**Courses and Research Apprenticeships**

FHL offers educational opportunities for students in spring, summer and autumn. Students earn credits through the University of Washington but do not need to be currently enrolled at UW to apply. Courses and apprenticeships are taught by UW faculty as well as faculty from other universities and research institutions world-wide.

The instructional program in summer is intended for graduate students and advanced undergraduates. Well-qualified undergraduates may be admitted to graduate-level courses with the consent of the director and the faculty of the courses. Summer courses (5 weeks) may be taken sequentially but not concurrently.

Courses in spring and autumn quarters (10 weeks) are targeted to undergraduates and post-baccalaureates. Research Apprenticeships are intense, full-time research training experiences offered to qualified undergraduates and post-baccalaureates in spring and autumn. Small groups work on focused research guided by faculty and graduate student mentors. Students report that these experiences make them more likely to choose scientific research as a career option.

**Scientific Facilities**

**Laboratories and Equipment:** The teaching and research laboratories consist of thirteen buildings with running sea water. Walk-in cold rooms, a microtechnique room, a large flume and a workshop are available. Analytical equipment for general use includes centrifuges, computers, scintillation counter, HPLC, LC-Mass spectrometer, GEMS, PCR thermocyclers and other equipment for molecular biology, spectrophotometers, culture chambers, fluorescence microscope, video equipment, scanning laser confocal microscopes and electrophysiological equipment. A scanning electron microscope, transmission electron microscope and CT scanner may be used by investigators with appropriate training. An Ocean Acidification Environmental Laboratory, analytical chemistry laboratory and in-water mesocosms are also available.

**Stockroom:** The FHL stockroom loans small research equipment, labware and photographic equipment to students and investigators and provides consumable lab provisions and reagents at cost. Persons needing unusual materials, large quantities, radioisotopes or special equipment should make arrangements in advance.

**Facilities for Scuba Diving & Boating:** Scientific divers certified by the UW or other AAUS institutions may rent FHL’s four boats and a limited number of tanks and weights for specific projects approved by the Diving Officer. Study site information as well as check-out dives are provided by the Diving Officer.

**Library:** The FHL Library provides a core collection of books, journals and electronic resources with a focus on the marine sciences. Areas of emphasis include developmental biology, cellular biology, oceanography, fish biology, marine botany and marine ecology. Access to the UW Libraries catalog, article indexes and electronic journals is available through the library Web page.

**Marine Equipment:** A 58-foot steel research vessel, the R/V Centennial, equipped for dredging, trawling, net hauling and water sampling is available for classwork and research. We also offer the services of an ROV submersible, capable of working to 1000-foot depths. Rowboats and outboard powered boats are also available.

**Synoptic Collection:** A collection of preserved marine animals and plants is available as an aid to identification and location. In addition, files of collecting, study-site surveys and color transparencies of local marine life and habitats are maintained for reference.

**Importation of Species:** Most imports of marine species into Washington State for research are illegal without a permit from the Washington State Department of Fish and Wildlife. Permits, when granted, will require strict quarantine of non-native organisms with no contact with the FHL seawater system.

**Vertebrate Research:** Persons intending to work with fish at FHL must do so under a protocol approved in advance by the University of Washington Animal Welfare Office.
The Helen Riaboff Whiteley Center provides a retreat for established scholars and artists to study, write, create and interact with collaborators in a peaceful and stimulating environment. Scholars of any discipline may work at the Center for stays of several days to three months, undisturbed by the conflicting demands of their academic and artistic careers.

Scholarships & Fellowships

Scholarship and fellowship support is available to qualified students in need. This funding is from generous donations from FHL alumni and friends of the Laboratories. Financial aid is awarded on the basis of need and merit; admission decisions are not influenced by financial aid needs. Support is available to both undergraduate and graduate students. For additional information regarding scholarships and fellowships please visit http://depts.washington.edu/fhl/Whiteley.

Post-Doctoral Fellowships

FHL supports a post-doctoral scientist for a two-year appointment to establish an active research program and assist the Director in facilitating the efforts of visiting scientists and students. Applications are welcome from scientists with qualifications in any area of marine research readily supportable by FHL. For additional information regarding post-doctoral fellowships, please visit http://depts.washington.edu/fhl/resPdocFellowInfo.html.

