



Northeastern



Biology

College of Science
Graduate Programs
2011-2012

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Our Mission:

To educate students for a life of fulfillment and accomplishment.

To create and translate knowledge to meet global and societal needs.

Northeastern University is an equal opportunity/affirmative action Title IX education institution and employer.

Tuition rates, all fees, rules and regulations, courses, and course content are subject to revision by the President and the Board of Trustees at any time.

Northeastern University is accredited by the New England Association of Schools and Colleges, Inc.

July 2011

Material subject to revision.

Faculty

Chair

Gunther Zupanc, PhD, University of California, San Diego; Dr. rer. nat. habil.,
University of Tübingen

Fields: Behavioral and Development Neurobiology; Regenerative Biology

Professors

Joseph L. Ayers, Jr., PhD, University of California–Santa Cruz

Field: Neurophysiology

Albert-László Barabási, University Distinguished Professor, PhD, Boston University
*Jointly appointed with the Department of Physics and the College of Computer
and Information Science*

Fields: Biological physics, condensed matter theory

Frederick C. Davis, PhD, University of Texas–Austin

Fields: Neurobiology, circadian rhythms

H. William Detrich, PhD, Yale University

Fields: Biochemistry, molecular biology

Slava Epstein, PhD, Institute of Oceanology, Moscow

Field: Microbial ecology

Gwilym S. Jones, PhD, Indiana State University

Fields: Vertebrate systematics, ecology

Kim Lewis, PhD, Moscow University

Field: Microbiology

James M. Manning, PhD, Tufts University

Field: Protein structure and function

Richard L. Marsh, PhD, University of Michigan

Fields: Environmental physiology, muscle physiology

Susan Powers-Lee, PhD, University of California–Berkeley

Field: Enzyme structure and function

Dagmar Sternad, PhD, University of Connecticut
*Jointly appointed with Electrical & Computer Engineering
and the Department of Physics*
Fields: Motor Control and Neuroscience

Michail Sitkovsky, Eleanor M. Black Chair, PhD, Moscow State University
*Jointly appointed with the Department of Pharmaceutical Sciences, Bouve
College of Health Sciences*
Fields: Biochemistry and Immunopharmacology

Phyllis R. Strauss, PhD, Rockefeller University
Field: Cell biology

Associate Professors

Kostia Bergman, PhD, California Institute of Technology
Field: Bacterial signal transduction

Donald P. Cheney, PhD, University of South Florida
Fields: Algal ecology, biotechnology

Donald M. O'Malley, PhD, Harvard Medical School
Field: Neurobiology

Jacqueline M. Piret, PhD, Massachusetts Institute of Technology
Fields: Microbiology, molecular biology

Rebeca B. Rosengaus, PhD, Boston University
Fields: Behavioral ecology, insect sociobiology

Wendy A. Smith, PhD, Duke University
Graduate Coordinator
Field: Cellular endocrinology

Geoffrey Trussell, PhD, College of William and Mary
Field: Evolutionary and community marine ecology

Assistant Professors

Matthew E. Bracken, PhD, Oregon State University

Fields: Marine biology and ecology

Erin Cram, PhD, University of California–Berkeley

Fields: Molecular and cell biology

Veronica Godoy-Carter, PhD, Tufts University

Fields: Microbiology, molecular biology

Steven V. Vollmer, PhD, Harvard University

Fields: Evolutionary ecology, genetics and speciation

The graduate programs in biology at Northeastern University seek to enhance students' education in biology and enable them to achieve sophistication in a chosen area of specialization. To reach these goals, students learn to formulate and solve problems of fundamental importance.

