

FLORIDA STATE UNIVERSITY DEPARTMENT OF BIOLOGICAL SCIENCE



UNDERGRADUATE HANDBOOK 2005 – 2006

THE DEPARTMENT OF BIOLOGICAL SCIENCE ADMINISTRATION

The Department of Biological Science administration and faculty are housed in multiple buildings on the Florida State campus including Conradi Building, Biology Unit I, and the Biomedical Research Facility. Biological science faculty are also housed in the Institute of Molecular Biophysics and the Nuclear Research Building. The department consists of 50 faculty members; over 60 administrative, technical, and support staff; 80 graduate students; and 1,300 undergraduate majors.

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THE BIOLOGICAL SCIENCE MAJOR

OVERVIEW

Florida State University's (FSU's) Department of Biological Science encompasses a large and complex array of research disciplines, state-of-the-art facilities, and computational support systems. Undergraduate students with a strong commitment to the study of science, who have good written, verbal, and mathematical/computational skills will find contemporary biological science an exciting major. Central to the excellence of the department, and to that of the undergraduate program, is our internationally recognized research and graduate training programs in ecology and evolutionary biology, neuroscience, physiology, structural biology, and molecular biophysics. Faculty research support is in excess of \$10 million (2002-2003) annually.

At FSU, the degree in biological science emphasizes a broad education in the principles of biology, reflecting the research scope of the department, while also providing significant elective time for emphasis in a traditional discipline of biology such as zoology or botany, or in more contemporary disciplines such as molecular biology, environmental science, marine biology, or neuroscience.

Students who major in biological science are generally preparing for continued study and research in graduate school, careers in secondary science teaching, positions in governmental regulatory agencies or private consulting companies or laboratories, or admission to a professional or allied health school. The majority of students expecting to continue their studies in the health professions of medicine, optometry, dentistry, osteopathy, veterinary medicine, pharmacy, physical therapy, and related fields may major in biological science. Whether in preparation for graduate study, a health profession, or direct entry into the work force, the quality of the FSU degree is reinforced annually in the successes of our graduates.

The biological science major requires a minimum of 38 semester hours of biological science courses, and a minimum of 32 semester hours of collateral courses in mathematics, chemistry, and physics. The major requirements are summarized on a one-page checklist provided on the last page of this handbook. The major commences with prerequisite, introductory courses in mathematics, chemistry, and biology, assuring an appropriate foundation for the advanced courses in the curriculum. Of the 38 biological science course hours required for the major, 19 hours are specified by the department as mandatory, and 19 hours are considered elective. Biology elective hours can be as focused or as eclectic as the student wishes. Students who wish to concentrate their electives in a particular sub-discipline of biology may follow an *academic track* in the major. The eight academic tracks offered by the Department of Biological Science are outlined on pages 6 through 15.

Students are strongly encouraged to meet frequently (i.e., at least once a semester) with one of the department's three, full-time undergraduate academic advisors. Academic advisors are professionals who can provide detailed information regarding the university, department, major, including scholarships, resources, choice of elective courses or academic tracks, semester schedules, four-year plans, and academic and career consultation. Additional information on academic advising is provided on pages 23 through 25.

The faculty and staff of the department strive to provide a positive learning environment through excellent teaching, appropriate support systems, and opportunities for "hands-on" experience. We encourage your involvement in the department and we look forward to your time with us at Florida State.

BIOLOGICAL SCIENCE MAJOR CODES

The department is committed to helping ensure the success of our majors. Therefore, enrollment in upper division (3000 level and higher) biology courses is restricted to students who have completed certain major prerequisite courses in chemistry and biology. These major prerequisite courses provide the foundation for understanding the material presented in the upper division biology courses. To assist in determining which students have fulfilled these major prerequisite courses, the Department of Biological Science has been assigned two major codes. As you begin study in the biological science major, you will be assigned the major code **111197** (Biological Science - *prerequisites incomplete*). Upon satisfactory completion of the major prerequisite courses outlined below, you will be assigned the major code **111110** (Biological Science - *prerequisites complete*). *Most students complete the major prerequisite courses by the end of the sophomore year and begin taking upper division biology courses by the beginning of the junior year.*

It is important that students complete the major prerequisite courses as quickly as possible because registration access for upper division biological science courses is limited to students with the 111110 major code. Procrastination on completing the major prerequisite courses may result in less than desirable schedules and/or an increase in the time required for obtaining a B.S. in biological science.

REQUIREMENTS FOR BEING DESIGNATED MAJOR CODE 111110 AND TAKING UPPER DIVISION (3000 LEVEL AND HIGHER) BIOLOGICAL SCIENCE COURSES

1. Completion (C- or better) of Biological Science I and II with labs (BSC 2010/2010L and BSC 2011/2011L) or their equivalents.
2. Completion (C- or better) of General Chemistry I and II with labs (CHM 1045C and CHM 1046C or CHM 1050/1050L and CHM 1051/1051L) or their equivalents.
3. A minimum 2.0 biology and collateral GPA and no more than five (5) unsatisfactory grades (F, D-, D, D+, U) in all biological science, chemistry, physics, mathematics, and statistics courses that apply to the major.

REQUIREMENTS FOR THE DEGREE

REQUIRED ACADEMIC PERFORMANCE AND STANDARDS

- A. All biological science courses applicable to the major must be completed with a grade of C- or better.
- B. All required collateral courses in chemistry, physics, mathematics, and statistics must be completed with a grade of C- or better.
- C. Designation, continuation, and graduation as a biological science major requires a minimum 2.0 biology GPA in all courses taken for the major (biological science, chemistry, physics, mathematics, and statistics). The biology GPA is calculated using all grades earned for courses in the major, whether taking the course for the first time, repeating the course, or repeating the course under the FSU Forgiveness Policy.
- D. A student who has earned more than five (5) unsatisfactory grades (F, D-, D, D+, U) in courses required for the major (biological science, chemistry, physics, mathematics, statistics), or their prerequisite courses, at FSU or elsewhere, whether or not repeated and whether or not taken under the FSU Forgiveness Policy, will not be permitted to graduate with a degree in biological science.
- E. A biological science student who has been dismissed from FSU for academic reasons, or who has not been enrolled for two consecutive semesters (including summer), or who must apply for readmission, must meet the degree requirements of the *General Bulletin* in force on the date of readmission. Readmission to the University does not imply readmission to the biological science department.
- F. A student who is not in good academic standing in the major (i.e., biology GPA < 2.0 or more than five unsatisfactory grades in courses that apply to the major) may request an exception to the required academic performance and standards noted above by filing a formal appeal to the Department of Biological Science Undergraduate Appeals Committee. To initiate the appeals process, students must meet with Dr. Robert Reeves, Associate Chairman for Undergraduate Studies (850-644-2248; 330 Conradi).

REQUIRED BIOLOGICAL SCIENCE COURSES

A. A total of thirty-eight (38) semester hours of biological science courses must be completed for the major. At least twenty (20) of the required thirty-eight semester hours must be taken at FSU. The 38 semester hours include the requirements described below.

1. Nine (9) semester hours of *required* introductory biology courses including:

BSC 2010	Biological Science I (3 hrs)
BSC 2010L	Biological Science I Lab (1 hr)
BSC 2011	Biological Science II (3 hrs)
BSC 2011L	Biological Science II Lab (2 hrs)

2. Ten (10) semester hours of *required* upper division biology courses including:

PCB 3063	Genetics (3 hrs)
BSC 3402L	Experimental Biology Lab (2 hrs)
BOT 3015	Plant Biology (2 hrs)
PCB 4674	Evolution (3 hrs)

3. Nineteen (19) semester hours of upper division elective biology courses including:

a. A total of two Area Courses, representing two different Areas:

Area I: Cell and Molecular Biology

MCB 4403/L	Prokaryotic Biology (3 hrs) & Lab (2 hrs)
PCB 3134	Cell Structure and Function (3 hrs)
PCB 4024	Molecular Biology (3 hrs)
PCB 4253	Animal Development (3 hrs)

Area II: Physiology

BOT 4503	Plant Physiology (3 hrs)
PCB 3743	Vertebrate Physiology (3 hrs)
PCB 4723	Comparative Animal Physiology (3 hrs)

Area III: Ecology and Environmental Science

BSC 3052	Conservation Biology (3 hrs)
PCB 3043	General Ecology (3 hrs)
ZOO 4513	Animal Behavior (4 hrs)

b. Additional upper division elective biology courses at the 3000/4000 level to complete the required thirty-eight (38) semester hours of biological science courses.

B. Completion of at least five (5) laboratory and/or field courses in biological science. In addition to the three required laboratory courses, two additional courses designated by an "L" or a "C" must be taken.

C. No more than six (6) semester hours of honors work in biological science (BSC 4970), six (6) semester hours of Directed Individual Study (BSC 4900) or Research Methods (BSC 4933), two (2) semester hours of Senior Tutorial (BSC 4931), and one (1) semester hour of Undergraduate Supervised Teaching (BSC 4945) can be applied to the thirty-eight (38) semester hours of biological science coursework.

REQUIRED COLLATERAL COURSES

A. Mathematics/Statistics: Nine (9) to twelve (12) semester hours including:

MAC 2311: Calculus with Analytical Geometry I (4 hrs) and MAT 3930: Biocalculus lab (1hr)

And ONE of the following three options:

MAC 2312: Calculus with Analytical Geometry II (4 hrs);

STA 2171: Statistics for Biology (4 hrs);

STA 2122: Introduction to Applied Statistics (4 hrs) **plus** one of the following 2nd statistics courses:

STA 4102	Computational Methods in Statistics I (3 hrs)
STA 4202	Analysis of Variance and Design of Experiments (3 hrs)
STA 4203	Applied Regression Methods (3 hrs)
STA 4222	Sample Surveys (3 hrs)
STA 4322	Mathematical Statistics (3 hrs)
STA 4442	Introductory Probability I (3 hrs)
STA 4502	Applied Nonparametric Statistics (3 hrs)
STA 4664	Statistics for Quality and Productivity (3 hrs)
STA 4702	Applied Multivariate Analysis (3 hrs)
STA 4853	Time Series and Forecasting Methods (3 hrs).

B. Chemistry: Fifteen (15) semester hours including:

CHM 1045C or 1050/1050L	General Chemistry I (3 hrs) & Lab (1 hr)
CHM 1046C or 1051/1051L	General Chemistry II (3 hrs) & Lab (2 hrs)
CHM 2210	Organic Chemistry I (3 hrs)
CHM 2211	Organic Chemistry II (3 hrs)

C. Physics: Eight (8) to ten (10) semester hours including:

PHY 2048C General Physics I (5 hrs)	or	PHY 2053C College Physics I (4 hrs) and
PHY 2049C General Physics II (5 hrs)	or	PHY 2054C College Physics II (4 hrs)

REQUIREMENTS FOR A MINOR IN BIOLOGICAL SCIENCE

Students who decide to change their majors from biological science to another major and students from other majors often inquire about the requirements for receiving a minor in biological science. A minor in biological science requires a minimum of twelve (12) semester hours of approved biological science courses to include the following or their equivalents:

BSC 2010 (3 hrs)
BSC 2010L (1 hr)
BSC 2011 (3 hrs)
BSC 2011L (2 hrs)
Additional biology elective course (approved for the major) to complete the twelve hours

All biological science courses applicable to the biological minor must be completed with a grade of C- or better. In addition, a minimum of four (4) of the twelve (12) semester hours required for a biological science minor must be taken at FSU.

EXPLANATION OF ACADEMIC TRACKS IN THE BIOLOGICAL SCIENCE MAJOR

At the Florida State University, the Department of Biological Science offers one undergraduate major, which is Biological Science. All undergraduate students who declare a major in Biological Science, and successfully complete the requirements for the major, receive a Bachelor of Science (B.S.) or a Bachelor of Arts (B.A.) in **Biological Science**.

Currently, a minimum of 38 hours in biological science coursework and a minimum of 32 hours of collateral coursework in mathematics, chemistry, and physics are required for the major. Nineteen of the 38 biology hours are considered core courses required by all biological science majors. This required core emphasizes a broad education in the principles of biology. The remaining 19 hours consist of elective courses in biological science, chosen by each student based on individual interests, capabilities, or anticipated career.

Although not required to do so by the department, biological science majors may choose to concentrate their biology elective hours in a particular sub-discipline of biology (i.e., "academic track"). Academic tracks are defined as groupings of departmental courses within a traditional or contemporary sub-discipline of biology that may be used to tailor the degree requirements to student interests. Currently, the Department of Biological Science offers eight academic tracks in the following sub-disciplines of biology:

- Cell and Molecular Biology
- Ecology, Evolution, and Environmental Science
- Marine Biology
- Mathematical and Computational Biology
- Physiology and Neuroscience
- Plant Sciences
- Pre-professional Health Sciences (including medicine, veterinary medicine, optometry, dentistry, pharmacy, physical therapy and physician's assistant)
- Zoology

Academic tracks are not majors; they are intended to serve only as guidance and recommendations for departmental courses offered within a sub-discipline of biology. Selecting an academic track does not prevent a biological science student from taking elective courses in another academic track. Because each track contains numerous courses, students should not expect to take all recommended courses for each academic track. Some courses from other departments may be suggested as good professional development (skills or content) choices for a particular academic track. Unless otherwise noted, courses outside of the Department of Biological Science do not count toward the biological science major. Biological science students may also choose not to select an academic track, in which case the 19 biology elective courses are selected from several sub-disciplines of biology.

Academic Track in the Biological Science Major

CELL AND MOLECULAR BIOLOGY

Cell and molecular biologists study the molecular organization and control of cell function. Faculty involved in this program have interests ranging from molecular genetics to immunology, subcellular organization of cell structure, virology, and molecular evolution. Students following this academic track are generally preparing for careers in research, medicine, the allied health fields, teaching, or graduate study in genetics, cell, or molecular biology.

CURRICULUM: Genetics (PCB 3063), a required upper division biology course, should be taken as early as possible following completion of the major prerequisite courses. Cell Structure & Function (PCB 3134) and Molecular Biology (PCB 4024) are strongly recommended for all students interested in cell and molecular biology. Students who plan to pursue graduate study in cell or molecular biology are strongly encouraged to take a Directed Individual Study (BSC 4900) or Research Methods (BSC 4933) course. The following represents a list of other recommended elective courses offered by the department that are applicable to cell and molecular biology. Students should determine which elective courses to take based on educational interests and career goals.