Ocean Acidification Environmental Laboratory

FHL’s Ocean Acidification Environmental Laboratory consists of three major components; the in-water mesocosms installed off the FHL dock, indoor mesocosms with temperature and pH control and an analytical chemistry laboratory. The lab is capable of hosting a wide range of projects and serves the needs of FHL and visiting scientists. For additional information visit http://depts.washington.edu/fhl/oael.html.

Blinks/NSF REU/Beacon Internship Program

The Blinks/NSF REU/Beacon Summer Internship program offers hands-on, full-immersion summer research internships to 12-15 motivated undergraduates and post-baccalaureates. By linking students with marine scientists, students learn both the process and the substance of scientific research. Participants in the NSF Research Experiences for Undergraduates program will work 1:1 with a scientist on a full-time basis for eight weeks. The program is funded by the National Science Foundation, the Blinks Endowment and BEACON. The Andrew W. Mellon foundation, ASCB and FASEB also contribute. The 2015 research projects can be found at http://depts.washington.edu/fhl/REU.html.

Dr. Billie J. Swalla, Director

Friday Harbor Laboratories is a premier marine lab with the primary goals of marine research, education and outreach to the community. We strive for the highest quality and serve students and faculty from UW, across the USA and internationally. I hope to see you at FHL this year!

Administration & Support Staff

Director: Dr. Billie J. Swalla
Administrator: Scott Schwinge
Advancement: Rachel Anderson
Fiscal Specialist: Aimee Urata
Student Coordinator: Stacy Markman
Facilities Coordinator: Bernadette Holthuis
Whiteley Coordinator: Kathy Cowell
Diving Safety Officer: Perna Kitaeff
Boating Safety Officer: Kristy Kull
Computer Specialist: Alan Caums
Maintenance Supervisor: Fred Ellis
OAEL Manager: Rebecca Guenther
K-12 Education: Jenny Roberts
Stockroom: Jeannie Meredith
Dining Hall: Laurie Spaulding

Personnel

The University of Washington reaffirms its policy of equal opportunity regardless of race, color, creed, religion, national origin, sex, sexual orientation, age, marital status, disability, or status as a disabled veteran or Vietnam era veteran in accordance with University policy and applicable federal and state statutes and regulations. The University of Washington is committed to providing access, equal opportunity and reasonable accommodation in its services, programs, activities, education and employment for individuals with disabilities. To request disability accommodation in the application process, contact Friday Harbor Laboratories at fhlrec@uw.edu.
Summer low tide (M.S. Holmes)

Front cover photo: Marine algae, *Fryeella gardneri* (T. Mumford)

This marine red alga was chosen because its name honors researchers who were instrumental in the founding of Friday Harbor Labs in 1904. It symbolizes the labs ongoing teaching and research interests.
**SPRING QUARTER**  
March 28 - June 3, 2016, application review: Feb 1

**THE ZOO-BOT QUARTER**  
Students enroll in 3 standard courses plus optional Marine Sciences Seminar, 16 or 17 total credits:
- **Marine Zoology** (FHL 430/BIOL 430, 5 credits)  
  Dr. Megan Dethier
- **Marine Botany** (FHL 440/BIOL 445, 5 credits)  
  Dr. Thomas Mumford
- **Research in Marine Biology** (FHL 470, 6 credits)  
  Dr. Colette Feehan
- **Marine Sciences Seminar** (optional, FHL 490, 1 credit)

**MARINE BIOLOGY QUARTER**  
Students select a combination of courses, minimum total 12 credits:
- **Marine Biology** (FISH/BIOL/OCEAN 250, 5 credits) TBD
- **Science Writing for Diverse Audiences** (FHL 333, 3 credits) TBD
- **Marine Biogeochemical Cycles** (OCEAN 330, 5 credits) Dr. James W. Murray
- **Introduction to Probability & Statistics** (Q SCI 381, 5 credits) TBD
- **Marine Sciences Seminar** (FHL 490, 1 credit) TBD

**BLINKS – NSF REU – BEACON INTERNSHIP**  
June 13 – August 6, 2016, application deadline March 1  
Paid summer research internships for undergraduates, post-bacs or graduate students from diverse cultural backgrounds.

