DIVISION OF MARINE BIOLOGY HOPKINS MARINE STATION

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Courses given in Marine Biology at the Hopkins Marine Station have the subject code BIOHOPK. For a complete list of subject codes, see Appendix.

The Hopkins Marine Station, located 90 miles from the main University campus in Pacific Grove, was founded in 1892 as the first marine laboratory on the west coast of North America. The modern laboratory facilities on the 11-acre campus on Cabrillo Point house ten faculty, all members of the Department of Biological Sciences. The Miller Library has a collection of literature in marine science. The Hopkins faculty offers undergraduate and graduate courses in biology which focus on the marine realm and involve topics including oceanography, environmental and comparative physiology, molecular evolution, biomechanics, cellular biology, conservation biology, and neurobiology and behavior. Most courses have laboratory sections that exploit the potential of working with readily available marine plants and animals. Small class sizes encourage close student-faculty interactions. Undergraduates have opportunities to carry out research projects with Hopkins faculty during the academic year or summer months. Courses are offered in Winter, Spring, and Summer quarters.

COURSES

BIOHOPK 43. Plant Biology, Evolution, and Ecology—Introduction to biology in a marine context. Principles of plant biology: physiology, structure, diversity. Principles of evolution: macro and microevolution, population genetics. Ecology: the principles governing the distribution and abundance of organisms; population, community, and ecosystem ecology. Equivalent to BIOSCI 43. GER: DB-NatSci
5 units, Spr (Denny, M; Palumbi, S; Watanabe, J)

BIOHOPK 44Y. Core Experimental Laboratory—Laboratory and field projects provide working familiarity with the concepts, organisms, and techniques of plant and evolutionary biology, and ecology. Emphasis is on hands-on experimentation in the marine environment, analysis of data, and written and oral presentation of the experiments. Lab fee. Equivalent to BIOSCI 44Y. Corequisite: BIOHOPK 43. GER: DB-NatSci, WIM
5 units, Spr (Denny, M; Palumbi, S; Watanabe, J)

BIOHOPK 56H. History and Philosophy of Science—The nature of scientific inquiry, its logic, historical patterns, and sociology. Emphasis is on the unique aspects of the biological sciences.
2 units, Spr (Somero, G)

BIOHOPK 161H/261H. Invertebrate Zoology—(Graduate students register for 261H.) Survey of invertebrate diversity emphasizing form and function in a phylogenetic framework. Morphological diversity, life histories, physiology, and ecology of the major invertebrate groups, concentrating on local marine forms as examples. Current views on the phylogenetic relationships and evolution of the invertebrates. Lectures, lab, plus field trips. Prerequisite: Biological Sciences core or consent of instructor. GER: DB-NatSci
5 units, Win (Watanabe, J)

BIOHOPK 162H/262H. Comparative Animal Physiology—(Graduate students register for 262H.) How animals work. Topics: physiology of respiration, circulation, energy metabolism, thermal regulation, osmotic regulation, muscle physiology, and locomotion. Evolutionary and ecological physiology. Lectures, lab, and field research. An option to combine the course work with a more intensive research focus, with more units, is available. Prerequisite: Biological Sciences core or consent of instructor. GER: DB-NatSci
5-8 units, alternate years, not given this year (Block, B)

BIOHOPK 163H/263H. Oceanic Biology—(Graduate students register for 263H.) How the physics and chemistry of the oceanic environment affect marine plants and animals. Topics: seawater and ocean circulation, separation of light and nutrients in the two-layered ocean, oceanic food webs and trophic interactions, oceanic environments, biogeography, and global change. Lectures, discussion, and field trips. Recommended: PHYSICS 21 or 51, CHEM 31, Biological Sciences core, or consent of instructor. GER: DB-NatSci
4 units, Win (Denny, M; Somero, G)

