) Identification of publicly-available contemporary omics datasets from the surface ocean that provide information on the taxonomic structure of microbial communities (from campaigns such as Malaspina and TARA Oceans) that include also contextual data (e.g., microbial cell counts, pigment analysis, physicochemical data), 2) Identification of publicly available long time series of Multi-spectral satellite Ocean Colour data and modeled physicochemical variables that can be matched to the omics datasets , 3) Use of Deep Learning (DL) to train and validate a model using omics and imagery datasets, and 4) Analysis of selected images using the trained DL model in order to extract information about the composition of main phytoplankton groups, aiming to detect broad changes (e.g., the expansion or reduction of diatoms or cyanobacteria).

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

5. *Plan de formación 5.* ***Exploring the phycosphere***

The interactions between phytoplankton and bacteria that drive much of the ocean metabolism and play such an important role in climate regulation, occur in fact in the chemically distinct tiny regions around individual phytoplankton cells that we call the phycosphere. 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. We are exploring how these gradients can be used by the phytoplankton cell to control its environment and recruit and communicate with a friendly community of bacteria. You will join our group (https://simolab.icm.csic.es/) in this effort, and will participate in joint experiments as well as design and carry on your own research. To do this you will learn how to culture phytoplankton and bacteria, and will also learn some cutting-edge techniques, such as microrheology and microfluidics, that are new to research in oceanography and in microbial ecology. These tools will allow you to map the physical and chemical properties of the phycosphere and will help us understand how these microbial interactions unfold in the ocean and what they mean for the ecosystem.

Responsable: Rafel Simó (rsimo@icm.csic.es)

i. Composición de la Comisión de Selección:
   i. Presidencia: Josep M. Gasol, Director Científico de la Acreditación de Excelencia "Severo Ochoa", ICM-CSIC.

   ii. Vocales:

      i. Francesc Piferrer, Vicedirector de transferencia, ICM-CSIC.
      ii. Marta Coll, Vicedirectora de estrategia, ICM-CSIC.
      iii. Valentí Sallarés, Director, ICM-CSIC.

   iii. Secretaría: Sònia Sagristà, gestora de la Acreditación de Excelencia "Severo Ochoa", ICM-CSIC.

En Barcelona, a 3 de Octubre de 2022

Fdo. D. Valentí Sallarès Casas

SALLARES CASAS VALENTI - DNI 37330495T

Firmado digitalmente por SALLARES CASAS VALENTI - DNI 37330495T
Nombre de reconocimiento (DN): c=ES, o=CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS, ou=CERTIFICADO ELECTRONICO DE EMPLEADO PUBLICO, ou=ICM, ou=37330495, serialNumber=IDCES-37330495T, sn=SALLARES CASAS, givenName=VALENTI, cn=SALLARES CASAS VALENTI - DNI 37330495T
Fecha: 2022.10.03 14:28:45 +02'00'

Director del Instituto Instituto de Ciencias del Mar