

Postdoc Project Call 2017 – BACKGROUND AND RESEARCH TOPICS

The Kiel based Cluster of Excellence ‘The Future Ocean’ integrates marine research by combining expertise in the natural and life sciences, in informatics and engineering, and in law, economics, philosophy, political and social sciences and arts. Recently, it expanded its base to include theology. In the future, ‘The Future Ocean’ will strengthen its engagement in supporting interactions between governmental, public, and private sectors as well as with civil society towards co-design of sustainable and scalable ocean solutions. Innovative information technologies and approaches to support local and global ocean education and lifelong learning will complement this engagement.

The overall objective is to advance the scientific basis towards sustainable ocean development against the framework of the UN Sustainable Development Goals (SDGs) through integrative research, innovation and development. Researchers from all faculties of Kiel University, from GEOMAR Helmholtz Centre for Ocean Research Kiel, Kiel Institute for the World Economy (IfW), Leibniz Information Centre for Economics (ZBW), Leibniz Institute for Science and Mathematics Education (IPN), and Muthesius University of Fine Arts and Design will co-develop information and ocean development scenarios by exchanging knowledge with a range of societal actors. Scientifically, three grand challenge areas have been identified that encompass the integrative scientific scope of the Cluster of Excellence: *Ocean Pressures*, *Ocean Resilience* and *Ocean Prosperity*, supplemented by the integrative themes *Digital Ocean* and *Ocean Education & Lifelong Learning*. The Clusters research covers areas from discovery, understanding, and assessment to solutions.

Ocean Pressures: Enhanced input of anthropogenic waste in the form of dissolved or solid matter represents a threat to the Ocean. Ocean pollution includes littering of plastics and industrial waste, noise from shipping and offshore wind farms, fertilizers applied for terrestrial agricultural production, emissions from ships, tailings from mining and elevated atmospheric CO₂. This thematic area covers understanding the distribution and dilution pathways of pollutants and e.g. assessing the potential, vulnerability and environmental and societal impacts of oceanic carbon sequestration options as well as the effectiveness and socio-economic consequences of carbon management techniques.

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Ocean Resilience: Resilience against natural ocean disasters will become increasingly important under the perspective of growing population and urbanisation in coastal areas. On the other hand, human activities have altered the ocean and its ecosystems beyond their natural state. This thematic area covers ecological and geological hazards (e.g. harmful algae blooms, de-oxygenation, earthquakes, submarine mass movements or volcanic eruptions) and how to assess, sustain and restore ocean and ecosystem services

(food provisioning, climate regulation, coastal protection and cultural benefits) and improve or restore the resilience of coastal societies.

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Ocean Prosperity: Oceans provide spiritual, cultural, provisioning and regulating services that improve human physical and mental health and rely on a functional, intact ecosystem. At the same time, the extraction of resources such as food, molecules of biotechnological/medicinal relevance, energy, and raw materials may comprise the integrity of marine ecosystems. This thematic area investigates benefits and challenges of marine seabed resource extraction, marine food supply and marine health/disease functions to improve long term overall human wealth and well-being. An understanding and assessment of the services and potential disservices of the ocean to human's well-being is fundamental for the development of risk assessments and counteractive measures since humankind is progressively turning towards the oceans for securing future resource supplies.

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Digital Ocean: The digital revolution towards open science in all disciplines holds tremendous opportunities for integrated marine sciences. Within this thematic area key methods and technologies from mathematics, computer science and engineering are developed and provided for scientific solutions of problems concerned with marine data and computations, by combining the emerging areas of Ocean Informatics and Ocean Numerics. Open science principles will define the basic architecture for an open science approach to ocean science, increase the efficiency of workflows and the transfer of information between expert disciplines. Building on the products of Digital Ocean, a new Ocean Media Lab will develop visualization tools to improve the scientific workflows in marine sciences and to enhance stakeholder engagement.

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Ocean Education & Lifelong Learning: A key opportunity for advancing an integrated ocean agenda is to support improvements and innovation in the areas of education, lifelong learning and literacy. The vision for this thematic area is to develop a comprehensive and lifelong learning and education program that addresses a diverse clientele - from schoolchildren and the general public to national and international university students, early career researchers, and professionals. Research in this area will focus on how different approaches, e.g. using serious games and digital media, are perceived by the respective target group and can be employed to enhance ocean literacy.

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