**SUMMER SESSION A**  
June 13 - July 15, 2016, application review: Feb 1

- **Marine Invertebrate Zoology** (FHL/BIOL 432, 9 credits)  
  Dr. Megan Schwartz & Dr. Kevin Kocot
- **Comparative Invertebrate Embryology** (FHL/BIOL 536, 9 credits)  
  Dr. Sally Leys & Dr. Michelangelo von Dassow
- **Marine Botany: Diversity & Ecology** (FHL 446, 9 credits)  
  Dr. Thomas Mumford & Dr. Jeffery Hughey
- **Evolutionary Response to Climate Change in the Sea** (FHL 568, 9 credits)  
  Dr. John Wares & Dr. Morgan Kelly

**SUMMER SESSION B**  
July 18 - August 19, 2016, application review: Feb 1

- **Ecology & Conservation of Marine Birds & Mammals** (FHL/FISH 492, 9 credits)  
  Dr. Eric Anderson & W. Breck Tyler
- **Larval Biology** (FHL/BIOL 536, 9 credits)  
  Dr. Richard Emlet & Dr. Daniel Grunbaum
- **Fish Functional Morphology** (FHL 528, 9 credits)  
  Dr. Adam Summers, Dr. Alice Gibb & Dr. Andrew Clark
- **Marine Biodiversity Methods** (FHL 568, 9 credits)  
  Dr. Gustav Paulay & Dr. James O’Donnell

**Summer Workshop on the Dynamic Brain**  
August 21 – September 4, 2016, application deadline April 1  
Co-hosted by the Allen Institute for Brain Science and the Computational Neuroscience Program at the University of Washington and directed by Drs. Christof Koch and Adrienne Fairhall. http://courses.washington.edu/braindyn

**AUTUMN QUARTER**  
September 28 - December 9, 2016  
Two application review dates: May 15 and July 1

**MARINE BIOLOGY QUARTER (MBQ)**  
Students select a combination of courses, minimum total 12 credits:
- **Marine Biology** (FISH/BIOL/OCEAN 250, 5 credits)
- **Integrative Oceans** (OCEAN 210, 4 credits)
- **Biology of Fishes** (FHL 305, 5 credits)
- **Reading & Writing the Marine Environment** (ENGL 365, 5 credits)
- **Research in Marine Biology: Eelgrass Stressors & Susceptibility to Disease** (FHL 470, 6 credits)
- **Marine Sciences Seminar** (FHL 490, 1 credit)

**RESEARCH APPRENTICESHIP:**  
**PELAGIC ECOSYSTEM FUNCTION IN THE SAN JUAN ARCHIPELAGO** (OCEAN 492, 15 credits)  
Dr. Jan Newton, Dr. Matthew Baker & W. Breck Tyler

**RESEARCH APPRENTICESHIP:**  
**MARINE SEDIMENTARY PROCESSES** (OCEAN 492, 15 credits)  
Dr. Andrea Ogston & Dr. Ian M. Miller

http://depts.washington.edu/fhl/
Robert Andersen, UW-FHL
Algal systematics to assemble the heterokont tree of life

Jack Bell, Los Medanos College & UW
Analytical chemistry of marine environments

Emily Carrington, UW-Biology: Course Faculty
Physiological ecology and biomechanics

Megan N. Dether, UW-FHL: Course Faculty
Shoreline ecology and monitoring change

Petra Ditse, UW-FHL: Course Faculty
Functional investigations on the adhesive mechanism of Clingfish

David O. Duggins, UW-FHL: Course Faculty
Distribution & utilization of macrophyte detritus

Victoria Foe, UW-Biology
Cytokinesis in echinoderm cells

Carolyn Friedman, UW-SAIF: Course Faculty
Investigations of the ecology of infectious marine diseases

Nicholas Gidmark, UW-FHL: Course Faculty
Fish jaw muscle physiology

H. Gary Greene, UW-FHL
Geology and habitat characterization of Salish Sea

Danny Grunbaum, UW-Oceanography: Course Faculty
Larval biology, biomechanics and behavior

Terrie Klinger, UW-School of Marine Affairs
Nearshore ecology, marine conservation biology

