BIOLOGY

These are thrilling times to study biology. Advances in molecular biology, epigenetics, and bioinformatics are leading to extraordinary new insights in every field, from evolution and ecology to development, cell biology, genetics/genomics, and neuroscience. These research areas are providing essential information as we address the urgent challenges of biodiversity conservation, global climate change, epidemiology, and human health and well-being. Biology is also at the heart of new ways of understanding ourselves as human beings in relation to other living things. Connections between biological disciplines are raising key questions in new ways, while biological knowledge has become fundamentally integrated with social and medical ethics, public policy, and journalism.

The Biology Department offers a broad range of courses that emphasize the process of scientific inquiry and current experimental approaches. Our courses also consider real-world implications of biological issues: the ethics of embryonic stem cell research, gender issues and reproductive technologies, the AIDS epidemic, and the impact of human activity on natural communities. Biology courses can be the start of a dedicated career in research, medicine, conservation, public health, bioethics, sustainable resource use, and many other areas. They can also bring the intellectual excitement of these investigations to students whose major focus is in the arts, humanities, or social sciences. We welcome students of all backgrounds and interests to join us.

FACULTY

Gloster B. Aaron
BA, Oberlin College; PHD, University of Pennsylvania
Associate Professor of Biology; Chair, Neuroscience and Behavior; Associate Professor, Neuroscience and Behavior; Associate Professor, Integrative Sciences

David Bodznick
BS, University of Illinois Urbana; MAA, Wesleyan University; PHD, University of Washington
Professor of Biology; Professor, Neuroscience and Behavior

Ann Campbell Burke
AB, New York University; MA, Harvard University; PHD, Harvard University
Professor of Biology; Chair, Biology

Barry Chernoff
BS, SUNY at Stony Brook; MS, Adelphi University; PHD, University of Michigan
Robert Schuman Professor of Environmental Studies; Professor of Earth and Environmental Sciences; Professor of Biology; Chair, Environmental Studies Program; Director, College of the Environment; Professor, Environmental Studies

Frederick M. Cohan
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Laura B. Grabel
BA, Brandeis University; MAA, Wesleyan University; PHD, University of California, San Diego
Lauren B. Dachs Professor of Science and Society; Professor of Biology; Professor, Feminist, Gender, and Sexuality Studies

Ruth Ineke Johnson
BS, University of Witwatersrand; PHD, Cambridge University
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Alan M. Dachs Professor of Science; Professor of Biology; Professor, Neuroscience and Behavior

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Professor of Biology; Professor, Integrative Sciences

AFFILIATED FACULTY

David Borrego
Visiting Scholar in Biology

EMERITI

Allan Berlind
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Professor of Biology, Emeritus

J. James Donady
BS, SUNY at Stony Brook; PHD, University of Iowa
Professor of Biology, Emeritus

UNDERGRADUATE PROGRAM

DEPARTMENTAL ADVISING EXPERTS

All departmental faculty

- Undergraduate Biology Major (catalog.wesleyan.edu/departments/biol/ugrd-biol)
- Graduate Biology Program (catalog.wesleyan.edu/departments/biol/grad-biol)
BIO102 Science Information Literacy
Information literacy is the set of skills needed to find, retrieve, analyze, and use information. This course will focus on teaching these skills as especially applied to scientific information. Students will learn to determine the nature and extent of information needed, to acquire needed information effectively and efficiently, to evaluate information and its sources critically, and to use information effectively to accomplish a specific purpose. Students will also examine the economic, ethical, legal, and social issues surrounding the use of information and how information literacy is important to lifelong learning and keeping current to new developments in his/her field. Topics will include the structure of scientific information and scientific publishing, the research process, types of information retrieval systems, search strategies and syntax, use of bibliographic management software (e.g., EndNote), criteria for critical evaluation, open-access publication, plagiarism, and copyright.
Offering: Crosslisting
Grading: OPT
Credits: 0.50
Gen Ed Area: None
Identical With: MBB102, CHEM102, PHYS103, NS&B102, PSYC102, E&ES102, ASTR102, MBB102, CHEM102, PHYS103, NS&B102, PSYC102, E&ES102, ASTR102
Prereq: None

BIO106 The Biology of Sex
This course is featured as a general education course within the Department of Biology. Serving to complement courses currently offered within biology that only touch upon the subject of sex, this course will delve into specifics regarding sexual behavior and will serve to highlight new discoveries that have been facilitated by novel scientific techniques and approaches. As we study the biology of sex in the animal world, it becomes apparent that sex is achieved in a multitude of ways, many appearing rather bizarre and flamboyant. Yet under these guises, animals are still able to mate and reproduce. Sex is often defined according to sexual reproduction, whereby two individuals that are male and female mate and have offspring. However, many organisms engage in asexual reproduction and/or a combination of the two reproductive strategies. Reproductive anatomy and behavior will be addressed as we explore a variety of organisms, ranging from marine mollusks and their "sex changes" to the (female) marmoset monkey that can give birth to chimeras (an offspring with more than two parents). As an organism pursues sex, what are the mating strategies? What are the chemicals of sex (pheromones and hormones)? By examining the biology of sex in detail, we will also debate age-old topics such as whether sexual reproduction is sexist, the competing strategies of males and females, and whether human cultural displays are yet another way to decipher quality in a potential mate.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL
Prereq: None

BIO107 Perspectives in Genetics
This course will utilize a historical survey of milestones in the science of genetics that have brought us to a current era where genetics is involved in all aspects of our lives. In addition to learning the principles of genetics and the methods of analysis (classical and molecular), students will have an opportunity to discuss issues that genetics raises in ethics, politics, and economics. However, these issues are not the primary focus of the course.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL
Prereq: None

BIO111 Life on Planet Earth: Diversity, Evolution, and Extinction
Evolution is the basic unifying theory for biological systems, and it is generally agreed that "nothing in biology makes sense except in the light of evolution." There is, however, no agreement on how exactly evolution works. New paleontological discoveries, as well as the development of theories on the close interaction between organisms and their environment, have profoundly changed the way in which earth scientists look at evolution. At the same time, rapid accumulation of molecular information and new techniques in developmental biology have revolutionized life scientists' view of evolution. This course is designed to combine the information from life and earth sciences to provide basic knowledge about organismic diversity, evolution, and broad-based environmental issues to nonscience students. We will discuss evolutionary changes over geological time and the extrinsic (environmental) and intrinsic (biotic) factors that affected that change, introducing students to the basic history of life on our planet. We will look into fundamental issues of organismic diversity with an understanding of the environmental factors that constitute natural selection pressures. We will also address the historical development of evolutionary theory to provide understanding of the way in which one of the major modern scientific insights—evolution—has developed in historical times.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL
Identical With: E&ES111, E&ES111
Prereq: None

BIO118 Reproduction in the 21st Century
This course will cover basic human reproductive biology, new and future reproductive and contraceptive technologies, and the ethics raised by reproductive issues.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL, NSM-BIOL, NSM-BIOL
Identical With: FGSS118, PHIL118, SISP118, FGSS118, PHIL118, FGSS118, PHIL118, FGSS118, PHIL118, FGSS118, PHIL118, FGSS118, PHIL118, FGSS118, PHIL118, FGSS118, PHIL118, SISP118, FGSS118, PHIL118, FGSS118, PHIL118, FGSS118, PHIL118, FGSS118, PHIL118, FGSS118, PHIL118, FGSS118, PHIL118
Prereq: None

BIO123 Seminar in Human Biology
This seminar will take up a range of topics in the biology of humans including human evolution, reproduction and development, cell division, stem cells, cancer, digestion, nutrition, and neurobiology. The course will have a combined lecture/discussion and student seminar format. Working in pairs, the students will be responsible for two presentations on an aspect of the discussion topics.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL
Prereq: None

BIO131 Service-Learning Clinical Experience at Connecticut Valley Hospital
This service-learning course in the life sciences is open to sophomores interested in careers in the health professions by permission of instructor (POI). Learning and experience will come from civic engagement at Connecticut Valley Hospital (CVH).

Students will be introduced to the psychiatric rehabilitation plan that is patterned after the Psychiatric Rehab Consultants (PRC) program of Dr. Robert Liberman, MD, of UCLA.
Students will be trained to administer the diagnostics tool developed by PRC called clients’ assessment of strengths, interests, and goals (CASIG). Then each student will administer the CASIG to one or more CVH patients. The results of the CASIG will be reported to the patient’s treatment team.

In following years, students may volunteer at CVH and assist the same patient(s) in achieving the goals that were identified in the CASIG. CVH will offer skills training to increase strengths in the patients. The students can assist in this endeavor and observe the results of the recovery effort of the patient and the staff. This would constitute an extended clinical experience for Wesleyan students.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL
Identical With: FGSS148, FGSS148, FGSS148, FGSS148
Prereq: None

BIOL149 Neuroethology: Sensory Basis of Animal Orientation and Navigation
This course is about the sensory and neuronal processes underlying the ability of animals to orient in and move through their environments. We will consider the basic functions of sensory and nervous systems that underlie the remarkable abilities of animals to orient themselves in personal space, move through their home range, and move through the world in long-distance migrations and in homing. Animals from invertebrates through fish, birds, and mammals will be considered. The format of the course will be seminar/discussion and some lectures with heavy student participation. The course is intended for first-years with high school level courses in at least two of the following: biology, chemistry, or physics.