BIOHOPK 164H/264H. Marine Botany—(Graduate students register for 264H.) Phytoplankton and oceanic productivity; macrophytes and nearshore ecology; marine angiosperms from taxonomical, physiological, and ecological perspectives. Lectures, lab. Prerequisite: Biological Sciences core or consent of instructor. GER: DB-NatSci
5 units, Win (Connor, J), alternate years, not given next year

BIOHOPK 166H/266H. Molecular Ecology—(Graduate students register for 266H.) How modern technologies in gene sequencing, detection of nuclear nucleotide polymorphisms, and other approaches are used to gather data on genetic variation that allow measurement of population structure, infer demographic histories, inform conservation efforts, and advance understanding of the ecology of diverse types of organisms. GER: DB-NatSci
5 units, Win (Palumbi, S)

BIOHOPK 167H/267H. Nerve, Muscle, and Synapse—(Graduate students register for 267H.) Fundamental aspects of membrane excitability, nerve conduction, synaptic transmission, and excitation-contraction coupling. Emphasis is on biophysical, molecular, and cellular level analyses of these processes in vertebrate and invertebrate systems. Labs on intra- and extracellular recording and patch clamp techniques. Lectures, discussions, and labs. Prerequisites: PHYSICS 23, 28, 43, or equivalent; CHEM 31, 135; calculus; or consent of instructor. GER: DB-NatSci
5 units, Spr (Gilly, W)

BIOHOPK 168H/268H. Marine Pollution—(Graduate students register for 268H.) Major pollutants in marine organisms; how they are affected and how they cope.
2 units, Spr (Epel, D)

BIOHOPK 169H/269H. Neurobiology and Behavior—(Graduate students register for 269H.) The neural mechanism responsible for generating animal behavior. Topics: sensory ecology, neronal excitability, synaptic plasticity, and neural circuits. Lectures, discussions, demonstrations, and lab. Prerequisite: Biological Sciences core or consent of instructor. GER: DB-NatSci
5 units, Win (Thompson, S)

BIOHOPK 170H/270H. Topics in Marine Biology—(Graduate students register for 270H.) Primary literature. Prerequisite: Biological Sciences core or consent of instructor. May be repeated for credit.
1 unit, Win (Staff)

BIOHOPK 171H/271H. Ecological and Evolutionary Physiology—(Graduate students register for 271H.) The interplay between environmental factors, such as temperature, light, nutrient supply, salinity, and oxygen availability, and adaptive change at the physiological level. Emphasis is on marine species and the roles played by physiological adaptations in establishing their distribution and performance. Prerequisite: Biological Sciences core or consent of instructor. GER: DB-NatSci
4 units, Win (Somero, G)

BIOHOPK 172H/272H. Marine Ecology—(Graduate students register for 272H.) Introduction to the principles of ecology as applied to life in the sea. Population dynamics, community ecology, and the effects of man on the oceans. Lectures, lab. Prerequisite: Biological Sciences core or consent of instructor. GER: DB-NatSci

5 units, Win (Micheli, F)

BIOHOPK 173H/273H. Marine Conservation Biology—(Graduate students register for 273H.) The science of preserving marine diversity. Goal is to introduce students to major conservation issues associated with marine ecosystems. Topics include decline of open ocean fisheries, salmon conservation, bycatch issues in fisheries, use of marine reserves, marine invasions, marine pollution, and global warming. Includes five lecturers from other universities who specialize in marine conservation.

1-3 units, alternate years, not given this year (Block, B)

BIOHOPK 174H/274H. Experimental Design and Probability—(Graduate students register for 274H.) Variability is an integral part of biology. Introduction to probability and its use in designing experiments to address biological problems. Focus is on analysis of variance, when and how to use it, why it works, and how to interpret the results. Design of complex, but practical, asymmetrical experiments and environmental impact studies, and regression and analysis of covariance. Computer-based data analysis. Prerequisite: Biological Sciences core or consent of instructor. GER: DB-NatSci, WIM

3 units, Spr (Watanabe, J)

