ECOLOGY AND EVOLUTION: PHD (BEE)

Stony Brook University Graduate Bulletin: www.stonybrook.edu/gradbulletin 1

Ecology and Evolution Department

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Degrees Awarded
M.A. in Biological Sciences: Concentration in Applied Ecology or Concentration in Applied Evolution; Ph.D. in Ecology and Evolution

Web Site
http://life.bio.sunysb.edu/ee/programs.htm

Ecology and Evolution Department

The Department of Ecology and Evolution and the Graduate Program in Ecology and Evolution (GPEE) at Stony Brook were the first such units in the United States and have served as models for corresponding units at many other institutions. The Faculty of the GPEE at Stony Brook includes two members of the National Academy of Sciences, several past presidents of national and international societies in ecology, evolution, and systematics, and authors of influential books in these disciplines. GPEE provides training that leads to the M.A. and Ph.D. Since its inception, the program has emphasized the integration of concepts from ecology and evolutionary biology.

The faculty and the graduate students in GPEE are engaged in research on Long Island and around the world, including Alaska, the continental US, the Caribbean, Mexico, Central and South America, and Africa. They study terrestrial, freshwater, and marine organisms in a wide range of taxa, including fish, amphibians, reptiles, primates, birds, mollusks, insects, vascular plants, fungi, and bacteria. Their research interests incorporate experimental, comparative, theoretical, and statistical approaches and utilize field and laboratory studies. Research in GPEE includes interspecific interactions, geographical variation and phylogeography, population genetics, experimental evolution, evolutionary genomics, evolutionary developmental biology, phylogenetics, evolutionary ecology, biological invasions, phenotypic plasticity, and paleontology. There is great interest in development of methods for systematics, morphometrics, and multivariate statistics. Many faculty members are active in the application of their research to problems in conservation.

Graduates are qualified for positions in academic or research institutions, government agencies, conservation organizations, and environmental consulting companies. Former students have become faculty members in biology, ecology and evolution, agricultural entomology, and marine biology departments at prestigious private and public universities as well as selective liberal arts and smaller state colleges. Although GPEE emphasizes basic research, many of its graduates have entered careers that apply ecological and evolutionary principles to problems in such areas as marine toxicology, agricultural entomology, invasive species, natural resource management, conservation, and risk assessment.

Master of Arts in Biological Sciences

Concentration in Applied Ecology and Concentration in Applied Evolution

The Graduate Program in Ecology and Evolution at Stony Brook University is among the finest of its kind in the world. Our program has graduate students studying toward both the master and doctoral degrees.

The masters program in Applied Ecology is intended to address the need for professionals in environmental sciences at federal, state, county, and other levels of government, environmental departments of large industrial companies and smaller environmental consulting firms, and non-governmental conservation and environmental protection organizations. The Applied Evolution concentration will also prepare students for work in these sectors, specifically for technical positions that require genetic, evolutionary and population based analytical skills. Career paths in biotechnology, forensics and biomedicine will also be available to graduates of this program. Both concentrations are useful for further specialized degree programs or careers in education. Both programs are particularly strong in quantitative skills, providing enhanced career opportunities for those with mastery in this area.

The plan of study is individually tailored within the course offerings and other training opportunities to match the student's personal goals. Courses offered by the Department of Ecology and Evolution provide training in ecology, evolution, conservation biology, mathematical methods, and statistics, with applications in these fields. Students must complete 30 graduate credits and a masters’ project for the degree. Credits can also be earned through a traineeships and participation in research projects on or off campus. This program can be completed in three to four semesters of full time enrollment.

Ph.D. Program in Ecology and Evolution
Graduate students in the GPEE are supervised by a temporary advisor and the Entering Student Advisory Committee (ESAC) during their first year. First year students take courses in ecology, evolution, and biometry, and they take a general preliminary examination at the end of the first year. They are encouraged to take specialized courses at Stony Brook and other institutions and to become involved in research during the first summer. Advanced courses and seminars are taken in subsequent years, and students appoint a permanent advisor and advisory committee during the second year. After completing a review paper in their third semester and passing an oral examination that concentrates on the areas of their proposed research and submitting a research proposal to the faculty, students undertake original research that is typically independent of their advisor’s research. An atmosphere of collegiality and intellectual interchange prevails throughout the GPEE and is fostered by discussion groups and an exciting weekly program of invited speakers during the academic year. A detailed description of the program, including degree requirements, and descriptions of the faculty research interests, and application materials are available on the web at http://life.bio.sunysb.edu/ee/programs.htm. Applicants are strongly encouraged to contact individual faculty members whose interests they share.