Offering: Crosslisting
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-NSB, NSM-NSB, NSM-NSB, NSM-NSB
Identical With: NS&B149, NS&B149, NS&B149, NS&B149, NS&B149, NS&B149, NS&B149, NS&B149, NS&B149, NS&B149, NS&B149
Prereq: None

BIOL155 Ethnobotany and Agroecology
This course is about the intersection of botany, ecology, and the world’s food plants. Using readings, videos, and class discussions, we will explore issues such as ecologically sound agricultural practices, genetic and taxonomic diversity of crop plants, and why some plants make it big as sources of human nutrition while others remain relatively obscure. Along the way students will investigate fundamentals of plant physiology (including the process that is the ultimate basis for all we eat), morphology (have you ever wondered why strawberries have their seeds on the outside?), and evolution. Each week will include a detailed, hands-on examination of locally available food plants.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL
Identical With: MB&B155
Prereq: None

BIOL173 Global Change and Infectious Disease
Among the most insidious effects of global change are the expanded geographical ranges and increased transmission of infectious diseases. Global warming is bringing tropical diseases, such as malaria, poleward from the tropics; the extreme weather events of a changed world are leading to outbreaks of zoonotic diseases, such as those caused by Hantaviruses; and nonclimatic anthropogenic factors, such as forest fragmentation, are taking their toll on human health, for example, by increasing the incidence of Lyme disease. This course will cover the evidence that global change has increased the geographical ranges and rates of incidence of infectious diseases, in humans, in agricultural animals and plants, and in endangered species. We will explore how interactions between different anthropogenic effects (for example, habitat loss and pollution) are exacerbating the effects of global warming on infectious diseases. We will analyze and critique projections for future changes in geographic ranges in infectious diseases. Finally, we will cover how revolutions in bioinformatics will increase the resolution of tracking and predicting responses of disease organisms to global change. The course has no formal prerequisites and will introduce material from ecology and microbiology, as needed, to allow students to read and interpret the recent literature on global change and infectious disease.

Offering: Host
Grading: OPT
BIOL181 Principles of Biology I: Cell Biology and Molecular Basis of Heredity
This course presents an exploration of the contemporary view of the cell and an introduction to the molecules and mechanisms of genetics and gene function. The course will have two major themes. First, we will focus on the central dogma of molecular biology, describing the process of information transfer from genetic code in DNA through protein synthesis and function. Topics include DNA replication and repair, chromosome dynamics, RNA transcription, protein translation, gene regulation, and genomics. Second, we will focus on cell theory and the underlying molecular mechanisms of cellular activity, including cell signaling, energetics, cell motility, and cell cycling. Lectures (Mondays, Wednesdays) will stress the experimental basis of conclusions presented and highlight important details and major themes. The course will also emphasize problem-solving approaches in cell and molecular biology (Fridays).
Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-MBB, NSM-MBB, NSM-MBB
Prereq: None

BIOL182 Principles of Biology II
This course concerns biological principles as they apply primarily at tissue, organismic, and population levels of organization. Course topics include developmental biology, animal physiology and homeostatic control systems, endocrinology, neurophysiology and the neuronal basis of behavior. Evidence for evolution is reviewed, as are the tenets of Darwin’s theory of evolution by natural selection. The nature and importance of variation among organisms and of stochastic processes in evolution are discussed, as are modern theories of speciation and macroevolution. Finally, the course addresses interactions between organisms and their environments as well as the interactions among organisms in natural communities. Each of the topics of the course is explored from a comparative viewpoint to recognize common principles as well as variations among organisms that indicate evolutionary adaptation to different environments and niches.
Offering: Host
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-BIOL
Identical With: MB&B182
Prereq: [MB&B181 or BIOL181]

BIOL186 Introduction to the Biology of Nutrition and Impact on Human Health
This course will introduce students to the concepts of nutrition. It will cover the biology of the different food groups that make a balanced diet (carbohydrates, fats, proteins) and how our bodies obtain energy and important molecules, such as vitamins, from our food. The course will also cover the relevant anatomy involved in digestion and excretion. Other topics such as the effects of food production on the environment, fad diets, and disease states will also be studied, along with the latest hot topics in the news.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL
Prereq: None

BIOL191 Principles of Biology I--Laboratory
This laboratory course, to be taken concurrently with MB&B181 or BIOL181, provides direct experience with techniques used in cell biology and molecular biology. These include polymerase chain reaction (PCR), electrophoresis, enzyme assays, microscopy, and spectrophotometry. The lab course is a chance to learn these key techniques firsthand.
Offering: Crosslisting
Grading: Cr/U
Credits: 0.50
Gen Ed Area: NSM-MBB
Identical With: MB&B191
Prereq: None

BIOL192 Principles of Biology II--Laboratory
This laboratory course, designed to be taken concurrently with BIOL182 or MB&B182, will introduce students to experimental design, laboratory methods, data analysis, and empirical approaches to developmental biology, physiology, ecology, and evolution. Laboratory exercises use the techniques of electrophysiology, microscopy, computer simulations, and analyses of DNA sequence data. Some exercises will include exploration of physiological processes in living animals.
Offering: Host
Grading: Cr/U
Credits: 0.50
Gen Ed Area: NSM-BIOL
Identical With: MB&B192
Prereq: [MB&B191 or BIOL191]

BIOL193 Principles of Cell and Molecular Biology: Advanced Topics
This 0.25-credit course is open to students currently enrolled in any section of MB&B/BIOL181 Principles of Biology I. The course is intended to supplement the introductory biology series at a more advanced level to provide a more challenging and enriching experience for students with strong backgrounds in biology (e.g., high school AP Biology with scores of 4 or 5). Students will read recently published journal articles at the frontiers of modern cell and molecular biology. This course introduces students to current technologies and methods being used in the field to advance our understanding of human biology and disease.
Offering: Crosslisting
Grading: Cr/U
Credits: 0.25
Gen Ed Area: NSM-MBB, NSM-MBB
Identical With: MB&B193, MB&B193
Prereq: None

BIOL194 Principles of Biology II: Advanced Topics
This 0.25-credit course is open to students currently enrolled in MB&B/BIOL182 Principles of Biology II. The course is intended to supplement the introductory biology course at a more advanced level to provide a more challenging and enriching experience for students with strong backgrounds in biology (e.g., students who performed well in MB&B/BIOL181). Students will read recently published journal articles at the frontiers of physiology, development, evolution, and ecology. This course introduces students to current technologies and methods being used in the field to advance our understanding of life.
Offering: Host
Grading: Cr/U
Credits: 0.25
Gen Ed Area: NSM-BIOL, NSM-BIOL
Identical With: MB&B194, MB&B194, MB&B194, MB&B194
Prereq: BIOL181 or MB&B181

BIOL197 Introduction to Environmental Studies
This interdisciplinary study of human interactions with the environment and the implications for the quality of life examines the technical and social causes of
environmental degradation at local and global scales, along with the potential for developing policies and philosophies that are the basis of a sustainable society. This will include an introduction to ecosystems, climatic and geochemical cycles, and the use of biotic and abiotic resources over time. It includes the relationship of societies and the environment from prehistoric times to the present. Interrelationships, feedback loops, cycles, and linkages within and among social, economic, governmental, cultural, and scientific components of environmental issues will be emphasized.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-EES, NSM-EES
Identical With: E&ES197, ENV197, E&ES197, E&ES197, ENV197, E&ES197
Prereq: None

BIOL208 Molecular Biology
This course is a comprehensive survey of the molecules and molecular mechanisms underlying biological processes. It will focus on the cornerstone biological processes of genome replication, gene expression, and protein function. The major biomacromolecules—DNA, RNA, and proteins—will be analyzed to emphasize the principles that define their structure and function. We will also consider how these components interact in larger networks within cells to permit processing of external and internal information during development and discuss how these processes become perturbed in disease states.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-MBB, NSM-MBB, NSM-MBB, NSM-MBB, NSM-MBB
Prereq: ([MB&B181 or BIOL181] AND [BIOL182 or MB&B182]) OR ([MB&B181 or BIOL181] AND [BIOL182 or MB&B182]) OR ([MB&B195 or BIOL195] AND [BIOL182 or MB&B182])

BIOL210 Genomics: Modern Genetics, Bioinformatics, and the Human Genome Project
Genetics has provided a foundation for modern biology. We will explore the classical genetics and go on to consider how genomics has transformed this field. This course is intended to introduce students to the fields of genetics and genomics, which encompass modern molecular genetics, bioinformatics, and the structure, function, and evolution of genomes. We will discuss important new areas of research that have emerged from the genome projects, such as epigenetics, polymorphisms, transgenics, systems biology, stem cell research, and disease mapping. We will also discuss bioethical issues that now face us in this new postgenome era.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL, NSM-BIOL
Prereq: [MB&B181 or BIOL181] OR [MB&B195 or BIOL195] OR [MB&B181 or BIOL181]

BIOL212 Principles and Mechanisms of Cell Biology
The cell is the fundamental unit of life. Understanding cell behavior and function at the cellular level is critical for understanding biological function from the molecular to organismic levels. The goals of this course are to introduce many concepts of cellular function. Topics covered include cell and organelle structure and function, trafficking, cell adhesion and motility, proliferation, signal transduction and cell differentiation. Journal papers will introduce students to research in these topics of cell biology. To demonstrate how basic biological processes combine to form a coherent whole, we will discuss examples of integration of biological functions in tissues—and when these go awry in diseases.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-MBB, NSM-MBB, NSM-MBB
Prereq: [MB&B181 or BIOL181] OR [MB&B181 or BIOL181] OR [MB&B195 or BIOL195]

BIOL213 Behavioral Neurobiology
This course will introduce the concepts and contemporary research in the field of neuroscience and behavior. The course is intended for prospective neuroscience and behavior majors (for whom it is required) and for biology and psychology majors who wish to gain broad introduction to neuroscience. The initial few weeks will be devoted to fundamental concepts of neuroanatomy and neurophysiology. Subsequent classes will deal in-depth with fundamental problems of nervous system function and the neural basis of behavior, including neurotransmitter systems; organization of the visual system and visual perception; the control of movement; neurological and neuropsychiatric disorders; the neuroendocrine system; control of autonomic behaviors such as feeding, sleep, and temperature regulation; the stress response; and language, learning, and memory. Experimental results from a variety of species, including humans, will be considered.

