

**[MUS 232 Bach to Beethoven: Music in the 18th Century (M1)**

4 sem. hrs. Not offered in 2006–2008.]  
 Surveys music and related disciplines in the 18th century. Discusses great changes in society, contact with non-Western countries, and the musician's place within society. Topics include Bach and Handel, E. Jacquet de la Guerre, Haydn and Mozart, the American and French Revolutions, Voltaire, Jefferson, and others. Slowik.

**MUS 234 Music of the Romantic Tradition (M1) (S-1)**

4 sem. hrs.  
 Studies 19th-century musicians, such as Debussy, Puccini, and Rimsky-Korsakov, who created music that was international and multicultural and influenced by Asiatic and Indonesian cultures, such as Japan and Bali. Introduces diverse topics, including art songs, fascination with the macabre, the "romantic" artist, and women composers—Clara Schuman, Fanny Mendelssohn-Hensel, and America's first well-known female composer, Amy Beach. Slowik.

**MUS 239 Paris in the Modern Age (M1) (F-1)**

4 sem. hrs.  
 Studies the highly diversified gathering of artists, writers, and musicians in Paris at the dawn of the 20th century. Examines the music, art, and literature of these fascinating people. Topics include Debussy and Impressionism, Stravinsky and Picasso, influences of African culture, Paris International Exhibition, Gertrude Stein, Proust, and others. Slowik.

**MUS 349 Directed Study (F-1,2; S-1,2)**

4 sem. hrs.  
 Private lessons with faculty of the New England Conservatory. Requires department approval. Staff.

**MUS 350 Independent Study (F-1,2; S-1,2)**

4 sem. hrs.  
 Individualized projects at an advanced level. Slowik.

**MUS/ART 370 Internship (F-1,2; S-1,2)**

4 sem. hrs.  
 See description on page 66.

**Department of Biology**

- Mary H. Owen, *Chair and Associate Professor*
- D. Bruce Gray, *Associate Professor*
- Jane Lopilato, *Associate Professor*
- Vladimir Douhovnikoff, *Assistant Professor*
- Elizabeth Scott, *Assistant Professor*
- Randi Lite, *Instructor*
- Arthur Skura, *Laboratory Manager*
- Jyl Richards, *Laboratory Supervisor*
- Tracy Machcinski, *Assistant to the Laboratory Manager/Supervisor*
- Victoria Galloway, *Administrative Assistant*

The department's offerings are designed to help students develop an understanding of the scope, the methods of inquiry, and the specialties of biology, as well as an appreciation of modern biological trends. Undergraduate preparation in biology may lead to career opportunities in government, university, hospital, and commercial laboratories in areas such as animal and plant physiology, developmental biology, molecular biology, biochemistry, microbiology, immunology, ecology, and biotechnology. The curriculum also prepares students for graduate study in biology and in such areas as allied health careers, medicine, dentistry, veterinary science, and genetic engineering.

Cooperation with other departments in the College provides opportunities for joint programs, such as majors in biochemistry, psychobiology, and environmental science. Certification for teaching biology at the middle school and secondary school levels is possible by enrollment in the Department of Education. An accelerated five-year BS Biology/ MS Nutrition program is jointly offered by the biology department and the nutrition department in the School for Health Studies.

F = Fall  
 S = Spring  
 U = Summer  
 STC = Short-Term Course  
 1 = Academic Year 2006-2007  
 2 = Academic Year 2007-2008  
 M = Mode  
 \* = Schedule t.b.a.

### **Major in Biology**

For students desiring a broad education in the life sciences, ranging from the molecular and cellular level to that of populations and ecosystems, this major provides maximum flexibility in preparation for careers in biology, biotechnology, and related fields; it also serves as excellent preparation for graduate and professional schools.

**Requirements:** Students planning a program in biology satisfy the core requirements by taking the following courses:

#### **Year 1:**

BIOL 113	General Biology
BIOL 218	Principles of Zoology

#### **Year 2:**

BIOL 222	Animal Physiology
BIOL 225	Cell Biology

#### **Year 3:**

BIOL 336	Genetics
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To complete the minimum requirements, students must take three additional courses in biology, at least two of which must be numbered 300 or higher.