BOT 4394	Plant Growth and Development (3)	PCB 4233	Immunology (3)
BSC 4833C	Radiation Biology (3)	PCB 4233L	Immunology Laboratory (1)
MCB 4403	Prokaryotic Biology (3)	PCB 4253	Animal Development (3)
MCB 4403L	Prokaryotic Biology Laboratory (2)	PCB 4253L	Animal Development Lab (1)
PCB 4024L	Molecular Biology Laboratory (1)	PCB 4514	Adv. Genetics & Molecular Biology (3)
PCB 4063L	Experimental Genetics Laboratory (3)		

FACULTY: Undergraduate teaching and guidance is a large part of the commitment of our regular faculty in Biological Science. Our faculty value interaction and discussion with students and encourage individual discussion and research projects. The following faculty have expertise in cell and molecular biology:

Hank Bass	Molecular and cellular biology of meiosis in maize; meiotic telomere behavior
George Bates	Plant cell and molecular biology; gene transfer
P. Bryant Chase	Biomechanics of cardiac and skeletal muscle
Wu-Min Deng	Molecular mechanism of cell polarization
Ross Ellington	Structure, function, and evolution of enzymes
Lloyd Epstein	Eukaryotic molecular genetics; RNA processing; catalytic DNA
Debra Fadool	Olfactory signal transduction; ion channel structure and function; neuromodulation
James Fadool	Developmental biology; cellular and genetic analysis of visual system development
Piotr Fajer	Molecular mechanisms of muscle contraction and calcium signaling
Betty Jean Gaffney	Structural biology; enzyme structure
Laura Keller	Molecular genetics; signal transduction and gene regulation
Thomas Keller	Cell and molecular biology of the cytoskeleton
Timothy Moerland	Biochemistry, biophysics, and physiology of muscle; response of muscle to disease and environment
William Outlaw, Jr.	Plant physiology; regulation of carbon metabolism
Robert Reeves	Bacterial and phage genetics; tRNA structure and expression
Thomas Roberts	Cell biology; cell motility
Kenneth Roux	Molecular immunology; immunogenetics; immunochemistry
Kenneth Taylor	Macromolecular structure of proteins; 3-D Electron Microscopy

FACILITIES: The research facilities available within the Department of Biological Science allow for the performance of virtually any experiment in the field of cell and molecular biology. In addition to the standard equipment available in the laboratories of individual faculty members, the department also maintains a DNA sequencing laboratory; monoclonal antibody production laboratory; microscopy laboratory with transmission and scanning electron microscopes, confocal microscope, and fluorescence microscope; analytical laboratory with HPLCs, gel scanning densitometers, ultracentrifuges, and PCR equipment; computerized molecular modeling and gene database facility; and DNA synthesis and protein sequencing facilities (available through a cooperative liaison with the Department of Chemistry).

Academic Track in the Biological Science Major

ECOLOGY, EVOLUTION & ENVIRONMENTAL SCIENCE

Ecology, evolution, and environmental science are the most inclusive fields in the biological sciences, using principles from an array of disciplines. Ecology and environmental science study the relationship between organisms and their natural environments. Evolution is the study of the process by which species change morphologically and physiologically over time. Students following this academic track are preparing for careers in environmental consulting or government, or graduate study in ecology, evolution, animal behavior, and environmental science.

CURRICULUM: A combination of conceptual and taxonomically oriented courses is recommended for this academic track. Beyond the major prerequisite courses, Genetics (PCB 3063) and Evolution (PCB 4674) are the foundational courses of the track. Students who plan to pursue graduate study in ecology, evolution, or environmental science are strongly encouraged to take a Directed Individual Study (BSC 4900) or Research Methods (BSC 4933) course. The following represents a list of other recommended elective courses offered by the department that are applicable to ecology, evolution and environmental science. Students should determine which elective courses to take based on educational interests and career goals.

BOT 3143C	Field Botany (4)	PCB 4341C	Advanced Field Biology (3)
BOT 4373C	Biology of Higher Plants (4)	ZOO 3203/L	Adv. Invert. Zoology (2) & Lab (2)
BSC 3052	Conservation Biology (3)	ZOO 4204C	Bio. Higher Marine Invertebrates (5)
BSC 3312	Marine Biology (3)	ZOO 4232/L	Parasitology (3) & Lab (2)
BSC 4514	Aquatic Pollution Biology (3)	ZOO 4343C	Biology of Lower Vertebrates (4)
BSC 4613	Systematics (3)	ZOO 4353C	Biology of Higher Vertebrates (4)
PCB 3043	General Ecology (3)	ZOO 4513	Animal Behavior (4)
PCB 4042	Perspectives in Ecol. & Evol. Bio. (3)	ZOO 4823	Insect Biology (3) & Lab (2)

Additional Recommended Electives (Not for Biological Science major credit):

BCH 4605	Mammalian Biochem. & Genetics (3)	EXP 3203/L	Animal Sensory Processes (3) & Lab (1)
CHB 3304	Behavioral Genetics (3)	EXP 3422/L	Conditioning and Learning (3) & Lab (1)
CHM 4080	Environmental Chemistry II (3)	PSB 2000	Introduction to Brain and Behavior (3)
CHM 4609	Environmental Chemistry (3)	PSB 3004/L	Physiological Psychology (3) & Lab (1)

FACULTY: Undergraduate teaching and guidance is a large part of the commitment of our regular faculty in Biological Science. Our faculty value interaction and discussion with students and encourage individual discussion and research projects. The following faculty have expertise in ecology, evolution and environmental science.

Lawrence Abele	Molecular systematics and evolution of crustaceans
Peter Beerli	Evolutionary genetics/genomics
Gregory Erickson	Evolutionary morphology of vertebrate and paleobiology
Thomas Hansen	Theoretical evolutionary biology and mathematical modeling
William Herrnkind	Behavior and marine biology
David Houle	Population genetics; maintenance of genetic variation
Brian Inouye	Population and community ecology
Don Levitan	Marine ecology and population biology of marine organisms
Austin Mast	Plant systematics, evolution, ecology, and biogeography
Thomas Miller	Community ecology; plant evolutionary biology
Gavin Naylor	Mechanisms underlying biological diversification
Fredrik Ronquist	Computational and theoretical phylogenetics; phylogeny, systematics, and evolution of cynipoid wasps.
Scott Steppan	Evolutionary biology and mammalian systematics
David Swofford	Molecular evolution and evaluation; phylogenetic inference
Joseph Travis	Population biology of fishes and amphibians
Walter Tschinkel	Social biology and ecology of ants
Nora Underwood	Ecology and evolution of plant-insect interactions
Alice Winn	Evolution and ecology of plants
Janie Wulff	Roles of predators, physical disturbance and competition in shaping sponge faunas

FACILITIES: The Mission Road plant growth facility, the FSU Marine Lab, and the private Tall Timbers Research Station accommodate research projects in ecology, evolution and environmental science. Several large computers, biochemical laboratories, and specialized equipment are available for research needs.

Academic Track in the Biological Science Major

MARINE BIOLOGY

Marine biology is the study of saltwater organisms, including algae, plants, and invertebrate and vertebrate animals, with respect to a specific aspect of their biology (e.g., ecology, physiology, behavior, reproduction). Students following this academic track are generally preparing for careers in teaching, government, or research. Careers specific to marine biology typically require a graduate degree (i.e., M.S., Ph.D., or D.V.M.). Qualified junior and senior undergraduates can apply to FSU's Certificate Program in Living Marine Resource Ecology (see page 30) to help prepare for advanced careers in marine biology. The certificate program provides students with a background in marine biology through internships, research, and field and lecture courses.

CURRICULUM: Marine Biology (BSC 3312) should be taken as a background course as early as possible following completion of the major prerequisite courses. Conservation Biology (BSC 3052) and General Ecology (PCB 3043) are recommended for all students interested in marine biology. Students who plan to pursue graduate study in marine biology are strongly encouraged to take a Directed Individual Study (BSC 4900) or Research Methods (BSC 4933) course. The following represents a list of other recommended elective courses offered by the department that are applicable to marine biology. Students should determine which elective courses to take based on educational interests and career goals.

BSC 3402	Experimental Bio Lab (Marine only) (2)	BSC 4940**	Research Intern Marine Bio (3-9)
BSC 4514	Aquatic Pollution Biology (3)	MCB 4403+L	Prokaryotic Biology (3) and Lab (2)
BSC 4900	D.I.S. (Marine only) (3)	PCB 4341C	Adv. Field Bio. (Marine only) (3)
BSC 4931	Sr. Tutorial (Marine only) (1)	PCB 4723	Comp. Animal Physiology (3)
BSC 4933	Selected Topics in Bio.: (Bio. of Fishes (4) or Marine Resource Mngmt. & Ocean Policy (3) only)	ZOO 3203/L	Adv. Invert. Zoology (2) & Lab (2)
		ZOO 4204C	Biol. of Higher Marine Invert. (5)
		ZOO 4343C	Biology of Lower Vertebrates (4)
BSC 4937**	Sem. in Living Marine Res Ecol (1)	ZOO 4513	Animal Behavior (4)

Additional Recommended Electives Offered Outside of the Department of Biological Science:

OCB 4930	Zooplankton Ecology (3)	OCE 4906*	Directed Individual Study (1-3)
OCE 4011*	Principles of Oceanography (3)	OCE 4906*	Benthic Microbiology (3)

* Does not count towards the biological science major unless the student completes the FSU Certificate Program in Living Marine Resource Ecology.

** Only for students accepted into Marine Certificate Program.

FACULTY: Undergraduate teaching and guidance is a large part of the commitment of our regular faculty in Biological Science. Our faculty value interaction and discussion with undergraduates and encourage individual discussion and research projects by undergraduates. The following faculty have expertise in marine biology.

Lawrence Abele	Molecular systematics and evolution in crustaceans
William Herrnkind	Behavioral and ecological specializations of lobsters and other marine crustaceans
Don Levitan	Population biology of marine organisms, reproductive strategies and mating success
Michael Meredith	Reception and processing of chemical stimuli in the nervous system of elasmobranchs
Timothy Moerland	Physiology and biochemistry of fishes, temperature adaptation
Gavin Naylor	Evolutionary tree for sharks and rays based on DNA sequence comparisons.
Janie Wulff	Roles of predators, physical disturbance and competition in shaping sponge faunas

ADJUNCT FACULTY

Felicia Coleman	Life history strategies of reef fishes; fisheries management; marine fishery reserves
Chris Koenig	Reef fish behavior and ecology; marine fishery reserves

Biological Science Academic track in the major

MATHEMATICAL AND COMPUTATIONAL BIOLOGY (HUGHES FELLOWSHIPS)

Mathematical and computational approaches are being increasingly utilized in all areas of biological science, whether in basic research or in the many areas of applied biology. This track provides students majoring in biological science a variety of coursework and research experiences to help prepare them for careers in biology utilizing computational approaches. It also confers eligibility to apply for financial support through Hughes Fellowships (see page 28).

CURRICULUM: Students on this track fulfill the normal core and collateral requirements for the biological science major, as well as 19 hours of electives in biology, including 2 elective lab or field courses and 2 area courses.

Specific courses necessary for mathematical and computation emphasis should include:

- Both **Statistics for Biology (STA 2171)** and **Calculus II (MAC 2312)**.
- Physics with calculus treatment (PHY 2048C, PHY 2049C)** to fulfill the collateral requirement.
- Two semesters of directed individual study (BSC 4900)** in computational biology to fulfill BSC 3402L requirement.

The following specific Biology Electives:

- Biological Modeling (offered by the Mathematics Department) (3 hrs)**
- Introduction to Bioinformatics (3 hrs)**
- Programming Skills for Computational Biology and Bioinformatics (3 hrs)**

FACULTY: Undergraduate teaching and guidance is a large part of the commitment of our regular faculty in Biological Science. Our faculty value interaction and discussion with students and encourage individual discussion and research projects. The following faculty have expertise in mathematical and computational biology

Peter Beerli	Computational and mathematical biology; evolutionary and population genetics/genomics.
P. Bryant Chase	Biomechanics of cardiac and skeletal muscle
Piotr Fajer	Molecular simulations
Betty Gaffney	Magnetic resonance of proteins
Thomas Hansen	Theoretical evolutionary genetics
David Houle	Theoretical population genetics
Thomas Houpt	Custom software to analyze patterns of eating and drinking, spatial patterns of gene expression in the brain, and sequences of genes related to brain and nerve function
Brian Inouye	Theoretical ecology and population dynamics
Thomas Miller	Mathematical modeling of community ecology
Gavin Naylor	Phylogenetic analysis of DNA sequence comparisons; evolutionary tree for sharks and rays
Thomas Roberts	Dynamics of cell motility
Fredrik Ronquist	Computational and theoretical phylogenetics; phylogeny, systematics, and evolution of cynipoid wasps
David Swofford	Computational approaches in phylogenetics
Kenneth Taylor	Image processing of electron micrographs to produce 3-D images of biological macromolecules
Joseph Travis	Mathematical models for structured populations
Nora Underwood	Theoretical population dynamics

Faculty mentors for mathematical and computational biology are also available in the following departments: Computational Science and Information Technology, Chemistry, Chemical Engineering, Computer Science, Mathematics, Physics, and Statistics. Mentors are also not restricted to this list and the Committee can work with Hughes Fellows to identify additional faculty to serve as research sponsors. The Committee anticipates that many Hughes Fellows will interact with more than one mentor over the one-year period of research, for example in cases where data are collected in one laboratory and then computationally evaluated in a second laboratory.

FACILITIES: Computer facilities have been dramatically enhanced by the Howard Hughes funds. The FSU central bioinformatics server has been replaced with a modern quad-cpu platform capable of providing fast and powerful analyses to any size undergraduate laboratory course. This server is also available to the FSU research community at large for computational biology analyses. It is loaded with the Accelrys GCG Wisconsin Package for sequence analysis, the PAUP* and PHYLIP packages for phylogenetic inference, and a whole suite of public-domain sequence analysis programs. Joint-use computer laboratories have also been created and expanded with Howard

Hughes funding. The existing Biology Department joint-use computer laboratories have been expanded and new Statistics Department, as well as Mathematics Department, joint-use computer laboratories will be established.

Academic Track in the Biological Science Major

PHYSIOLOGY & NEUROSCIENCE

Physiology is the study of functional processes, such as gas exchange, water and ion balance, and muscle contraction, at all levels of biological organization from the cellular/molecular to tissues and organs. Physiologists typically utilize physical-chemical tools and techniques to probe these functional processes. Neuroscience is the study of the physiology, chemistry, and structure of excitable cells such as neurons, muscle cells, and receptor cells. Neuroscientists investigate a wide array of processes, including membrane biochemistry and membrane biophysics, neuroendocrine regulation of physiological processes, the detection of external stimuli by receptor cells, the coding of information as electrical events in the nervous system, and the neuronal basis of behavioral processes. Students following this academic track are generally preparing for careers in research, medicine, the allied health fields, or graduate study in physiology or neuroscience.