The Graduate Programs

The complex research problems facing biology today demand the ability to address questions at all levels of biological organization: molecular, physiological, organismal and population. Our faculty have expertise across this whole spectrum that can be grouped into four key research areas:

- Biochemistry, Cell, and Developmental Biology
- Microbiology
- Biology of Movement Systems
- Regenerative Neurobiology
- Marine Ecology and Environmental Science

In addition to well-equipped research laboratories, facilities include: microarray analysis, bioinformatics computer cluster, electron microscopy center, research museum for vertebrate study, controlled-environment rooms, cell culture facilities, and a wide variety of preparative and analytical instruments, including FACS, real time pcr, phosphoimager, confocal microscopes, electrophysiological devices, and equipment for image analysis. Facilities of the Marine Science Center, nearby at Nahant, include an ocean-going research vessel, a running seawater system, and a robotics laboratory. Please visit www.biology.neu.edu for more information about research in the Department of Biology.

Procedures for Admission

Northeastern University offers two degree programs in biology: Doctor of Philosophy (PhD) and Master of Science in Biology (MS, full- or part-time). The Department of Biology also participates in three Professional Science Masters (PSM) programs which are sponsored by the Sloan Foundation: MS in Bioinformatics and Computational Molecular Biology, MS in Biotechnology, and the MS in Marine Biology. Please contact the Department of Biology office at gradbio@neu.edu to obtain further information. Application materials for all programs except the MS in Biotechnology are available on-line at www.neu.edu/casgraduate. The priority admission deadline is January 1. Those interested in the MS in Biotechnology should contact the Biotechnology Initiative at biotech@neu.edu or reference their web site at www.biotech.neu.edu.

Financial Aid

All full-time students enrolled in the Biology department's doctoral or master's degree programs are eligible to be considered for departmental financial aid. As noted in the general University policies, all students who hold assistantships are expected to devote full time to their studies and the duties of the award.

Teaching assistantships in the Department of Biology provide remission of tuition and a stipend for the academic year. Some summer-semester stipends are also available to augment the academic-year stipends. These assistantships require twenty hours of work per week. Individual faculty with research grants provide support for research assistantships. The research assistant award provides remission of tuition and a stipend equivalent to that of the teaching assistant. A limited number of tuition scholarships that provide tuition remission only are also available.

Awards are made on the basis of academic record, GRE scores, consideration of the awards available, and the candidate's experience and skills for teaching or research in the various fields. For initial award, international students must demonstrate proficiency in writing and speaking English with an official TOEFL report (minimum score of 100 for Internet-based test); or IELTS report (minimum score of 6.5) of a test taken within the last two years. After the first year, reappointments are considered on the basis of academic performance and on professor and student evaluations from the assigned classes. Departmental financial aid is available on a limited basis; therefore, early application is encouraged.

Satisfactory Academic Progress

Satisfactory progress means satisfying requirements in the Graduate School's General Regulations and in the regulations specified in the departmental booklet. The Graduate School sets minimum standards for all students to fulfill. Departments and programs may have additional requirements that exceed those of the Graduate School.

Receipt of financial support administered by the Graduate School is contingent on satisfactory academic progress toward the degree and on meeting department-specific guidelines. See the Graduate School's General Regulations for further details.

The Doctor of Philosophy Degree

The PhD program provides both a broad background knowledge base and an in-depth study of a specialized area of biology. The program emphasizes close interaction between graduate students and faculty in developing the intellectual and experimental skills required for creative independent research.

Admission

To be considered for admission to the doctoral program, a student must have a bachelor's or master's degree, preferably in a biological science. Individuals with degrees in other natural sciences may be considered, depending on their interests and background.

Unofficial transcripts, a personal statement, and three letters of recommendation are submitted on-line via the Apply Yourself system. An official general GRE test score report of a test taken within the last five years is required. Submitting subject GRE test scores in biology, biochemistry, cell and molecular biology, chemistry, or physics is recommended. International applicants are required to submit an official TOEFL report (minimum score of 100 for Internet-based test) or IELTS report (minimum of 6.5) of a test taken within the last two years. Admissions decisions are made by the department's Graduate Committee and recommended to the Graduate School.

Academic Requirements

PhD students entering with a bachelor's degree are required to complete 30 semester hours of graduate coursework. Of these, 20 semester hours must be Biology Department courses that carry a letter grade, with an option to petition substitution of courses from other departments.

