Department of
Biology

Courses of Study:
Major (B.A./B.S.)
Combined B.S./M.S.

Objectives

Undergraduate Major
The undergraduate program in biology, leading either to the B.A. or to the B.S. degree, is designed to give students an understanding of fundamental and current biological knowledge in a variety of fields. The program offers a wide array of courses to undergraduates, ranging from introductory courses to advanced, specialized, graduate-level courses in many of these areas. The biology department has 26 full-time faculty members with teaching and research interests in the fields of genetics, molecular biology, development, immunology, neurobiology, motility, cell biology, structural biology, and environment/ecology.

Since the interests and needs of our students vary, the major is designed to provide flexibility once the core courses have been completed. Students may elect undergraduate level courses in a variety of areas of biology and biochemistry, or may choose to obtain more advanced, in-depth training in one particular area. Students are also encouraged to take advantage of opportunities to become integral members of research laboratories in the department and to attend departmental colloquia.

A major in biology provides excellent preparation for students intent on careers in biological research who want to go to graduate school, for those seeking careers in medicine, veterinary medicine, and dentistry, and for those interested in the allied health professions such as public health, genetic counseling, physical therapy, or physician assistant. For those seeking courses concerned with ecology or environmental science, the biology department offers study in those areas. See "Special Note B" on the next page for additional programs in those areas.

Graduate Programs in the Biological Sciences
For M.S. and Ph.D. degrees in the biological sciences, see the separate listings for molecular and cell biology, biophysics and structural biology, neuroscience, and genetic counseling programs in this *Bulletin*.

How to Become an Undergraduate Major

Students wishing to major in biology should enroll in General Chemistry during their first year. Students may elect to take BIOL 15b, an introductory course in biology in the first year, or omit it and begin the biology series with Genetics and Molecular Biology or Cell Structure and Function (BIOL 22a [formerly BIBC 22a] or b). During their sophomore year, students typically enroll in Organic Chemistry, Cell Structure and Function, and Genetics and Molecular Biology, with associated labs. While other course schedules are possible, the one described above allows students ample time to complete the remaining requirements (calculus, physics, and biology electives) for the biology degree during the junior and senior years and leaves students the option of enrolling in Senior Research during the senior year. Exceptionally well-prepared students may enroll in Cell Structure and Function and/or Genetics in their first year.

To learn more about the biology major, students should attend one of the special departmental programs held each fall or consult with the undergraduate advising head.

Faculty

Michael Rosbash (Volen National Center for Complex Systems), Chair
RNA processing and molecular neurobiology.

Laurence Abbott (Volen National Center for Complex Systems)
Modeling of neural networks.

Susan Birren (Volen National Center for Complex Systems)
Developmental neurobiology.

Carolyn Cohen (Rosenstiel Center)
Structural molecular biology.

David DeRosier (Rosenstiel Center)
Structural studies of actin, actin-containing cytoskeletal assemblies, and bacterial flagella.

Chandler Fulton
Cell differentiation and selective gene expression in eucaryotic cells. Morphogenesis of cell shape and assembly of cell organelles, especially flagella.

Bruce Goode (Rosenstiel Center)
Biochemistry and genetics of yeast cytoskeleton.

Leslie Griffith (Volen National Center for Complex Systems)
Biochemistry of synaptic plasticity.

James Haber (Rosenstiel Center)
Genetics and molecular biology of yeast meiotic and mitotic recombination. Mating-type switching. Repair of broken chromosomes.

Jeffrey Hall (Volen National Center for Complex Systems)
Neurogenetics and molecular neurobiology of higher behaviors in *Drosophila*.

Kenneth Hayes (Director, Foster Animal Lab)
Comparative nutritional pathophysiology in man and animals. Lipoprotein metabolism and atherogenesis, cholelithiasis.

Elaine Hiller
Human genetics.

John Lisman (Volen National Center for Complex Systems)
Mechanisms of phototransduction. Molecular mechanism of memory storage.

Susan Lovett (Rosenstiel Center)
Genetics and molecular biology of bacteria and yeast. DNA repair. Recombination and mutagenesis.

Eve Marder (Volen National Center for Complex Systems)
Neurotransmitter modulation of neural circuits.

Sacha Nelson (Volen National Center for Complex Systems)
Synaptic integration in the visual cortex.

Dan L. Perlman
Ecology and biodiversity.

Joan Press (Rosenstiel Center)
Developmental immunology and immunogenetics.

Ruibao Ren (Rosenstiel Center)
Signal transduction.

Ranjan Sen (Rosenstiel Center)
Molecular immunology. Transcription factors.

Piali Sengupta (Volen National Center for Complex Systems)
Developmental neurobiology in *C. elegans*.

William Silen
Human anatomy.

Neil Simister (Rosenstiel Center)
Molecular immunology. Antibody transport.

Judith Tsipis, Undergraduate Advising Head
Genetic counseling.

