

DEPARTMENT OF BIOLOGICAL SCIENCES

About

Chair

Chad W. Hargrave (CWH005@shsu.edu)

Departmental Mission

The Department of Biological Sciences is dedicated to the pursuit and dissemination of knowledge and scientific discovery in the life sciences through innovative teaching and research programs. The department strives to instill in its students the philosophy of lifelong scholarship, producing scientifically literate members of society who have the knowledge to contribute and compete in a rapidly changing world.

Contact Information

(936) 294-1540

Website

www.shsu.edu/~bio_www/ (http://www.shsu.edu/~bio_www/)

Highlights

The graduate program in biology is designed to prepare students for both a related doctoral program and for a career as a professional biologist in industry, government, and academia. This degree is research-oriented, requiring 26 hours of course work, and 6 hours of thesis. A diverse faculty allows students to choose among the gamut of biological research options, from studying the molecular basis of disease to investigating the ecological and evolutionary processes of macroorganisms. Faculty disciplines include:

- Cell and Molecular Biology
- Genetics
- Microbiology
- Physiology
- Forensic Science
- Systematics
- Animal Behavior
- GIS
- Ecology
- Entomology
- Botany
- Parasitology
- Ichthyology
- Herpetology
- Ornithology
- Mammalogy

Explore more about the faculty at Department of Biological Sciences (<http://www.shsu.edu/academics/biological-sciences/people/faculty.html>).

The Department of Biological Sciences houses an animal facility, greenhouses, and laboratories with a scanning electron microscope and modern molecular biology equipment. We maintain the Warner Herbarium, Sam Houston State Vertebrate Museum, Texas Bird Sound Library, and the Center for Biological Field Studies, a 250-acre field station that contains the Southeast Texas Applied Forensic Science Facility, dedicated to biological and environmental research and teaching.

Student Organizations and Activities

The Biological Sciences Graduate Student Organization (BSGSO) was established by graduate students. The purpose of the organization is to foster the interests of graduate students in the Department of Biological Sciences, to promote and support academic and social activities of interest to graduate students, and to serve as liaison between the graduate students, faculty, staff, and other organizations. Membership in BSGSO consists of being a graduate student in the Department of Biological Sciences. Anne Gaillard is the faculty advisor for BSGSO. Visit the BSGSO website (http://www.shsu.edu/~org_bsgso) for more information.

Scholarships

Academic scholarships, research and travel awards are available from the Department of Biological Sciences, the College of Sciences, and the Office of Graduate Studies. These awards include:

- The Joey Harrison Scholarship from the Department of Biological Sciences
- The College of Sciences Special Graduate Scholarship
- Office of Graduate Studies Scholarship
- Office of Graduate Studies Travel Awards

Departmental scholarship information may be obtained by writing to

Scholarships
Department of Biological Sciences
Box 2116
SHSU
Huntsville, Texas 77341-2116

or by visiting www.shsu.edu/~bio_www/scholarships.html (http://www.shsu.edu/~bio_www/scholarships.html) .

Please visit the College of Sciences and the Office of Graduate Studies websites for specifics on their application process.

Graduate Student Support

Competitive teaching and research assistantships are available to graduate students in Biology through the Department of Biological Sciences (<http://www.shsu.edu/academics/biological-sciences>) and individual faculty members. The Office of Graduate Studies and College of Sciences offers scholarships to graduate students to support travel to scientific meetings to present research findings. For details and application materials, contact

Graduate Committee Chair
Justin Williams
Department of Biological Sciences
Box 2116
Sam Houston State University
Huntsville, TX 77341-2116
(936) 294-2226
email bio_www@shsu.edu .

Details are also available at the Department of Biological Sciences (<http://www.shsu.edu/academics/biological-sciences/.html>) .

- Master of Science in Biology (catalog.shsu.edu/archives/2016-2017/graduate/college-departments/sciences/biological-science/biology-ms)
- See also Master of Science in Forensic Science (catalog.shsu.edu/archives/2016-2017/graduate/college-departments/criminal-justice/forensic-sciences/forensic-science-ms) in the College of Criminal Justice (catalog.shsu.edu/archives/2016-2017/graduate/college-departments/criminal-justice)

BIOL 5095. Independent Grad Study in BIOL. 4 Hours.

This course is designed to provide an avenue for selected graduate students to engage in independent studies. Registration is on an individual basis but is limited to students in residence. A topic of study is selected and approved by the Biology faculty. Variable Credit (1-3).

Prerequisite: Graduate standing in Biology and consent of department chair.

BIOL 5200. Professional Aspects Of Sci. 2 Hours.

An essential course on scientific professionalism for the beginning M.S. student. This course provides students with an introduction to the professional and ethical responsibilities of scientists. Students will also discuss philosophical and controversial issues in academia and science, as well as political issues that may influence the process and practice of science. Most importantly, this course encourages and helps students to develop skills needed for presenting their research to fellow scientists through the processes of publishing, giving conference presentations, writing grant proposals, and becoming active in the scientific community. Required of all graduate students in Biology.

