Bermuda Institute of Ocean Sciences

Julie Ann Wrigley Global Futures Laboratory
Arizona State University

2026 Summer Course

Marine Molecular Ecology

The Bermuda Institute of Ocean Sciences, a unit of the Julie Ann Wrigley Global Futures Laboratory, is a U.S. oceanographic research institution based in Bermuda. Founded in 1903, BIOS gained prominence after 1927 when the US National Academy of Sciences appointed the Lillie Commission to assess the needs of the U.S. oceanographic research community. Bermuda was selected as a key “substation” because it is “truly oceanic in location” and therefore in “the best situation in the North Atlantic for investigation into the phenomena that are fundamentally characteristic of the ocean basins.”

Today, ASU BIOS continues to conduct state-of-the-art oceanographic research with an emphasis on the North Atlantic Ocean and the coral reef platform of Bermuda. Because Bermuda is in the path of major ocean currents and in a region of significance with respect to climate change, our research portfolio has global relevance. We also leverages our core research to create unique educational programs at all levels—grade school through graduate school—many in collaboration with U.S. universities including; Princeton University, Lehigh University, University of Rhode Island, Roger Williams University.

Bermuda is located in the sub-tropical Atlantic Ocean, some 600 miles from the coast of the U.S. Located in the middle of the North Atlantic Ocean, Bermuda is uniquely situated to serve as a base for research on a variety of inland, coastal, and deep water issues of both local, national and global interest. From here, scientists can easily venture into the surrounding Sargasso Sea, one of the world’s most diverse open ocean ecosystems. Bermuda is also home to some of the world’s most northern coral reefs, allowing researchers from around the globe an opportunity to study corals outside tropical waters.

Bermuda Institute of Ocean Sciences

Julie Ann Wrigley Global Futures Laboratory
Arizona State University

Marine Molecular Ecology
Course Syllabus

2026

Course Syllabus
subject to change

July 13 - 31, 2026

Instructor: Dr. Brett Jameson (ASU BIOS)
Co-instructor: Dr. Sheryl Murdock (ASU)
Co-instructor: Dr. Nick Baetge (ASU BIOS)

bios.asu.edu

Course Overview

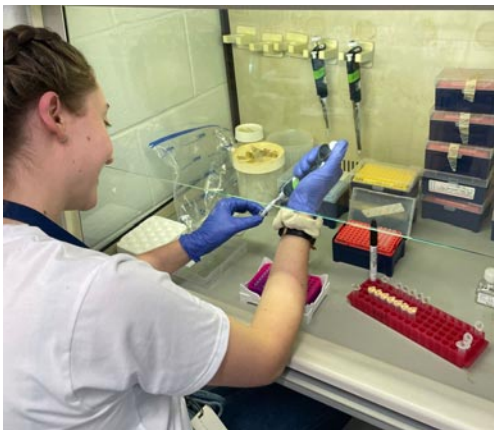
The Marine Molecular Ecology (MME) course explores the biology, diversity, and ecological importance of microorganisms in marine environments. Participants will investigate how microbial communities mediate key biogeochemical processes and respond to environmental change. Through a blend of lectures, fieldwork, laboratory experiments, and data analysis workshops, the course integrates molecular, ecological, and computational concepts to understand microbial ecosystem dynamics from genes to ecosystem function.

Participants will gain hands-on experience aboard the R/V Atlantic Explorer during an oceanographic sampling cruise to Hydrostation ‘S’, the world's longest-running ocean observation program. They will also:

- Examine the physiological, ecological, and evolutionary processes that structure marine microbial communities.
- Engage in hands-on field sampling and environmental data collection in coastal and open-ocean settings.
- Conduct laboratory experiments, including experimental manipulations, incubations, and DNA-based molecular surveys.
- Monitor environmental variability and place empirical findings in their broader ecological context.
- Learn and apply analytical techniques for processing and interpreting microbial community data using R.
- Critically evaluate and discuss current research articles in marine microbiology and biogeochemistry.
- Communicate scientific findings through written reports, data visualizations, and oral presentations.

This intensive three-week field course provides undergraduate and graduate students with practical experience in marine molecular ecology, with an emphasis on marine microbial communities. Course modules and laboratory exercises are designed to introduce participants to the molecular, ecological, and analytical tools used to study microorganisms and their roles in shaping marine ecosystems. Although the course centers on marine microbes, the skills developed are broadly applicable across biomedical, ecological, environmental, and life-science disciplines.