Gina Turrigiano (Volen National Center for Complex Systems)
Activity-dependent regulation of neuronal properties.

Lawrence Wangh
Molecular controls of DNA replication in *Xenopus egg*.

Michael Welte (Rosenstiel Center)
Regulation of motor-driven transport.

Kalpana White, Senior Honors Coordinator (Volen National Center for Complex Systems)
Developmental neurogenetics.

Requirements for the Undergraduate Major

A. Required of all candidates: BIOL 22a (formerly BIBC 22a),b; BIOL 18a,b lab; CHEM 10a,b or CHEM 11a,b or CHEM 15a,b; CHEM 18a,b or CHEM 19a,b lab; CHEM 25a,b; CHEM 29a,b lab; MATH 10a; PHYS 10a,b or PHYS 11a,b; PHYS 18a,b or PHYS 19a,b lab; *and* Option I or II below.

Option I: The B.A. Degree in Biology
The standard biology option that provides students with a general background in biology. In addition to the courses required of all candidates (listed above), students must complete five elective courses chosen from BIOL, BIBC, BCHM, and NBIO offerings above the 22-level (excluding courses numbered 90-99). The following may also serve as electives: ANTH 116a, BIOL 15b, BIOL 17b, CHEM 41a, CHEM 41b. One of the following math or quantitative methods courses may also serve as an elective: MATH 10b, NPHY 115a, NPSY 137b, or PSYC 51a. Two semesters of BIOL 99 can count as one elective for the B.A. in biology.

Option II: The B.S. Degree in Biology
The intensive biology option that provides students with a strong background in several areas of biology. In addition to the courses required of all candidates (listed above), students must complete BCHM 100a plus an additional course in calculus (MATH 10b) or quantitative methods (BIOLº51a, NBIO 136b, NPHY 115a, NPSY 137b, PSYC 51a). Students must also complete five elective courses chosen from BIOL, BIBC, BCHM, and NBIO offerings above the 22-level (excluding courses numbered 90-99). BIOL 51a, NBIO 136b can be used either to satisfy the quantitative methods requirement or to count as one of the required electives; thus cannot be used for both. The following may also serve as electives: ANTH 116a, BIOL 15b, BIOL 17b, CHEM 41a, and CHEM 41b. Two semesters of BIOL 99 can count as one elective for the B.S. in biology.

No course offered for major requirements in either Option I or II may be taken on a pass/fail basis. Satisfactory grades (C- or above) must be maintained in all biology and biochemistry courses offered for the major and in all elective courses offered for the major in biology. No more than one D will be allowed in any other course offered toward the requirements in this department.

B. Senior Research
Any senior, regardless of grade point average, may enroll in laboratory research (BIOL 99d and/or 99e). Students petition the department during the beginning of their senior year for participation in Senior Research. Petitions and information about Senior Research are available in the biology department office. See BIOL 99d course description for details.

C. Senior Honors Program
Laboratory research is a major component of the senior honors program. Enrollment in BIOL 99 (Senior Research) is obligatory; students must fulfill the BIOL 99 requirements (see B above). At the conclusion of their second semester of BIOL 99 (Senior Research), candidates for senior honors will give an oral defense of their senior honors thesis to a designated faculty research committee. At the conclusion of their senior year, candidates for senior honors must either have a 3.30 grade point average in all courses offered for the biology major, or have a 3.00 grade point average in courses offered for the biology major and have achieved an average of B+ or better in three biology electives. Petitions and information about the senior honors program are available in the biology department office.

Combined B.S./M.S. Program

Candidates for departmental honors may be admitted to a special four-year B.S./M.S. program upon recommendation of the department and approval by the Graduate School. Application must be made by May 1 preceding the senior year; applications should include a proposed course of study, specifying how all degree requirements will be met, a transcript, a letter of recommendation from the research sponsor, and a brief description of the proposed research project. To qualify for the B.S./M.S. degree in biology, students must complete a total of 38 courses; these courses must include those needed to satisfy requirements A, option II, and B, as indicated to the left plus three additional electives in biology or biochemistry or as listed under requirement A, option II, above. Of the eight electives required for the B.S./M.S. degree, at least six must be at the graduate level (and completed with a grade of B- or above) and they must include courses from at least three of the research areas of the biology department. Research areas include genetics, molecular biology, cell biology, structural biology, immunology, and neurobiology. In addition, a substantial research contribution is required and students must submit a research thesis to the biology department graduate committee for review. A thesis submitted for the master's degree may also be submitted to the biology department for departmental honors.

Special Notes Relating to the Undergraduate Program

A. Premedical and Predental Students
BIOL 18a,b (labs) and BIOL 22a (formerly BIBC 22a), b will satisfy the general biology entrance requirements of most medical schools.

B. Biology majors wishing to study ecology, conservation, and marine studies may wish to look into the environmental studies program described in this *Bulletin*, as well as the following program. See Mr. D.L. Perlman for further information on these programs, including information on transferability of course credits as biology electives.