Requirements for Admission to the Ph.D. Program

In addition to Graduate School admission requirements, the department requirements include:

A. A bachelor’s degree in biology, chemistry, mathematics, or other courses of study that provide an appropriate background for advanced training in ecology and evolution.

B. Formal coursework in genetics, ecology, evolution and the biology of a particular group of organisms is strongly recommended. Prior biological research experience also strongly influences the likelihood of admission.

C. Report of Graduate Record Examination (GRE) General Test scores and, for non-native speakers of English, TOEFL scores.

D. Acceptance by the Graduate Program in Ecology and Evolution and by the Graduate School.

E. Prior correspondence with GPEE Faculty member(s) to discuss research interests and possibilities is strongly recommended.

Requirements for Admission to the M.A. Program

The application deadline for the Masters Program is March 15 for Fall admission. Most MA students enter the program in Fall semester. The Department does not offer support for MA students; loans and other financial aid may be available through the University. Stony Brook University has among the lowest tuition and fees of any university in the U.S.

Fill out an online application on the Graduate School website.

Applicants will also need to provide:

1. Official transcripts of undergraduate and (if applicable) graduate course work
2. Official Graduate Record Examination (GRE) scores (Stony Brook’s code for score reporting is 2548)
3. Three letters of recommendation
4. A non-refundable application fee of $100.00. (Please note that applications will not be processed without the $100.00 fee.)
5. Foreign students are required to take the TOEFL test for proficiency in English.

For more information on applying, call the Ecology and Evolution departmental office (631-632-8600). You can also email the Ecology and Evolution department's Graduate Program Coordinator, or use the Information Request Form.

For further Information, contact:

Dr. Lev Ginzburg, Director
MA Program in Applied Ecology and Applied Evolution
Department of Ecology & Evolution
Stony Brook University
Stony Brook, New York 11794-5245

Facilities of Ecology and Evolution Department

Ample laboratory, greenhouse, and environmental facilities and all of the standard laboratory equipment for molecular studies are available. All the equipment typically found in modern laboratories undertaking protein electrophoresis and DNA analysis is available, including automated DNA sequencer/fragment analyzer, high-speed and ultracentrifuges, sonicators, fraction collectors, spectrophotometers, liquid scintillation, and spectrofluorometers. The department houses laboratories of Drosophila genetics, bacterial genetics, and ecology. The department has excellent computing facilities. In addition to microcomputers in most labs, Unix-based servers are also available within the department for mail and more intense computations than can be provided by desktop computers.

Field and marine study areas are at Flax Pond, a University-affiliated laboratory near campus. Terrestrial studies are performed at the Ashley Schiff Nature Preserve, a 26-acre forested area on campus. The University is a member of the Organization for Tropical Studies, which maintains field stations in Costa Rica. There are other opportunities for field studies both in this country and abroad; faculty members have continuing
projects at Friday Harbor Marine Labs in Washington, Cook Inlet in Alaska, Ranomafana National Park in Madagascar, and Cajas National Park in Ecuador. Collaboration is possible with scientists at Brookhaven National Laboratory and Cold Spring Harbor Laboratory. Opportunities are also available for projects at field stations maintained by other university centers and colleges of the State University of New York. The School of Marine and Atmospheric Sciences is located on campus. Stony Brook is close enough to New York City and Washington, D.C., for arrangements to be made for consultation and work at museums and other institutions in those cities.

Requirements for the M.A. Degree in Ecology and Evolution

Concentration in Applied Ecology

The Concentration in Applied Ecology provides students with a strong foundation in ecological principles and the quantitative tools necessary for sound assessment of environmental issues. This training is valuable in environmental planning, resource use and regulation, conservation biology and data analyses for decision makers in government and the private sector.

Required Graduate Courses:
1. Principles of Applied Ecology and Evolution (4 cr.)
2. Applied Ecology and Conservation Biology Laboratory (3 cr.)
3. Mathematical Methods in Population Biology (3 cr.)
4. Landscape Ecology Laboratory (3 cr.) or Ecology Laboratory (3 cr.)
5. Biometry (4 cr.)

