



**NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230**

NSF 17-140

Dear Colleague Letter: Dear Colleague Letter: Advancing Frontiers in Seafloor Science and Engineering Research

September 20, 2017

Dear Colleague:

The oceans cover over 70% of the planet, and despite relevance to geohazards, mineral resources, and biological diversity, the seafloor and sub-seafloor remain largely unexplored and poorly understood. The seafloor environment is a harsh and dynamic place where the deep ocean presents barriers to most electromagnetic radiation including light and radio communication because of its high pressure, its corrosive composition, cold temperature, and opaqueness. These conditions make it challenging to obtain data to characterize geological, physical, chemical, and biological processes. Most data transmitting systems, autonomous instrumentation, and communication technologies used on land are not possible in the deep ocean and this compounds the problems of obtaining data in real-time. Existing sensors that work under normal terrestrial conditions need to be re-engineered or re-imagined for the deep-sea environment. Building new technology to overcome the conditions found within and beneath the oceans will be an engineering grand challenge and will drive engineering innovation.

Developing a better understanding of this vast and mainly unexplored undersea region of Earth requires future sensor devices to be intelligent, autonomous, agile, and have the capability of communicating with each other and land-based laboratories in real time. Future sensors will also need the capability of being deployed for long durations; perhaps extracting energy from the ambient environment. Engineering advances are required to explore Earth in the least-invasive manner and with a minimal environmental footprint. New methods for sub-seafloor imaging are also envisioned. Such new technology could be applicable to sensing in other settings with extreme conditions.

Enhanced partnerships between the Engineering and the Marine Geology and Geophysics (MG&G) research communities are needed to advance sensing capabilities. To stimulate these partnerships, NSF requests proposals to support conferences that focus on appropriate engineering and marine science challenges and stimulate debate, discussion, visioning, and collaboration between the two research communities. Such conferences are typically identified as workshops and hereafter, will be referred to as workshops.

Workshops typically support 20-80 attendees. In addition to academic researchers, workshop participants may include scientists, engineers, educators, and practitioners from industry and federal agencies. Workshop proposals should include two deliverables: 1) a draft report at the end of the workshop that defines the technology gaps and engineering challenges as well as innovative new directions in technology development, and 2) a second more comprehensive report that addresses these topics and includes a technology road map.

Prior to submitting a workshop proposal, the PI must contact one of the individuals listed below to ensure that the proposal fits the goals of this Dear Colleague Letter. PIs will then be directed to appropriate Program Directors for submission through the normal submission process outlined in the NSF [Proposal and Award Policies and Procedures Guide](#) (PAPPG). The budget of a workshop proposal is generally limited to \$50,000 but under exceptional circumstances may be supported up to \$100,000.

Workshop proposals must be submitted by November 15, 2017 for consideration. Workshop proposals should focus their activities and deliverables in the early 2018 timeframe. Proposals or requests where PIs have not contacted the relevant Program Officers, as described in this Dear Colleague Letter, may be returned without consideration.

POINTS OF CONTACT

Kandace Binkley (Ocean Technology and Interdisciplinary Coordination)

kbinkley@nsf.gov

Deborah Smith (Marine Geology and Geophysics) dksmith@nsf.gov

Jenshan Lin (Communications, Circuits, and Sensing Systems) jenlin@nsf.gov

Sincerely,

William E. Easterling
Assistant Director, Directorate for Geosciences

Dawn M. Tilbury
Assistant Director, Directorate for Engineering