CURRICULUM: The following list recommends elective courses offered by the department that are applicable to physiology and neuroscience. Students should determine which elective courses to take based on educational interests and career goals.

PCB 3134	Cell Structure and Function (3)	PCB 4843	Fundamentals of Neuroscience (3)
PCB 3743	Vertebrate Physiology (3)	PCB 5746	Mammalian Physiology I (4)*
PCB 4024	Molecular Biology (4)	PCB 5747	Mammalian Physiology II (4)*
PCB 4024L	Molecular Biology Lab (1)	ZOO 4513	Animal Behavior (4)
PCB 4723	Comparative Animal Physiology (3)		
PCB 4731L	Experimental Physiology Lab (2)		

* Graduate-level course. Enrollment by special permission only.

Additional Recommended Electives (Not for Biological Science major credit):

BCH 4053	General Biochemistry I (3)	EXP 3203L	Animal Sensory Processes Lab (1)
BCH 4053L	General Biochemistry Lab (3)	EXP 3422	Conditioning and Learning (3)
BCH 4054	General Biochemistry II (3)	EXP 3422	Conditioning and Learning Lab (1)
EXP 3202	Sensation and Perception (3)	PSB 2000	Introduction to Brain and Behavior (3)
EXP 3202L	Sensation and Perception Lab (1)	PSB 3004	Physiological Psychology (3) & Lab (1)
EXP 3203	Animal Sensory Processes (3)	PSB 4240	Biological Basis of Brain Dysfunction (3)

FACULTY: Undergraduate teaching and guidance is a large part of the commitment of our regular faculty in Biological Science. Our faculty value interaction and discussion with students and encourage individual discussion and research projects. The following faculty have expertise in physiology and or neuroscience.

P. Bryant Chase	Biomechanics of cardiac and skeletal muscle
John Elam	Nerve cell maintenance and regeneration
Ross Ellington	Comparative physiology and biochemistry
Debra Fadool	Olfactory signal transduction; ion channel structure and function; neuromodulation
James Fadool	Developmental biology; cellular and genetic analysis of visual system development
Piotr Fajer	Molecular biophysics of muscle contraction
Marc Freeman	Neuroendocrine regulation of reproduction
Thomas Houpt	Molecular neurobiology of learning and memory of food intake
Michael Meredith	Sensory physiology (olfaction); computer modeling of brain circuits
Timothy Moerland	Muscle physiology and biochemistry
David Quadagno	Hormonal control of behavior
Paul Trombley	Synaptic physiology and plasticity; ion channel modulation

Many members of the physiology/neuroscience faculty are also appointed in the Neuroscience program, a nationally recognized interdepartmental research program with faculty from the Departments of Biological Science and Psychology. Some faculty are also appointed in the Molecular Biophysics Program and in the Structural Biology Program.

FACILITIES: Physiologists and neuroscientists have access to a variety of research facilities including the scanning and transmission electron microscope laboratory, the Analytical Biochemistry Lab, the Monoclonal Antibody facility, and the Psychobiology Microcomputer facility. The staff of the Laboratory Animal Resources (LAR) maintains vertebrate animals. Some faculty members also conduct research at the FSU Marine Laboratory, located on the Gulf of Mexico.

Academic Track in the Biological Science Major

PLANT SCIENCES

The plant sciences involve the study of organisms that utilize sunlight as an energy source. Students following this academic track are generally preparing for careers in private industry, environmental consulting, government, teaching, or graduate study in ecology, systematics, physiology, biochemistry, molecular biology, structural biology, agriculture, or horticulture.

CURRICULUM: Diversity of the plant sciences is reflected in the recommended course work. Plant Biology (BOT 3015), a required upper division biology course, should be taken as early as possible following completion of the major prerequisite courses. Students who plan to pursue graduate study in the plant sciences are strongly encouraged to take a Directed Individual Study (BSC 4900) or Research Methods (BSC 4933) course.

The following represents a list of other recommended elective courses offered by the department that are applicable to the plant sciences. Students should determine which elective courses to take based on educational interests and career goals.

BOT 3143C	Field Botany (4)	BOT 4503L	Plant Physiology Lab (1)
BOT 3015L	Plant Biology Lab (1)	PCB 3043	General Ecology (3)
BOT 3800	Plants and Man (3)	PCB 3134	Cell Structure and Function (3)
BOT 4373C	Biology of Higher Plants (4)	PCB 4024	Molecular Biology (3)
BOT 4394	Plant Molecular Biology (3)	PCB 4024L	Molecular Biology Lab (1)
BOT 4503	Plant Physiology (3)		

FACULTY: Undergraduate teaching and guidance is a large part of the commitment of our regular faculty in Biological Science. Our faculty value interaction and discussion with students and encourage individual discussion and research projects. The following faculty have expertise in the plant sciences.

Hank Bass	Molecular and cellular biology of meiosis in maize; meiotic telomere behavior
George Bates	Plant cell and molecular biology; gene transfer
Laura Keller	Gene regulation in photosynthetic algae
Austin Mast (Proteaceae)	Comparative ecology, biogeography, and phylogeny of the Australian Banksias
Thomas Miller	Plant community ecology and the evolution of competitive ability
William Outlaw Jr.	Plant physiology and biochemistry; guard cell histochemistry
Alice Winn	Plant ecology and evolutionary biology; plant adaptations

FACILITIES: Instructional and research facilities for the plant sciences at FSU are exceptional. Advanced undergraduates who have demonstrated special aptitude have access to state-of-the-art instrumentation and expertise in most areas of the plant sciences. In-house electronic, machine, and wood shops support instructional and research activities, as do the Electron Microscope Labs, the Monoclonal Antibody Lab, the Structural Biology Lab, and the Analytical Lab. The Mission Road Plant Growth Facility and the FSU Marine Laboratory on the Gulf of Mexico are available for terrestrial and aquatic plant research projects. The FSU Herbarium facilities contain approximately 200,000 plant specimens. Other local resources such as the privately owned Tall Timbers Research Station provide additional plant research opportunities in fire ecology, land covers, and conservation.

Academic Track in the Biological Science Major

PRE-PROFESSIONAL HEALTH SCIENCES

Students following this academic track are preparing for entrance into professional or allied health science schools, including medicine, veterinary medicine, optometry, dentistry, pharmacy, physical therapy, and physician's assistant. Advising for the pre-professional and allied health sciences is available in the **Health Professions Advising Office, 2140 College of Medicine (850-644-7678)**. The required courses for the biological science major meet *most* of the course requirements for admission to the various health professional schools. The Health Professions Advising Office offers academic advising, schedule planning, information about health science schools and required entrance exams, and assistance in the application process for admission to health professional schools. The programs and courses required for admission are outlined in Table 1 below.

CURRICULUM: For most of the pre-professional health sciences, Genetics (PCB 3063) should be taken as early as possible following completion of the major prerequisite courses. Students who hope to conduct medical research are strongly encouraged to take a Directed Individual Study (BSC 4900) or Research Methods (BSC 4933) course. Lists of recommended elective courses offered by the department that are applicable to each professional or allied health science school are listed in Table 1 on the next page. Students should determine which elective courses to take based on educational interests and career goals. Students interested in the health professions are encouraged to complete key courses such as BSC 2010/L, BSC 2011/L, CHM 1045C, CHM 1046C, CHM 2210, CHM 2211/L, PHY 2048C/2049C or PHY 2053C/2054C, PCB 3063, and anatomy and physiology (see Table 1 for which courses are required for admission to each program) *prior* to taking entrance examinations.

FACULTY: Undergraduate teaching and guidance is a large part of the commitment of our regular faculty in Biological Science. Our faculty value interaction and discussion with students and encourage individual discussion and research projects. The following faculty have expertise in health science related areas:

John Elam	Nerve cell maintenance and regeneration
Ross Ellington	Comparative physiology and biochemistry
Lloyd Epstein	Eukaryotic molecular genetics; RNA processing; catalytic DNA
Debra Fadool	Olfactory signal transduction; ion channel structure and function; neuromodulation
James Fadool	Developmental biology; cellular and genetic analysis of visual system development
Piotr Fajer	Molecular mechanisms of muscle contraction and calcium signaling
Marc Freeman	Neuroendocrine regulation of reproduction
Betty Jean Gaffney	Structural biology; enzyme structure
Thomas Houpt	Molecular neurobiology of learning and memory of food intake
Laura Keller	Molecular genetics; signal transduction and gene regulation
Thomas Keller	Cell and molecular biology of the cytoskeleton
Michael Meredith	Sensory physiology (olfaction); computer modeling of brain circuits
Timothy Moerland	Muscle physiology and biochemistry
David Quadagno	Hormonal control of behavior
Robert Reeves	Bacterial and phage genetics; RNA structure and expression
Thomas Roberts	Cell biology; cell motility
Kenneth Roux	Molecular immunology; immunogenetics; immunochemistry
Kenneth Taylor	Macromolecular structure of proteins; 3-D Electron Microscopy
Paul Trombley	Synaptic physiology and plasticity; ion channel modulation

FACILITIES: The research facilities available within the Department of Biological Science allow for the performance of virtually any experiment in the health sciences. The department maintains a DNA sequencing laboratory; monoclonal antibody production laboratory; microscopy laboratory with transmission and scanning electron microscopes, confocal microscope, and fluorescence microscope; analytical biochemistry laboratory with HPLC's, gel scanning densitometers, ultracentrifuges, and PCR equipment; computerized molecular modeling and gene data base facility; and DNA synthesis and protein sequencing facilities (available through a cooperative liaison with the Department of Chemistry). The staff of the Laboratory Animal Resources (LAR) maintains vertebrate animals. Some faculty also conduct marine animal research at the FSU Marine Laboratory.

Table 1-Summary of Professional and Allied Health Science Schools: Courses Required For Admission and Additional Recommended Preparatory Biological Science Elective Courses*		
Program	Courses Required for Admission	Recommended Preparatory Biological Science Elective Courses
Medicine (Including Osteopathic, Chiropractic and the FSU College of Medicine (COM))	BSC 2010/L and BSC 2011/L PCB 3063 and PSY 2012 are both strongly recommended CHM 1045C, CHM 1046C, CHM 2210, and CHM 2211/L Some schools and FSU COM require BCH 4053 and BCH 4054 PHY 2053C and PHY 2054C or PHY 2048C and PHY 2049C	MCB 4403/L, PCB 3134, PCB 3743, PCB 4024/L, PCB 4233/L, PCB 4731L, ZOO 3713C, ZOO 4232/L, ZOO 4753C
Veterinary Medicine	BSC 2010/L and BSC 2011/L PCB 3063 and MCB 4403/L Animal Science (ANS 3006) and Animal Nutrition (ANS 4445) ** CHM 1045C, CHM 1046C, CHM 2210, and CHM 2211/L BCH 4053 PHY 2053C and PHY 2054C or PHY 2048C and PHY 2049C MAC 2311 STA 2122 or STA 2171	PCB 3134, PCB 3743, PCB 4024/L, PCB 4253/L, PCB 4723, PCB 4731L, ZOO 4513, ZOO 4753C
Optometry	BSC 2010/L and BSC 2011/L CHM 1045C, CHM 1046C, CHM 2210, and CHM 2211/L Either BCH 3023C or BCH 4053 (Requirement varies by school; see FSU COM) PHY 2053C and PHY 2054C or PHY 2048C and PHY 2049C MAC 2311	MCB 4403/L, PCB 3134, PCB 3743, PCB 4843, ZOO 3713C, ZOO 4753C
Dentistry	BSC 2010/L and BSC 2011/L PCB 3063 <u>or</u> PCB 4024 MCB 4403/L General Psychology (PSY 2012) or Developmental Psychology (DEP 2004) *** CHM 1045C, CHM 1046C, CHM 2210, and CHM 2211/L BCH 4053 PHY 2053C and PHY 2054C or PHY 2048C and PHY 2049C	MCB 4403/L, PCB 3134, PCB 3743, PCB 4024/L, PCB 4233/L, ZOO 3713C, ZOO 4753C, STA 2122, a Logic Course
Pharmacy	BSC 2010/L and BSC 2011/L BSC 2085/2086 + labs or PET 3322/3323 + labs Public Speaking Course (see Oral Competency Requirements for FSU) Economics of the National Economy (ECO 2013) or Economics of the Price System (ECO 2023) CHM 1045C, CHM 1046C, CHM 2210, and CHM 2211/L PHY 2053C and PHY 2054C or PHY 2048C and PHY 2049C Some schools require MAC 2311	BOT 3800, MCB 4403/L, PCB 3134, PCB 3743, PCB 4024/L, PCB 4233/L
Physical Therapy	BSC 2010/L and BSC 2011/L BSC 2085/2086 + labs or PET 3322/3323 + labs CHM 1045C, CHM 1046C, CHM 2210C PHY 2053C and PHY 2054C or PHY 2048C and PHY 2049C	ZOO 3713C
Physician's Assistant	BSC 2010/L and BSC 2011/L BSC 2085/2086 + labs or PET 3322/3323 + labs MCB 2004/L Medical Terminology (NUR 3090) CHM 1045C and CHM 1046C STA 2122 or STA 2171	

* Refers to admissions requirements for professional and allied health science schools located in the state of Florida. The Health Professions Advising Office can provide admissions requirements for out-of-state professional and allied health science schools.

** ANS 3006 and ANS 4445 are offered at FAMU and UF. Only 6 of the 8 hours are accepted as credit for the biological science major.

*** DEP 2004 is offered at Tallahassee Community College.

Academic Track in the Biological Science Major

ZOOLOGY

Zoology is the study of the morphology, physiology, ecology, geographic distribution, and evolution of animals. Students following this academic track are generally preparing for careers in technical jobs, government, or environmental consulting. Some students will combine this track with preparation for careers in teaching. Those interested in research careers should expect to do graduate study.

CURRICULUM: Students interested in this academic track are encouraged to select courses that cover varying groups of animals and many conceptual approaches. Students who plan to pursue graduate study in zoology are strongly encouraged to take a Directed Individual Study (BSC 4900) or Research Methods (BSC 4933) course.

Subsequent to the completion of the major prerequisite courses, the following represents a list of recommended elective courses offered by the department that are applicable to zoology. Students should determine which elective courses to take based on educational interests and career goals.