In the senior year, students must satisfy their independent study requirement by taking two semesters of BIOL 350 or BIOL 370.

**Prerequisites:** Students are required to take CHEM 111 or 113, 114, and 225 as well as MATH 120 or its equivalent. Students interested in medical or dental school or in pursuing graduate study in certain areas of biology should plan to include CHEM 226, MATH 121, and a year of physics.

Students interested in careers in dentistry, medicine, optometry, podiatry, veterinary medicine, and the allied health professions should consult the health professions advisor, Mary Owen, associate professor of biology.

### **Education Track**

This track is recommended for students majoring in elementary school education who desire a general science background with an emphasis in biology. It is not recommended for students planning on graduate school or research careers. Students wishing to teach on the secondary level must take the courses detailed above to fulfill the major in biology.

**Requirements:** Students taking the education track should enroll in BIOL 113 General Biology and CHEM 111 Introductory Chemistry: Inorganic in their first year. In subsequent years, students should enroll in four biology courses numbered above 200, one of which should be either BIOL 245 Principles of Ecology or BIOL 333 Marine Biology. Students must also take PHYS/BIOL 103 Great Discoveries in Science and any two of the following:

CHEM 112	Introductory Chemistry: Organic
NUTR 110	Sociocultural Implications of Nutrition
PHYS 110	Introductory Physics

The independent learning requirement can be satisfied by successfully completing EDUC 382 Practicum: Elementary School (Grades 1–6) or two semesters of BIOL 350 or BIOL 370.

### **Joint Major in Biochemistry**

The major in biochemistry is jointly administered by the Departments of Biology and Chemistry and is designed for students with a strong interest in both chemistry and biology. The rapidly growing field of biochemistry involves the application of chemical concepts and techniques to the understanding of life processes in agriculture, medical research, biotechnology, nutritional research, and other areas at the interface of chemistry and biology. Students majoring in biochemistry will be well equipped for professions in research and industry, as well as the pursuit of graduate study in biochemistry, medicine, genetics, and related fields.

**Requirements:** The program consists of a core of chemistry and biology courses beginning in the first year and continuing for the first three years, a choice of two 300-level elective courses in chemistry and/or biology, and a one-year independent study project culminating in a thesis. In addition, there are six prerequisite courses in biology, chemistry, calculus, and physics. See pages 78–79 for the complete biochemistry curriculum.

### ***Joint Major in Environmental Science***

Environmental science is a joint major offered by the Departments of Biology and Chemistry. This major recognizes the importance of environmental problems in the contemporary world and the expansion of career opportunities in this area. Environmental careers fall into three broad categories: environmental protection, natural resource management, and planning/communication. With regard to career preparation, the Simmons major is most closely associated with the environmental protection area. This field depends particularly on the application of science to problems such as air quality, water quality, solid waste, hazardous waste, and habitat destruction. Persons pursuing careers in environmental protection need strong preparation in the basic sciences combined with the broad outlook that can distinguish environmentally responsible development from narrowly-focused projects that ignore any environmental impact.

The environmental science major incorporates strong preparation in basic sciences (biology, chemistry, physics, and statistics), four science courses with specific emphasis on environmental problems, and non-science courses that explore the relationships between environmental protection and economics and government. An internship in an environmental science laboratory or with an environmental protection agency/organization is encouraged.

For a detailed description of the environmental science major and curriculum, please refer to page 79–80.

### ***Joint Major in Psychobiology***

Students of both biology and psychology may wish to consider the joint major in psychobiology administered by the two departments. Psychobiology draws from subject matter in the physical sciences, social sciences, and mathematics as well as the parent disciplines of biology and psychology. It serves as an excellent preparation for a career in psychobiology and graduate work in either of the parent disciplines.

**Requirements:** A core sequence of courses equally balanced between biology and psychology and electives designed to tailor the major to the student's particular interest are required for completion of the psychobiology major. The complete curriculum of required, elective, and prerequisite courses is listed on pages 204–205.

### ***Minor in Biology***

A minor in biology requires BIOL 113 General Biology and four additional courses in biology, all of which must be numbered 200 or above. Students should contact the department chairperson to discuss course selection.