A minimum GPA of 3.000 for all graduate work is required for the award of the PhD degree. All regulations of the Graduate School regarding maintenance of academic standing apply. Requirements for students entering with a master's degree depend on the recommendations of the doctoral dissertation adviser and examination committees.

Qualifying Examination

The PhD Candidacy Examination consists of both written and oral examinations, with the written examination preceding the oral examination. The written examination is intended to evaluate the student's knowledge at the graduate level. This examination covers both basic principles and knowledge of current literature in selected areas of biology related to the student's specialization. The oral

examination, or the PhD research proposal defense, is intended to ascertain the student's readiness to pursue a research program in the area chosen and focuses on areas related to the research proposal.

After students have taken their Oral Exams, and hence, achieved candidacy, they will be required to meet with their dissertation committee on a yearly basis.

Timetable

For students who enter with the bachelor's degree, the written qualifying examination will be scheduled toward the end of the second semester of the second year of graduate study. For students who enter with an M.S. degree, the written examination may be taken in the spring of either their first or second year in the program. For students who transfer from the M.S. program, the written examination will be scheduled for the earliest exam time one year after formal application to transfer. Requests to alter this schedule should be submitted in writing to the graduate committee. The oral examination (the PhD research proposal defense) should be completed within 6 months after the completion of the written examination. A student must successfully complete both the written examination and the oral research proposal defense in order to become a PhD candidate.

Dissertation

The dissertation is the most important part of the PhD degree and must be an original and independent scientific study. The dissertation adviser and student work closely to develop the problem and arrange for a PhD dissertation committee of at least five members. One member must be an acknowledged expert from outside the Department. PhD students must have one first-authored publication accepted for publication before defending the dissertation.

Residence Requirement

After admittance to doctoral candidacy, the student may satisfy the residence requirement through one year (or two 6-month periods) of full-time graduate work on campus.

The Master of Science Degree

The Master of Science in biology can be pursued on a part-time or full-time basis.

Admission

Application to the Master of Science program requires submitting the same materials described for the PhD program.

Academic Requirements

The academic requirements for the MS degree are the same as for PhD students who entered with a BS degree.

A minimum GPA of 3.000 for all graduate work is required for the award of the MS degree. All regulations of the Graduate School regarding the maintenance of academic standing apply.

This program involves laboratory or field research leading to the written and oral defense of a thesis. Students are directed by an adviser and two other committee members. The adviser and at least one other member must be Biology department faculty members.

MS Literature Thesis

A Master of Science literature thesis option is available and involves a program of extensive literature research leading to a comprehensive written review of an important biological problem and an oral examination. This study is undertaken with a member of the biology graduate faculty and a committee of two other biology faculty members.

Master's Program Students Applying to the PhD Program

A candidate for the MS degree may apply to the PhD program after completing 15 semester hours of coursework in the master's program. The application must include an up-to-date transcript of courses taken since admission to the master's program and letters of reference from two Northeastern faculty members, including a letter of commitment from the student's proposed doctoral dissertation adviser. Students applying to the PhD program must meet all course requirements for the PhD.

The Master of Science Degree in Bioinformatics and Computational Molecular Biology

The Master of Science in Bioinformatics and Computational Molecular Biology is a professional program that is designed to train students to work in this exciting new field. All courses are available in the late afternoon or evening to accommodate those who are employed during the day.

A graduate Co-op or internship (6 months maximum) in a commercial, academic, or government laboratory is required. Applicants must have earned a baccalaureate degree in a biological science, chemistry, physics, computer science or engineering or other related discipline from an accredited institution. Professionals with a background in medicine, pharmacy, nursing, or other health discipline are also encouraged to apply.

The Master of Science Degree in Biotechnology

The Master of Science in Biotechnology is an interdisciplinary professional program with three tracks or concentrations: 1) Molecular Biotechnology, 2) Pharmaceutical Biotechnology, and 3) Engineering Biotechnology. Each track consists of core courses, elective courses and an internship (6 month maximum) in a commercial, academic, or government laboratory. All courses are available in the late afternoon or evening to accommodate those students who are employed during the day.