Electives include:
1. Molecular Diversity Laboratory (3 cr.)
2. Population Genetics and Evolution (3 cr.)
3. Environmental Toxicology and Public Health (3 cr.)
4. Environmental Law and Regulation (3 cr.)
5. Introduction to Ecological Modeling (3 cr.)
6. Principles of Evolution (4 cr.)

Concentration in Applied Evolution

In recent years, there has been growing recognition that what had previously been considered to be strictly ecological problems often have a significant evolutionary dimension. Environmental impacts often reduce the size of populations (the ecological component) but may also result in evolutionary changes within the impacted populations that adversely affect human welfare (e.g., evolution of antibiotic or pesticide resistance), reduce the sustainability of vulnerable populations, or their value to humans (e.g., higher levels of inbreeding, loss of genetic variability and valuable genetic traits). Evolutionary principles are also regularly applied in biotechnology, forensics, agricultural, pharmaceutical, and biomedical fields, and especially to problems of genome and protein sequence analysis.

Required Graduate Courses:
1. Principles of Applied Ecology and Evolution (4 cr.)
2. Population Genetics and Evolution (3 cr.) or an equivalent approved by the Program Director
3. Computational Biology (3 cr.) or AMS 533 - Numerical Methods and Algorithms in Computational Biology (3 cr.)
4. Molecular Diversity Laboratory (3 cr.)
5. Biometry (4 cr.)

Electives include:
1. Mathematical Methods in Population Biology (3 cr.)
2. Applied Ecology and Conservation Biology Laboratory (3 cr.)
3. Principles of Ecology (4 cr.)
4. Molecular Modeling of Biological Molecules (3 cr.)
5. Quantitative Genetics (3 cr.)
6. Human Evolution (4 cr.)
7. Primate Evolution (4 cr.)
8. Vertebrate Evolution (4 cr.)
9. Molecular Genetics (3 cr.)

Requirements for the Ph.D. Degree in Ecology and Evolution

A. Course Requirements

1. In the first year in residence, students are normally required to take BEE 550 Principles of Ecology, BEE 551 Principles of Evolution, BEE 552 Biometry, and BEE 556 Research Areas in Ecology and Evolution.

2. In later semesters, students must take a minimum of three other graduate courses, other than seminars, within this or other programs of this or other universities in order to advance to Ph.D. Candidacy.
3. BEE 671 and BEE 672 Colloquium in Ecology and Evolution must be taken each semester in residence.

4. A minimum of one graduate seminar per year is required under normal circumstances.

5. Most students will require advanced training in various ancillary disciplines appropriate to their chosen field of research. Requirements will be determined by the student’s advisory committee and may include a foreign language or advanced studies in mathematics, statistics, computer science, molecular biology, taxonomy, or other areas.

B. Entering Student Advising and Evaluation

Early in the first semester of study, each student meets with an advisory committee that recommends additional courses beyond required first-year courses. At the end of the second semester, a Preliminary Examination is given testing students' knowledge in the fields of ecology and evolution. In the third semester, each student writes a substantial paper reviewing a topic of interest in ecology and evolution.

C. Oral Examination

Preferably in the second or third year but no later than the end of the fourth year of study, each student takes an Oral Examination tailored to the student’s interests and administered by his or her advisory committee. The student and his or her committee decide in advance on the areas to be covered in this examination. This examination is concurrent with the submission of a Dissertation Research Proposal that is written by the student and must be approved by the advisory committee before advancement to Ph.D. candidacy.

D. Advancement to Candidacy

The faculty will recommend a student to the Graduate School for advancement to candidacy upon satisfactory completion of the Oral Examination and any language requirement established for the student, and upon acceptance of the written Dissertation Research Proposal by the faculty.

E. Research and Dissertation

A dissertation is required for the Ph.D. degree. It must contain the results of original and significant investigation. A student’s progress in research is monitored by regular evaluations by the faculty in meetings held twice a year. Continued lack of progress may result in probation or dismissal.

F. Dissertation Committee

Students select a temporary advisor during the first semester and a permanent advisor at the beginning of the third semester. The advisory committee, consisting of the permanent advisor and at least two other GPEE faculty members, is nominated by the student in consultation with his or her permanent advisor and must be approved by the Graduate Program Director. Additional members from outside GPEE and/or the University may be appointed to the dissertation committee.