Woods Hole Biological Laboratory: Five courses are offered each fall as part of a residential Semester in Environmental Science. The program offers courses in the analysis of terrestrial and aquatic ecosystems, microbial and animal ecology, global issues, and ecological modeling. Every student must do an independent research project during the semester. Up to four semester-course credits may be earned toward the Brandeis degree and three semester course credits may be counted toward the biology B.A. or B.S. elective requirement.

Marine Studies Consortium: The MSC, with which Brandeis is affiliated, offers a wide variety of courses on the marine environment. These courses are listed among the Biology and Environmental Studies course offerings in this *Bulletin*.

Denmark's International Studies Program: DIS offers a range of programs in marine biology and ecology, environmental biology, medical practice and policy, and molecular biology and genetics.

Biosphere 2: This program, run by Columbia University, offers an interdisciplinary approach to environmental studies, considering ecological and social aspects of environmental problems.

Organization for Tropical Studies: OTS, a consortium of more than 50 U.S. and Costa Rican universities, offers semester-long interdisciplinary programs covering tropical biology, Latin American culture, and Spanish: summer courses include field tropical ecology and field ethnobiology.

School for Field Studies: SFS offers programs at a number of different sites around the world, including East Africa, Costa Rica, Baja Mexico, Australia, and the West Indies.

School for International Training: SIT offers programs around the world in ecology, conservation, and sustainable development.

C. Biology majors who wish to enroll in PHYS 11a,b (Basic Physics), rather than PHYS 10a,b (Physics for the Life Sciences), must complete *both* MATH 10a and b as prerequisites.

Courses of Instruction

(1-99) Primarily for Undergraduate Students

BISC 1a Biology of Neurological and Mental Illness
[sn]
Does NOT meet requirements for the major in biology. May not be taken by students who have completed NBIO 140b. Enrollment limited to 60.
This course will discuss the basic features of the brain and nervous system needed to understand the current state of knowledge concerning neurological and mental illnesses. The etiology and biological bases for treatment for depression, schizophrenia, multiple sclerosis, epilepsy, Parkinson's, and Alzheimer's disease will be discussed. Usually offered every third year. Last offered in the spring of 1997.
Ms. Marder

BISC 2a Human Reproduction, Population Explosion, Global Consequences
[sn]
Does NOT meet requirements for the major in biology. Some lectures and discussions will be conducted jointly with BISC 3b. Enrollment limited to 60.
Appropriate for students interested in a broad range of fields including biology, environmental studies, and the social sciences. Progresses from the molecular and cellular biology of human reproduction, to a demographic view of human population explosion, to a consideration of some of the very complex problems arising from the presence of six billion people (and counting) on Earth today. Readings include scientific papers appropriate to students with high school backgrounds in biology and chemistry, essays in the social sciences, and a wide variety of other texts. Usually offered every second year. Last offered in the spring of 2003.
Mr. Wangh

BISC 2b Genes, Culture and History: A Case Study
[sn]
Does NOT meet requirements for the major in biology. Enrollment limited to 30.
An interdisciplinary course with contributions from four professors in three departments. Findings from the Human Genome Project will be correlated with cultural and historical information about specific human populations. The focus in 2004 is on the Jewish people. Usually offered every third year. Will be offered in the spring of 2004.
Mr. Brettler, Mr. Kahn, Ms. Tsipis, Mr. Wangh

BISC 3a Paradigms of Biological Investigation
[sn]
Does NOT meet requirements for the major in biology. May not be taken by students who have completed BIOL 22a (formerly BIBC 22a) or BIOL 22b. Enrollment limited to 35.
Examines the concepts and principles of scientific research with examples from its Greek beginnings to modern times. Topics from evolutionary biology, neuroscience, biophysics, and molecular biology are used to describe the nature of scientific advances. Concepts related to experimental design and critical thinking are considered. Usually offered every year. Last offered in the fall of 2002.
Mr. Farber

BISC 3b Humans and the Environment
[sn]
Does NOT meet requirements for the major in biology. Some lectures and discussions will be conducted jointly with BISC 2a. Enrollment limited to 60.
Explores a range of interactions between organisms and their environments. Focuses on human impacts on, and interactions with, the natural world. Usually offered every second year. Last offered in the spring of 2003.
Mr. D.L. Perlman

BISC 4a Heredity
[sn]
Does NOT meet requirements for the major in biology. May not be taken by students who have completed BIOL 22a (formerly BIBC 22a).
An exploration of what genes are that focuses on human genetics. Examines how genes are inherited, how they work, and how changes in certain genes cause inherited diseases. Also investigates recent biological developments such as Human Genome Project, gene therapy, and designer babies, and the new challenges these developments pose in the 21st century. Usually offered every third year. Will be offered in the fall of 2003.
Ms. White