### ***BS Biology/ MS Nutrition Program***

Students complete this accelerated BS/MS program in five years and receive a bachelor of science degree with a major in biology and a minor in chemistry and a masters of science degree in nutrition. Graduates of this program will find opportunities and careers in a variety of fields promoting health, which include research, government programs, weight loss centers, and exercise facilities.

Application to this program occurs in the second semester of the student's junior year and is directed to the Chair of the Nutrition Department. A grade point average of 3.0 is required, but no GRE scores are necessary.

The curriculum for this program is described below. Two graduate courses, SHS 410 Research Methods and SHS 450 Health Care Systems: Interdisciplinary Perspectives, are taken in their senior year and are counted to their undergraduate degree credits and also fulfill two of their

graduate course requirements giving the students a significant tuition reduction.

Requirements for the undergraduate biology major, chemistry minor, and graduate degree in nutrition:

**Year One**

- BIOL 113 General Biology
- CHEM 113 Principles of Chemistry
- MCC 101 Culture Matters
- Modern Language (101)
- BIOL 218 Zoology
- or BIOL 221 Microbiology
- CHEM 114 Organic Chemistry I
- MCC 102 Culture Matters
- Modern Language (102)

**Year Two**

- CHEM 225 Organic Chemistry II
- Modern Language (201)
- MATH 120 Calculus I
- Mode 1 Elective
- CHEM 226 Quantitative Analysis
- BIOL 225 Cell Biology
- NUTR 112 Introduction to Nutrition Science
- Elective

**Year Three**

- BIOL 231 Anatomy and Physiology I
- CHEM 347 Advanced Topics in Biochemistry
- NUTR 237 The Practice of Community Nutrition
- Mode 2 Elective
- BIOL 232 Anatomy and Physiology II
- BIOL 300-level Elective
- MATH 118 Statistics (M3)
- Mode 5 Elective

**Year Four**

- SHS 410 Research Methods
- BIOL 350 Independent Laboratory Research
- BIOL 370 Internship
- BIOL 336 Genetics

Mode 6 Elective

- SHS 450 Health Care Systems
- BIOL 300-level Elective
- Elective

Working with her advisor, a student will take SHS 410 Research Methods and SHS 450 The Health Care System: Interdisciplinary Perspectives during the fall and spring of senior year. Students need to maintain a 3.00 GPA to continue in the program. Please visit <http://www.simmons.edu/shs/academics/nutrition/curriculum.shtml> and view the *Nutrition Catalog 2006–2007* for graduate requirements.

***Double-Degree Program in Biology and Physician Assistant Studies***

Under the provisions of an interinstitutional agreement with the Massachusetts College of Pharmacy and Health Sciences (MCPHS), Simmons College offers a double-degree program for Simmons students leading to the Bachelor of Science degree in biology from Simmons and the Master of Physician Assistant Studies from MCPHS. MCPHS, a member of the Colleges of the Fenway consortium, is located on Longwood Avenue, one block from Simmons, and is accredited by the New England Association of Schools and Colleges and the American Council on Pharmaceutical Education. For further information about MCPHS, please see the description under the double-degree program in chemistry and pharmacy on page 80. Students interested in the program should contact the program advisor, Mary Owen, in the biology department.

Physician assistants play an important role in the health care community by providing health care services to diverse patient populations with a range of acute and chronic medical and surgical conditions. Physician assistants have excellent employment prospects in both urban academic health centers and remote rural communities. Simmons students who complete this program will have extensive background and

training in biology and chemistry, basic medical science, clinical disciplines, and discipline specific problem-solving skills. The physician assistant program at MCPHS is fully accredited, and students who successfully complete the program are eligible to sit for the national certifying examination for physician assistants.

The curriculum for the program includes four full years at Simmons and approximately two years of professional training (coursework and clinical clerkships which may include summer study) at MCPHS. The required undergraduate coursework is listed below by academic year. Students accepted into the program must maintain a minimum cumulative science GPA of 2.8 in the undergraduate program and 3.0 in the graduate component. Students must also take the Graduate Record Exam, including the writing section, in their third year and earn an overall score of 1500 (combined score of 1000 or greater on the verbal and quantitative sections). Students must obtain experience working with patients in the clinical environment. They must also undergo an interview process in their sophomore and junior years with the Simmons College program advisor and director of the physician assistant program at MCPHS.