Offering: Crosslisting
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-NSB
Identical With: NS&B213, PSYC240
Prereq: None

BIOL214 Evolution
This course covers current areas of research in evolutionary biology. Topics include the evidence for evolution, the nature of variation, adaptive and random evolutionary processes in natural populations, mechanisms of speciation, origin of major groups, reconstruction of the history of life through comparative analysis of morphological and DNA sequence data, coevolution of plant-animal interactions, and the application of evolutionary principles to conservation biology.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL
Prereq: [BIOL182 or MB&B182] OR ([MB&B181 or BIOL181] AND [BIOL182 or MB&B182]) OR ([MB&B181 or BIOL181] AND [BIOL196 or MBB196]) OR ([MB&B195 or BIOL195] AND [BIOL182 or MB&B182]) OR ([MB&B195 or BIOL195] AND [BIOL196 or MBB196])

BIOL215 Evolution in Human-Altered Environments
Human activities have altered natural environments and, indeed, have created entirely novel ecosystems such as cities and high-input farms. This course considers how these human alterations to the environment affect the evolution and coevolution of diverse organisms. Starting with an overview of basic ecological and evolutionary principles, we will consider a number of compelling contemporary scenarios: evolutionary response to environmental contaminants, exploitation of natural populations, and global climate change; evolution in urban and agricultural ecosystems; and the evolutionary impact of alien, invasive, and genetically modified species.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL, NSM-BIOL
BIOL216 Ecology
Ecology is the study of interactions between organisms and their environment, both physical and biotic. We will look at how these interactions shape fundamental characteristics of populations, communities, and ecosystems. Topics will include predation, competition, symbiosis, and effects of stress and resource limitation in diverse environments. We will cover important consequences of interactions such as coevolution, population outbreaks, ecological coexistence, patterns of biodiversity, ecological succession, species invasions, food web dynamics, nutrient and energy cycling, variation in ecosystem goods and services, and global change.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL
Identical With: ENVSc216, ENVSc216, ENVSc216, ENVSc216, ENVSc216, ENVSc216, ENVSc216, ENVSc216
Prereq: [BIOL182 or MB&B182] OR [BIOL182 or MB&B182] OR [BIOL196 or MB&B196]

BIOL218 Developmental Biology
This course covers the mechanisms of development at the molecular, cellular, and organismal levels. Special attention will be paid to the process of scientific discovery: the experiments. Students will read and discuss both original research articles and the secondary review literature. We will discuss ethical considerations for some of the topics covered.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL
Prereq: [BIOL182 or MB&B182] OR [BIOL182 or MB&B182] OR [BIOL196 or MB&B196]

BIOL220 Conservation Biology
This course will focus on the biology of conservation rather than cultural aspects of conservation. However, conservation issues will be placed in the context of ethics, economics, and politics. We will cover the fundamental processes that threaten wild populations, structure ecological communities, and determine the functioning of ecosystems. From this basis, we will explore important conservation issues such as population viability, habitat loss and alteration, food web alteration, invasive species, and climate change. We will use readings from the primary literature and field projects to learn about current research methods used in conservation biology.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL
Identical With: ENVSc220, ENVSc220, ENVSc220, ENVSc220, ENVSc220, ENVSc220
Prereq: [BIOL182 or MB&B182] OR [BIOL182 or MB&B182] OR [BIOL196 or MB&B196]

BIOL222 Issues in the Health Sciences
The course is intended to present current issues from the biomedical professions that pose difficult questions and problems for the scientist or practitioner.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL
Prereq: [[MB&B181 or BIOL181] AND [BIOL182 or MB&B182]] OR [[MB&B181 or BIOL181] AND [BIOL182 or MB&B182]] OR [[MB&B195 or BIOL195] AND [BIOL182 or MB&B182]]

BIOL223 Integration of Clinical Experience and Life Science Learning
A classroom discussion of biological, chemical, and psychological aspects of mental illness as well as weekly volunteering at Connecticut Valley Hospital (CVH). This course is POI.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL
Prereq: None

BIOL224 Hormones, Brain, and Behavior
Hormones coordinate the anatomical, physiological, and behavioral changes necessary for developmental, seasonal, and diurnal transition in animals. These molecules have profound effects on the development of the brain and on adult brain function. How do hormones orchestrate brain assembly and the expression of specific behaviors? How do behavior, social context, and the environment influence hormone secretion? This course will provide a critical survey of our understanding of the relationship between endocrinology, the brain, and behavior in a variety of animal systems. Select topics include insect metamorphosis; sexual differentiation of the vertebrate brain and behavior; reproductive and aggressive behavior in birds, lizards, and rodents; song learning and song production in birds; and the effects of hormones on sexual behavior and cognitive function in primates, including humans. The exploration of a variety of systems will provide students with an appreciation of the ways in which the relationships between hormones and behavior vary across species, as well as the extent to which these relationships are conserved.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL
Identical With: NS&B224
Prereq: [NS&B213 or BIOL213 or PSYC240] OR [BIOL182 or MB&B182]

BIOL226 Invasive Species: Biology, Policy, and Management
Invasive species account for 39 percent of the known species extinctions on Earth, and they are responsible for environmental damages totaling greater than $138 billion per year. However, the general population has little knowledge of what invasive species are or what threats they pose to society. In this course, we will explore the biological, economic, political, and social impacts of invasive species. We will begin by exploring a definition of an invasive species and looking at the life history characteristics that make them likely to become pests. Then, we will consider the effects of invasive species expansion on the conservation of biodiversity and ecosystem function, as well as their global environmental and political impacts. Finally, we will explore the potential future changes in invasive species distributions under a changing climate.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL
Prereq: [E&ES197 or BIOL197 or ENVS197] OR [BIOL182 or MB&B182] OR E&ES199

BIOL228 Introductory Medical Biochemistry
This introductory course will focus on the essential concepts of biochemistry important to students interested in the health professions, including the chemical and biological foundations of cellular metabolism and related disease states. Major topics will include the structure and function of biological molecules in the human body (proteins, carbohydrates, fats, nucleic acids, vitamins), enzyme catalysis, cellular signaling, as well as digestion, absorption, and processing of nutrients for energy and growth.
Offering: Crosslisting
Grading: A-F
Credits: 1.00  
Gen Ed Area: NSM-MBB, NSM-MBB, NSM-MBB  
 Identical With: MB&B228, MB&B228, MB&B218, MB&B228, MB&B228, MB&B218, MB&B228, MB&B228, MB&B218  
Prereq: [MB&B181 or BIOL181] AND CHEM251  

**BIOI229 Geobiology Laboratory**  
This laboratory course will explore more deeply some of the concepts introduced in E&ES233. Both the fundamental patterns and practical applications of the fossil record will be emphasized.  
Offering: Crosslisting  
Grading: A-F  
Credits: 0.50  
Gen Ed Area: NSM-EES, NSM-EES  
Prereq: E&ES101 OR E&ES115 OR E&ES199 OR [E&ES197 or BIOL197 or ENVS197]  

**BIOI231 Microbiology**  
This course will study microorganisms in action, as agents of disease, in ecological situations, and as tools for research in molecular biology, genetics, and biochemistry. Particular emphasis will be placed on new ideas in the field.  
Offering: Crosslisting  
Grading: A-F  
Credits: 1.00  
Gen Ed Area: NSM-MBB  
Identical With: MB&B231  
Prereq: [MB&B181 or BIOL181] OR [MB&B208 or BIOL208]  

**BIOI232 Immunology**  
In this introduction to basic concepts in immunology, particular emphasis will be given to the molecular basis of specificity and diversity of the antibody and cellular immune responses. Cellular and antibody responses in health and disease will be addressed, along with mechanisms of immune evasion by pathogens, autoimmune disease, and cancer.  
Offering: Crosslisting  
Grading: A-F  
Credits: 1.00  
Gen Ed Area: NSM-MBB, NSM-MBB  
Identical With: MB&B232, MB&B232, MB&B232, MB&B232  
Prereq: ([MB&B181 or BIOL181] AND [BIOL182 or MB&B182]) OR [MB&B208 or BIOL208]  

