NISHIDA LAB.

[Ocean Nanosensing]

Center for Integrated Underwater Observation Technology

http://www.microfluidics.iis.u-tokyo.ac.jp/

Ocean Nanosensing

Department of Systems Innovation

Underwater Nanoworld

Underwater Atomic Force Microscope

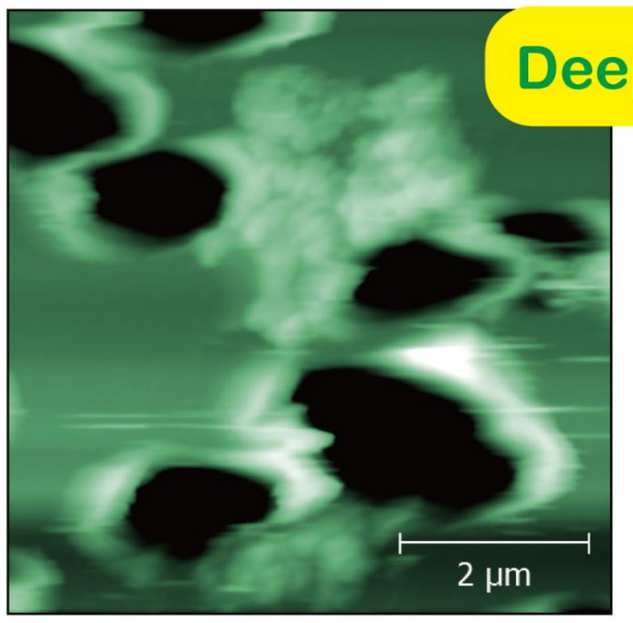
◆Research Goal

In marine environment including deep sea, there are various microorganisms and mineral particulates, which are deeply related to the ecosystems and material circulation in the ocean. Our goal is to develop *in situ* nanoscale sensing technologies for observing and analyzing the microscopic marine resources in deep sea, and reveal new findings of the nature of ocean.

◆Research Subjects

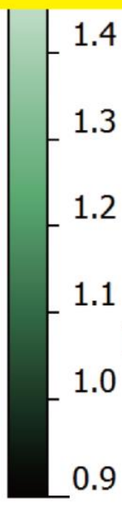
We are developing an Underwater Atomic Force Microscope (UAFM) system, which is mountable on various underwater vehicles for *in situ* nanoscale imaging in deep sea. The system is composed of various key technologies for operating UAFM in deep sea as follows:

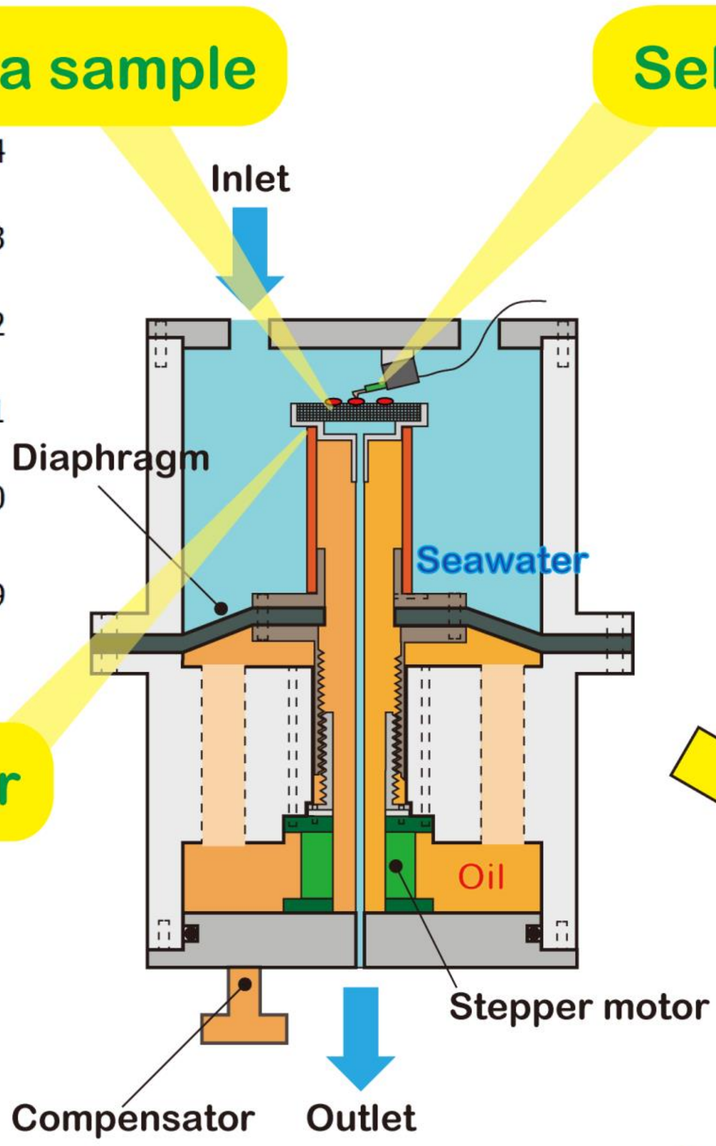
- Compact and Portable UAFM: Downsizing, Lightweight, Water and Pressure resistance
- Sampling mechanisms using microfluidic devices: Sample collection, Filtration, Sorting, Sample fixation, Environmental control system
- Mount mechanisms for underwater vehicles: Vibration isolation, Remote and Automatic control