BSC 3052	Conservation Biology (3)	ZOO 3713C	Comparative Vertebrate Anatomy (4)
BSC 3101	History of Biology (3)	ZOO 4204C	Biology of Higher Marine Invertebrates (5)
BSC 3312	Marine Biology (3)	ZOO 4232	Parasitology (3)
BSC 4514	Aquatic Pollution Biology (3)	ZOO 4232L	Parasitology Lab (2)
BSC 4613	Systematics (3)	ZOO 4343C	Biology of Lower Vertebrates (4)
PCB 3043	Ecology (3)	ZOO 4353C	Biology of Higher Vertebrates (4)
PCB 3743	Vertebrate Physiology (3)	ZOO 4513	Animal Behavior (4)
PCB 4253	Animal Development (3)	ZOO 4753C	Histology (4)
PCB 4723	Comparative Animal Physiology (3)	ZOO 4823	Insect Biology (3)
ZOO 3203	Advanced Invertebrate Zoology (2)	ZOO 4823L	Insects of North Florida (2)
ZOO 3203L	Advanced Invertebrate Zoology Lab (2)		

FACULTY: Undergraduate teaching and guidance is a large part of the commitment of our regular faculty in Biological Science. Our faculty value interaction and discussion with students and encourage individual discussion and research projects. The following faculty have expertise in zoology.

Lawrence Abele	Molecular systematics and evolution of crustaceans
Peter Beerli	Evolutionary and population genetics/genomics; water frogs
Ross Ellington	Biochemical adaptations of marine invertebrates
Gregory Erickson	Evolutionary morphology of vertebrates and paleobiology
William Herrnkind	Behavior and ecology of crustaceans
Brian Inouye	Effects of spatial variation in host-parasitoid interactions; roles of spatial and temporal variation in population and community ecology
Don Levitan	Reproductive ecology of marine invertebrates and fishes
Robert Livingston	Ecology of large-scale aquatic systems
Thomas Miller	Community and population ecology
Timothy Moerland	Adaptations to temperature in the muscle of poikilothermic vertebrates and the responses of muscle to diabetes; response of muscle to disease and environment
David Quadagno	Hormonal control of behavior
Scott Steppan	Evolutionary biology and mammalian systematics
Joseph Travis	Population biology of fishes and amphibians
Walter Tschinkel	Social biology and ecology of ants
Nora Underwood	Ecology and evolution of plant-insect interactions
Janie Wulff	Roles of predators, physical disturbance and competition in shaping sponge faunas

FACILITIES: There is a great variety of instructional and research facilities for zoology at FSU. The department shares the FSU Marine Laboratory with the Department of Oceanography. Other facilities used for research in zoology include the Analytical Laboratory, the Electron Microscope Center, the Sequencing Laboratory, a fully equipped dive locker, and boats for inshore as well as offshore research operations. Other local resources such as the privately owned Tall Timbers Research Station provide additional zoological research opportunities.

ACADEMIC POLICIES AND PROCEDURES

ACADEMIC PERFORMANCE AND GRADES

The Department of Biological Science has strict academic performance and grade requirements. These policies ensure that students who obtain a bachelor's degree in Biological Science from FSU have mastered the fundamental concepts associated with the discipline of biology.

DEFINITION OF A PASSING GRADE FOR THE BIOLOGICAL SCIENCE MAJOR

Biological science majors must earn grades of C- or better in all biological science courses and required collateral courses (chemistry, mathematics, physics, and statistics) to receive credit toward the major and to proceed to the next course in a sequence. In biological sciences courses graded on a satisfactory/unsatisfactory (S/U) basis, a student must earn a grade of S to receive credit toward the major.

MINIMUM REQUIRED BIOLOGY GPA

The Department of Biological Science calculates a biological science grade point average (biology GPA), which differs from your FSU GPA. The FSU GPA is based only on course work taken at this institution; grades earned at other institutions are not included in the calculation. The biology GPA is calculated using *all* biological science, mathematics, statistics, chemistry, and physics courses required for the major, *and their prerequisite course grades, taken either at FSU or elsewhere*, whether or not repeated, and whether or not taken under the FSU Forgiveness Policy. Designation, continuation, and graduation as a biological science major requires a minimum 2.0 biology GPA.

DEPARTMENT OF BIOLOGICAL SCIENCE FIVE D/F RULE

A student who has earned more than five (5) unsatisfactory grades (F, D-, D, D+, U) in courses required for the major (biological science, chemistry, physics, mathematics, and/or statistics), *or their prerequisite courses, taken either at FSU or elsewhere*, and whether or not repeated, will not be permitted to graduate with a degree in biological science.

DROPPING CLASSES

During the first four days of classes, individual courses may be added, dropped, or sections of a course changed. Students are financially liable for all courses that appear on their schedule after the fourth day of classes. Courses may be dropped through the seventh week of classes with the exception of mandated college preparatory courses, freshman composition, and courses involved in allegations of academic dishonesty; however, tuition charges will remain. Approval by the student's academic dean is required to reduce the academic load below twelve (12) semester hours or increase an academic load above eighteen (18) semester hours (to a maximum of twenty-one [21] semester hours). Courses dropped during this period will not appear on the student's transcript. To add courses after the first four days of classes requires the academic dean's approval.

A cumulative maximum of two (2) courses may be dropped between the eighth and twelfth week of classes during the semesters in which the student has earned fewer than sixty (60) hours of college credit; tuition charges will remain. A student may only drop one (1) course after earning sixty (60) hours of college credit and until graduation; tuition charges will remain. Approval by the student's academic dean is required. Courses dropped during this period will appear on the student's transcript with the notation "W."

After the twelfth week of classes, courses may be dropped only in exceptional circumstances. Dates are prorated for individual summer sessions. Approval is required by the academic dean. Such courses will appear on the student's transcript with the notation "WD." Students who register for courses but who do not attend the classes will receive grades of "F" if the courses are not officially dropped. Students changing from a previous catalog year should consult their academic dean regarding limitations concerning the above policy.

A student who has earned more than five (5) unsatisfactory grades (F, D-, D, D+, U) in courses required for the major (biological science, chemistry, physics, mathematics, and/or statistics), or their prerequisite courses, taken either at FSU or elsewhere, and whether or not repeated, will not be permitted to graduate with a degree in biological science. Designation, continuation, and graduation as a biological science major requires a minimum 2.0 biology GPA in all courses required for the major (biological science, chemistry, physics, mathematics, and/or statistics), and their prerequisite courses, taken either at FSU or elsewhere, and whether or not repeated.

INCOMPLETE GRADES

A student who is passing a course but has not completed all of the required work in the course at the end of the term may, with the permission of the instructor, be assigned an incomplete grade ("I"). An example of when a student might be assigned an "I" grade includes missing a final exam due to serious illness or verified family emergency. If you are assigned an "I" grade, it is your responsibility to immediately contact the instructor who assigned you the incomplete to determine what you need to do to make up the work and be assigned a final grade. You do not register again for a course in which you have an "I" grade. Once you have completed the work, it is your responsibility to contact the instructor to ensure that a Change of Grade Form has been completed and filed with the Registrar's Office. You must complete the missing work, and the instructor must submit the Change of Grade Form, by the end of the next semester in which you are enrolled at FSU, or the "I" grade will automatically revert to an "IE" grade, which is computed as the equivalent of an "F" grade in your FSU and Biology GPA. In addition, an "IE" grade is counted towards the Department of Biological Science's Five D/F Rule. Under exceptional circumstances (see the instructor for approval) an extension of time for clearing an incomplete grade may be given. You must complete and submit the Extension of Time for Clearing an Incomplete Grade Form by the end of the next semester in which you are enrolled at FSU or the "I" grade will automatically revert to an "IE" grade.

ACADEMIC CREDIT BY EXAMINATION

A total of 60 semester hours of credit earned through testing may be applied towards the bachelor's degree. Credit in the same subject will not be allowed more than once through coursework, other exams including CLEP, SAT, ACT, AP, IB, or on-campus testing. The following summarizes the scores required on various exams to receive academic credit for courses required for the biological science major.

BIOLOGICAL SCIENCE

Examination	Score	FSU Equivalent Course
Advanced Placement Biology	5	BSC 2010, BSC 2010L, BSC 2011, and BSC 2011L
International Baccalaureate Biology	5, 6, or 7	BSC 2010 and BSC 2010L

MATHEMATICS

The mathematics sequence for biological science majors consists of the following courses:

MAC 1105 (College Algebra)

MAC 1140 (Precalculus Algebra) and MAC 1114 (Trigonometry) OR MAC 1147 (Precalc. Algebra/Trig.)

MAC 2311 (Calculus I with Analytical Geometry) and MAT 3930 (Biocalculus lab) AND

MAC 2312 (Calculus II with Analytical Geometry) OR STA 2171 (Statistics for Biology) or a two-semester statistics option (STA 2122 + a 2nd approved statistics course).

Initial college mathematics placement is based on scores for the Scholastic Achievement Test (SAT) Quantitative, American College Testing Program (ACT), College Level Examination Program (CLEP) Mathematics Subject Test, Advanced Placement (AP) Mathematics Test, and/or International Baccalaureate (IB) coursework. At orientation, students are given a one-time-only opportunity to try and advance their initial college mathematics placement by taking either the Advanced Math Placement (AMP) test or the Supplemental Math Skills (SMS) test. The AMP is designed for students whose highest math placement scores are above a 470 SAT Quantitative or 21 ACT Math. The SMS is designed for students whose highest math placement scores are below a 470 SAT Quantitative or 21 ACT Math. A low score on the AMP or SMS does NOT require a student to drop below the initial mathematics placement, however, performing well on either test may improve your initial mathematics placement. Therefore, it is strongly recommended that students take the AMP or SMS tests at orientation.

The Department of Mathematics and the Department of Statistics evaluate all transfer mathematics and statistics credit, respectively, on an individual basis. Business-oriented mathematics or statistics courses such as MAC 1141, MAC 2233, STA 3014, and STA 3023 do not satisfy the mathematics requirement for the biological science major. Students with credit in these courses usually take MAC 1140, MAC 2311, and STA 2122 for reduced credit. The appropriate forms to take these courses for reduced credit are available in the Mathematics (222 Love, 850-644-5868) and Statistics (214 Oceanography and Statistics, 850-644-3218) advising offices.

Examination	Score	FSU Equivalent Course
SAT/ACT	SAT Quantitative \leq 430 ACT Math \leq 15	Student must take MAT 0024 unless SMS score waives this requirement by advancing math placement into a college-level course.
	440 \leq SAT Quantitative $<$ 460 16 \leq ACT Math \leq 20	Student must take MAT 1033 unless SMS score waives this requirement by advancing math placement into a college-level course.
	470 \leq SAT Quantitative \leq 590 21 \leq ACT Math \leq 25	Student may take MAC 1105. Student should take the AMP to advance math placement into a higher-level mathematics course.
	600 \leq SAT Quantitative \leq 670 26 \leq ACT Math \leq 29	The MAC 1105 prerequisite for MAC 1140, MAC 1114, and MAC 1147 is waived. Students may take MAC 1105, MAC 1114, or MAC 1147. Student should take AMP to try to earn 3 semester hours of credit for MAC 1105 and advance initial math placement into a higher-level mathematics course.
	680 \leq SAT Quantitative 30 \leq ACT Math	Student awarded 3 semester hrs. of credit for MAC 1105, may take MAC 1140, MAC 1114, or MAC 1147.
AP Calculus AB	3, 4 or 5	MAC 2311
AP Calculus BC	3	MAC 2311
AP Calculus BC	4 or 5	MAC 2311 and MAC 2312
IB Mathematics	4	MAC 1147
IB Mathematics	5	MAC 1147 and MAC 2233
IB Mathematics	6 or 7	MAC 2233 and MAC 2311
IB Mathematics-Advanced	4	MHF 1202
IB Mathematics-Advanced	5-7	MHF 1202 and MHF 1209
IB Mathematics-Methods	4	MAC 1105
IB Mathematics-Methods	5	MAC 1105 and MAC 1140
IB Mathematics-Methods	6 or 7	MAC 1140 and MAC 2233

CHEMISTRY

Examination	Score	FSU Equivalent Course
AP Chemistry	4	CHM 1045C
AP Chemistry	5	CHM 1045C and CHM 1046C
IB Chemistry	5-7	CHM 1020C, CHM 1045C

PHYSICS

Examination	Score	FSU Equivalent Course
AP Physics B	3	PHY 2053C
AP Physics B	4 or 5	PHY 2053C and PHY 2054C
AP Physics C-Mechanics	3	PHY 2053C
AP Physics C-Mechanics	4 or 5	PHY 2048C
AP Physics C-Elect.& Magn.	3	PHY 2054C
AP Physics C-Elect.& Magn.	4 or 5	PHY 2049C
IB Physics	6 or 7	PHY 2053C and PHY 2054C

FOREIGN LANGUAGE

The Department of Biological Science is within the College of Arts and Sciences, which requires that all graduates be proficient at the intermediate level in one language other than English. Students may satisfy this requirement by completing course work through the 2000 level (2200 or equivalent course) of a classical or modern foreign language. **It is important to note that this requirement is above and beyond the 2 years of high school foreign language required for admission to FSU.** All students who wish to continue studying the same foreign language learned in high school must take a placement test administered by the Dept. of Modern Languages. The test is free of charge and may be completed at any time prior to college language study in the Office of Evaluation Services (106 William Johnston Building).

If you took more than 2 years of a foreign language in high school you may be able to receive partial or complete college credit for the College of Arts and Sciences foreign language requirement by taking the College-Level Examination Program (CLEP) examination. In order to be eligible to receive college credit for the foreign language requirement, CLEP Examinations must be taken before students enroll in any college-level foreign language courses.

CLEP Examinations are administered through the Office of Evaluation Services (106 William Johnson Building; 850-644-3017). Contact this office to determine the date, time, location, and cost for taking a CLEP exam in the foreign language you are interested in receiving college credit for. Additional questions on foreign language placement or exemption from this requirement for bilingual students should be directed either to:

- | | | |
|---|-----------------|--------------|
| ➤ The Department of Modern Languages and Linguistics
(Arabic, Chinese, French, German, Hebrew, Italian,
Japanese, Korean, Russian, and Spanish) | 369 Diffenbaugh | 850-644-2606 |
| ➤ The Classics Department
(Greek and Latin) | 205 Dodd Hall | 850-644-4259 |
| ➤ The Department of Religion
(Sanskrit) | M05 Dodd Hall | 850-644-1020 |

COURSE TRANSFERS

The transcripts of students entering the biological science major with dual enrollment and/or other college credit will be evaluated on a course-by-course basis. If the courses are from out-of-state or from a private institution in Florida, the student should bring the college/university catalog to the transfer evaluation appointment.