**BIOI233 Geobiology**  
Fossils provide a glimpse into the form and structure of ancient ecosystems. Geobiology is the study of the two-way interactions between life (biology) and rocks (geology); typically, this involves studying fossils within the context of their sedimentary setting. In this course we will explore the geologic record of these interactions, including the fundamentals of evolutionary patterns, the origins and evolution of early life, mass extinctions, and the history of the impact of life on climate.  
Offering: Crosslisting  
Grading: A-F  
Credits: 1.00  
Gen Ed Area: NSM-EES, NSM-EES  
Prereq: E&ES101 OR E&ES115 OR E&ES199 OR [E&ES197 or BIOL197 or ENVS197]  

**BIOI235 Comparative Vertebrate Anatomy**  
This course will provide a comprehensive overview of the basic structure and function of the main organ systems in vertebrates. Developmental anatomy will be an integral part of the class because of the importance of embryology to understanding both similarity and variation of common systems in different taxa.  
The course will consist of both lectures and laboratory sessions for dissection of key systems.  
Offering: Host  
Grading: A-F  
Credits: 1.00  
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL, NSM-BIOL  

**BIOI237 Signal Transduction**  
Cells contain elaborate systems for sensing their environment and for communicating with neighbors across the membrane barrier. This class will explore molecular aspects of signal transduction in prokaryotic and eukaryotic cells. Topics will include membrane receptors, GPCRs, kinases, phosphorylation, ubiquitination, calcium signaling, nuclear receptors, quorum sensing, and human sensory systems. We will integrate biochemical functional approaches with structural and biophysical techniques.  
Offering: Crosslisting  
Grading: A-F  
Credits: 1.00  
Gen Ed Area: NSM-MBB, NSM-MBB  
Identical With: MB&B237, MB&B237, MB&B237, MB&B237  
Prereq: [MB&B208 or BIOL208]  

**BIOI239 Functional Anatomy of the Human Brain**  
A mass of tissue the consistency of firm jello and weighing about 2.5 pounds in the adult human, the brain is an organ that controls nearly every function of the body. It also enables the highest cognitive functions of humans such as learning and memory, thinking, consciousness, aesthetic appreciation, etc. Its malfunction results in a variety of diseases such as senility, mood disorders, motor dysfunctions, etc. This course will examine in some detail the complex organization of this organ and how it performs some of its basic functions. It will be of special interest to premed students; NS&B, biology, and psychology majors; and anyone simply interested in how the brain works.  
Offering: Crosslisting  
Grading: A-F  
Credits: 1.00  
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL, NSM-BIOL  
Identical With: NS&B239, PSYC239, NS&B239, PSYC239, NS&B239, PSYC239, NS&B239, PSYC239, NS&B239, PSYC239, NS&B239, PSYC239, NS&B239, PSYC239, NS&B239, PSYC239, NS&B239, PSYC239, NS&B239, PSYC239, NS&B239, PSYC239, NS&B239, PSYC239, NS&B239, PSYC239  
Prereq: [NS&B213 or BIOL213 or PSYC240]  

**BIOI243 Neurohistology**  
The aim of this course is to study the microscopic structure of the nervous system. Structural and functional relationships between neurons and glia, as well as the organization of major brain regions (cortex, hippocampus, and cerebellum) will be examined. In addition to traditional histological preparations, modern techniques including confocal microscopy and immunohistochemistry will be studied and performed. Laboratory exercises will include the preparation and visualization of microscopic slides using a variety of techniques. While this course will focus on mammalian nervous system, skills learned in this course will be applicable in a variety of research models.  
Offering: Crosslisting  
Grading: A-F  
Credits: 1.00  
Gen Ed Area: NSM-NSB, NSM-NSB, NSM-NSB  
Identical With: NS&B243, NS&B243, NS&B243, NS&B243, NS&B243, NS&B243, NS&B243  
Prereq: [NS&B213 or BIOL213 or PSYC240] OR [MB&B181 or BIOL181]
BIOL245 Cellular Neurophysiology

This course will deal with basic aspects of neuronal physiology, including the function of excitable membranes and the transfer of information between cells (synaptic physiology, neurochemistry, membrane receptors). In connection with each of these topics, consideration will be given to short- and long-term modification of neuronal function. Toward the end of the course, we will examine the neurophysiology of auditory perception in birds and mammals, focusing on the initial transduction of sound waves into neuronal codes.

Offering: Host
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL
Identical With: NS&B245, NS&B245, NS&B245, NS&B245, NS&B245, NS&B245, NS&B245
Prereq: [NS&B213 or BIOL213 or PSYC240]

BIOL246 Cell Biology of Major Health Challenges

Thanks to the development of antibiotics and vaccines, many contagious diseases have been eliminated or controlled. Nonetheless, we are still confronted with a group of debilitating diseases that affect a growing number of people. Diseases such as diabetes, addiction, AIDS, influenza, Alzheimer’s disease, and cancer are of great consequences to the individual and increasing concern to our society. Cancer will be the main topic of the course, but we will also learn about some other challenging diseases as well. We will consider the social and economic consequences of the topics of choice, but the main focus will be on the molecular and cellular basis of the disease, the difficulties in curing or treating the disease, as well new research approaches that offer hope for the future.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL
Prereq: ([BIOL181 or MB&B181] AND [BIOL182 or MB&B182]) OR ([BIOL195 or MB&B195] AND [BIOL196 or MB&B196]) OR ([BIOL195 or MB&B195] AND [BIOL182 or MB&B182])

BIOL247 Laboratory in Neurophysiology

This course introduces a wide range of techniques for recording the electrical signals from neurons and muscle cells. We will make use of a range of preparations and both invertebrate and vertebrate species (except birds and mammals). Experiments deal with sensory, motor, and coordinating elements and include studies of single cells and simple nervous systems using extracellular, intracellular recording techniques.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL
Prereq: [NS&B247, NS&B247, NS&B247, NS&B247, NS&B247, NS&B247, NS&B247, NS&B247, NS&B247, NS&B247, NS&B247, NS&B247]
Prereq: [NS&B213 or BIOL213 or PSYC240] AND [BIOL182 or MB&B182]

BIOL249 Neuroethology

Basic and integrative processes of nervous systems are considered with attention to their roles in species-typical behaviors. After a brief initial consideration of cellular properties of individual nerve cells, synaptic interactions and neuroanatomy form the basis for studying systems of neurons and their behavioral significance during the remainder of the semester. The focus is on the neuronal basis of naturalistic behaviors in animals from mollusks and insects through fish, birds, and mammals. Topics include sensory transduction, central processing of sensory information, production and control of patterned behaviors and movements, neural basis of orienting and navigation, and sensory-motor integration.

Offering: Host
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL
Identical With: NS&B249, NS&B249, NS&B249, NS&B249
Prereq: ([BIOL182 or MB&B182] AND [NS&B213 or BIOL213 or PSYC240])

BIOL250 Laboratory in Cellular and Behavioral Neuroscience

The goals of the course are to introduce cellular, molecular, and behavioral laboratory techniques within a framework of solving research problems. Students will be given the opportunity to design experiments through an independent research project. Both quantitative and qualitative approaches will be used to analyze experimental data obtained by the student so that the student will not only gain experience in specific laboratory techniques, but will also gain a feel for the research process itself by active participation in research. In addition to techniques practiced in the course, additional techniques employed in research will be presented through lecture. Techniques will include studies of transgenic mouse nervous system, primary neuronal cell culture, immunohistochemistry, and behavioral analyses of learning, memory, social behavior, and social dominance.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL, NSM-BIOL, NSM-BIOL
Identical With: NS&B250, NS&B250, NS&B250, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555, NS&B250, BIOL555

BIOL252 Cell Biology of the Neuron

Neuronal cell biology is an important and fast-moving field. The brain cannot be understood without first elucidating the properties and functions of its component neurons. This course will focus on cell biological studies of the nervous system. We will explore the structure and function of neurons, synapses, and circuits. Using both text books and primary literature, we will examine the basic cell biological mechanisms that underlie the formation, function, and plasticity of neurons and circuits. Areas studied will include polarity, synapse formation, synaptic transmission, intracellular transport, plasticity, and regeneration.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-NSB, NSM-NSB
Identical With: NS&B252, NS&B252, NS&B252, NS&B252
Prereq: [NS&B213 or BIOL213 or PSYC240] OR ([MB&B181 or BIOL181] AND [NS&B213 or BIOL213 or PSYC240] OR ([MB&B195 or BIOL195] AND [NS&B213 or BIOL213 or PSYC240])

BIOL254 Comparative Animal Behavior

An introduction to the study of animal behavior, this course will examine the factors that control the behavior of vertebrates and invertebrates within evolutionary, social, and physiological contexts.
BIOL265 Bioinformatics Programming
This course is an introduction to bioinformatics and programming for students with interest in life sciences. It introduces problem areas and conceptual frameworks in bioinformatics. The course assumes little or no prior programming experience and will introduce the fundamental concepts and mechanisms of computer programs and examples (sequence matching and manipulation, database access, output parsing, dynamic programming, etc.) frequently encountered in the field of bioinformatics.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL
Prereq: [MB&B181 or BIOL181] OR [MB&B181 or BIOL181] OR [MB&B195 or BIOL195]