BISC 5a Viruses and Human Disease
[sn]
Prerequisite: High school chemistry. Does NOT meet requirements for the major in biology. May not be taken by students who have completed BIOL 22a (formerly BIBC 22a) or BIOL 22b. Enrollment limited to 30.
Explores the biology of viruses that cause important human diseases such as HIV/AIDS, hepatitis, influenza, infectious mononucleosis, and cancer as well as emerging viruses like Ebola. Other topics include antiviral therapy, immune responses to viruses, and vaccine development. Usually offered every year. Last offered in the fall of 2002.
Staff

BISC 6b Environmental Health
[sn]
The impact on human health of environmental contamination with toxic, carcinogenic, or pathogenic agents. Tools of toxicology, epidemiology, and risk assessment are applied to specific environmental issues such as air and water quality, petroleum, metal, and other chemical contaminations. Usually offered every second year. Last offered in the spring of 2001.
Staff

BIOL 12a General Biology Lab I
Prerequisites: Must be taken concurrently with BIOL 14a. Does yield half-course credit toward rate of work and graduation. Two semester hour credits. Laboratory fee: $15 per semester. Does NOT meet requirements for the major in biology, biochemistry, or neuroscience, but does satisfy the general biology entrance requirement of most medical schools.
Provides firsthand experience with a wide array of organisms and illustrates basic approaches to problem solving in biology. Usually offered every summer.
Staff

BIOL 12b General Biology Lab II
Prerequisites: Must be taken concurrently with BIOL 14b. Does yield half-course credit toward rate of work and graduation. Two semester hour credits. Laboratory fee: $15 per semester. Does NOT meet requirements for the major in biology, biochemistry, or neuroscience, but does satisfy the general biology entrance requirement of most medical schools.
See BIOL 12a for course description. Usually offered every summer.
Staff

BIOL 14a General Biology I
[sn]
Does NOT meet requirements for the major in biology.
An introduction to the biology of organisms and populations. Topics include evolution of life, biological diversity, and the physiology of plants and animals. Usually offered every summer.
Staff

BIOL 14b General Biology II
[sn]
Prerequisites: BIOL 14a, an introductory biology course, or high school AP biology. Does NOT meet requirements for the major in biology.
An introduction to the principles of modern cellular and molecular biology. Also includes selected topics in genetics, biochemistry, and developmental biology. Usually offered every summer.
Staff

BIOL 15b Biology: Its Human Implications
[sn]
Core course for the HSSP major and minor. This course may not be taken for credit by students who have completed BIOL 22a (formerly BIBC 22a) or BIOL 22b.
Introduction to the biological sciences. Stresses the fundamentals of the cell biology and genetics of living organisms and explores the diversity of life, including microorganisms, animals, and plants. Evolution, population ecology, and basic human physiology are emphasized. Usually offered every year. Will be offered in the spring of 2004.
Mr. Simister

BIOL 17b Conservation Biology
[wi sn]
Enrollment limited to 40.
Considers the current worldwide loss of biological diversity, causes of this loss, and methods for protecting and conserving biodiversity. Explores biological and social aspects of the problems and their solutions. Usually offered every year. Last offered in the spring of 2003.
Mr. D.L. Perlman

BIOL 18a General Biology Laboratory
[wi sn]
Prerequisites: CHEM 18a or 19a, and BIOL 18b or permission of the instructor. BIOL 22a (formerly BIBC 22a) must be taken before or concurrently with this course. Does yield full-course credit toward rate of work and graduation. Four semester hour credits. Laboratory fee: $20 per semester. This lab is time intensive and students will be expected to come in to lab between regular scheduled lab sessions. Enrollment limited to 58 per section.
Provides firsthand experience with a wide array of organisms and illustrates basic approaches to problem solving in genetics and molecular biology. Usually offered every year. Will be offered in the spring of 2004.
Ms. Tsipis

BIOL 18b General Biology Laboratory
Prerequisites: CHEM 18a or 19a. BIOL 22b must be taken before or concurrently with this course. Does yield half-course credit toward rate of work and graduation. Two semester hour credits. Laboratory fee: $20 per semester. Enrollment limited to 48 per section.
Provides firsthand experience with a wide array of organisms and illustrates basic approaches to problem solving in cell biology. Usually offered every year. Will be offered in the fall of 2003.
Ms. Tsipis

BIOL 22a Genetics and Molecular Biology (formerly BIBC 22a)
[qr sn]
Prerequisite: CHEM 10a or 11a or 15a. This course may not be repeated for credit by students who have taken BIBC 22a in previous years.
An introduction to our current understanding of hereditary mechanisms and the cellular and molecular basis of gene transmission and expression. Usually offered every year. Will be offered in the spring of 2004.
Mr. Fulton

BIOL 22b Cell Structure and Function
[sn]
Prerequisite: CHEM 10a or 11a or 15a.
An introduction to the architecture of cells, organelles, and their macro-molecular components. Topics include fundamental processes that are common to all cells, and the functions of specialized cells. Usually offered every year. Will be offered in the fall of 2003.
Mr. Welte