REGISTRATION

DROP/ADD PERIOD OR CHANGES TO YOUR COURSE SCHEDULE

Drop/Add refers to the time period in which students can freely drop or add classes or change sections of a course without financial liability. *The Drop/Add period is the first four days of classes in any given semester.* After the fourth day of classes, students are financially liable for all courses that appear on their schedule. Thereafter, any changes to your schedule can result in additional paperwork and/or fees. The procedures followed for dropping or adding a class after the fourth day of class depends upon whether you are a basic division student (< 52 semester hours) or an upper division student (> 52 semester hours) and when in the semester the transaction takes place (drops only).

Dropping or Adding a Class After the Drop/Add Period

Students may drop classes between the fourth day of classes and until the end of the seventh week of classes *without permission of an academic dean.* With the exception of mandated college preparatory courses, freshman composition, and courses involved in allegations of academic dishonesty, courses may be dropped through the seventh week of classes; however, tuition charges will remain (Students withdrawing during the 2nd to 4th week of classes will receive a 25% adjustment in tuition; those withdrawing during the 5th to 7th week of classes will have full tuition liability). Courses dropped during this period will not appear on the student's transcript. To add courses after the first four days of classes requires the academic dean's approval.

A cumulative maximum of two (2) courses may be dropped between the eighth and twelfth week of classes during the semesters in which the student has earned fewer than sixty (60) hours of college credit; tuition charges will remain. A student may only drop one (1) course after earning sixty (60) hours of college credit and until graduation; tuition charges will remain. Approval by the student's academic dean is required. Courses dropped during this period will appear on the student's transcript with the notation "W."

Approval by the Dean of Undergraduate Studies is required to reduce the academic load below twelve (12) semester hours or increase an academic load above eighteen (18) semester hours (to a maximum of twenty-one [21] semester hours). Permission to take fewer than 12 credit hours is not necessary for students in the College of Arts and Sciences (i.e. students in the upper division). Students should understand that receipt of financial aid, tuition waivers, and health insurance coverage usually requires full time status (i.e., ≥ 12 semester hours) and these benefits may be adversely impacted if a drop transaction brings a student below full-time status.

After the twelfth week of classes, courses may be dropped only in exceptional circumstances. Dates are prorated for individual summer sessions. Approval to drop courses during this time period is required by the academic dean. Such courses will appear on the student's transcript with the notation "WD." Requests to withdraw from a class after the twelfth week of classes are granted only under exceptional circumstances. Fear of earning a grade of "D" or an "F" in a class is not a valid reason for dropping a course in this time period. The academic dean will coordinate with your professor to determine your current grade at the time of the drop request.

Dropping a Class After the Fourth DAY of Classes and Until the End of the Seventh WEEK of Classes

Basic Division Students (Less than 52 semester hours):

- Obtain an Drop/Add Permit form from the Biological Science Undergraduate Academic Advising Office (204 Conradi)
- Obtain the signature of Dean of Undergraduate Studies (A3400 University Center) only if the drop transaction decreases the course load to below 12 hours (i.e., ≤ 12 semester hours)
- Submit the completed Drop/Add Permit form to the Registrar's Office (A3900 University Center)

Upper division Students (Greater than 52 semester hours):

- Obtain a Drop/Add Permit Form from the Biological Science Undergraduate Academic Advising Office (204 Conradi)
- Submit the completed Drop/Add Permit Form to the Registrar's Office (A3900 University Center)

Dropping a Class After the Seventh WEEK of Classes

Basic Division Students (Less than 52 earned semester hours):

- Contact the Dean of Undergraduate Studies (A3400 University Center) and request to drop a class

If the drop request is approved, you must pick up the signed Drop/Add Form from the Dean's Office of Undergraduate Studies and submit the completed Drop/Add Permit Form to the Registrar's Office (A3900 University Center).

Upper Division Students (Greater than 52 earned semester hours):

- Contact the Dean of the College of Arts and Sciences (010 Longmire) and request to drop a class

If the drop request is approved, the College of Arts and Sciences will forward the completed Drop/Add Permit Form to the Registrar's Office.

Adding a Class After the Drop/Add Period

Under normal circumstances, no courses may be added after the official drop/add period. Under unusual circumstances a student may be given permission to enroll in a course early in the semester. Students are liable for additional tuition fees associated with the added course.

Basic Division Students (Less than 52 earned semester hours):

Obtain a Drop/Add Permit Form from the Biological Science Academic Advising Office (204 Conradi)
Obtain the signature of the professor teaching the class
Obtain the signature of Dean of Undergraduate Studies (A3400 University Center)
Submit the completed Drop/Add Permit Form to the Registrars Office (A3900 University Center)

Upper Division Students (Greater than 52 earned semester hours):

Obtain a Drop/Add Permit Form from the Biological Science Academic Advising Office (204 Conradi)
Obtain the signature of the professor teaching the class
Obtain the signature of Dean of the College of Arts and Sciences (010 Longmire), only if the add transaction increases the course load to > 18 hours (an overload permit will be needed)
Submit the completed Drop/Add Permit Form to the Registrars Office (A3900 University Center)

REGISTERING FOR FULL COURSES AND COURSE WAITING LISTS

If the registration system indicates that a Department of Biological Science course is full, students are encouraged to continue trying to register for it during the open registration period. Registration periods are listed in the Academic Calendar, which may be accessed online at <http://Registrar.fsu.edu>, or found in the Registration Guide. Once open registration ends, the Biological Science Undergraduate Academic Advising Office will review the enrollment of each biological science course and determine which classes require a waiting list. Waiting lists for biological science courses are released in 204 Conradi at 8 AM during the first day of classes (i.e., the first day of Drop/Add). **To maximize the chances of getting into a full biological science course, students are encouraged to:**

- Sign the waiting list in 204 Conradi
- Try to add the course as soon as Drop/Add opens
- Attend the first meeting of the class/lab and tell the instructor that you want to add it

For information on the possibilities of adding full courses offered by other departments, students should contact the appropriate departmental office. Chemistry has a web page, <http://chemweb.chem.fsu.edu/coursereq.htm>, that can be used to request seats in full chemistry courses.

REGISTERING FOR GRADUATE LEVEL COURSES FOR UNDERGRADUATE CREDIT

A biological science student is allowed to take graduate level courses offered through the Department of Biological Science for undergraduate credit if the following criteria are met:

- The appropriate form has been completed and eligibility has been certified by the Registrar's Office (A3900 University Center)
- Senior standing (90+ semester hours) or upper division (52+ semester hours) honors program member standing
- FSU GPA of at least 3.0 or a combined score of at least 1000 on the GRE (verbal + quantitative)
- Course load \leq 15 semester hours
- Permission from the instructor, the departmental chairman (see Ms. Judy Bowers; 202 Conradi, 850-644-3023), and the Dean of the College of Arts and Sciences (010 Longmire)

FIRST CLASS/LAB ATTENDANCE POLICY

The Department of Biological Science, as well as all other departments on campus, **takes attendance on the first day of classes and automatically drops from the class any student who was not present.** You must attend the first lecture and/or laboratory in every course for which you are registered. If illness or emergency prevents your attendance at the first session of a biological science class, please notify Ms. Judy Bowers (850-644-3023; 202 Conradi) of the Biological Science Undergraduate Academic Advising Office **prior** to the class meeting so your place can be reserved.

GRADUATION CHECKS AND GRADUATION

Graduation checks summarize your progress in and fulfillment of requirements for receiving your bachelor's degree. At FSU, there are three levels of graduation checks, each summarizing different degree requirements. A graduation check from the **Registrar's Office** summarizes progress in and fulfillment of general university requirements including liberal studies. A graduation check from the **College of Arts and Sciences** checks progress in and fulfillment of college requirements including completion of a foreign language, 3000 and 4000 upper level courses, and a minor. A graduation check from the **Department of Biological Science** summarizes progress in and fulfillment of major requirements including completion of biology, collateral, and lab courses, number of D/F grades, and biology GPA. Although graduation checks can be requested at any time and more than once, university policy states that upon completion of 90 semester hours of credit, or two terms prior to your anticipated graduation date you should:

- 1) Obtain a complete transcript from the Registrar's Office (A3900 University Center) and check it for accuracy
- 2) Obtain a university graduation check from the Registrar's Office (A3900 University Center)
- 3) Obtain a college graduation check from the College of Arts and Science Dean's Office (010 Longmire)
- 4) Obtain a major graduation check from the Department of Biological Science Undergraduate Academic Advising Office (204 Conradi)

You must also request both a university graduation check and a college graduation check upon reaching 110 credit hours, including hours registered for in a given semester. If this is not done prior to registration for the following semester, you will be unable to enroll in classes. In the semester during which you expect to graduate, you must also make application for your degree in the Registrar's Office (A3900 University Center) by the deadline listed in the Academic Calendar, published in the *Registration Guide* or listed online at <http://registrar.fsu.edu>.

It is the student's responsibility to be aware of all deadlines and academic policies. These deadlines and policies are published in the *FSU General Bulletin*, this *Undergraduate Handbook* and in the *Registration Guide*. If you have questions and you do not know which office to contact, ask the Department of Biological Science Undergraduate Academic Advising Office.

We urge you to keep a record of all contacts with any office with which you conduct business. Keep copies of all forms, letters, and other paperwork, especially if signed by anyone.

Academic Honor Code

The academic honor system of the Florida State University is based on the premise that each student has the responsibility:

1. To uphold the highest standards of academic integrity in the student's own work;
2. To refuse to tolerate violations of academic integrity in the University community; and
3. To foster a high sense of integrity and social responsibility on the part of the University community.

The Department of Biological Science will not tolerate violations of the University's Academic Honor Code. Biological Science majors are expected to uphold this code in all departmental matters including disclosure of information during academic advising and the appeals process and conduct during completion of degree requirements.

RESOURCES FOR UNDERGRADUATE STUDENTS

ACADEMIC ADVISING

THE DEPARTMENT OF BIOLOGICAL SCIENCE UNDERGRADUATE ACADEMIC ADVISING OFFICE

All biological science majors are encouraged to utilize the resources offered in the Department of Biological Science Undergraduate Academic Advising Office, located in 204 & 205 Conradi. The Biological Science Undergraduate Academic Advising Office is open from 8:00 AM to 5:00 PM, Monday through Friday. The advising office offers the following to biological science majors:

- Academic advising and course selection
- Counseling on choice of major and/or minor
- Information on careers, jobs, and graduate schools
- Graduation checks for the Biological Science major
- Departmental and university forms (Approval for Research Methods or DIS, Drop/Add Permit, Undergraduate Appeals, Extension of Time for Clearing an Incomplete Grade, Division Major Change, and Transient Student Forms)
- Four-year plans
- Departmental newsletters
- Referrals for help to appropriate persons in other units of the university
- Information and updates on departmental and university-wide academic policies and requirements, course offerings, internships, scholarships, and special programs

ADVISOR SELECTION

Three full-time undergraduate academic advisors, Dr. Joanna Carter, Ms. Cathy Oakley, Ms. Christina Murphy, and the Associate Chairman for Undergraduate Studies, Dr. Robert Reeves, staff the Biological Science Undergraduate Academic Advising Office. For incoming freshman or transfer students who have declared biological science as their major, initial academic advising is provided during orientation. For students who are undecided majors or another major, initial academic advising is provided when the choice of major is changed to biological science. The Department of Biological Science *does not* assign students to a particular advisor, therefore, students are free to meet with the advisor of their choice.

Students interested in the professional or allied health science professions (medicine, veterinary medicine, optometry, dentistry, pharmacy, physical therapy, and physician's assistant) should also see one of the Health Professions Advisors, Ms. Berne-Anderson or Mr. Borger, in the College of Medicine (COM), 2140 College of Medicine, 850-644-7678, for information about professional school requirements. The Health Professions Advisors offer individualized pre-professional and allied health advising, including:

- Information on prerequisite courses, GPAs, and exams required for admission to professional and allied health schools
- Opportunities to enhance professional and allied health school admittance including information on pre-professional organizations, volunteering, and employment
- Four-year plans
- Assistance in the application process for FSU College of Medicine and other professional and allied health schools

Biological Science majors interested in the health professions routinely see a biology undergraduate academic advisor in the **Biological Science Advising Office** to maintain progress in fulfilling major requirements, and a health professions advisor to maintain progress on applying and being admitted to a professional or allied health school. Students interested in graduate study and/or careers in biological professions other than the health professions should continue with the advising services furnished through the **Biological Science Undergraduate Academic Advising Office**. Students contemplating research careers should consider selecting a faculty advisor who will help match the curriculum to the student's specific scientific interests and career goals. Please review the list of biological science faculty and research interests provided on pages 50 through 55 for referral to the appropriate faculty advisor.

RECOMMENDED FREQUENCY OF ADVISING AND MAKING AN ADVISING APPOINTMENT

Although academic advising is not mandatory, biological science majors are strongly encouraged to meet with an undergraduate academic advisor *once a semester*, prior to registering for the subsequent semester(s). In addition, students should feel free to meet with an undergraduate academic advisor whenever additional needs or questions arise. Although most students wait until the *Schedule of Courses* is available to seek academic advising for a particular semester, students are encouraged to seek academic advising prior in advance when advisors are able to spend more time with them. To maximize the efficiency and quality of time spent with each student during an advising appointment, students are encouraged to make advising appointments, either by signing the appointment sheets provided in 204 Conradi, or calling an undergraduate academic advisor directly (see below). Students should understand that an advising appointment ensures being seen by an advisor in a timely fashion, while walk-ins risk not being seen immediately or at all on a given day depending upon the advisor's previous commitments. The Department of Biological Science undergraduate academic advisors can be contacted at the following:

- Dr. Joanna Carter 204 Conradi carter@bio.fsu.edu 850-644-3099
- Ms. Cathy Oakley 205 Conradi Oakley@bio.fsu.edu 850-644-9351
- Ms. Christina Murphy 204 Conradi cmurphy@admin.fsu.edu 850-644-4781

OTHER ADVISING OFFICES AND FREQUENTLY NEEDED TELEPHONE NUMBERS FOR BIOLOGICAL SCIENCE MAJORS

Information on the required collateral courses for the biological science major, course offerings outside of the Department of Biological Science and requirements for majors and/or minors other than biological science can be obtained by contacting the appropriate advising office. Telephone numbers are listed in the university telephone book and in the *Directory of Problem Solvers*. Advising offices frequently contacted by biological science majors are listed below.