G. Final Examination

The dissertation must be approved by the student’s advisory committee. A dissertation examining committee (which must include an external examiner) is then approved by the Dean of the Graduate School. A formal public oral dissertation defense is held, at which the student presents his or her findings and is questioned by members of the audience and then by the examining committee in a meeting immediately following the presentation.

H. Teaching Requirement

All graduate students completing a doctoral degree will function as teaching assistants during at least two semesters of their graduate careers.

I. Residence Requirement

At least two consecutive semesters of full-time graduate study are required. The demands of the course of study usually necessitate a longer period of residence.

J. Time Limit

The time limit imposed by the Graduate School is observed by GPEE. Students must satisfy all requirements for the Ph.D. degree within seven years after completing 24 credit hours of graduate courses in GPEE.

Faculty of Ecology and Evolution Department

Distinguished Professors

Dykhuizen, Daniel E., Ph.D., 1971, University of Chicago: Population genetics and molecular evolution, especially of bacteria

Fleagle, John G.¹, Ph.D., 1976, Harvard University: Primate evolution; comparative anatomy; behavioral ecology.

Futuyma, Douglas, Ph.D. 1969, University of Michigan: speciation, evolution of ecological interactions among species

Levinton, Jeffrey S., Ph.D., 1971, Yale University: Marine benthic ecology; population genetics of bivalve mollusks; paleoecology.
Rohlf, F. James, Ph.D., 1962, University of Kansas: Multivariate data analysis techniques applied to problems in taxonomy and ecology; computer modeling; applied ecology.


Professors
H. Resit Ackakaya, Ph.D. Stony Brook University, 1989: Applied ecology; conservation biology; population dynamics; landscape ecology.
Bell, Michael A., Ph.D., 1976, University of California, Los Angeles: Evolutionary biology; ichthyology; paleobiology; geographic variation.
Jernvall, J., Ph. D. 1995, University of Helsinki, Finland: Mammalian tooth development and evolution, vertebrate paleontology, diversity in recent and extinct communities.
Lopez, Glenn R., Ph.D., 1976, University at Stony Brook: Marine and freshwater benthic ecology; animal-microbe-sediment interactions; detritus.
Padilla, Dianna K., Ph.D., 1987, University of Alberta, Canada: Phenotypic plasticity, plant-herbivore functional ecology, ecology of invading species.
Wright, Patricia, Ph.D., 1985, City University of New York: Primates and tropical conservation.

Associate Professors
Armstrong, Robert, 1975, University of Minnesota: Mathematical modeling in marine ecology and biogeochemistry.
Battley, Edwin H., Emeritus. Ph.D., 1956, Stanford University: Thermodynamics of microbial growth; ecological energetics; microbial ecology; nitrification and denitrification in aquatic systems.
Bingham, Paul, Ph.D., 1979, Harvard University: Regulation of transcription in developing multicellular organisms; the role of transposons in evolution and speciation.
Chase, Ivan, Ph.D., 1972, Harvard University: Social behavior; dominance hierarchies; cooperation; resource distribution.
Graham, Catherine, Ph.D., 2003, University of Missouri – St. Louis: Landscape and behavioral ecology.
Hechtel, George J., Ph.D., 1962, Yale University: Systematics and zoogeography of marine demospongiae.
True, John, Ph.D., 1995, Duke University: Evolutionary and developmental genetics of color patterning in Drosophila.
Wiens, John J., Ph.D., 1995, University of Texas at Austin: Systematics and biology of reptiles and amphibians.

Assistant Professors
Baines, Stephen, Ph. D., 1993, Yale University-New Haven; Aquatic ecosystem ecology, biogeochemistry of carbon and trace elements.
Davalos, Liliana, Ph.D., 2004, Columbia University; Conservation biology, climate change, phylogeny.
Munch, Stephan, Ph.D., 2002, University at Stony Brook: Evolutionary ecology of growth and life history traits, Evolution in harvested populations, Applied population dynamics modeling, Mathematical modeling and statistics.
Rest, Joshua, Ph.D., 2004, University of Michigan; Genome evolution.
Number of teaching, graduate, and research assistants, fall 2009: 39
Students on fellowships: 11

1) Department of Anatomical Sciences
2) School of Marine and Atmospheric Sciences
3) Department of Anthropology
4) Department of Biochemistry
5) Department of Sociology
6) Director, Africa Program, Wildlife Conservation Society

NOTE: The course descriptions for this program can be found in the corresponding program PDF or at COURSE SEARCH.