To apply for admission to the program, students should contact the undergraduate admissions office. Internal transfers are accepted based upon available positions. Students accepted to the program should plan to meet with the program advisor in their first year.

Requirements for the undergraduate biology major and program requirements (first four years at Simmons):

#### Year One

MCC 101 Culture Matters I  
 BIOL 113 General Biology (M4)  
 CHEM 111 Introductory Chemistry: Inorganic Chemistry  
 or CHEM 113 Principles of Chemistry  
 Modern Language (101)  
 MCC 102 Culture Matters II

BIOL 221 Microbiology (200-level Biology elective)  
 CHEM 114 Organic Chemistry I  
 Modern Language (102)

#### Year Two

PSYC 101 Introduction to Psychology (M6)  
 CHEM 225 Organic Chemistry II  
 MATH 120 Calculus I (M3)  
 Modern Language (201 or 210; M2)  
 BIOL 225 Cell Biology  
 CHEM 226 Quantitative Analysis  
 MATH 121 Calculus II  
 SOCI 101 Principles of Sociology (M5)

#### Year Three

BIOL 336 Genetics  
 CHEM 347 Advanced Topics in Biochemistry (300-level elective)  
 BIOL 231 Anatomy and Physiology I  
 SOCI 242 Death and Dying  
 NUTR 334 Medical Nutrition Therapy (300-level elective)  
 SOCI 247 Orientation to Health Professions  
 BIOL 232 Anatomy and Physiology II  
 PSYC 231 The Nature of Abnormal Behavior

#### Year Four

MATH 238 Applied Statistical Models  
 PHYS 112 Fundamental of Physics I  
 BIOL 350/370 Independent Study/Internship Elective (M1/M2)  
 MCPHS Gross Anatomy (cross-register; 300 level elective)  
 Elective (M1/M2)  
 BIOL 350/370 Independent Study/Internship  
 PHIL 131 Biomedical Ethics (M6)

#### Years Five and Six at MCPHS

*The double-degree program is currently evaluating the required courses for the master's degree. Consult Mary Owen or MCPHS for further information.*

## COURSES

### **BIOL 102 Biology of Human Development (M4) (F-1)**

4 sem. hrs. Not a prerequisite for further courses in the department.

Explores human development across the life span and the issues and processes that recur throughout that span. Examines human development from the embryonic period through aging and provides a practical understanding of individual growth and change. Owen.

### **BIOL/PHYS 103 Great Discoveries in Science (M4) (F-1,2)**

4 sem. hrs. Not a prerequisite for further courses in the department.

Focuses on breakthrough ideas concerning the universal laws of nature, the origin and composition of the universe, the nature of matter, and the origin and evolution of life. Encourages learning through inquiry and cooperative strategies to foster an appreciation of the processes, accomplishments, and limitations of science. Weekly laboratory meetings support the classroom learning. Johnson.

### **BIOL 107 Plants and Society (M4) (S-2)**

4 sem. hrs. Not a prerequisite for further courses in the department.

Covers basic plant form, function, and life cycle as well as plant diversity as related to human use and potential uses of plant biotechnology. Surveys the historical and current use of plants by humans as sources of food, beverages, medicines, clothing, and shelter. Includes lecture and laboratory sessions. Douhovnikoff.

### **BIOL 109 Biology of Women (M4) (F-2; S-1)**

4 sem. hrs. Not a prerequisite for further courses in the department.

Considers biological factors that contribute to sex identification and the role of women in contemporary society. Emphasizes the genetic, developmental, anatomical, and physiological differences between the sexes and the behavioral consequences of those differences. Includes lecture and laboratory sessions. Scott.

### **BIOL 113 General Biology (M4) (F,S-1,2; U-1)**

4 sem. hrs.

Introduces basic principles of biology, including cell structure and function, biochemistry, and metabolism; Mendelian and molecular genetics; and discussion of the theory of evolution. Includes lecture and laboratory sessions. Scott, Douhovnikoff.

### **BIOL 218 Principles of Zoology (S-1,2)**

4 sem. hrs. Prereq.: BIOL 113, or consent of instructor.