Prerequisite: Graduate standing.

BIOL 5305. Forensic Entomology. 3 Hours.

The methods and materials necessary for use of insects as forensic evidence in legal investigation will be discussed. Laboratory included.

Prerequisite: Introductory entomology and graduate standing.

BIOL 5310. Class And Natrl/Hist Plants. 3 Hours.

Classification and natural history of major groups of nonvascular and vascular plants are presented. Emphasis is on morphological recognition, ecological and physiological differences and economic importance of major taxa. Laboratory included.

Prerequisite: Introductory botany course and graduate standing.

BIOL 5320. Statistical Design in Biology. 3 Hours.

This course surveys various experimental designs and associated statistical analyses common in biology. Using primarily the general linear model, we will explore in detail appropriate designs for the following statistical applications: independent t-test, Analysis of Variance, block, multivariate, paired t-test, repeated measures, correlation, regression, Analysis of Covariance, ordination, clustering, randomization, and goodness of fit. The class will consist of lecture, practical exercises in analyzing data (using SAS, SPSS, or another comparable analytical program), and class discussion of experimental designs published in the primary literature. This course is meant to be a follow up to Biostatistics (BIOL4374) in that the basic statistical theory will not be presented. Rather, this course will focus on the practical use of experimental design for analyzing and interpretation data. Grading in this class will be based on exams and individual practical exercises.

Prerequisite: BIOL 4374 (or equivalent), or permission of instructor.

BIOL 5340. Electron Microscopy. 3 Hours.

This course is designed to teach students the methods of preparing specimens for electron microscope analysis and to use the electron microscope as a tool to conduct research. Students will become competent in using the electron microscope for visual analysis or chemical elemental analysis.

Prerequisite: 12 hours advanced biology.

BIOL 5350. Plant Evolutionary Biology. 3 Hours.

The developmental program of many plants is sufficiently plastic to allow a suite of evolutionary scenarios not encountered in other major lineages. Mechanisms such as hybridization, polyploidy, somaclonal variation, chromosomal rearrangement, and the evolution of diverse and unique breeding systems have allowed plants to thrive in every terrestrial biome. Additionally, many of these mechanisms allow for rapid evolution that can be documented over the span of a few generations. This course will cover the myriad ways in which plants have diversified from their endosymbiotic ancestors as well as the hallmarks of evolution that characterize major plant lineages.

Prerequisite: Graduate standing in the Department of Biological Sciences and an introductory course in botany.

BIOL 5360. Principles Of Systematics. 3 Hours.

Systematics is the study of biological diversity, encompassing the evolutionary origins of this diversity and the construction of classification systems that recognize evolutionary lineages. This course will cover the history and philosophy of classification as a whole, from the development of nomenclature to modern techniques of molecular phylogenetics. Topics will include species concepts, nomenclature, interpreting and inferring phylogenies from many kinds of data, the use of DNA databases, DNA barcoding and alternatives to the Linnaean system of nomenclature.

Prerequisite: Graduate standing and an introductory course in statistics.

BIOL 5362. Advanced Plant Physiology. 3 Hours.

Further studies of the life processes of plants at the molecular, cellular and organismal levels with focus on current research and recent advances in this field. A scholarly paper on a selected physiological topic is required. Three hours of lecture per week.

Prerequisite: 12 hours advanced biology.

BIOL 5364. Cell Structure And Physiology. 3 Hours.

A study of signal transduction pathways in the cell. For the laboratory portion of the course, students will conduct independent investigations of cells defective in signal transduction and prepare a scientific paper of the results.

Prerequisite: Cell Biology and Organic Chemistry.

BIOL 5368. Advanced Invertebrate Zoology. 3 Hours.

Invertebrates are the dominant form of life on earth, comprising greater than 75% of all described species. Students will be briefly introduced to the phylum/class level characteristics of the major groups of invertebrate animals. The majority of the course will deal with the evolutionary history and phylogeny of invertebrates, invertebrate ecology, and the myriad solutions invertebrates have evolved to deal with the common problems of reproduction, feeding, osmoregulation, respiration, locomotion and developmental patterns.

Prerequisite: 12 hours advanced biology, invertebrate zoology recommended.

BIOL 5371. Evolution. 3 Hours.

This course is concerned with modern concepts of the evolution of organisms. Extended reading and classroom discussion supplement the lecture treatment. Three one-hour lectures a week are scheduled.

Prerequisite: Introductory genetics.

BIOL 5375. Bacterial Physiology. 3 Hours.

A study of bacterial metabolism that will include fermentation, anaerobic respiration, bacterial photosynthesis and nitrogen fixation. This course will also discuss how bacteria sense their environment and adjust their metabolism accordingly. Three hours of lecture per week.

Prerequisite: Microbiology, Genetics, and Organic Chemistry II or General Physiology.

BIOL 5378. Virology. 3 Hours.

A study of viruses that infect plants, animals, and bacteria. Areas considered include chemical and structural properties of viruses, virus-host relations, and infection and growth phenomena, including interference and regulation. Also included are the roles of viruses as agents of disease and malignancy, and as gene vectors in natural settings, but also as tools in biotechnology and gene therapy. Three hours of lecture per week.