BIOL 23a Evolutionary Ecology
[sn]
Prerequisites: BIOL 22a or 22b, or 15b, or a score of 5 on the AP Biology Exam. Enrollment limited to 30.
Ecology is the study of organisms and the environments in which they live. This class, taught from an evolutionary perspective, focuses on the physical factors and intra- and inter-species interactions that explain the distribution and abundance of individual species. Usually offered every year. Last offered in the fall of 2002.
Mr. D.L. Perlman

BIOL 25a Molecular Motors
[sn]
Prerequisite: BIOL 22b.
A discussion of movement at the cellular level. Analyzes how molecular motors generate motion and how their activity is controlled. Topics include intracellular transport, muscle contraction, rotary motion, enzymes moving along DNA, and cell division. Usually offered every second year. Last offered in the spring of 2003.
Mr. Welte

BIOL 27a Aquatic Ecology
[sn]
Prerequisites: BIOL 22a (formerly BIBC 22a) and BIOL 22b. Enrollment limited to 20. Students may not take this course and BIOL 17b for credit.
Analysis of biotic and abiotic factors that govern life in lakes and streams. Topics include hydrology, food webs, special aquatic habitats, conservation and restoration, and principles of monitoring the health of fresh waters. Field and laboratory work is included. Usually offered every second year. Last offered in the fall of 2000.
Staff

BIOL 28a Marine Biology
[sn]
Prerequisites: BIOL 22a (formerly BIBC 22a) and BIOL 22b. Signature of Professor Perlman required. Offered under the auspices of the MSC and open to Brandeis students by petition. Please see the special note on page 95 on MSC courses.
Survey of the basic biology, behavior, and life history of marine biota. Review of physical habitats from polar to tropical waters. Focus is on the evolution of adaptive responses to the physical and biological factors in marine communities. Weekly laboratory consists of field trips to different habitats and examination of specimens from several marine phyla. Usually offered every fall (at Brandeis). Will be offered in the fall of 2003.
Mr. D.L. Perlman (Brandeis coordinator)

BIOL 30b Biology of Whales
[sn]
Prerequisites: BIOL 22b, BIOL 28a, BIOL 42a recommended. Signature of Professor Perlman required. Offered under the auspices of the MSC and open to Brandeis students by petition. Please see the special note on page 95 on MSC courses.
Examines the biology and conservation of whales, dolphins, and porpoises. Topics include physiology, morphology, population biology, life history, molecular genetics, distributional ecology, and social behavior. Usually offered every year (at Brandeis). Last offered in the spring of 2003.
Mr. D.L. Perlman (Brandeis coordinator)

BIOL 31b Biology of Fishes
[sn]
Prerequisites: BIOL 22a (formerly BIBC 22a) and BIOL 22b, BIOL 28a is recommended. Signature of Professor Perlman required. Offered under the auspices of the MSC and open to Brandeis students by petition. Please see the special note on page 95 on MSC courses.
Evolution, systematics, anatomy, physiology, and behavior of freshwater, marine, and anadromous fishes from temperate and tropical environments. Fish interactions in communities: predator/prey, host/symbiont relationships, and fish as herbivores. The ecology of fish populations. Usually offered every year. Last offered in the spring of 2002.
Mr. D.L. Perlman (Brandeis coordinator)

BIOL 32a Field Biology
[sn]
Signature of the instructor required.
Introduces students to the biodiversity of southern New England, emphasizing insects and woody plants. Course work primarily takes place on field trips to various terrestrial and aquatic habitats. Field trip scheduling will be discussed during the first meeting. Usually offered every second year. Will be offered in the fall of 2003.
Mr. D.L. Perlman

BIOL 37b Biology of Extreme Environments
[sn]
Prerequisites: BIOL 22a (formerly BIBC 22a) and BIOL 22b; BCHM 100a recommended.
A study of molecular, metabolic, and physiological mechanisms of adaptations to extreme environments, such as hot springs, polar regions, and deserts. Examines the limits to which biological systems can be modified by nature and human manipulation. Usually offered every second year. Last offered in the spring of 2002.
Staff

BIOL 42a Physiology
[sn]
Prerequisite: BIOL 22b.
Basic physiological principles will be introduced with an overview of neural and hormonal control mechanisms. Topics include physiology of cardiovascular and respiratory systems, electrolyte regulation, digestion and absorption, and the reproductive system. Usually offered every year. Will be offered in the fall of 2003.
Ms. Marder

BIOL 43b Human Anatomy
[sn]
Prerequisite: BIOL 22b. Signature of the instructor required.
Designed to provide a sound basis for an understanding of human (mammalian) anatomy. The gross and microscopic morphology of each organ system is discussed in depth. Correlations between structure and function are emphasized. Usually offered every semester. Will be offered in the fall of 2003.
Mr. Silen