- Department of Chemistry 850-644-6004 208 Hoffman Teaching Lab
- Department of Mathematics 850-644-5868 222 Love
- Department of Physics 850-644-3245 304 Keen
- Department of Psychology 850-644-4260 203 PSY
- Department of Statistics 850-644-7412 110 OSB
- Health Professions (COM) 850-644-7678 2140 COM

Some of the offices commonly accessed by students for answers to other academic questions are listed below. If you are unsure of the appropriate office to which to direct your question, see your academic advisor for a referral.

Department/Office/School	Telephone	Location	Reason for Contacting
Career Center	850-644-6431	A4100 University Center	Major selection; <i>Introduction to Career Development Course</i> (SDS 3340); career information; job listings.
College of Arts & Sciences (A & S)	850-644-1081	010 Longmire	Dean's office for all upper division biological science majors (> 52 hours); major changes for all upper division biological science majors; grad checks for A & S requirements.
Chemistry Help Center	850-644-4588	124 Hoffman Teaching Lab	Free tutoring and assistance in CHM 1045/L and CHM 1046/L.
Classics Department	850-644-4259	205 Dodd Hall	Placement, testing and evaluation of foreign language competency in Greek and Latin.
Financial Aid	850-644-0539	A4474 University Center	Information on financial aid, scholarships, grants, and loans.
Math Help Center	850-644-3768	110 Carothers Hall	Free tutoring and assistance in MAT 0024, MAT 1033, MAC 1105, MAC 1114, MAC 1140, MAC 1147, MAC 2233 and MAC 2311; mathematics pre-CLAST practice test.
Department of Modern	850-644-2606	369 Diffenbaugh	Placement, testing and evaluation of

Languages and Linguistics			foreign language competency in Arabic, Chinese, French, German, Hebrew, Italian, Japanese, Korean, Russian, and Spanish.
Registrars Office	850-644-1050	A3900 University Center	Obtain and submit Transient Student Forms, FSU Forgiveness Policy Forms, Extension of Time for Clearing an Incomplete Grade Forms, and Drop/Add Permits; <i>Registration Guide</i> ; CLAST; CLEP records; FAMU-FSU and TCC-FSU Cooperative Programs; official transcripts; graduation and commencement information; readmissions; student certifications; grad checks for Liberal Studies requirements.
Department of Religion	850-644-1020	M05 Dodd Hall	Placement, testing and evaluation of foreign language competency in Sanskrit.
Thagard Student Health Center	850-644-9496	Thagard Student Health Center	Medical assistance; immunizations, counseling services; immunization clearances for Transient Student Forms and FAMU-FSU Cooperative Program.
Undergraduate Studies Advising First	850-644-3430	A3200 University Center	Academic advising for undecided majors.
Undergraduate Studies-Dean's Office	850-644-2451	A3400 University Center	Dean's office for all Basic Division (BD) biological science majors (< 52 semester hours); transfer evaluation of liberal studies courses; questions on liberal studies, oral communication, and computer competency requirements; major change for all BD students.

DEPARTMENT OF BIOLOGICAL SCIENCE WEBSITE

Students are strongly encouraged to review the Department's website at www.bio.fsu.edu/. The website contains an electronic copy of departmental forms and publications, including this manual, information on the biological science major and minor, faculty listings with research areas and contact information, information for current students, departmental course materials and notes, special announcements regarding course registration, academic advising, course offerings, scholarships, and links to special sites and resources which may be helpful to biological science majors. Any comments, suggestions, or additional links for the website should be brought to the attention of Dr. Bob Reeves, Associate Chair for Undergraduate Studies (850) 644-2258; reeves@bio.fsu.edu.

BIOLOGY STUDY CENTER

The Biology Study Center is located in **339 Conradi**. It is open to all Biological Science undergraduate students and is staffed by Senior Teaching Assistants who provide free tutoring and assistance for the introductory biology courses, BSC 2010/L and BSC 2011/L. The Biology Study Center houses course reference materials and exam files, career information, and three computers networked into the university system. The Biology Study Center is open from 9:00 AM to 4:00 PM, Monday through Friday, during the fall and spring semesters (closed during summer).

ACADEMIC COMPUTER LAB

The Academic Computer Lab (215, 219 and 223 Conradi) houses Macintosh and PC computers, laser printers, and a variety of other computerized resources. The lab is open from 8:00 AM to 5:00 PM, Monday through Friday, to all undergraduate biological science and secondary science teaching students who are currently enrolled in biological science courses. Access to the lab after hours and on weekends is restricted to undergraduate biological science and secondary science teaching majors who have an FSU Card and who have filed the appropriate paperwork (which includes faculty permission) with the Conradi Computer Office in Room 221. Answers to general questions, or forms for using the Academic Computer Lab after hours can be obtained from either Alexander Stuy (astuy@bio.fsu.edu, 850-644-1006) or Sean Burnside (burnside@bio.fsu.edu, 850-644-9302) in the Conradi Computer Office, room 221.

STUDENT ORGANIZATIONS

ALPHA EPSILON DELTA

Alpha Epsilon Delta (AED) is an international honorary society for pre-professional health science students. The society organizes and presents frequent lectures by health professionals, admissions deans, and topics of interest to students whose career plans include medicine (including osteopathic and chiropractic medicine), veterinary medicine, optometry, dentistry, pharmacy, and the allied health professions. *AED* also organizes trips to professional and allied health schools in the state of Florida. News about upcoming programs can be found on the *AED* bulletin board located near 213 Conradi. Membership information can be obtained by contacting the Health Professions Advising Office, or the *AED* Advisor or President (see below).

Health Professions Advising Office	2140 College of Medicine	850-644-7678
<i>AED</i> Advisor	Mr. Rob Borger	850-644-7678
2004-05 <i>AED</i> President	Collette Washington	

AMERICAN MEDICAL STUDENT ASSOCIATION

The American Medical Student Association (AMSA) is the largest independent national medical student organization. AMSA is student-governed, and is committed to representing the concerns of physicians-in-training. With a membership of nearly 30,000 medical students, pre-medical students, interns and residents from across the country, AMSA is committed to improving health care and health care delivery to all people, promoting active improvement in medical education, involving its members in the social, moral and ethical obligation of the profession of medicine, assisting in the understanding and improvement of world health problems, contributing to the welfare of medical students, interns, residents, and post-MD/DO trainees, and advancing the profession of medicine. The association presents lectures by health professionals to students whose career plans include medicine, organizes and performs volunteer activities, and tours local hospitals. Membership information can be obtained by contacting the AMSA advisor.

AMSA Faculty advisor	Dr. Robert Reeves	330 Conradi	850-644-2248
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BETA BETA BETA (Tri-Beta)

Beta Beta Beta is a national honorary and professional fraternity of undergraduates of any major, dedicated to improving the understanding and appreciation of biological study and extending boundaries of human knowledge through scientific research. Tri-Beta promotes undergraduate research in Biology through publishing its undergraduates-only journal, *Bios*, holding meetings at which undergraduate research papers are presented in the style of graduate meetings, and awarding competitive research stipends to faculty supervisors who support undergraduate research and publication. Annual awards are given for outstanding student and chapter accomplishment. Members of the local chapter provide services to University, Department, and fellow students. Membership information can be obtained by contacting an advisor.

Tri-Beta Advisor	Dr. Debra Fadool	214 Biomedical Research Fac.	850-644-4775
Tri-Beta Advisor	Dr. Hank Bass	230A Biology Unit I	850-644-9711

DEPARTMENT OF BIOLOGICAL SCIENCE MENTORS PROGRAM

The Biological Science Mentor Program was established in spring 2001 by a group of concerned biological science majors and the department's undergraduate advising center. Biology mentors are usually junior- and senior-level students who volunteer their time to encourage and guide their peers. In addition to assisting the Undergraduate Advising Center with Preview and Orientation sessions, the mentors maintain an office in 206 Conradi, where students may receive individual attention and peer counseling. The mentors also serve as needed on student and joint student/faculty committees for grade appeals. Students wishing to participate in this program should contact the advisor.

Biology Mentors Advisor Dr. Joanna Carter Conradi 204 carter@bio.fsu.edu 644-3099

FLORIDA PUBLIC INTEREST RESEARCH GROUP

FPIRG is a campus-wide public interest research group funded directly by the students of FSU. Biological Science majors with an interest in environmental and ecological issues are encouraged to participate in *FPIRG* activities and research. The *FPIRG* office is located in 322 Oglesby Union (850-644-2483).

UNDERGRADUATE SCHOLARSHIPS

The Department of Biological Science offers several annual scholarships to undergraduate biological science majors. Scholarship information will be announced, and applications will be made available, at the beginning of the fall semester. Applications are typically due in October, with announcements of scholarship winners and an awards ceremony taking place at the end of the fall semester. For specific information and to obtain applications, watch the bulletin boards outside of 204 Conradi for application deadlines, or contact the Biological Science Undergraduate Academic Advising Office (204 Conradi) during the fall semester. Information on other scholarships, grants, and loans can be obtained through the Office of Financial Aid, 4474 University Center, 644-0539. A brief description of each scholarship offered by the Department of Biological Science is presented below.

BIOLOGICAL SCIENCE ALUMNI SCHOLARSHIP

A \$1000 award to an outstanding upper-division biological science major. The scholarship is intended to support exceptional undergraduates in pursuing professional careers in biological science.

BIOLOGICAL SCIENCE FACULTY AWARD FOR UNDERGRADUATE SCHOLARSHIP

A scholarship of up to \$1,350 awarded annually to the outstanding senior biological science major.

CHARLES M. MCALLISTER UNDERGRADUATE RESEARCH AWARD

Two scholarships of \$500 each awarded annually to outstanding upper division biological science majors with financial need and the opportunity to replace work time with research (Directed Individual Study; BSC 4900). Selection criteria include academic performance, financial need, and potential for undergraduate research.

FRANCENIA E. FISHER SCHOLARSHIP

Scholarship of \$2,500 awarded annually to an outstanding senior biological science major specializing in botany. This scholarship is intended to encourage talented undergraduates to pursue a career in plant biology. Selection criteria include academic excellence, competence in plant biology, and demonstrated interest in a career in the plant sciences.

JOHN MARK CAFFREY SCHOLARSHIP

A \$1,500 scholarship awarded annually to an outstanding senior with an academic interest in biology, structural biology, biochemistry, or physiology. Selection criteria include academic performance and evidence of outstanding potential for a career as a research scientist.

VARINA VAUGHN - WINONA JORDAN SCHOLARSHIP

Scholarship of \$1,000 awarded annually to an outstanding upper division biological science major who intends to pursue a career in the plant sciences. Selection criteria include academic performance and a demonstrated interest in the field.

HUGHES FELLOWSHIPS IN MATHEMATICAL AND COMPUTATIONAL BIOLOGY

About the Fellowships

A number of Hughes Fellowships are available on a competitive basis for students pursuing the Mathematical and Computational Biology track. This program is supported by the Howard Hughes Medical Institute and enables students in their senior year to acquire state-of-the-art training through research in laboratories of faculty using computational methodologies. Students selected as "Hughes Fellows" conduct computational research during the summer following their junior year and continue research while completing course work during the fall and spring semesters of their senior year. Fellows receive financial support to help offset living expenses and other educational costs. This includes a \$5000 fellowship stipend for educational expenses, a \$1200 housing allowance for summer research participation, plus additional funds for research expenses and attending a national research meeting.

When to apply

Students who are pursuing the Mathematical and Computational Biology track are eligible to apply for a Hughes Fellowship during the fall semester of the junior year. The Fellowships are awarded to students who have reached senior status (90 credit hours) at the start of the summer semester preceding their senior year. Selection of 12 Fellows per year is made on a competitive basis by the Hughes Faculty Advisory Committee.

Specific Fellowship activity

Research: Hughes Fellows are paired with one or more FSU Science Faculty members to carry out research. A large number of faculty members in the Departments of Biological Science, Chemistry, Chemical Engineering, Computer Science, Mathematics, Physics, and Statistics have volunteered to serve as mentors to Hughes Fellows. All have strong mathematical/computational components in their biological research and are able to expose students to a variety of modern computational methods. Advising staff work with Hughes Fellows to identify faculty to serve as research sponsors. Many Hughes Fellows interact with more than one mentor over the one-year period of research, for example in cases where data are collected in one laboratory then computationally evaluated in a second laboratory.

Research is conducted throughout the one year duration of the Fellowship (summer-spring) but is most concentrated during the summer semester. Summer term may either be devoted to full-time research without enrollment in courses or to doing research while being enrolled in one course (related to the computational studies or required for completion of the major/minor). Fellows also attend a (non-credit) weekly seminar to further introduce them to computation biology and to general issues confronting biological researchers. During the fall and spring semesters Fellows continue reduced levels of research, which carries DIS (BSC 4900) or Honors in the Major (BSC 4970) credit, in addition to courses in their senior year. Biology majors may fulfill their Experimental Biology (BSC 3402L) course requirement through enrollment in either BSC 4900 or BSC 4970.

Coursework: Hughes fellows complete their remaining Mathematical and Computational Biology track coursework during the fall and spring of their senior year.

Students who are interested in pursuing the Mathematical and Computational Biology track should report this interest to one of the undergraduate departmental advisors (204/205 Conradi) and become registered as a student on the track. This will allow advisors to guide students in selecting courses, monitor their progress, and advise them of application procedures for Hughes Fellowships.

BULLETIN BOARDS

The department posts a variety of notices, including *BioNotes*, a weekly publication containing departmental news and announcements, on the bulletin boards next to the elevators in Conradi and Biology Unit I and between 213 and 215 Conradi. The bulletin boards outside of the Biological Science Undergraduate Academic Advising Office in 204 Conradi are for information on changes in requirements and course offerings, scholarships, work opportunities, internships, and careers. Posters describing courses to be offered the next semester are next to 232 Conradi, graduate schools are next to 217 Conradi, and summer research opportunities are across from 234 Conradi.

DEPARTMENTAL COLLOQUIA

The Biological Science Department offers weekly colloquia on Thursday afternoons at 4:00 PM in 228 Conradi. Coffee is served at 3:30, and a reception (with food!) for the speaker is held after the colloquium in 232 Conradi. Students are encouraged to attend the colloquia, which feature speakers from other institutions as well as faculty from FSU. Announcements of the speaker and topic are posted on the bulletin boards each week. In addition to the regular colloquia, special seminars will be scheduled and announced in *BioNotes* and on bulletin boards. The

department's colloquia and seminars are free, stimulating, informative, social, and an excellent way to add to your education in the biological sciences.