BIOHOPK 175H. Problems in Marine Ecology and Ecophysiology—Field-based, emphasizing individual and small group research for advanced undergraduates. Students learn field and laboratory techniques to address ecological, ecophysiological, and biomechanical problems faced by marine organisms. Original research projects may be integrated with ongoing research programs in the Hopkins Marine Life refuge. Prerequisites: Biological Sciences core, consent of instructor. GER: DB-NatSci, WIM

10 units, Spr (Somero, G; Epel, D)

BIOHOPK 176H. Experimental Neurobiology—Lab, emphasizing methods in the neurosciences, including electrophysiological, biochemical, molecular, behavioral, and histological techniques. Students work on individual original research projects under guidance of the faculty. Prerequisites: strong interest in neurobiology and previous relevant course work, consent of instructors. GER: DB-NatSci, WIM

6-12 units, Spr (Thompson, S)

BIOHOPK 178H/278H. Polar Biology—(Graduate students register for 278H.) Seminar. The deep sea is the largest, least understood fraction of the biosphere. Organisms living here possess diverse adaptations to allow life under high pressure. Recent discoveries in deep-sea biology including the biology of the hydrothermal vents, and the technology that makes these advances possible. Prerequisites: Biological Sciences core, consent of instructor.

2 units, Spr (Somero, G)

BIOHOPK 182H/323H. Stanford at Sea—(Graduate students register for 323H; same as EARTHSYS 323, GES 323.) Five weeks of marine science including oceanography, marine physiology, policy, maritime studies, conservation, and nautical science at Hopkins Marine Station, followed by five weeks at sea aboard a sailing research vessel in the Pacific Ocean. Shore component comprised of three multidisciplinary courses meeting daily and continuing aboard ship. Students develop an independent research project plan while ashore, and carry out the research at sea. In collaboration with the Sea Education Association of Woods Hole, MA. Only 6 units may count towards the BioSci major. GER: DB-NatSci

16 units, Spr (Block, B; Dunbar, R; Micheli, F), alternate years, not given next year

BIOHOPK 184H/284H. Holistic Biology: Monterey Bay and the Sea of Cortez—(Graduate students register for 284H.) For majors and non-majors. Complexity in natural systems from complementary points of view, including scientific, historical, philosophical, and literary. The work and writings of Ed Ricketts and John Steinbeck and historical and contemporary works concerning marine ecology and fisheries. Field work, laboratory studies with living invertebrates, and an individual research project. Course includes a component in Baja California, Mexico. Only 6 units may count towards the BioSci major. GER: DB-NatSci

16 units, alternate years, not given this year (Gilly, W)

BIOHOPK 186H/286H. Ocean Pollution: Land, Air, and Sea Interactions—(Graduate students register for 286H.) The scientific basis of environmental pollution; how organisms protect themselves against toxicants; how protection can be overcome; policy issues in government regulation of pollution.

3 units, Win (Epel, D)

BIOHOPK 198H. Directed Instruction or Reading—May be taken as a prelude to research and may also involve participation in a lab or research group seminar and/or library research. Credit for work arranged with out-of-department instructors restricted to Biological Sciences majors and requires department approval.

1-15 units, Aut, Win, Spr, Sum (Staff)

BIOHOPK 199H. Undergraduate Research—Qualified undergraduates undertake individual work in the fields listed under 300H. Arrangements must be made by consultation or correspondence.

1-15 units, Aut, Win, Spr, Sum (Staff)

BIOHOPK 290H. Teaching of Biological Science—Open to upper-division undergraduates and graduate students. Experience in teaching lab biology or serving as a lecture course assistant. Prerequisite: consent of instructor.

1-15 units, Win, Spr, Sum (Staff)

BIOHOPK 300H. Research—Graduate study involving original work undertaken with staff in the fields indicated:

B. Block: Comparative Vertebrate Physiology—biomechanics, metabolic physiology and phylogeny of pelagic fishes, evolution of endothermy.