BIOL 50b Biology of Behavior
[sn]
Prerequisites: BIOL 15b, BIOL 22a (formerly BIBC 22a), BIOL 23a or BIOL 60b. Signature of the instructor required.
Examines mating and reproductive behaviors, territoriality, and costs and benefits of sociality along with other behaviors. The course employs an ecological framework to understand the evolution of behavior. Usually offered every second year. Will be offered in the spring of 2004.
Mr. D.L. Perlman

BIOL 51a Biostatistics
[sn]
Prerequisite: MATH 10a. Enrollment limited to 40.
A basic introduction to methods of statistics, differential calculus, and mathematical analysis applied to problems in the life sciences. Topics include statistical analysis of experimental data, mathematical description of chemical reactions, and mathematical models in neuroscience, population biology, and epidemiology. Usually offered every year. Will be offered in the spring of 2004.
Staff

BIOL 55b Diet and Health
[sn]
An elective for science majors with previous course work in nutrition, physiology, or biochemistry. Enrollment limited to 50.
Reviews the current evidence concerning the dietary impact on the chronic diseases of humans. Topics include genetics and nutrition, cardiovascular disease, obesity, diabetes, osteoporosis, and cancer. Students also examine the involvement of specific nutrients, e.g., fat and cholesterol, vitamins, minerals, fiber, and alcohol in these disease processes. Usually offered every fourth year. Last offered in the spring of 2003.
Mr. Hayes

BIOL 60b Evolution
[sn]
Prerequisite: BIOL 22a (formerly BIBC 22a). A library-intensive course. Enrollment limited to 44.
An introduction to evolution, with in-depth exploration of selected topics in evolutionary biology. These topics will range from molecular evolution as revealed by DNA sequencing to the origin and evolution of primates. Usually offered every second year. Will be offered in the fall of 2003.
Mr. Fulton

BIOL 98a Readings in Biology
Prerequisites: BIOL 22a (formerly BIBC 22a) and BIOL 22b. Signature of the instructor required. Does NOT meet the requirement in biology. May not be taken for credit by students who have satisfactorily completed BIOL 98b.
Open to exceptionally well-qualified students. This is a tutorial course with readings in a specified biological field. The student will be given a reading list, including current literature and reviews of the topic to be discussed. Course requirements include weekly discussions and the writing of several papers. Usually offered every year.
Staff

BIOL 98b Readings in Biology
Prerequisites: BIOL 22a (formerly BIBC 22a) and BIOL 22b. Signature of the instructor required. Does NOT meet the major requirement in biology. May not be taken for credit by students who have satisfactorily completed BIOL 98a.
See BIOL 98a for course description. Usually offered every year.
Staff

BIOL 99d Senior Research
Signatures of the instructor and the senior honors coordinator (Ms. White) required.
A year-long, two-semester course involving the student in an independent research project conducted under the supervision of a staff member and serving as an intensive introduction to specific methods of biological research. In cases where students are able to do unusually long, intensive work in the laboratory, they may request a third course credit during the petition process; if this request is approved by the senior honors coordinator, students should register for BIOL 99d (fall) followed by BIOL 99e (spring). The combined enrollments for Senior Research may not exceed three semester course credits. To fulfill the BIOL 99 requirements, students must (1) submit to their research sponsor, at the conclusion of their first BIOL 99 semester, a paper that reviews the literature pertinent to their field of research, and (2) submit to their research sponsor, at the conclusion of their second BIOL 99 semester, a senior thesis that includes an abstract, an introduction, a review of materials and methods, results, discussion, and references. Usually offered every year.
Staff

BIOL 99e Senior Research
Signatures of the instructor and the senior honors coordinator (Ms. White) required.
See BIOL 99d for course description.
Usually offered every semester.
Staff

(100-199) For Both Undergraduate and Graduate Students

BIOL 102b Structural Molecular Biology
[sn]
Prerequisites: BIOL 22a (formerly BIBC 22a) and BIOL 22b; or permission of the instructor. A library-intensive course.
Cells are filled with machines that carry materials about the cell, that chemically transform molecules, that transduce energy, and much more. Our understanding of how these machines work depends on understanding their structures. This introduction to the structural basis of molecular biology examines the designs of proteins and nucleic acids, their assembly into macromolecular complexes, and the means whereby we visualize these structures. Considers the physical and chemical basis for specificity in molecular recognition. Usually offered every second year. Last offered in the spring of 2002.
Mr. DeRosier

BIOL 103b Mechanisms of Cell Functions
[sn]
Prerequisite: BIOL 22b or permission of the instructor. Enrollment limited to 50.
An advanced course focusing on a mechanistic understanding of cell biological processes and the methods by which these processes are elucidated. Papers are chosen to illustrate a variety of experimental approaches including genetics, biochemistry, microscopy, and the design and use of in vitro assays. Topics include cell cycle, signal transduction, cytoskeleton and cell movement, membrane traffic, intercellular transport, and organelle functions. Usually offered every year. Last offered in the spring of 2003.
Mr. Goode