Studies animal form and function, origin of animal diversity, and the strategies that animals use to thrive in diverse environments. Considers taxonomy and phylogeny of major animal groups. Staff.

### **BIOL 221 Microbiology (S-1,2; U-1)**

4 sem. hrs. Prereq.: One semester each of college biology and chemistry; concurrent enrollment in CHEM 112 or CHEM 114.

Introduces the biology of microorganisms: bacteria, viruses, and fungi. Stresses control of microbial populations, systematic study, and use of quantitative methods. Includes lecture and laboratory sessions. Scott.

### **BIOL 222 Animal Physiology (F-1,2)**

4 sem. hrs. Prereq.: BIOL 113 and BIOL 218.

Studies basic organ system function in vertebrates and selected invertebrates. Uses living and preserved animals as well as computer simulation to reveal underlying principles of integration of cardiovascular, respiratory, excretory, digestive, reproductive, nervous, and endocrine function in animals. Includes lecture and laboratory sessions. Gray, Owen.

### **BIOL 225 Cell Biology (S-1,2)**

4 sem. hrs. Prereq.: One year each of college biology and chemistry or consent of the instructor.

Presents a thorough study of the cell, including structure, function, cell diversity, and methods of analysis. Examines major biochemical pathways of the cell in relation to particular organelles. Laboratory exercises introduce a wide range of techniques used by cell biologists. Lopilato, Owen.

**BIOL 231 Anatomy and Physiology I (F-1,2; U-1)**

4 sem. hrs. Prereq.: One year each of college biology and chemistry.

Presents an integrated approach to the fundamental facts and concepts of human anatomy and physiology. Emphasizes the cellular basis of membrane excitability and hormone action, neurobiology, and musculoskeletal system and motor control. Laboratory includes histology, gross anatomy, and physiological experiments. Lite.

**BIOL 231N Anatomy and Physiology I (S-1,2)  
[For nursing majors]**

4 sem. hrs. Prereq.: One semester each of college biology and chemistry.

See description for BIOL 231 Anatomy and Physiology I. Gray, Staff.

**BIOL 232 Anatomy and Physiology II (S-1,2; U-2)**

4 sem. hrs. Prereq.: One year each of college biology and chemistry; BIOL 231 recommended.

Introduces structural relationships and functional integration of major systems of the human body, with emphasis on reproductive, respiratory, renal, gastrointestinal, cardiovascular, and defense systems. Laboratory includes histology, gross anatomy, and physiological experiments. Lite, Staff.

**BIOL 232N Anatomy and Physiology II (F-1,2)  
[For nursing majors]**

4 sem. hrs. Prereq.: One year each of college biology and chemistry.

See description for BIOL 232 Anatomy and Physiology II. Gray, Staff.

**BIOL 245 Principles of Ecology (F-1)**

4 sem. hrs. Prereq.: One year of college biology or consent of the instructor.

Examines interrelations of plants and animals and the environment. Covers biological adaptations and biogeochemical cycles. Analyzes geographical, chemical, and biological aspects of the environment and their application to conservation, with an emphasis on New England. Includes fieldwork in mountain, marsh, bog, and rocky shore ecosystems. Douhovnikoff.

**BIOL 331 Immunobiology (S-1)**

4 sem. hrs. Prereq.: BIOL 225 and CHEM 225, or consent of the instructor.

Considers the basic principles of immunology with applications of immunologic theory and techniques to microbiology, biochemistry, genetics, developmental biology, and evolution. Canfield.

**BIOL 332 Exercise Physiology (S-1,2)**

4 sem. hrs. Prereq.: BIOL 222 or BIOL 231.

Studies the physiological and adaptive responses of the human body to acute and chronic exercise stress. Examines how exercise affects major organ systems across the spectrum of healthy and unhealthy populations. Laboratory uses a variety of exercise equipment to apply physiological concepts to exercise testing, prescription, and training. Lite.

**BIOL 333 Marine Biology (S-1)**

4 sem. hrs. Prereq.: BIOL 218 and one year of college chemistry.

Introduces the marine environment and its diverse communities, focusing on the classification and adaptations of marine organisms. Studies geological, physical, and chemical aspects of the environment. Includes laboratory sessions and field trips. Staff.