M. Denny: Biomechanics—the mechanical properties of biological materials and their consequences for animal size, shape, and performance.

A. De Tomaso: Developmental and Comparative Immunology, Stem Cell Biology—evolution of self/non-self recognition systems.

D. Epel: Developmental Biology—physiology and regulation of early embryonic development. Embryonic adaptation to environmental stress.

W. Gilly: Neurobiology—analysis of giant axon systems in marine invertebrates from molecular to behavioral levels.

F. Micheli: Marine Ecology—species interactions and community ecology, scale-dependent aspects of community organization, marine conservation and design of multi-species marine protected areas, behavioral ecology.

S. Palumbi: Molecular Evolution—mechanisms of speciation, genetic differentiations of populations, use of molecular tools in conservation biology, design of marine protected areas.

G. Somero: Ecological and Evolutionary Physiology—adaptations of marine organisms to the environment: temperature, pressure, desiccation, and oxygen availability.

S. Thompson: Neurobiology—neuronal control of behavior and mechanisms of ion permeation, signal transduction, calcium homeostasis, and neurotransmission.

J. Watanabe: Marine Ecology—kelp forest ecology and invertebrate zoology.

1-15 units, Aut, Win, Spr, Sum (Staff)

SUMMER PROGRAM

The summer program is open to advanced undergraduate, graduate students, and postdoctoral students, and to teachers whose biological bacskgrounds, teaching, or research activities can benefit from a summer's study of marine life. Applications and further information may be obtained by writing to Hopkins Marine Station, Pacific Grove, CA 93950. Completed applications should be submitted by April 15. Applications received later are considered if space is still available.

Summer Quarter is divided into two terms. It is possible to register for either term, or for the full quarter. Registration is possible for only one course during each term.

FIRST TERM

BIOHOPK 179H/279H. Subtidal Communities—(Graduate students register for 279H.) Lectures, lab, and field trips treating shallow water marine communities. Emphasis is on local habitats and the introduction of physical environmental parameters, community composition, aspects of the biology of constituent species, and methods for subtidal studies. Prerequisites: scuba certification, scuba equipment, ocean diving experience, and some background in biology. GER: DB-NatSci

6 units, Sum (Watanabe, J)

BIOHOPK 274. Hopkins Microbiology Course—(Same as BIOSCI 274S, CEE 274S, GES 274S.) Four-week, intensive. The interplay among molecular, physiological, ecological, evolutionary and geochemical processes that constitute, cause, and maintain microbial diversity. How to isolate key microorganisms driving marine biological and geochemical diversity, interpret culture-independent molecular characterization of microbial species, and predict causes and consequences. Laboratory component: what constitutes physiological and metabolic microbial diversity; how evolutionary and ecological processes diversify individual cells into physiologically heterogeneous populations; and the principles of interactions between individuals, their population, and other biological entities in a dynamically changing microbial ecosystem. Prerequisites: CEE 274A,B, or equivalents.

9-12 units, Sum (Spormann, A; Francis, C)

BIOHOPK 277H. Biomechanics, Ecological Physiology, and Genetics of Intertidal Communities—Introduction to the mechanical and physiological design of wave-swept organisms. How different abiotic stresses (wave exposure, wind speed, temperature, light) influence marine animals and plants, and adaptive responses to these stresses. Lab introduces methods for measuring environmental stress and organismal responses. Recommended: background in algology, intertidal ecology, or invertebrate zoology; basic physics and calculus.

4 units, Sum (Denny, M; Somero, G; Palumbi, S)
alternate years, not given next year

SECOND TERM

BIOHOPK 180H/280H. Problems in Subtidal Ecology—(Graduate students register for 280H.) Group and individual research projects focus on shallow water marine communities. Daily lectures, SCUBA dives, labs. Prerequisites: SCUBA certification; advanced or comparable experience, or 179H. GER: DB-NatSci

6 units, Sum (Watanabe, J)