Claudia E. Mills, UW-Biology
Biology of medusae, ctenophores, & siphonophores

M. Patricia Morse, UW-FHL
Molluscan meiofauna of the San Juan Islands

James W. Murray, UW-Oceanography
Investigations of ocean acidification in the NE Pacific

Jan A. Newton, UW-Applied Physics, Oceanography
Faculty for Pelagic Ecosystem Function course

Charles O’Kelly, UW-FHL
Research on smaller green algae and amoebeae

Garrett Odell, UW-Biology
Cell dynamics and computational biology

Kenneth Sebens, UW-Biology: SAFS: Course Faculty
Community ecology of the subtidal zone

Craig Staudt, UW-FHL
Biology of gammaridean amphipods

Richard Strathmann, UW-Biology
Evolution of embryos and larvae

Adam Summers, UW-Biology, SAFS: Course Faculty
Functional morphology and ecology of fishes

Billie Swalla, UW-Biology, CoErev: Course Faculty
Evolution & development of body plans

Pedro Verduzo, UW-Bioengineering
Polymer physics of marine biopolymers

Dennis Willows, UW-FHL
Nervous systems of freely behaving animals

Sandy Wyllie-Echeverria, UW-Forestry
Ecology and restoration of eelgrass

Ariel Chipman, Hebrew University of Jerusalem
Evolution of the arthropod body plan

M. Elizabeth Clarke, NOAA Fisheries
Science Directorate, SD Division

John Costello, Providence College
Planktonic animal-fluid interactions

Thomas DeLuca, University of Washington
School of Environmental and Forest Sciences

Andrew Dickson, UC San Diego Scripps Institute of Oceanography
Faculty for Ocean Acidification course

Paolo Domenici, International Marine Center, Organismal Biology
Fish locomotion in relation with predator-prey interactions

Casey Dunn, Brown University
Faculty for Practical Computing for Biologists Workshop

Joseph Felsenstein, University of Washington
Evolutionary biologist working on “Theoretical Population Genetics”

Paul Fortna, City University of New York, Brooklyn College Biology
Brain activation and neurochemistry in social acoustic behavior

William Frost, Rosalind Franklin University
Behavior and nervous system anatomy of the sea anemone Stomphia

Aaron Galloway, Oregon Institute of Marine Biology
Tracking primary production through marine food webs with biomarkers

Joe Gaydos, Seadoc Society
Marine mammal pathologies

Sophie George, Georgia Southern University
Development and distribution of echinoderm larvae

Rhonda Gillette, University of Illinois
Neural mechanisms of cost-benefit decision in simpler systems

Albert Gordon, UW
How calcium regulates muscle contractions

Charles Greene, Cornell University
Responses of global ocean ecosystems to climate

Maya Groner, Atlantic Veterinary College, Prince Edward Island, Canada
Physiological and environmental drivers of wasting disease in eelgrass

Martha Groom, UW, Bothell
Dynamics & restoration of eelgrass (Zostera marina) beds

Stephen Haddock, MBARI
Faculty for Practical Computing for Biologists Workshop

Brad Hanson, NOAA/NWFSC- Foraging ecology of killer whales

Michael Hart, Simon Fraser University, Biological Sciences
Population genetics of specialization

Catherine Drew Harvell, Cornell University
Faculty for Ecology of Infectious Marine Diseases

Marco Hatch, Northwest Indian College
Macrocystis gardens in the San Juan Archipelago

Jon Havenhand, University of Gothenburg
Faculty for Ocean Acidification course

Scottie Henderson, California State University at Fullerton
Effects of low tide exposure on intertidal invertebrate consumers

Eric Hessler, University of California, Santa Barbara
Potential impacts of submarine power cables on crab harvest

Jason Hodin, UW/Stanford
Life stage transitions in marine invertebrates

John Horne, University of Washington, School of Aquatic & Fishery Surveys
Surveys of the distribution and abundance of local fish populations

Erika Iyengar, Muhlenberg College
Ecology of symbiotic interactions involving suspension-feeding snails

Vikram Iyengar, Villanova University
Mating systems and reproductive strategies in arthropods

Jeffrey Jensen, UW, Bothell
Prey size selection & biometrics of feeding in R. vacca