N.B. There is NO SCUBA diving on this course

Reading Material and Computer Requirements
The instructors will provide relevant readings from primary scientific literature.

In addition to standard software (Microsoft Office is recommended), participants will need access to a computer with the capability to run R and R Studio to complete the data analysis and visualization modules. R and R Studio are open source and should be downloaded and installed on your personal computer prior to the course start date.

Prerequisites

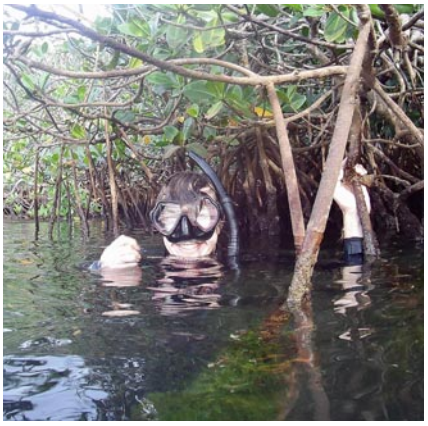
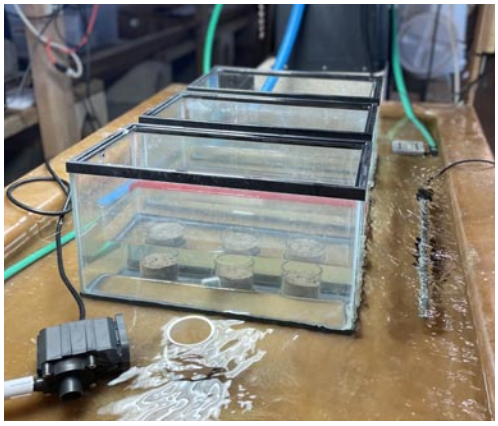
- University-level biology, chemistry, and ecology; marine science and/or oceanography are desirable.
- Experience with basic lab techniques including proficient use of micropipettes, implementation of aseptic technique, handling of common lab chemicals, ability to follow appropriate safety protocols (including PPE).

*This course involves field work both on-board research vessels and in the water. Participants should have the ability to work comfortably in the water with a mask and snorkel and should be prepared to spend extended periods of time on a boat.

Course Structure

The course has the following components:

- 12 lectures
- oceanographic sampling cruise on the R/V Atlantic Explorer to Hydrostation ‘S’
- at least 3 boat trips (4-6 hours each)
- at least 5 laboratory sessions (3-4 hours each, with additional time out of hours as needed)
- multiple precepts (0.5-1 hour each) to discuss background and methods for field and laboratory work
- final exam
- oral presentations to present the results of the group field and laboratory experiments

Grading

Course grading will consist of a quiz, a lab notebook, a data workshop report, an oral presentation, a final exam and a participation mark.

Lecture Topic examples:

- Introduction to Microorganisms
- Studying Microbial Communities
- Environmental Context
- Experimental Design
- Microbial Physiology and Metabolism
- Microbes and Nutrient Cycling
- Microbial Taxonomy and the 16S rRNA Gene
- High-throughput DNA Sequencing
- The “Omics” Era
- Devil’s Hole and Oxygen Minimum Zones
- Analyzing Molecular Datasets
- Bioreactors and Carbon

Field* and Laboratory Activities and Topics to include:

- Oceanographic sampling cruise to Hydrostation ‘S’
- Mangrove sediment coring
- Experiment selection and planning
- Wet-lab experiment set-up
- Experiment monitoring
- Seagrass meadows
- Sediment sampling for molecular analyses
- DNA extraction & NanoDrop quantitation
- DNA cleaning & qubit quantitation
- qPCR & gel electrophoresis
- Data analysis workshops

*** Field schedules are subject to change and dependent on prevailing weather and sea conditions**

Bermuda Institute of Ocean Sciences
17 Biological Station, St. George's GE 01, Bermuda

web: bios.asu.edu
email: bios.education@bios.asu.edu

Bermuda Institute of Ocean Sciences

ASU
Julie Ann Wrigley Global Futures Laboratory
Arizona State University