The Master of Science Degree in Marine Biology

The Master of Science in Marine Biology is a full-time, 15-month professional program offered in conjunction with the Three Seas Program. The program is designed primarily for students who wish to pursue a career in marine science without completing a formal research thesis. However, post-baccalaureate students lacking a strong background in marine biology have used this program as a springboard into the top PhD programs in the U.S. and abroad. The combination of a rigorous curriculum in marine science coupled with an intensive field experience in a variety of marine ecosystems allows our students to fully develop and refine their goals for dissertation research and to perform at the highest academic levels.

In addition to the Three Seas Program curriculum, students complete a research project (but not a formal thesis), and a six-month graduate co-op or internship at a

private consulting firm, academic institution, or government agency.

Applicants must have earned a baccalaureate degree in a biological science, chemistry, physics, computer science or engineering or other related discipline from an accredited institution. Required coursework includes a year of introductory biology and two additional biology electives (ecology is recommended).

For more information on the Three Seas Program, visit the web site at www.threeseas.neu.edu or contact the program director, Dr. Sal Genovese, at s.genovese@neu.edu or 781.581.7370 x311.

Special Student Status

Special students are not matriculated in a degree program, and acceptance as a special student is not related to admission into a departmental degree program. However, special students subsequently admitted into a degree program apply credits earned as a special student (up to 12 semester hours) toward degree requirements. Special students are expected to maintain a GPA of 3.000. Further information on admission procedures and standards can be obtained from the graduate coordinator.

Interdisciplinary Programs

Admission

Application and credentials for admission to interdisciplinary programs involving the Biology department, where this department is clearly the department of registration (see the section on interdisciplinary programs in the *General Regulations* booklet), should be discussed with the graduate coordinator.

Course Listing

The following is a listing of recent departmental course offerings. Please refer to www.northeastern.edu/registrar for course descriptions and relevant prerequisites.

Course Name	Credit (sh)
Graduate Biochemistry	4
Graduate Molecular Cell Biology	4
Structural Biology	4
Genome Structure and Function	4
Biochemistry Methods Laboratory	5
Immunology	4
Advanced Immunology	2
Embryonic Stem Cells	4
Bioinformatics Methods and Algorithms	5
Advanced Topics in Biochemistry, Cell & Molecular Biology	2
Biological Imaging	4
Biological Electron Microscopy	4
Medical Microbiology (+lab)	5
Microbial Biotechnology	4
Parasitology (+lab)	5
Developmental Biology (+lab)	5
Biological Clocks	4
Endocrinology	4
Comparative Neurobiology	4
Neuroethology (+lab)	5
Sociobiology	4
Principles of Animal Physiology (+lab)	5
Biology of Muscle: Molecules to Movements	4
Plant Development	5
Entomology (+lab)	5
Herpetology (+lab)	5
Ornithology (+lab)	5
Mammalogy (+lab)	5
Wildlife Biology (+lab)	5
Evolution	5
Advanced Topics in Integrative Biology	2
Marine Botany (+lab)	5
Marine Invertebrate Zoology (+lab)	5
The Biology of Corals and Coral Reefs	3
Biology and Ecology of Fishes	3
Marine Birds and Mammals (+lab)	3
Adaptations of Aquatic Organisms	3
Tropical Terrestrial Ecology	1

Course name	Credit (sh)
Benthic Marine Ecology	3
Oceanography (+lab)	3
Ocean and Coastal Processes	3
Experimental Design in Marine Ecology (+lab)	5
Molecular Marine Biology	3
Marine Microbial Ecology (+lab)	3
Diving Research Methods	2
Supervised Experience in College Teaching	2
Ethics in Biological Research	2
Bioinformatics Seminar	2
Biology Laboratory Rotation	1 4
Biology Laboratory Rotation	2 4
Directed Readings in Biology	1–4
Research Problem Solving, Ethics, and Communication Skills	4
Dynamics of Microbial Ecology	4
Neurobiology and Behavior	4
Bioinformatics Computational Methods 1	4
Bioinformatics Computation Methods 2	4
Bioinformatics Programming	4



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