BIOL 105b Molecular Biology
(formerly BIBC 105b)
[sn]
Prerequisites: BIOL 22a (formerly BIBC 22a) and BIOL 22b. This course may not be repeated for credit by students who have taken BIBC 105b in previous years.
Examination of molecular processes in replication and expression of genetic information and the molecular biological, genetic, and biochemical techniques by which this understanding has been achieved. Topics include structure and organization of DNA in chromosomes, chromatin structure, DNA replication and DNA repair, transcription and regulation of gene expression, RNA structure and processing, mRNA stability, and other mechanisms of post-transcriptional control. Molecular biological techniques will be introduced. Lectures will be supplemented with close readings of selected papers. Usually offered every year. Last offered in the fall of 2002.
Mr. Haber and Ms. Moore

BIOL 111a Developmental Biology
[sn]
Prerequisites: BIOL 22b.
How do complex organisms build themselves starting from single cells? Examines how processes such as fertilization, embryogenesis, cell differentiation, and tissue-specific gene expression occur; what is known about the key molecules and genes that orchestrate these processes; and how genetic changes affecting these processes underlie the evolution of body form. Usually offered every second year. Last offered in the fall of 2002.
Ms. Birren

BIOL 122a Molecular Genetics
[sn]
Prerequisites: BIOL 22a (formerly BIBC 22a).
A lecture and literature-based course concerning strategies of genetic analysis and the mechanisms that control genetic change and preserve genetic stability. Lectures cover the topics of genetic mutation, genetic recombination, repair of genetic damage, and chromosome structure and transmission. Research papers of current and historical interest will be discussed. Usually offered every third year. Last offered in the spring of 2003.
Mr. Haber and Ms. Lovett

BIOL 125a Immunology
[sn]
Prerequisites: BIOL 22a (formerly BIBC 22a) and BIOL 22b.
Topics include properties, functions of cells involved in immunity; genes, structure, function of immunoglobins and T cell receptors; cell interactions; antigen recognition; lymphokines; tolerance; lymphocyte differentiation; genetic regulation; viral immunity; autoimmunity; AIDS; vaccines. Usually offered every year. Will be offered in the fall of 2003.
Ms. Press

BIOL 126b Protein Structure and Disease
[sn]
Prerequisites: BIOL 22a (formerly BIBC 22a) and BIOL 22b, or the equivalent, or permission of the instructor. Enrollment limited to 25.
Reviews the basic principles of protein structure, so that the functional aspects of different protein designs may be understood. Examines various protein mutations related to certain molecular diseases and the architecture of some key viruses and their infectivity. Consideration of drug design is an integral part of the course. Student presentations are essential to the course. Usually offered every fourth year. Last offered in the spring of 2003.
Ms. Cohen

BIOL 128a Human Genetics
[sn]
Prerequisites: BIOL 22a (formerly BIBC 22a) and BIOL 22b. Enrollment limited to 50.
Survey of classical and nonclassical patterns of inheritance; cytogenetics; applications of molecular genetics techniques in human genetics, analysis of variation, gene mapping, identification of candidate genes and genetic disease diagnoses; single gene vs. complex inheritance; computer databases for human genetic research; and human population genetics. Usually offered every year. Will be offered in the fall of 2003.
Ms. Hiller

BIOL 132a General Microbiology
[sn]
Prerequisites: BIOL 22a (formerly BIBC 22a) and BIOL 22b, (BCHM majors may substitute BCHM 100a); CHEM 25a and 25b.
A survey of the physiology of bacteria and other microorganisms. Concentrates on those aspects of cell structure and function that are important for diverse microbial lifestyles. In addition, pays special attention to the biology of disease-causing organisms and microbiological problems facing medicine today. Usually offered every second year. Last offered in the spring of 2002.
Staff

BIOL 134b Topics in Ecology
[sn]
Prerequisites: BIOL 22a (formerly BIBC 22a) and BIOL 22b. This course may be repeated for credit. Signature of the instructor required.
Each year a different aspect of the global biosphere is selected for analysis using contemporary tools and approaches. In any year the focus may be on specific ecosystems (e.g., terrestrial, aquatic, tropical, arctic), populations, system modeling, or the contributions of physical or chemical factors defining a particular system. Please consult the *Course Schedule* for the particular topic. Usually offered every year. Last offered in the spring of 2002.
Staff

NBIO 136b Computational Neuroscience
[sn]
Prerequisites: MATH 10a or PHYS 10a or approved equivalents.
An introduction to methods and results in mathematical and computer modeling of neural systems. Topics include the basic biophysics of ion conduction, single- and multi-compartment neuron models, information theory and neural codes, the representation and processing of images by the visual system, and models of synaptic plasticity, learning, and memory. Usually offered every second year. Last offered in the spring of 2002.
Mr. Abbott