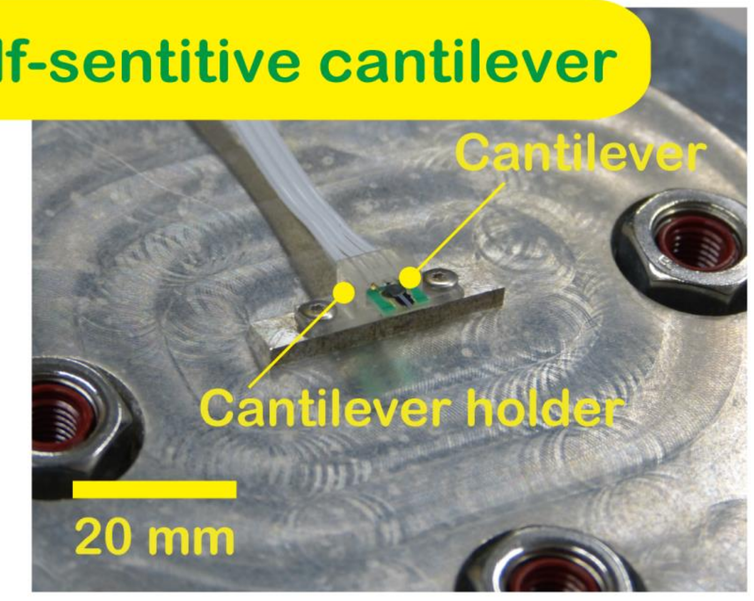
AFM image of microorganisms collected from deep water

Deep-sea sample



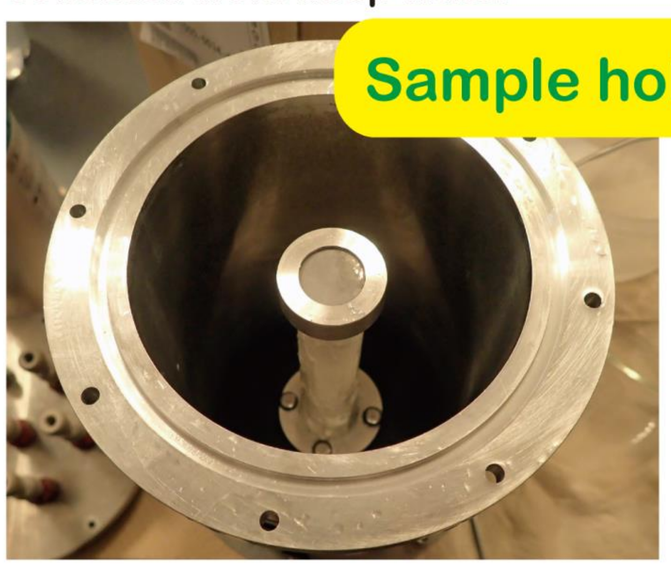


Self-sentitive cantilever

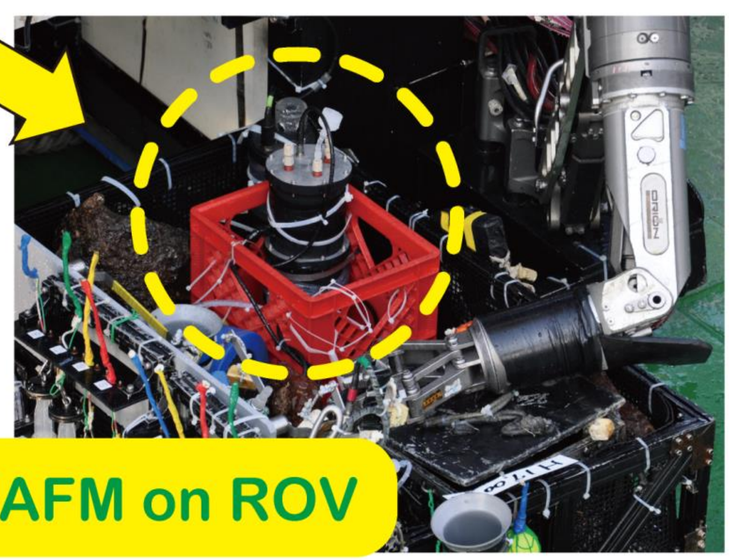


Self-sensitive cantilever insulated with Parylene for deep sea imaging

Sample holder



Sample collection and fixation mechanisms using membrane filter



UAFM on ROV

UAFM system mounted on remotely operated vehicle (ROV)