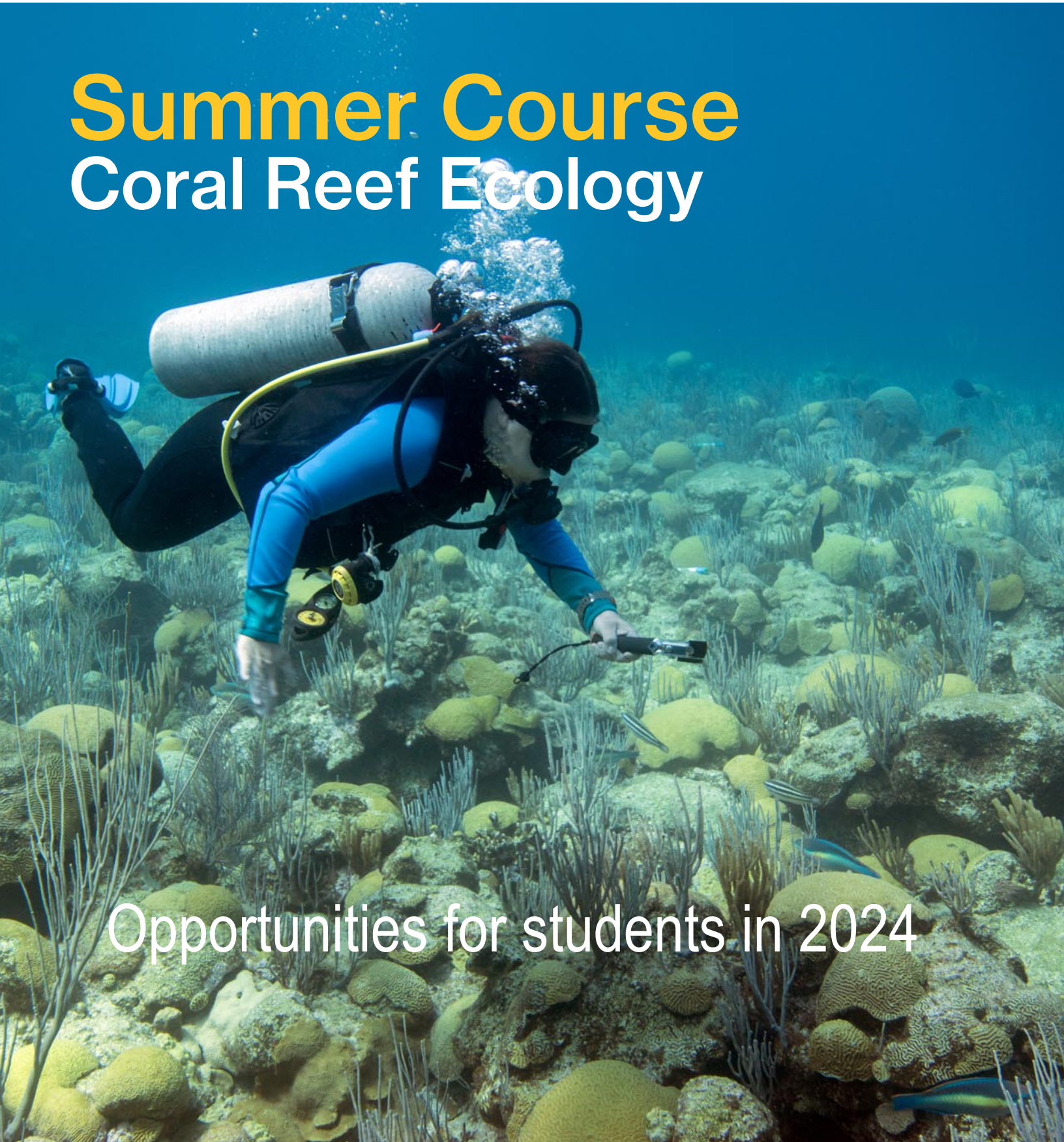
Bermuda Institute of Ocean Sciences

Julie Ann Wrigley Global Futures Laboratory
Arizona State University

Summer Course
Coral Reef Ecology



Opportunities for students in 2024

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, Furman 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.

Summer Course

Coral Reef Ecology: Functional Ecology of Coral Reefs

Course Syllabus

subject to change

July 15 – August 2, 2024

Instructor: Dr. Eric Hochberg (ASU BIOS)

Course Overview

The overall aim of this Coral Reef Ecology (CRE) course is to study how environment impacts reef benthic communities and the fundamental processes of reef metabolism. Production of organic and inorganic carbon underpins growth and maintenance of the reef ecosystem. These processes are strongly influenced by environmental parameters including water chemistry, hydrodynamics, light availability/capture, and temperature, as well as the taxonomic composition of the community itself. Reef geomorphological and ecological zonation demonstrates that benthic communities have adapted to (and influence) their prevailing environmental conditions. At the same time, conditions are never static, and communities must acclimate to short- and long-term changes in their environment. A vitally important question is how global change will impact this baseline of reef function. This course provides fundamental background in reef functional ecology, as well as training in the measurement and interpretation of reef processes and environmental parameters.

This is an intensive course—a semester of material condensed into three weeks. Course logistics include readings, lectures, discussions, presentations, and extensive laboratory and field work. Next to gaining a solid understanding of coral reef ecology and reef functional processes, students gain hands-on experience with state-of-the-art instrumentation and techniques for collecting and analyzing reef community and environmental data, including building underwater photomosaics, measuring current profiles, characterizing the underwater light field, characterizing water quality, and quantifying rates of primary production and respiration using traditional and advanced approaches.

Prerequisites

- University-level Biology and Ecology; marine science and oceanography desirable.
- The course will require boat work and the ability to work comfortably in the water with a mask and snorkel. SCUBA certification is highly recommended as those who are SCUBA certified* (minimum at the PADI Open Water Diver level, or internationally recognized equivalent) will be able to undertake fieldwork underwater and learn scientific diving skills.

** To be permitted to dive at ASU BIOS, course participants must complete, and return to the Dive Safety Officer, various forms and meet certain medical safety standards, which will require a physical examination from a health practitioner prior to arrival in Bermuda. The student dive information package (SDIP), including all such forms and supplemental information, will be provided after notification of acceptance to the course. A minimum of 12 dives, including at least one dive in the 6 months prior to the course, is highly recommended.*



Reading Material

Instructors will provide readings from the primary scientific literature.

Course Structure

The course has the following components:

- 9 lectures (approx. 1 hour long),
- 9 boat (snorkel/SCUBA) trips (3-4 hours each) conducting coral reef surveys and water quality assessment
- a 10-day-long laboratory experiment (flume metabolism),
- 2 3-day-long field experiments (reef community metabolism)
- several precepts (0.5-1 hour each) to discuss background and methods for field and laboratory work,
- several periods for guided laboratory analytical activities (e.g., water quality) and data analysis,
- a morning of oral presentations to present the results of the group field and lab experiments.

Lecture Topics

- Community Metabolism
- Physical Environment
- Chemical Environment
- Geological Environment
- Coral Biology
- Algae & Sediments
- Zonation & Trophics
- Reef Systems
- Reef Futures

Field and Laboratory Activities

- Field: Reef surveys—Transects, quadrats, photomosaics
- Field: Reef community metabolism via gradient flux
- Field: Measuring the underwater light field and collect water for water quality analysis
- Laboratory: Coral and algae community photosynthesis and respiration via flow respirometry (flume mesocosms)
- Laboratory: Water quality analysis (chlorophyll-a, particulate matter, [inorganic nutrients])

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