SPECIAL PROGRAMS

UNDERGRADUATE UNIVERSITY HONORS PROGRAMS

The FSU Honors Program consists of two honors curricula:

- The Liberal Studies Honors Program provides challenging courses for students who are pursuing the liberal studies requirements. Typically, these students are freshmen and sophomores.
- The Honors In The Major Program provides a chance for students to do independent projects during their junior and senior years.

Both honors programs are designed to allow academically talented students to develop to their fullest potential. Both encourage independent thinking, "tailor-made" university experiences, and close interaction with FSU faculty members. Honors students have priority registration for all FSU courses and may receive advising and other support, if desired from the staff of the University Honors Program.

THE LIBERAL STUDIES HONORS PROGRAM

The Liberal Studies Honors Program allows academically talented students to choose special, limited enrollment courses, which fulfill liberal studies requirements. For biological science majors who are in The Liberal Studies Honors Program, the department offers honors sections of Biological Science I and II (BSC 2010/L & BSC 2011/L). Honors sections are also offered in General Chemistry I and II (CHM 1050/L and CHM 1051/L) and in Calculus With Analytical Geometry I and II (MAC 2311 and MAC 2312). Each of these courses satisfies requirements for the baccalaureate degree in biological science. The main benefit to students who enroll in honor sections is smaller class size. For example, the maximum enrollment for the two regular sections of BSC 2010 in Fall 2000 are 244 and 144 students, respectively, while the corresponding two honors sections of BSC 2010 in Fall 2000 are limited to 36 students each.

An *invitation* for admission into this program is extended to incoming freshman and transfer students who meet the program criteria. Freshmen who earn a 3.8 GPA on twelve (12) to eighteen (18) hours in their first semester at FSU may request to be admitted into the Liberal Studies Honors Program. Information on the Liberal Studies Honors program or admittance criteria can be obtained by contacting the University Honors Program at A3600 University Center, 850-644-1841.

HONORS IN THE MAJOR

The Department of Biological Science offers an Honors In The Major Program to encourage talented juniors and seniors to undertake independent, original research as a part of the undergraduate experience. The program helps some students to decide whether they enjoy the independent work required in graduate study. Successful Honors In The Major students find that the talents they develop are especially useful later in graduate and professional school and in their careers. Each Honors In The Major student works with faculty members of their choice on a two- or three-semester research project culminating in an Honors Thesis. A thesis is defined as a document that describes the scope, methodology, results, and conclusions of academic research. Honors In The Major students defend their finished thesis in a meeting with their selected faculty members and submit the final thesis or research project to the University Honors Program. Successful completion of the Honors Thesis results in the distinction of graduating "*With Honors in Biological Science*". This distinction is announced at graduation and on the student's permanent record.

Students who participate in Honors In The Major become members of the University Honors Program and are eligible for all program activities and other benefits. Honors In The Major students are also eligible, on a space-available basis, for honors-only liberal studies courses. Each term that an honors student is in the program, the student enrolls in *BSC 4970r: Honors Work in Biological Science* for 3 semester hours. To allow sufficient time to complete the scientific research and write the Honors Thesis, the course is repeatable to a maximum of 12 semester hours, 6 hours of which can be used to meet the 38-hour biological science coursework requirement.

Biological science majors who are interested in the Honors In The Major Program may apply if they have:

- Completed at least 60, typically 75, college credits
- Earned a 3.2 cumulative grade point average (GPA) on all course work (including transfer credits)
- Earned a 3.2 GPA on at least twelve (12) semester hours of coursework at FSU.

General information on the Honors In The Major program or admittance criteria can be obtained by contacting the University Honors Program at A5400 University Center, 850-644-1841.

For specific information on applying to the Honors in the Biology Major program, biological sciences students are encouraged to contact Dr. Walter Tschinkel, Director of Honors In The Major for the Department of Biological Science (203 Bio Unit I; 850-644-4489). The following provides a summary of recent Honors In The Major research projects.

YEAR 2003-2004 HONORS IN THE MAJOR RESEARCH PROJECTS

Brian Bielfelt	Can releasing a native plant from its enemies cause it to have invasive qualities? Faculty Director: Dr. Underwood
Jonathan Block	Gene expression analysis in the vertebrate, <i>xenopus laevis</i> Faculty Director: Dr. Altmann
Matthew Breslow	Parvalbumin expression and kinetics along the length of sheephead skeletal muscle Faculty Director: Dr. Moerland
Jean Brown	Investigation of the nonmuscle myosin II A interaction with eukaryotic elongation factor 1 A Faculty Director: Dr. T. Keller
Jason Castroman	The Effect of Soluble A-Beta on Dendritic Spines Faculty Director: Dr. Ouimet
Ciara Csanadi	The osmoregulatory system in guard cells Faculty Director: Dr. Outlaw
Sarah Gray	Nutrient limitation in the inquiline community of the purple pitcher plant, <i>Saracenia purpurea</i> Faculty Director: Dr. Miller
Aaron Kline	Conformal maps of brain surfaces Faculty Director: Dr. Hurdal
Kevin McCluney	The relationship between fire intensity and ground-cover vegetation in the longleaf pine ecosystem Faculty Director: Dr. James
Miguel Mercado-Ochoa	Characterization of glutamate receptor subunit 2 in the rat olfactory bulb Faculty Director: Dr. Trombley
Trevor Morrison	Influence of endometriosis on the vascular permeability and motility of the female rat bladder Faculty Director: Dr. Reeves and Dr. Berkley
Randa Perkins	Axonal targeting of the olfactory bulb in Kv1.3 knockout mice Faculty Director: Dr. D. Fadool
Eric Powell	A model of evolution in a competitive community Faculty Director: Dr. Miller
Deena Westbrook	Investigating the role and genetic diversity of nitrogen processing microbes in global salt marsh and mangrove sediments and macrobenthos Faculty Director: Dr. Swofford
Amanda White	Induced and constitutive resistance to herbivores in tomato Faculty Director: Dr. Underwood
Kenneth Winnard	The influence of colon inflammation on bladder function in the rat Faculty Director: Dr. Berkley

UNDERGRADUATE RESEARCH OPPORTUNITIES

RESEARCH FACILITIES

Along with undergraduate teaching and graduate student training, research is strongly emphasized in the Department of Biological Science. The department is internationally noted for its research programs in both systematic and experimental biology. Fully equipped research laboratories are located in five buildings on campus (Conradi, Biological Science Unit I, Institute of Molecular Biophysics, Biomedical Research Building, and Nuclear Research Building). On-campus research facilities include the Electron Microscope Center (including one scanning electron microscope, three transmission microscopes, a quantitative fluorescence microscope, and a laser scanning confocal microscope). A recently installed Philips CM 300-FEG TEM is equipped for high-resolution cryomicroscopy of unstained protein molecules and protein crystals. Researchers also have access to radioisotope instrumentation laboratories, an X-ray laboratory, the Monoclonal Antibody Laboratory, the Analytical Laboratory, the Structural Biology Laboratory, and the National High Magnetic Field Laboratory. Special service facilities include the Histology Laboratory, special culture chambers, greenhouses, machine and electronics shops, animal housing, ultracentrifuges, cold laboratories, sterile laboratories, shielded electrophysiological laboratories, field vehicles, special instrumentation for biological photography, the Instrument Design Laboratory, and the facilities of the Supercomputer Computations Research Institute (SCRI). Significant research collections of microorganisms and of birds are also maintained on campus and the department supports a herbarium containing about 200,000 specimens. Off-campus research facilities include the FSU Marine Laboratory on the Gulf of Mexico, and the Mission Road Greenhouse. The privately endowed Tall Timbers Research Station is located just north of Tallahassee.

REQUIRED AND ELECTIVE BIOLOGICAL SCIENCE RESEARCH COURSES

Experimental Biology Lab: The Department of Biological Science has established a required research course entitled “*Experimental Biology Lab*” (BSC 3402L) to insure that every student will have completed at least one research project as a part of the baccalaureate degree in biological science. This required course does not follow traditional patterns of lecture and laboratory meetings. Each section of this course covers a different topic of research. The faculty member, schedule for conducting laboratory research, analysis of data, and associated lecture/conferences will vary for each section. For specifics in the frequency of meeting times, and the topic of research for each section, check the *Schedule of Courses* and/or the bulletin board outside of 204 Conradi. A more complete description of BSC 3402L is provided on page 38.

Directed Individual Study (DIS) and Research Methods Courses: Students with significant interest in research should consider taking either a Directed Individual Study (BSC 4900r) or Research Methods (BSC 4933r) course. Each of these elective courses provides a unique opportunity for undergraduates to perform research at the undergraduate level. In order to take a DIS or Research Methods course, students select a Biological Science faculty member with whom to design and perform a research project of mutual interest. Research under the direction of a faculty member in another department may be approved if the research content is appropriate and if a Department of Biological Science faculty member is willing to coordinate the project with the directing faculty member.

To be eligible to participate in a DIS or Research Methods course, students must have:

- Junior or senior standing as a Biological Science (major code 111110), Science Education (major code 220204), or Secondary Science and Mathematics Teaching (major code 111115) major; and
- A minimum 3.0 biology GPA in all biological science, chemistry, physics, mathematics, and statistics courses that apply to the major.

A student who is ineligible (see requirements above) to take a DIS or Research Methods course may obtain a waiver of eligibility requirements by submission of a written justification from the faculty sponsor. An eligibility form and additional information on DIS and Research Methods courses can be obtained from the Department of Biological Science Undergraduate Academic Advising Office located in 204 Conradi. Both the DIS and Research Methods courses are repeatable and students may register for 1-4 credit hours per semester. A maximum of 6 hours of DIS or Research Methods coursework can be used to meet the 38-hour biological science coursework requirement.

INTERNSHIPS

Research internships may be available with state and federal agencies such as the Florida Department of Environmental Protection, the Florida Game and Fresh Water Fish Commission, and the National Oceanographic and Atmospheric Administration. Internship listings and information are available at the Career Center, A4100 University Center (850-644-6431).

CERTIFICATE PROGRAM IN LIVING MARINE RESOURCE ECOLOGY

Interest in marine resources is widespread at the national level, and they are one of the top three career choices of most students entering college. The Department of Biological Science has designed a Certificate Program in Living Marine Resource Ecology to provide junior or senior biological science majors interested in marine biology with both a challenging academic program and substantive hands-on experiences in the field. The program prepares students to effectively pursue professional career development in the application of ecology to significant resource issues of the marine environment. The certificate requirements assure a strong knowledge base in relevant biological disciplines, hands-on research experience on marine organisms and habitats, and awareness of major problems of marine resource ecology now confronting science and society and how they might be solved.

The program benefits tremendously from close relationships with the Mote Marine Laboratory, the National Marine Fisheries Service, the National Estuarine Research Reserves, and the Florida Division of Marine Fisheries. Whenever possible, courses will be taught at the Florida State University Marine Laboratory in Turkey Point, located approximately an hour south of the FSU campus.

Students who are interested in the certificate program should apply in the spring or summer proceeding their junior or senior year. Students selected to enroll in the Certificate Program In Living Marine Resource Ecology will be required to complete at least 16 additional hours of coursework to earn the certificate. These 16 certificate hours will apply towards the biological science major. A maximum of 10 students will be accepted into the certificate program each year. Students wishing to enter the program retroactively may do so before the first semester of their senior year.

Entry into certificate program

- Completion of prerequisites for the major in Biological Science (BSC 2010/L, BSC 2011/L, CHM 1045C, and CHM 1046C; and
- 3.0 GPA or better in 2000-level introductory biological science courses (BSC 2010/L and 2011/2011L).

Completion of certificate program

- 3.0 GPA or better in certificate courses.

Students interested in the Certificate Program in Living Marine Resource Ecology are encouraged to meet with either Dr. Herrnkind (850-644-9840; 309 Conradi) or Dr. Coleman (850-644-2019; 112 Conradi), FSU faculty advisers for the program. Printed information and applications for the certificate program are available in the Biological Science Undergraduate Academic Advising Office (204 Conradi).

THE FLORIDA STATE UNIVERSITY COLLEGE OF MEDICINE A UNIQUE PATHWAY TO A MEDICAL CAREER

A new four-year medical school has been established for the first time in 20 years in the U.S., at Florida State University. The former FSU Program in Medical Sciences (PIMS), which which had been in operation for over 30 years, is the foundation on which the new medical school is being built. The new FSU College of Medicine accepted students in 2001 for the inaugural class of the new medical school, which matriculated in May 2001. The mission of the Florida State University College of Medicine will be to provide a unique community-based approach to training future physicians for Florida with a focus on primary care and geriatric patients, particularly in medically underserved areas.

Additional information about the Florida State University College of Medicine or the professional or allied health sciences may be obtained by contacting:

College of Medicine
2140 College of Medicine
Florida State University
Tallahassee, Florida 32306-4300
(850) 644-7678
rob.borger@med.fsu.edu

UNDERGRADUATE SUPERVISED TEACHING ASSISTANTSHIPS

Each year, 20 to 25 outstanding *senior* biological science majors are awarded paid undergraduate supervised Teaching Assistantships (senior TAs) through the Department of Biological Science. The stipend for these assistantships varies but usually approximates \$1,000 per semester depending upon responsibilities assigned. In addition to receiving a stipend, Senior TAs may choose to register for BSC 4945 and receive 1 hour of credit toward the 38-hour biological science coursework requirement. Undergraduate Senior TAs are assigned to:

- Staff the Biology Help Center and serve as tutors in the introductory biological science courses for majors (BSC 2010 and BSC 2011); or
- Serve as tutors in the liberal studies biology lecture course for *nonmajors* (BSC 1005); or
- Serve as laboratory TAs in the liberal studies biology laboratory course for *nonmajors* (BSC 1005L).

Students who are expecting to continue in graduate study (or are considering a career in teaching) are strongly encouraged to apply for an Undergraduate Supervised Teaching Assistantship, since most beginning graduate students receive teaching assistantships similar those experienced in this program. To be eligible to apply for an Undergraduate Supervised Teaching Assistantship, students must have:

- Senior standing as a Biological Science (major code 111110), Science Education (major code 220204), or Secondary Science and Mathematics Teaching (major code 111115) major; and
- A minimum 3.0 FSU GPA.