Prerequisite: Microbiology, Genetics, and Organic Chemistry.

BIOL 5380. Advanced Ecology. 3 Hours.

An advanced theoretical and practical study of biotic and abiotic ecosystem interactions encompassing the physiology of individuals, growth of populations including social and species interactions within populations, analysis of population composition and change, the distribution of communities, and the functioning of ecosystems. Independent study of a selected ecological topic required.

Prerequisite: General Chemistry I and II, General Ecology.

BIOL 5381. Ecological Computer Modeling. 3 Hours.

An introduction to the development and application of computer models in ecology and population biology. Principles of modeling, programming concepts, specific model dynamics, and prepackaged computer models will be explored. Two hours of lecture and two hours of laboratory per week.

Prerequisite: General Ecology.

BIOL 5382. Ichthyology. 3 Hours.

Ichthyology will introduce general concepts in biology, taxonomy, systematics, evolution, zoogeography and ecology of fishes. Students will learn the characteristics and identifying features for most of the dominant fish families on Earth. Moreover, students will leave with a working knowledge on the taxonomy and nomenclature of the marine and freshwater fishes of Texas as well as the skills necessary to identify fishes from across the globe. This class includes a 2-hour weekly laboratory and field work.

Prerequisite: Introductory biology plus 12 hours advanced biology.

BIOL 5383. Herpetology. 3 Hours.

An introduction to the biology of amphibians and reptiles and one of the most important evolutionary events in natural history: the rise and diversification of terrestrial vertebrates. A comprehensive introduction will address the taxonomy, systematics, evolution, anatomy, physiology, ecology, distribution, and natural history of these unique vertebrates. Upon completion of this course, students will understand and appreciate why amphibians and reptiles serve as excellent biological models in research, and will become familiar with the major research questions and programs in herpetology. A laboratory and field component will introduce students to a variety of sampling and collecting techniques. Common museum practices for specimen preservation and documentation will also be addressed. Although regional species will receive the most emphasis, this course will address the biology of all amphibians and reptiles. Two-hour laboratory plus field work.

Prerequisite: Introductory biology plus 12 hours advanced biology.

BIOL 5384. Ornithology. 3 Hours.

The classification evolution, anatomy, physiology, ecology, behavior and conservation of birds are studied in this course. Laboratories include general anatomy, taxonomy, identification and field techniques used in the study of behavior and migration. Laboratories may include independent research projects related to topics discussed in this course. Two-hour laboratory plus field work.

Prerequisite: Introductory biology plus 12 hours advanced biology.

BIOL 5385. Mammalogy. 3 Hours.

The taxonomy, systematics, anatomy, ecology, distribution, and life history of mammals are studied in this course. Laboratories include general taxonomy, identification, and field techniques. Two-hour laboratory plus field work.

Prerequisite: Introductory biology plus 12 hours advanced biology.

BIOL 5386. Reproductive Physiology. 3 Hours.

Physiological control of animal reproduction is the subject of this course. Current literature relating to this subject is critically examined and evaluated. An individual research problem is undertaken by the student. Two-hour laboratory.

Prerequisite: Introductory courses in physiology and organic chemistry.

BIOL 5390. Limnology. 3 Hours.

This class examines physical, chemical, and biological characteristics of freshwater stream and lake ecosystems. Limnological techniques are stressed with special emphasis on physiochemical conditions of freshwater environments and their effects on aquatic life. Plankton analysis, a study of bottom fauna, lake and stream mapping and evaluation of aquatic productivity are included. Two-hour laboratory plus field work.

Prerequisite: 8 hours college chemistry plus 12 hours advanced biology.

BIOL 5391. Advanced Genetics. 3 Hours.

This is an advanced study of the principles of heredity and the nature and function of the gene. Emphasis will be on molecular genetics with special attention to recent advances in DNA technologies. Laboratory studies include completion of a mini-research project and preparation of a scientific paper. Two-hour laboratory.

Prerequisite: Introductory genetics with grade of C or better and organic chemistry.

BIOL 5394. Spcl Topics In Graduate Bio. 3 Hours.

This course of Graduate Faculty-led study is designed to provide exposure of graduate students to new biological topics and concepts in a course setting, prior to that course's formal Department, College, and University course adoption. This course may be repeated for different Advanced Special Topics (different courses).

Prerequisite: Graduate standing in the Department of Biological Sciences or consent of the instructor.

BIOL 5480. Comparative Animal Physiology. 4 Hours.

A study of the physiological adaptive mechanisms and the comparison of adaptive strategies across vertebrate taxa. Emphasis will be directed toward homeostatic mechanisms of water, energy and electrolyte balance, and metabolism. A two-hour laboratory to emphasize investigative skills employing modern laboratory techniques is included. Independent original research project required.

Prerequisite: Organic chemistry, general physiology, or instructor's consent.

BIOL 6099. Thesis. 1-3 Hours.

BIOL 6398. Thesis. 3 Hours.

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