BIOL266 Bioinformatics
This course is an introduction to bioinformatics for students with interest in the life sciences. The course is similar to BIOL265 but only meets in the second half of the semester (with BIOL265) and is designed for students with programming background, ideally in Python. The course introduces problem areas and conceptual frameworks in bioinformatics and discusses programming approaches used in bioinformatics such as sequence matching and manipulation algorithms using dynamic programming, clustering analysis of gene expression data, analysis of genetic nets using Object Oriented Programming, and sequence analysis using Hidden Markov Models, Regular Expressions, and information theory.
Offering: Host
Grading: A-F
Credits: 0.50
Gen Ed Area: NSM-BIOL
Identical With: COMP266, MB&B266, CIS266
Prereq: [MB&B181 OR BIOL181]

BIOL282 Ecophysiology of Animals
This course will examine the physiological adaptations of animals to their natural habitats. Starting with an overview of basic physiological requirements (energy and metabolism, thermal considerations, water relations), a series of case studies will investigate physiological and life-history specializations to diverse ecological conditions in a variety of invertebrates and vertebrates.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL
Prereq: [BIOL182 or MB&B182]

BIOL286 Evolution in Human-Altered Environments
Human activities have altered natural environments and, indeed, have created entirely novel ecosystems such as cities and high-input farms. This course considers how these human alterations to the environment affect the evolution and coevolution of diverse organisms. Starting with an overview of basic ecological and evolutionary principles, we will consider a number of compelling contemporary scenarios: evolutionary response to environmental contaminants, exploitation of natural populations, and global climate change; evolution in urban and agricultural ecosystems; and the evolutionary impact of alien, invasive, and genetically modified species.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL, NSM-BIOL
Prereq: [BIOL182 or MB&B182] OR BIOL214

BIOL290 Plant Form and Diversity
This course begins with an overview of plant evolutionary history, then covers the basic structure and function of the plant body and the life cycle and ecological diversity of plants in natural habitats. Special events include a field trip to the Smith College botanical garden, a hands-on day for working with living specimens, and a special guest lecture by a local plant biologist.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL, NSM-BIOL
Identical With: BIOL590, BIOL590, BIOL590, BIOL590
Prereq: [BIOL182 or MB&B182] OR [BIOL182 or MB&B182] OR [BIOL196 or MB&B196]

BIOL299 Waves, Brains, and Music
Pressure waves bounce against the ear, and we create perceptions called sounds from them. We organize sounds to make music, making more waves, and the cycle goes forward. This course will provide an introduction to the fraction of these phenomena that can be measured and analyzed, focusing on the mathematics of signal analysis, auditory physiology, and the physiology of musical perception and production. Periodic waveforms include musical tones and the voltage fluctuations that can be measured from brains. The first third of this course (waves) is an introduction to the quantitative analysis of periodic waveforms, with the goal that the student will have a better understanding of how to interpret the analysis of both musical sounds and neuronal recordings. The second part of the course (brains) examines the known mechanical processes (physiology) by which the mammalian brain analyzes the periodic waveforms that we interpret as sound. The third part of the course uses these lessons to examine original research articles about the neuroscience of music, i.e., how neuronal networks produce musical perception.
Offering: Host
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL, NSM-BIOL
Prereq: [NS&B213 or BIOL213 or PSYC240]

BIOL310 Genomics Analysis
This course is an introduction to genomics and analysis for students with interest in life sciences. It introduces current applications of genomics techniques, how to build a genomics workflow, and an introduction to statistical analyses in R programming language. This course assumes little or no prior programming experience and will provide hands on experience in taking raw next-generation
sequencing data through a custom workflow and ending with analyses in R statistical software.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL, NSM-BIOL, NSM-BIOL
Identical With: CIS310, MB&B311, CIS310, CIS310, CIS310, BISLS30
Prereq: [MB&B311 or CIS310] OR [CIS310 or MB&B311]

Biology 316 Plant-Animal Interactions

In this advanced seminar, we consider how genes and environment interact to shape the development and behavior of organisms, including humans. After an initial series of lectures and discussions on classic and current readings, the class will consist of in-depth student presentations and discussion.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL
Identical With: BIOL518, BIOL518, BIOL518, BIOL518
Prereq: [BIOL214 OR BIOL218 OR [BIOL210 or MB&B210] OR [BIOL224 or NS&B224] OR BIOL214 OR BIOL218 OR [BIOL254 or NS&B254] OR [BIOL224 or NS&B224]

Biology 320 Quantitative Methods for the Biological and Environmental Sciences

This course offers an applied approach to statistics used in the biological, environmental, and earth sciences. Statistics will be taught from a geometric perspective so that students can more easily understand the derivations of formulae. We will learn about deduction and hypothesis testing. We will also learn about the assumptions that methods make and how violations affect applied outcomes. There will be an emphasis on analysis of data, and there will be many problem sets to solve to help students become fluent with the methods. The course will focus upon data and methods for continuous variables. In addition to basic statistics, we will cover regression, ANOVA, and contingency tables.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL

Biology 313 Microbes and Human-Caused Environmental Change

This is a time of unprecedented change in the world we share with billions of species. Unlike the previous catastrophic changes seen over geological time, the changes we see today are caused primarily by just one species, our own. In this new human-dominated era, the Anthropocene, humans have critically changed the conditions of life through a great diversity of activities, including release of greenhouse gases into the atmosphere, accelerated transport of organisms, fragmentation of forests, consumption of antibiotics, agriculture, hunting prey to near extinction, bushmeat hunting, and many other activities. This course will address two kinds of effects of each of these activities on microbes: (1) that humans and agricultural animals and plants are being subjected to new infectious diseases, and the geographical and temporal patterns of infection are changing; and (2) microbes are being challenged to adapt to new environmental challenges, both biotic and abiotic. Students will read and discuss articles from the scientific literature, and they will each write a research proposal.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-ENV5, NSM-ENV5
Identical With: ENVS313, ENVS313, ENVS313, ENVS313
Prereq: [BIOL182 or MB&B182]

Biology 316 Plant-Animal Interactions

This course will address two kinds of effects of each of these activities on microbes: (1) that humans and agricultural animals and plants are being subjected to new infectious diseases, and the geographical and temporal patterns of infection are changing; and (2) microbes are being challenged to adapt to new environmental challenges, both biotic and abiotic. Students will read and discuss articles from the scientific literature, and they will each write a research proposal.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL

Prereq: [MB&B181 or BIOL181] OR [MB&B181 or BIOL181]
BIOL327 Evolutionary and Ecological Bioinformatics
Bioinformatic analysis of gene sequences and gene expression patterns has added enormously to our understanding of ecology and evolution. For example, through bioinformatic analysis of gene sequences, we can now reconstruct the evolutionary history of physiology, even though no traces of physiology exist in the fossil record. We can determine the adaptive history of one gene and all the gene’s descendants. We can now construct the evolutionary tree of all of life. Bioinformatics is particularly promising for analysis of the ecology and biodiversity of microbial communities, since well over 99 percent of microorganisms cannot be cultured; our only knowledge of these organisms is through analysis of their gene sequences and gene expression patterns. For example, even when we cannot culture most of a microbial community, we can determine which metabolic pathways are of greatest significance through analysis of community-level gene expression. All these research programs are made accessible not only by breakthroughs in molecular technology, but also by innovation in the design of computer algorithms. This course, team-taught by an evolutionary biologist and a computer scientist, will present how bioinformatics is revolutionizing evolutionary and ecological investigation and will present the design and construction of bioinformatic computer algorithms underlying the revolution in biology. Students will learn algorithms for reconstructing phylogeny, for sequence alignment, and for analysis of genomes, and students will have an opportunity to create their own algorithms.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-NSB, NSM-NSB
Identical With: MB&B333, MB&B333, BIOL327
Prereq: [MB&B213 or BIOL213 or PSYC240]

BIOL328 Chemical Senses
The least well understood of the senses, chemical sensation, is key to survival and behavior of many species. In this course, you will study the structure and function of sensory neurons in both the gustatory and olfactory systems, as well as in chemosensory irritation. We will examine coding of sensory information to understand how higher cortical areas interpret stimuli. We will look at a variety of animal models and discover common organizing principles across phyla. An emphasis will be placed on the cell biology of these systems. Students will participate in reading, analyzing, and presenting recent studies from different areas within chemical sense to highlight recent findings and where the emphasis in chemosensory research is focused.
Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-NSB, NSM-NSB
Identical With: MB&B328, NS&B328, NS&B328, NS&B328, NS&B328, NS&B328, NS&B328, NS&B328, NS&B328
Prereq: [NS&B213 or BIOL213 or PSYC240]

BIOL333 Gene Regulation
This course aims to develop a genome perspective on transcriptional gene regulation. The genome sequence, now completed in a number of organisms, is described as a blueprint for development. More than simply a parts list (i.e., genes), this blueprint is an instruction manual as well (i.e., regulatory code). A next critical phase of the genome project is understanding the genetic and epigenetic regulatory codes that operate during development. Through a combination of lectures and discussion of primary literature, this course will explore current topics on promoters and transcription factors, chromatin structure, regulatory RNA, chromosomal regulatory domains, and genetic regulatory networks. An overarching theme is how genomes encode and execute regulatory programs as revealed by a global systems biology approach in modern genomics research.
Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: None
Identical With: MB&B533, MB&B333, BIOL333
Prereq: [BIOL182 or MB&B182]