**BIOL 334 Neurobiology (F-2)**

4 sem. hrs. Prereq.: BIOL 225 or BIOL 231, or consent of the instructor.

Introduces human brain function using comparative and evolutionary concepts with emphasis on molecular, cellular, and neurophysiological techniques. Uses neuropathologies and disorders to illustrate basic concepts. Laboratory introduces students to neuroanatomy and basic techniques in neuroscience research. Gray.

**BIOL 335 Developmental Biology (S-2)**

4 sem. hrs. Prereq.: BIOL 225, BIOL 336, and CHEM 225.

Studies the morphological changes that occur in the development of organisms and the molecular events that underlie these processes. Laboratory sessions explore the development of many organisms, including vertebrates, invertebrates, and plants. Owen.

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**BIOL 336 Genetics (F-1,2)**

4 sem. hrs. Prereq.: CHEM 225 and BIOL 225 or consent of the instructor.

Studies the principles of classical and molecular genetics in both eukaryotic and prokaryotic genetics systems. Emphasizes problem solving to illustrate techniques of genetic analysis. Includes lecture and laboratory sessions. Lopilato.

**BIOL 337 Molecular Biology (S-1)**

4 sem. hrs. Prereq.: CHEM 225 and BIOL 225 or consent of the instructor.

Examines gene structure and function; regulation of DNA, RNA, and protein synthesis; the control of gene expression; and the use of recombinant DNA technology as an investigative tool. Lopilato.

**BIOL 338 Microbial Pathogenesis (F-1)**

4 sem. hrs. Prereq.: BIOL 225 and CHEM 225.

Considers host-pathogen relationships by exploring the molecular and cellular mechanisms by which selected viruses, bacteria and parasites invade host cells, commandeer cellular machinery, evade the host immune response, and cause cellular damage. Drug and vaccine development will also be considered. Staff.

**BIOL 339 Special Topics in Biology (S-2)**

4 sem. hrs. Prereq.: Consent of the instructor.

An intensive study of a specific topic in biology. Topics vary from year to year in response to faculty expertise, student interest, and current developments in biology. Staff.

**BIOL 340 Plant Biology (F-2)**

4 sem. hrs. Prereq.: One year each of college biology and chemistry or consent of the instructor.

Introduces the physiology, biochemistry, and control of growth and development in higher plants. Topics include photosynthesis, hormonal regulation of development, transport mechanisms, plant tissue culture, nitrogen fixation, and plant pathogen relations. Includes lecture and laboratory sessions. Douhovnikoff.

**BIOL 342 Topics in Behavioral Biology (F-1)**

4 sem. hrs. Prereq.: One year of college biology or consent of the instructor.

Studies invertebrate and non-human vertebrate behavior, including such topics as anatomical and

physiological bases of behavior, effects of stress on behavior, genetics and ontogeny of behavior, courtship and aggression, communication, and migration. Lecture and laboratory sessions provide opportunities for extended experiments. Gray.

**BIOL 345 Tropical Marine Biology (S-2)**

Explores the interrelationships of marine organisms and their environment. Includes lecture and laboratory components at Simmons College and a ten-day field trip experience at a field station on the island of San Salvador, Bahamas. Provides the opportunity to explore the open ocean and coral reefs and contributes to a better understanding of the delicate biological balance on isolated islands. Owen.

**BIOL 349 Directed Study (F-1,2; S-1,2)**

4 sem. hrs. Prereq.: Consent of the instructor.

Directed study addresses coursework required for the major or degree not being offered formally that semester. Students work under the close supervision of a faculty member. Consent is required for a directed study, which does not count toward the independent learning requirement. Staff.

**BIOL 350 Independent Laboratory Research (F-1,2; S-1,2)**

4–8 sem. hrs. Prereq.: Senior standing, consent of the department.

Usually taken for two semesters (eight semester hours) but may be elected for one semester (four semester hours) at the discretion of the faculty sponsor. Staff.

**BIOL 370 Internship (F-1,2; S-1,2)**

4–8 sem. hrs. Prereq.: Senior standing, consent of the department.

Provides a supervised professional experience off campus. Potential sites include clinical settings, government agencies, conservation groups, and zoos. Placement is the student's responsibility, with the support of the Career Education Center and the approval of the department. Staff.