Stephen Kajiura, Florida Atlantic University Biological Sciences
Joel Kingsolver, University of North Carolina, Chapel Hill
Ecological responses of echinoderms to climate change

Amy Lambert, UW, Bothell
Impacts of herbivory on Euchlorax ausoniides insulanus

Gretchen Lambert, California State University
Ecology of invasive Tunicates

Adam Leache, UW, Burke Museum of Natural History & Culture
San Juan Island amphipaths

Louise McGarry, Cornell University
Rockfish behavior using bioacoustics

George Mackie, University of Victoria, Canada
Interaction of nerves and excitable epithelia in hydromedusan behavior

Robert Meech, University of Bristol, UK
The molecular basis of behavior in jellyfish

Rachel Merz, Swarthmore College
Biomechanical investigations of invertebrates

John Meyer, University of Washington, College of the Environment
Impact of non-indigenous invaders in native systems

Susan Middleton, UW-SAFS: Course Faculty
Ecological responses of ectotherms to climate change

James A. Murray, California State University, East Bay
Neuroethology of navigation and chemical ecology of sea slugs

Tigran Norekian, The Whitney Laboratory for Marine Bioscience
Nervous system in Ctenophores

Andrea Ogost, UW-Oceanography: Course Faculty
Invertebrate biology and sedimentary processes on the Elwha River

Julian Olden, UW, School of Aquatic & Fisheries Sciences
Global change drivers on freshwater ecosystems

Monica Orellana, Institute for Systems Biology
Diatom responses to ocean acidification and climate change

Karen Osborn, Smithsonian Institution
Invertebrate Zoology

Dianna Padilla, SUNY at Stony Brook
Faculty for Marine Invertebrate Zoology

Misty Paig-Tran, California State University, Fullerton:
Faculty for Feeding performance and movement invertebrates

Jan Pecherkin, Tufts University, Biology
Latent effects on post-metamorphic development during larval life

Gustav Paulay, University of Florida
Faculty for Marine Invertebrate Zoology course

John Pirtle, The College of Idaho
Neuronal control of locomotion in Clione limacina

Sean Place, University of South Carolina
Faculty for Three Seas Program

Ann Potter, Washington Department of Fish & Wildlife
Distribution of the endemic Island Marble Butterfly

Ellis Ridgway, Virginia Commonwealth University
Understanding how calcium regulates muscle contraction

Laura Rogers-Bennett, UC Davis Bodega Marine Lab
Subtidal crustose coralline algae inside & outside kelp beds

Megan Schwartz, UW, Bothell
Nemertean morphological and molecular phylogenetics

Charles Shuster, New Mexico State University
Faculty for Comparative Invertebrate Embryology

Joseph Sisneros, University of Washington, Psychology
Sound source localization by the Plainfin midshipman fish

Craig Smith, University of Hawaii at Manoa
Faculty for Deep Sea Biodiversity, Connectivity & Ecosystem Function

John Steffensen, University of Copenhagen
Faculty for Fish Swimming course

Bill Stickle, Louisiana State University, Biological Sciences
Thermal tolerance & a Subcommittee of intertidal gastropods

Steve Stricker, University of New Mexico
Molecular mechanisms of oocyte maturation and fertilization

John Thompson, University of California at Santa Cruz
Dataset on cooperation interactions between plants and pollinators

W. Breck Tyler, University of California, Santa Cruz
Faculty for Ecology & Conservation of Marine Birds & Mammals

Theodore Uyeno, Vaidosta State University, Biology
Biomechanics of hard biting in soft, elongate & jawless fish

Janice Voltzow, University of Scranton, Biology
Functional morphology of marine gastropods

Michelangelo van Dassow, Duke University Marine Laboratory
Biomechanics of development & sensitivity to the environment

Robert Waaland, University of Washington, Biology
Seaweed diversity, distribution and productivity

H. Arthur Woods, University of Montana, Biological Sciences
Ecological and environmental physiology of insects

Linda Wordeman, UW, Physiology & Biophysics
Miticic motor distribution in dividing echinoderms

Sylvia B. Yamada, Oregon State University
Ecology of native crabs and their mollusk prey

Russel Zimmer, University of Southern California
Developmental biology of lophophorate phyla