BIOL334 Integrating Cell Structure and Function
Changes in cell shape, size, and position, and changes in cell number profoundly influence tissue and organ formation and function. By examining a range of developmental processes and structures in Drosophila, students will be challenged to consider the following questions: What are the cellular mechanisms that govern the shapes of cells during development? How do forces (stress and tension) modify cell behavior? How do cells move within and out of a tissue? How is organ size determined? Why is cell position an important factor in determining cell fate or differentiation? During the course, students will be introduced to working with Drosophila to address these questions in cell biology.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-NSB, NSM-NSB, NSM-NSB, NSM-NSB

BIOL335 Research Approaches to Disease
In recent decades, research has expanded our understanding of the contribution of genetic and developmental factors and disease vectors in many human diseases and abnormalities. This knowledge shapes how we manage and treat disease. This course will examine how scientists investigate the cell and genetic biology of disease using different cell and organism models. Each student will prepare a seminar on one topic (for example, type II diabetes, cholera, cervical cancer, retinoblastoma, malaria, spina bifida, alcoholism, etc.) that will be followed by a group discussion and exploration of recent peer-reviewed research. This course will enhance students’ interpretative understanding of research and challenge the need for and ethical considerations of research.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-NSB, NSM-NSB
Identical With: BIOL535, BIOL535
Prereq: BIOL218 OR [BIOL212 or MB&B212]
BIOI336 Landscape Ecology

Biogeography is the study of the distribution of living things (plant, animal, and microbe) on the earth’s surface and the historical, ecological, and human factors responsible. Landscape ecology is a subfield of biogeography that focuses on relationships between spatial pattern and ecological processes across broad spatial and temporal scales. This course will be approached as an introduction to biogeography with a focus on landscape ecology and ecological biogeography.

Topics in the course will reflect the diversity of research conducted by landscape ecologists: concepts of scale, island biogeography, metapopulation dynamics and habitat fragmentation, ecological disturbance, species viability, processes of land use and land-cover change, and ecosystem management. This course will include biogeographic patterns, physical and biological processes and interactions that produce these patterns, and methods and techniques used to study them.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL
Identical With: [BIOL182 or MB&B182] OR [E&ES197 or BIOL197] OR E&ES199

BIOI337 The Origins of Bacterial Diversity

Wherever there is life, there are bacteria. Free-living bacteria are found in every environment that supports eukaryotes, and no animal or plant is known to be free of bacteria. There are most likely a billion or more species of bacteria, each living in its unique ecological niche. This course will explore the origins of bacterial biodiversity: how bacteria evolve to form new species that inhabit new ecological niches. We will focus on how the peculiarities of bacterial sex and genetics facilitate bacterial speciation. Topics will include the characteristics of bacterial sex, why barriers to genetic exchange are not necessary for speciation in bacteria, the great potential for formation of new bacterial species, the evolutionary role of genetic gifts from other species, and the use of genomics to identify ecologically distinct populations of bacteria.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL
Identical With: BIOL537, BIOL537, ENVS337, BIOL537, BIOL537, ENVS337, BIOL537, BIOL537, ENVS337, BIOL537, BIOL537, ENVS337, BIOL537, BIOL537, ENVS337, BIOL537, BIOL537, ENVS337
Prereq: [BIOL182 or MB&B182]

BIOI340 Issues in Development and Evolution

This advanced seminar explores the relationship between embryonic development and morphological evolution. The course will include a combination of lectures, discussion, and student presentations of papers chosen from the primary literature. Subjects covered will include broad, fundamental issues such as the concept of homology and developmental characters and phylogeny, as well as the evolutionary significance of specific developmental phenomena such as animal segmentation, direct development, and major morphological transitions in evolution.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL
Identical With: BIOL540
Prereq: BIOI218 OR BIOI214

BIOI343 Muscle and Nerve Development

We will examine the structure and function of muscle cells, the development of muscle cell identity, the development of motor neurons, and the interactions between nerve and muscle that lead to a functioning neuromuscular system. The course will focus primarily on vertebrate model systems such as chick, mouse, and fish. We will also examine human diseases, including muscular dystrophies and other neuromuscular disorders.

Offering: Host
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL
Identical With: NS&B543, BIOL543, NS&B543, BIOL543, NS&B543, BIOL543, NS&B543, BIOL543, NS&B543, BIOL543, NS&B543, BIOL543, NS&B543
Prereq: BIOI218 OR [[BIOL182 or MB&B182] AND [BIOL212 or MB&B212]] OR [[BIOL182 or MB&B182] AND [NS&B213 or BIOL213 or PSYC240]] OR [[BIOL196 or MB&B196] AND [BIOL212 or MB&B212]] OR [[BIOL196 or MB&B196] AND [NS&B213] OR [MB&B193] OR [PSYC240]]

BIOI345 Developmental Neurobiology

Near the top of the list of unsolved mysteries in biology is the enigma of how the brain constructs itself. Here is an organ that can make us feel happy, sad, amused, and in love. It responds to light, touch, and sound; it learns; it organizes movements; it controls bodily functions. An understanding of how this structure is constructed during embryonic and postnatal development has begun to emerge from molecular-genetic, cellular, and physiological studies. In this course, we will discuss some of the important events in building the brain and explore the role of genes and the environment in shaping the brain. With each topic in this journey, we will ask what the roles of genes and the environment are in forming the nervous system. We will also discuss developmental disorders resulting from developmental processes that have gone astray. This is a reading-intensive seminar course emphasizing classroom discussions, with readings from a textbook and the primary scientific literature.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL
Identical With: NS&B543, NS&B545, BIOL545

BIOI346 The Forest Ecosystem

This course examines basic ecological principles through the lens of forest ecosystems, exploring the theory and practice of forest ecology at various levels of organization from individuals to populations, communities, and ecosystems. Lectures, lab exercises, and writing-intensive assignments will emphasize the quantification of spatial and temporal patterns of forest change at stand, landscape, and global scales.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL
Prereq: [BIOL182 or MB&B182] OR [E&ES197 or BIOL197 or ENVS197] OR E&ES199 OR [BIOL182 or MB&B182] OR [BIOL196 or MB&B196] OR [BIOL196 or MB&B196] OR [E&ES197 or BIOL197] OR E&ES199

BIOI347 Mammalian Cortical Circuits

While scientists are still very unsure of how the mammalian cortex enables conscious perception and thought, there has been a tremendous explosion of knowledge recently concerning the wide heterogeneity of neuronal classes and the specific kinds of connections between these classes. Detailed wiring diagrams of local cortical circuits are emerging, colored with dynamic connections that have created a wellsprings of ideas motivated toward understanding the cortex with reverse-engineering strategies. This course will focus on cortical circuit
Gen Ed Area: [NS&B213 or BIOL213 or PSYC240] OR [NS&B213 or BIOL213 or PSYC240] OR [NS&B213 or BIOL213 or PSYC240]

BIOL356 Neurodevelopmental Disorders
This course aims to provide a foundation in the underlying mechanisms of neurodevelopmental disorders. We will explore through lectures and readings of primary literature a number of important neurological and psychiatric diseases, including genetic disorders such as Down syndrome, Fragile X, and Williams syndrome; spectrum disorders such as autism and fetal alcohol syndrome; ADHD, Tourettes, Cerbral Palsy, and some motor disorders including developmental coordination disorder, stereotypic movement disorder, sensory ingestion disorder, and neonatal hypoxia. This course focuses on the fundamental molecular and cellular mechanisms that underlie neurological disorders and is designed to engage students who wish to study basic cellular aspects of brain function.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-NSB, NSM-NSB
Identical With: NS&B356, PSYC356, NS&B356, PSYC356, NS&B356, PSYC356, NS&B356, PSYC356
Prereq: [NS&B213 or BIOL213 or PSYC240]

BIOL369 Ecological Resilience: The Good, The Bad, and The Mindful
This course will examine the concepts of resilience, fragility and adaptive cycles in the context of ecosystem and social-ecological-system (SES) structures. These concepts have been developed to explain abrupt and often surprising changes in complex ecosystems and SES that are prone to disturbances. We will also include non-hierarchical interactions among components of systems (termed panarchy) to compare the interactions and dependencies of ecological and human community systems. A systems approach will be applied to thinking about restoration ecology, community reconstruction, and adaptive management theory.

All of the terms--resilience, fragility, adaptation, restoration, reconstruction--are fraught with subjectivity and valuation. We will use mindfulness and meditation techniques (including breathing and yoga) to more objectively and dynamically engage in the subject matter, leaving behind prejudice or bias. Students will be expected to approach these techniques with an open mind and practice them throughout the semester. The objective is to provide students with a more comprehensive framework with which to gain deeper understanding and integration of the science with the social issues.