NBIO 140b Principles of Neuroscience
[sn]
Prerequisite: BIOL 22b or permission of the instructor.
Basic principles of neurobiology. Topics include ion channels and their role in generating resting and action potentials; basics of synaptic physiology and pharmacology; neural circuits underlying behavior, learning, and mental illness. Usually offered every year. Will be offered in the fall of 2003.
Ms. Turrigiano

NBIO 143b Developmental Neurobiology
[sn]
Prerequisite: BIOL 22b or permission of the instructor.
Discusses the mechanisms used in the development of the nervous system. Topics include determination of neuronal cell fates, neuronal differentiation and pattern formation, neuron survival and growth, and mechanisms responsible for generation of connectivity in the nervous system. Usually offered every second year. Last offered in the fall of 2002.
Ms. Sengupta

NBIO 145b Systems Neuroscience
[sn]
Prerequisite: NBIO 140b. Enrollment limited to 25.
The neural basis of sensation and animal behavior studied at the level of individual neurons and neural circuits. Students will read and discuss papers from the scientific literature. Usually offered every year. Will be offered in the spring of 2004.
Mr. Nelson

NBIO 147a Neurogenetics
[sn]
Prerequisites: BIOL 18a and BIOL 22a (formerly BIBC 22a).
Development and function of the nervous system and responses of excitable cells studied in neurological and behavioral mutants. Characterization and manipulation of genes, defined by these mutations and using molecular biological tools. Organisms: microbes, roundworms, fruit flies, mammals. Neurobiological areas: embryonic neural development, nerve cell differentiation and pattern formation, membrane excitability, responses to visual and chemical stimuli, biological rhythms, and reproductive behavior. Usually offered every third year. Will be offered in the fall of 2003.
Mr. Hall

NBIO 148b Cellular Neuroscience
(formerly NBCH 148b)
[sn]
Prerequisite: NBIO 140b or permission of the instructor. May be taken concurrently with NBIO 140b. This course may not be repeated for credit by students who have taken NBCH 148b in previous years.
Focuses on the ionic and molecular basis of action and synaptic potentials with special emphasis on cellular mechanisms of plasticity. Students examine the Hodgkin-Huxley experiments on axonal action potentials and the original research literature dealing with many aspects of synaptic transmission, neuronal excitability, and plasticity. Usually offered every year. Will be offered in the fall of 2003.
Ms. Griffith

BIOL 149b Molecular Pharmacology
[sn]
Prerequisites: BIOL 22b, and CHEM 25a, b. NBIO 140b strongly recommended. Signature of the instructor required.
Covers the essentials of pharmacology and the study of the actions of chemical agents (drugs, toxins, neurotransmitters, and hormones) that interact with living systems. Emphasizes molecular mechanisms of neuropharmacology. Topics include pharmacokinetics, hormone action, autonomic pharmacology, and the psychopharmacology of drugs of abuse and mental disorders. Usually offered every third year. Last offered in the spring of 2003.
Ms. Griffith

BIOL 160b Human Reproductive and Developmental Biology
[wi sn]
Prerequisites: BIOL 22a (formerly BIBC 22a) and BIOL 22b. Signature of the instructor required. A library-intensive course.
This course deals with hormonal, cellular, and molecular aspects of gametogenesis, fertilization, pregnancy, and birth. Discusses pathological and abnormal variations that occur and the available medical technologies for intervention, correction, and facilitation of these processes. Usually offered every year. Will be offered in the fall of 2003.
Mr. Wangh

BIOL 172b Growth Control and Cancer
[sn]
Prerequisites: BIOL 22a (formerly BIBC 22a) and BIOL 22b. Enrollment limited to 80. A library-intensive course.
Covers the fundamental rules of behavior of cells in multicellular organisms. Examines cellular and molecular mechanisms that govern cell growth, differentiation and survival in normal cells as well as how this regulation is disrupted in cancer. Usually offered every year. Last offered in the spring of 2003.
Mr. Ren

BIOL 173b Programmed Cell Death
[sn]
Prerequisites: BIOL 22a (formerly BIBC 22a), BIOL 22b, and BCHM 100a or permission of the instructor. Enrollment limited to 24.
Apoptosis, the programmed death of vertebrate cells, is essential for normal development and health. Examines the topic through recent research papers, lectures, and student presentations, with emphasis on the mechanism of apoptosis and its role in human diseases such as cancer and neurological disorders. Usually offered every third year. Last offered in the spring of 2001.
Mr. Fulton

BIOL 175b Advanced Immunology
[sn]
Prerequisite: BIOL 125a or permission of the instructor.
A survey of recent advances in molecular immunology. Topics include hematopoietic stem cell biology, blood lineage commitment, growth factor signal transduction, the nature and specificity of antigen receptors, the regulation and mechanism of V(D)J recombination, and B and T cell development. Usually offered every second year. Last offered in the spring of 2002.
Mr. Sen

Cross-Listed Courses

ANTH 116a
Human Osteology