Offering: Crosslisting
Grading: A-F
Credits: 1.25
Gen Ed Area: NSM-ENVS, NSM-ENVS, NSM-ENVS
BIOL377 Advanced Genetics
This course will focus on classical genetics, a discipline that grew from a desire to explain how adaptive traits are passed from generation to generation. Special emphasis will be placed on model organism genetics and on understanding how classical genetic analysis, in conjunction with the analysis of cellular and chromosome behavior, led to key discoveries about the nature of the gene, DNA, RNA, protein, and cellular function.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-MBB, NSM-MBB, NSM-MBB

BIOL401 Individual Tutorial, Undergraduate
Topic to be arranged in consultation with the tutor.
Offering: Host
Grading: OPT

BIOL402 Individual Tutorial, Undergraduate
Advanced work in certain fields of biology for qualified students with the consent of the department.
Offering: Host
Grading: OPT

BIOL407 Senior Tutorial
Downgraded Senior Thesis Tutorial - Project to be arranged in consultation with the tutor.
Offering: Host
Grading: A-F

BIOL408 Senior Tutorial
Downgraded Senior Thesis Tutorial - Project to be arranged in consultation with the tutor.
Offering: Host
Grading: A-F

BIOL409 Senior Thesis Tutorial
Offering: Host
Grading: OPT

BIOL410 Senior Thesis Tutorial
Offering: Host
Grading: OPT

BIOL411 Group Tutorial, Undergraduate
Topic to be arranged in consultation with the tutor.
Offering: Host
Grading: OPT

BIOL412 Group Tutorial, Undergraduate
Offering: Host
Grading: OPT

BIOL419 Student Forum
Offering: Host
Grading: Cr/U

BIOL420 Student Forum
Offering: Host
Grading: Cr/U

BIOL421 Undergraduate Research, Science
Advanced experimental research in biochemistry, developmental biology, genetics, microbiology, animal physiology, neurophysiology, behavioral genetics, cell biology, and molecular biology.
Offering: Host
Grading: OPT

BIOL422 Undergraduate Research, Science
Advanced experimental research in biochemistry, developmental biology, genetics, microbiology, animal physiology, neurophysiology, behavioral genetics, cell biology, and molecular biology.
Offering: Host
Grading: OPT

BIOL423 Advanced Research Seminar, Undergraduate
Offering: Host
Grading: OPT

BIOL424 Advanced Research Seminar, Undergraduate
Offering: Host
Grading: OPT

BIOL465 Education in the Field, Undergraduate
Offering: Host
Grading: OPT

BIOL470 Independent Study, Undergraduate
Offering: Host
Grading: OPT
Credits: 1.00
Gen Ed Area: None
Prereq: None

BIOL491 Teaching Apprentice Tutorial
Offering: Host
Grading: OPT

BIOL492 Teaching Apprentice Tutorial
Offering: Host
Grading: OPT

BIOL496 Research Apprentice, Undergraduate
Offering: Host
Grading: Cr/U

BIOL497 Undergraduate Research, Science
Advanced experimental research in biochemistry, developmental biology, genetics, microbiology, animal physiology, neurophysiology, behavioral genetics, cell biology, and molecular biology.
Offering: Host
Grading: OPT

BIOL500 Graduate Pedagogy
The elements of good teaching will be discussed and demonstrated through lectures, practice teaching sessions, and discussions of problems encountered in the actual teaching environment. The staff consists of faculty and experienced graduate students. An integral part of the course is a required one-day workshop BEFORE the first day of formal classes.
Offering: Crosslisting
Grading: Cr/U
Credits: 0.50
Gen Ed Area: None

BIOL501 Graduate Pedagogy
Advanced experimental research in biochemistry, developmental biology, genetics, microbiology, animal physiology, neurophysiology, behavioral genetics, cell biology, and molecular biology.
Offering: Host
Grading: OPT

BIOL502 Graduate Pedagogy
Advanced experimental research in biochemistry, developmental biology, genetics, microbiology, animal physiology, neurophysiology, behavioral genetics, cell biology, and molecular biology.
Offering: Host
Grading: OPT

BIOL503 Graduate Pedagogy
Advanced experimental research in biochemistry, developmental biology, genetics, microbiology, animal physiology, neurophysiology, behavioral genetics, cell biology, and molecular biology.
Offering: Host
Grading: OPT

BIOL504 Graduate Pedagogy
Advanced experimental research in biochemistry, developmental biology, genetics, microbiology, animal physiology, neurophysiology, behavioral genetics, cell biology, and molecular biology.
Offering: Host
Grading: OPT
BIOL501 Individual Tutorial for Graduates
A sequence of laboratory research projects in different fields; the type and duration are decided upon an individual basis. For first-year graduate students only.
Offering: Host
Grading: OPT

BIOL502 Individual Tutorial for Graduates
A sequence of laboratory research projects in different fields; the type and duration are decided upon an individual basis. For first-year graduate students only.
Offering: Host
Grading: OPT

BIOL503 Selected Topics, Graduate Sciences
Topic to be arranged in consultation with tutor. A seminar primarily concerned with papers taken from current research publications designed for, and required of, graduate students. One 90-minute meeting each week.
Offering: Host
Grading: OPT

BIOL504 Selected Topics, Graduate Sciences
A seminar primarily concerned with papers taken from current research publications designed for, and required of, graduate students. One 90-minute meeting each week.
Offering: Host
Grading: OPT

BIOL505 Cell and Development Journal Club I
Presentation and active discussion of a series of current research articles in the field of cell and developmental biology from journals including CELL, JOURNAL OF CELL BIOLOGY, DEVELOPMENT, GENES AND DEVELOPMENT, DEVELOPMENTAL BIOLOGY, SCIENCE, and NATURE.
Offering: Host
Grading: OPT
Credits: 0.25
Gen Ed Area: None
Prereq: None

BIOL506 Cell and Development Journal Club II
Presentation and active discussion of a series of current research articles in the field of cell and developmental biology from journals including CELL, JOURNAL OF CELL BIOLOGY, DEVELOPMENT, GENES AND DEVELOPMENT, DEVELOPMENTAL BIOLOGY, SCIENCE, and NATURE.
Offering: Host
Grading: OPT
Credits: 0.25
Gen Ed Area: None
Prereq: None

BIOL507 Evolution Journal Club I
Presentation and active discussion of current research articles in evolutionary biology. Each semester the class will choose one theme within evolutionary biology to be the focus of discussion. Themes from recent semesters have included genome-based evolution studies, coevolution, speciation, phylogenetic approaches for investigating natural selection, the role of competition in evolution, the evolution of host-parasite relationships, the evolution of behavior, and the impact of niche construction on adaptive evolution. Articles for discussion generally come from the journals EVOLUTION, AMERICAN NATURALIST, GENETICS, SCIENCE, and NATURE.
Offering: Host
Grading: OPT
Credits: 0.25
Gen Ed Area: None
Prereq: None

BIOL508 Evolution Journal Club II
Presentation and active discussion of current research articles in evolutionary biology. Each semester the class will choose one theme within evolutionary biology to be the focus of discussion. Themes from recent semesters have included coevolution, speciation, phylogenetic approaches for investigating natural selection, the role of competition in evolution, evolution of host-parasite relationships, and the evolution of behavior. Articles for discussion generally come from the journals EVOLUTION, AMERICAN NATURALIST, GENETICS, SCIENCE, and NATURE.
Offering: Host
Grading: OPT
Credits: 0.25
Gen Ed Area: None

BIOL509 Neurosciences Journal Club I
Presentation and discussion of current research articles in the field of neuroscience.
Offering: Host
Grading: Cr/U
Credits: 0.25
Gen Ed Area: None
Identical With: NS&B509, NS&B509
Prereq: None

BIOL510 Neurosciences Journal Club II
Presentation and discussion of current research articles in the field of neuroscience.
Offering: Host
Grading: Cr/U
Credits: 0.25
Gen Ed Area: None
Identical With: NS&B510, NS&B510
Prereq: None

BIOL511 Group Tutorial, Graduate
Offering: Host
Grading: OPT

BIOL512 Group Tutorial, Graduate
Offering: Host
Grading: OPT

BIOL516 Plant-Animal Interactions
This course will explore the ecology and evolution of interactions between plants and animals, including mutualism (e.g., pollination, frugivory) and antagonism (e.g., herbivory, granivory), that are central to the functioning of ecosystems and the generation of biodiversity. The format will be seminar-style, involving reading, discussion, and student presentations of key papers on chosen topics.
Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL
Identical With: BIOL316
Prereq: BIOL214 OR [BIOL220 or ENVS220] OR [BIOL290 or BIOL590] OR [BIOL216 or ENVS216]

BIOL518 Nature and Nurture: The Interplay of Genes and Environment
In this advanced seminar, we consider how genes and environment interact to shape the development and behavior of organisms, including humans. After an
initial series of lectures and discussions on classic and current readings, the class will consist of in-depth student presentations and discussion.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL
Identical With: BIOS320, BIOS320, BIOS320, E&ES570, ENV3210, BIOS320, E&ES570,
E&ES520, ENV520, BIOS320, E&ES520, INSTALL310, ENV520, BIOS320, E&ES520,
E&ES520, ENV520, BIOS320, E&ES520, ENV520, BIOS320, E&ES520, ENV520,
BIOS320, E&ES520, ENV520, BIOS320, E&ES520, ENV520

BIOL520 Quantitative Methods for the Biological and Environmental Sciences
This course offers an applied approach to statistics used in the biological, environmental, and earth sciences. Statistics will be taught from a geometric perspective so that students can more easily understand the derivations of formulae. We will learn about deduction and hypothesis testing. We will also learn about the assumptions that methods make and how violations affect applied outcomes. There will be an emphasis on analysis of data, and there will be many problem sets to solve to help students become fluent with the methods. The course will focus upon data and methods for continuous variables. In addition to basic statistics, we will cover regression, ANOVA, and contingency tables.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL
Identical With: BIOS320, E&ES520, E&ES570, ENV520, BIOS320, E&ES520,
E&ES520, ENV520, BIOS320, E&ES520, INSTALL310, ENV520, BIOS320, E&ES520,
E&ES520, ENV520, BIOS320, E&ES520, ENV520, BIOS320, E&ES520, ENV520,
BIOS320, E&ES520, ENV520, BIOS320, E&ES520, ENV520

BIOL527 Evolutionary and Ecological Bioinformatics
Bioinformatic analysis of gene sequences and gene expression patterns has added enormously to our understanding of ecology and evolution. For example, through bioinformatic analysis of gene sequences, we can now reconstruct the evolutionary history of physiology, even though no traces of physiology exist in the fossil record. We can determine the adaptive history of one gene and all the gene's descendants. We can now construct the evolutionary tree of all of life. Bioinformatics is particularly promising for analysis of the ecology and biodiversity of microbial communities, since well over 99 percent of microorganisms cannot be cultured; our only knowledge of these organisms is through analysis of their gene sequences and gene expression patterns. For example, even when we cannot culture most of a microbial community, we can determine which metabolic pathways are of greatest significance through analysis of community-level gene expression. All these research programs are made accessible not only by breakthroughs in molecular technology, but also by innovation in the design of computer algorithms. This course, team-taught by an evolutionary biologist and a computer scientist, will present how bioinformatics is revolutionizing evolutionary and ecological investigation and will present the design and construction of bioinformatic computer algorithms underlying the revolution in biology. Students will learn algorithms for reconstructing phylogeny, for sequence alignment, and for analysis of genomes, and students will have an opportunity to create their own algorithms.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL
Identical With: BIOS327, COMP327, COMP527, CIS327, BIOS327, COMP327,
COMP527, CIS327, BIOS327, COMP327, COMP527, CIS327, BIOS327, COMP327,
COMP527, CIS327, BIOS327, COMP327, COMP527, CIS327, BIOS327, COMP327,
COMP527, CIS327, BIOS327, COMP327, COMP527, CIS327, BIOS327, COMP327,
BIOL536 Landscape Ecology

Biogeography is the study of the distribution of living things (plant, animal, and microbe) on the earth’s surface and the historical, ecological, and human factors responsible. Landscape ecology is a subfield of biogeography that focuses on relationships between spatial pattern and ecological processes across broad spatial and temporal scales. This course will be approached as an introduction to biogeography with a focus on landscape ecology and ecological biogeography. Topics in the course will reflect the diversity of research conducted by landscape ecologists: concepts of scale, island biogeography, metapopulation dynamics and habitat fragmentation, ecological disturbance, species viability, processes of land use and land-cover change, and ecosystem management. This course will include biogeographic patterns, physical and biological processes and interactions that produce these patterns, and methods and techniques used to study them.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-EES, NSM-EES
Identical With: E&ES336, BIOL336, E&ES336, BIOL336
Prereq: [BIOL182 or MB&B182] OR [E&ES197 or BIOL197] OR E&ES199

BIOL537 The Origins of Bacterial Diversity

Wherever there is life, there are bacteria. Free-living bacteria are found in every environment that supports eukaryotes, and no animal or plant is known to be free of bacteria. There are most likely a billion or more species of bacteria, each living in its unique ecological niche. This course will explore the origins of bacterial biodiversity: how bacteria evolve to form new species that inhabit new ecological niches. We will focus on how the peculiarities of bacterial sex and genetics facilitate bacterial speciation. Topics will include the characteristics of bacterial sex, why barriers to genetic exchange are not necessary for speciation in bacteria, the great potential for formation of new bacterial species, the evolutionary role of genetic gifts from other species, and the use of genomics to identify ecologically distinct populations of bacteria.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL, NSM-BIOL
Identical With: BIOL337, ENV5337, BIOL337, ENV5337, BIOL337, ENV5337, BIOL337, ENV5337, BIOL337, ENV5337, BIOL337, ENV5337, BIOL337, ENV5337, BIOL337, ENV5337, BIOL337, ENV5337
Prereq: [BIOL182 or MB&B182]

BIOL540 Issues in Development and Evolution

This advanced seminar explores the relationship between embryonic development and morphological evolution. The course will include a combination of lectures, discussion, and student presentations of papers chosen from the primary literature. Subjects covered will include broad, fundamental issues such as the concept of homology and developmental characters and phylogeny, as well as the evolutionary significance of specific developmental phenomena such as animal segmentation, direct development, and major morphological transitions in evolution.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL
Identical With: BIOL340
Prereq: BIOL218 OR BIOL214

BIOL543 Muscle and Nerve Development

We will examine the structure and function of muscle cells, the development of muscle cell identity, the development of motor neurons, and the interactions between nerve and muscle that lead to a functioning neuromuscular system. The course will focus primarily on vertebrate model systems such as chick, mouse, and fish. We will also examine human diseases, including muscular dystrophies and other neuromuscular disorders.

Offering: Crosslisting
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL
Identical With: BIOL343, NS&B543, NS&B343, BIOL343, NS&B543, NS&B343, BIOL343, NS&B543, NS&B343
Prereq: BIOL218 OR ([BIOL182 or MB&B182] AND [BIOL212 or MB&B212]) OR ([BIOL182 or MB&B182] AND [NS&B213 or BIOL213 or PSYC240]) OR ([BIOL196 or MB&B196] AND [BIOL212 or MB&B212]) OR ([BIOL196 or MB&B196] AND [NS&B213 or BIOL213 or PSYC240])

BIOL545 Developmental Neurobiology

Near the top of the list of unsolved mysteries in biology is the enigma of how the brain constructs itself. Here is an organ that can make us feel happy, sad, amused, and in love. It responds to light, touch, and sound; it learns; it organizes movements; it controls bodily functions. An understanding of how this structure is constructed during embryonic and postnatal development has begun to emerge from molecular-genetic, cellular, and physiological studies. In this course, we will discuss some of the important events in building the brain and explore the role of genes and the environment in shaping the brain. With each topic in this journey, we will ask what the roles of genes and the environment are in forming the nervous system. We will also discuss developmental disorders resulting from developmental processes that have gone astray. This is a reading-intensive seminar course emphasizing classroom discussions, with readings from a textbook and the primary scientific literature.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL
Identical With: BIOL345, NS&B345, NS&B545

BIOL546 The Forest Ecosystem

This course examines basic ecological principles thorough the lens of forest ecosystems, exploring the theory and practice of forest ecology at various levels of organization from individuals to populations, communities, and ecosystems. Lectures, lab exercises, and writing-intensive assignments will emphasize the quantification of spatial and temporal patterns of forest change at stand, landscape, and global scales.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL
Prereq: [BIOL182 or MB&B182] OR [E&ES197 or BIOL197 or ENV5197] OR E&ES199 OR [BIOL182 or MB&B182] OR [BIOL196 or MB&B196] OR [E&ES197 or BIOL197] OR E&ES199

BIOL549 Advanced Research Seminar, Graduate

Offering: Host
Grading: OPT

BIOL550 Advanced Research Seminar, Graduate

Offering: Host
BIOL555 Laboratory in Cellular and Behavioral Neuroscience

The goals of the course are to introduce cellular, molecular, and behavioral laboratory techniques within a framework of solving research problems. Students will be given the opportunity to design experiments through an independent research project. Both quantitative and qualitative approaches will be used to analyze experimental data obtained by the student so that the student will not only gain experience in specific laboratory techniques, but will also gain a feel for the research process itself by active participation in research. In addition to techniques practiced in the course, additional techniques employed in research will be presented through lecture. Techniques will include studies of transgenic mouse nervous system, primary neuronal cell culture, immunohistochemistry, and behavioral analyses of learning, memory, social behavior, and social dominance.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL, NSM-BIOL, NSM-BIOL

BIOL557 Advanced Research Seminars in Biology

This course focuses on the specific research projects of the individual graduate students in the Biology Department, and it comprises student presentations and discussion including the department faculty, graduate students, and interested undergraduates. Background readings for each session may include relevant papers from the literature. The course offers a forum for presenting new results and exploring new ideas, as well as for providing researchers with feedback and suggestions for solving methodological problems. It also provides an opportunity for undergraduate majors and new graduate students in the program to become familiar with the wide range of biological research taking place in the department.

Offering: Host
Grading: Cr/U
Credits: 0.50
Gen Ed Area: None
Prereq: None

BIOL589 Advanced Research, BA/MA

Intensive investigation of special research problems leading to a BA/MA thesis.

Offering: Host
Grading: A-F

BIOL590 Plant Form and Diversity

The course begins with an overview of plant evolutionary history, then covers the basic structure and function of the plant body and the life cycle and ecological diversity of plants in natural habitats. Special events include a field trip to the Smith College botanical garden, a hands-on day for working with living specimens, and a special guest lecture by a local plant biologist.

Offering: Crosslisting
Grading: A-F

Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL, NSM-BIOL
Identical With: BIOL290, BIOL290, BIOL290, BIOL290, BIOL290, BIOL290, BIOL290, BIOL290, BIOL290, BIOL290, BIOL290, BIOL290, BIOL290, BIOL290, BIOL290, BIOL290, BIOL290, BIOL290, BIOL290, BIOL290, BIOL290, BIOL290
Prereq: [BIOL182 or MB&B182] OR [BIOL182 or MB&B182] OR [BIOL196 or MB&B196]

BIOL591 Advanced Research, Graduate

Investigation of special problems leading to a dissertation or thesis.

Offering: Host
Grading: OPT

BIOL592 Advanced Research, Graduate

Investigation of special problems leading to a dissertation or thesis.

Offering: Host
Grading: OPT