Specific questions regarding undergraduate supervised teaching should be addressed to Dr. Joanna Carter (204 Conradi; 850-644-3099) for senior TAs in BSC 2010 and BSC 2011, or from Dr. Ann Lumsden (431 Carothers; 850-644-6826), for Senior TAs in BSC 1005/L. Applications for Undergraduate Teaching Assistantships are available in the Biological Science Undergraduate Academic Advising Office (204 Conradi). Completed applications should be turned into Ms. Judy Bowers (850-644-3023; 202 Conradi). Departmental faculty will interview qualified applicants. If selected to be a Senior TA, students must participate in a mandatory, week-long training workshop sponsored by the Department of Biological Science the week before fall semester classes begin. Senior TAs are provided support and closely monitored during their assistantship by Department of Biological Science faculty.

SECONDARY SCIENCE AND MATHEMATICS TEACHING

Secondary Science and Mathematics Teaching (major code 111115) is an interdisciplinary major designed to address the critical shortage of science and math teachers in the state of Florida. Students completing this four-year program will receive a Bachelor of Science degree in Secondary Science and Mathematics Teaching from the College of Arts and Sciences and be certified for entry into the Florida Beginning Teacher Program. The program includes several unique features.

- ❖ The condensed pedagogy (i.e., the study of teaching) component can be completed in essentially one semester. This feature frees students to take additional content courses in their areas of specialty.
- ❖ Most students will be certified to teach in two areas. This feature prepares teachers for the reality of the secondary school environment in which faculty often are required to teach more than one subject.
- ❖ A seminar course addresses specific problems and issues related to science and mathematics teaching at the secondary level.

Secondary Science and Mathematics Teaching majors must complete a basic science/math core and courses from one of seven specialty-teaching tracks (mathematics/physics, physics/chemistry, physics/earth-space science, biology/chemistry, biology/earth-space science, biology/psychology, mathematics/statistics). Each specialty-teaching track has been certified as an approved teacher-education program by the Florida Department of Education.

Students may obtain a double major by completing the major requirements for any of the individual science (e.g., biological sciences) or math departments in addition to the requirements of the Secondary Science and Mathematics Teaching major. In most cases, this requires about 15 to 20 additional hours in the department granting the second major as opposed to a minimum of 30-35 hours of additional class work if the student decides to obtain a second bachelors degree after graduation.

For more information regarding the Secondary Science and Mathematics Teaching major contact:

Dr. Ellen Granger
Office of Science Teaching Activities
227 Conradi Building
Florida State University
Tallahassee, FL. 32306-1100
(850) 644-6747

FAMU-FSU COOPERATIVE PROGRAM

Students enrolled at FSU may enroll in courses at Florida Agricultural & Mechanical University (FAMU) for FSU credit so long as the following conditions are met (see the *General Bulletin* for a more detailed description):

- A similar course is not offered at FSU
- The course is offered at the 3000 or 4000 level
- The course must be graded on a satisfactory/unsatisfactory (S/U) basis
- An immunization clearance is obtained from Thagard Student Health Center
- Permission is obtained from the appropriate FAMU department and FSU academic dean

Biological science students who are interested in taking a major course at FAMU should first check with the Biological Science Undergraduate Academic Advising Office (204 Conradi) to make certain that the course will transfer in for biological science major credit. For information on how to register for classes at FAMU, contact the FAMU-FSU Cooperative Program Representative in the Registrar's Office (3900 UCA) at 850-644-1050.

TCC-FSU COOPERATIVE PROGRAM

Students enrolled at FSU may enroll in courses at Tallahassee Community College (TCC) so long as the following conditions are met (see the *General Bulletin* for a more detailed description):

- The same course is not offered at FSU
- The student obtains approval from the FSU Registrar's Office, the FSU academic dean, and the TCC Registrar's Office
- The student follows the TCC academic calendar and registration procedures
- The student pays registration fees to TCC

Biological science students who are interested in taking a course for the major at TCC should first check with the Biological Science Undergraduate Academic Advising Office (204 Conradi) to make certain that the course will transfer in for biological science major credit. For information on how to register for classes at TCC, contact the TCC-FSU Cooperative Program Representative in the Registrar's Office (3900 UCA) at 850-644-1050.

DEPARTMENTAL COURSE DESCRIPTIONS

Note: The instructors of and frequency of offering for each course is tentative and is subject to change depending upon historical course demand, enrollment numbers and faculty commitments.

INTRODUCTORY BIOLOGICAL SCIENCE COURSES FOR UNDERGRADUATE STUDENTS

- BSC 2010** **BIOLOGICAL SCIENCE I (3 hrs)**
Instructors: Chase, Elam, Ellington, D. Fadool, Fajer, Granger, Houpt, Moerland, Roux, or Trombley
Frequency Offered: Every semester
Prerequisites or corequisites: CHM 1045C
Corequisite: BSC 2010L
Typical Format: 3 hours lecture/week; 2-3 exams and final
Lecture topics: Chemical constituents of life, biomolecules, cell structure and function, bioenergetics, kinetics, enzyme catalysis, cellular respiration and metabolism, photosynthesis, nutrients and tropism, DNA structure and replication, protein synthesis, regulation of gene expression, genetic engineering, cancer, gas exchange, transport and translocation mechanisms, circulation, hormones, excitable cells, nerve cell function, and muscle cell function.
- BSC 2010L** **BIOLOGICAL SCIENCE I LABORATORY (1 hr)**
Instructors: Epstein
Frequency Offered: Every semester
Prerequisite or corequisite: CHM 1045C
Corequisite: BSC 2010
Typical Format: 3 hours lab/week; lab reports; weekly quizzes and data sheets
Lab topics: Methods in cell chemistry, enzyme kinetics, molecular biology, and physiology.
- BSC 2011** **BIOLOGICAL SCIENCE II (3 hrs)**
Instructors: Bates, Epstein, Houle, Inouye, Levitan, Underwood, or Winn
Frequency Offered: Every semester
Prerequisites: BSC 2010 & BSC 2010L
Typical Format: 3 hours lecture/week and scheduled help session; 3 exams and final
Lecture Topics: Cell differentiation, metamorphosis and regeneration, embryonic development, cell cycles, mitosis and meiosis, Mendelian inheritance, gene expression and gene interactions, human inheritance, mechanisms of evolution, natural selection, adaptation, population genetics, speciation, sexuality, evolution and the origin of life, the biosphere, communities and community succession, ecosystems, energy and productivity, mineral cycles, community structure, population dynamics, population growth and reproductive strategies, population regulation, human populations, human intrusion in ecosystems.
- BSC 2011L** **ANIMAL DIVERSITY LABORATORY (2 hrs)**
Instructors: Herrnkind, Naylor or Tschinkel
Frequency Offered: Every semester
Prerequisites: BSC 2010 & BSC 2010L
Typical Format: 1 hour lecture/week, 1 hour recitation/week, 3 hours lab/week; weekly laboratory quizzes, laboratory practical exam
Lecture Topics: Discussion of the form and function of structures, organs, and organ systems of animals considered in the laboratory each week. The phyla treated are: Porifera, Cnidaria, Platyhelminthes, Nemertina, Nematoda, Rotifera, Annelida, Arthropoda, Mollusca, Bryozoa, Echinodermata, Chordata, and Protozoa. The sequence of topics may vary depending upon the lecturer.
Lab Topics: Each of the above phyla is treated in turn. Students learn basic dissection, use of the compound and dissecting microscopes, and the internal and external features of representative animals from each group.

UPPER DIVISION BIOLOGICAL SCIENCE COURSES FOR UNDERGRADUATE STUDENTS

NOTE: BSC 2010/L, BSC 2011/L, CHM 1045C and CMH 1046C are prerequisite courses to all upper division biology courses in the major. Upper division courses are restricted to majors who have successfully completed the major prerequisite courses and have been assigned the major code 111110.

- BOT 3015** **PLANT BIOLOGY (2 hrs)**
Instructors: Outlaw or Mast
Frequency Offered: Every semester
Prerequisites: Major prerequisite courses
Typical Format: 2 hours lecture and demonstration/week; 2-5 exams
Lecture Topics: Plants, fungi, autotrophic and osmotrophic protists, and bacteria are presented in an evolutionary and ecological context. The natural history, anatomy, physiology, biochemistry, and development of angiosperms are stressed, particularly as they relate to agronomic practices.
Additional Information: Designated as a required upper division biology course.
- BOT 3015L** **PLANT BIOLOGY LABORATORY (1 hr)**
Instructors: Outlaw or Mast
Frequency Offered: Every semester
Prerequisites: Major prerequisite courses
Prerequisite or Corequisite: BOT 3015
Typical Format: 3 hours lab/week; 4 exams, 3 reports, notebook
Lab Topics: Morphology, anatomy, reproduction, development, symbioses, and physiology of angiosperms, fungi, osmotrophic protists, and non-flowering plants.
- BOT 3143C** **FIELD BOTANY (4 hrs)**
Instructor: Mast
Frequency Offered: Annually, fall semester
Prerequisites: Major prerequisite courses
Typical Format: 2 hours lecture/week, 6 hours lab/week; 3 exams and final; preparation of a pressed, identified plant collection
Lecture and Lab Topics: Introductory plant taxonomy with emphasis on laboratory and field study; principles of plant identification, classification, and rules of nomenclature; use of keys; collecting techniques; survey of major flowering plant families; field trips and laboratory work on collections.
- BOT 3800** **ELEMENTARY BOTANY: PLANTS AND MAN (3 hrs)**
Instructor: TO BE ANNOUNCED
Frequency Offered: Annually, spring semester
Prerequisites: Major prerequisite courses
Typical Format: 3 hours lecture/week; term paper required, frequent quizzes and final
Lecture Topics: Man's uses of plants for food, spices, oils, rubber, resins, perfumes, dyes, clothing, building materials, paper, and medicine; importance of poisonous plants and weeds; plant exploration and early history; plant geography; some basic botany; color slides and other visuals used extensively.
- BOT 4373C** **BOTANY OF HIGHER PLANTS (4 hrs)**
Instructor: TO BE ANNOUNCED
Frequency Offered: To be announced
Prerequisites: Major prerequisite courses
Typical Format: 2 hours lecture/week, 4 hours lab/week; 3 exams and final
Lecture and Lab Topics: External and internal morphology of representatives of all major groups of vascular plants (ferns, fern allies, gymnosperms, flowering plants); review of origin of land plants and vascular plant systematics; life histories with reference to phylogenetic specializations; emphasis on anatomical structure of cells, tissues, and organs; extensive use of live plants and microscope slides in the laboratory, supplemented by color slides.

- BOT 4394** **PLANT MOLECULAR BIOLOGY (3 hrs)**
Instructor: Bass
Frequency Offered: Biennially, odd years, fall semester
Prerequisites: Major prerequisite courses
Typical Format: 3 lectures/week; assigned reading; 2 exams, 1 final
Lecture Topics: Early development; forces that shape the embryo; gradients and polarity; nuclear cytoplasmic interactions; meristems; morphogenetic fields; organogenesis; cell-cell interactions; cell adhesion and recognition; receptors and cell signaling; cell wall structure and assembly; control of gene expression; plant hormones; photoperiodism; chloroplast development; plant- bacterial interactions; genetic engineering of plants.
- BOT 4503** **PLANT PHYSIOLOGY (3 hrs)**
Instructor: Outlaw
Frequency Offered: Biennially, even years, spring semester
Prerequisites: Major prerequisite courses, BOT3015, and CHM 2210; PCB 3134 recommended
Typical Format: 3 lectures/ week; biweekly exams and final
Lecture Topics: Exchange of molecules and energy with the environment; intercellular communication; transport and translocation; photosynthesis and its adaptations to environmental demands; aspects of plant respiration; nitrogen and sulfur metabolism; regulation of plant growth and development by hormones and the environment; plant responses to herbicides, pollutants, and pathogens.
Additional Information: Designated as an Area II (Physiology) course.
- BOT 4503L** **PLANT PHYSIOLOGY LABORATORY (1 hr)**
Instructor: To be announced
Frequency Offered: To be announced
Prerequisites: Major prerequisite courses and CHM 2210; PCB 3134 recommended
Prerequisite or Corequisite: BOT 4503
Typical Format: 3 hours lab/week
Lab Topics: Topics related to lecture topics in BOT 4503. Course emphasizes data computation, analysis, and presentation. Uses selected instrumentation including the spectrophotometer, fluorimeter, O₂ electrode system, spectroradiometers, and CO₂ analyzer.
- BSC 3052** **CONSERVATION BIOLOGY (3 hrs)**
Instructors: Underwood or Beerli
Frequency Offered: Annually, fall semester
Prerequisites: Major prerequisite courses
Typical Format: 3 lectures/week; 1 research paper; several computer assignments; 3 exams
Lecture Topics: The history of the conservation movement; research on populations of animals and plants that is relevant to man's impact on the environment; pollution in terrestrial and aquatic ecosystems; the management of endangered species; wildlife biology; government regulation; sustainable ecosystems.
Additional Information: Designated as an Area III (Ecology and Environmental Science) course.
- BSC 3101** **HISTORY OF BIOLOGY (3 hrs)**
Instructor: To be announced
Frequency Offered: To be announced
Prerequisites: Major prerequisite courses; junior (60-89 semester hours) or senior (90+ semester hours) standing
Typical Format: 3 lectures/week; midterm exam and final
Lecture topics: Biological thought from the ancients through the Middle Ages with emphasis on the development of ideas and the concurrent changes in technology. Examines the origin of modern science with William Harvey; relationship of scientific development and social changes; review of histories of cell doctrine, evolution, physiology, embryology, and genetics; and importance of the patron to the development of biological science.

BSC 3312**MARINE BIOLOGY (3 hrs)****Instructor:** Wulff**Frequency Offered:** Annually, fall semester**Prerequisites:** Major prerequisite courses**Typical Format:** 3 hours lecture/week; midterm and final**Lecture topics:** Marine geology; sea-floor spreading and plate tectonics; chemistry of oceans; tides, waves, oceanic circulation and currents; the ecology of pelagic and benthic organisms, including those from rocky coasts, unconsolidated shores, and coral reefs; island biology; benthic plants and phytoplankton; zooplankton and nekton; marine invertebrates, fishes, reptiles, birds and mammals; marine productivity and fisheries; marine pollution and conservation.**BSC 3402L****EXPERIMENTAL BIOLOGY LABORATORY (2 hrs)****Instructors:** Numerous research faculty of the biological science department. Research topics vary with instructor. The following faculty and topics are tentatively planned for 2004-2005:

- ❖ Chase: Muscle enzymes
- ❖ Epstein: Genetics and evolution in *Drosophila*
- ❖ Gaffney: Protein biotechnology
- ❖ L. Keller: Algal genetics
- ❖ Levitan: Marine biology
- ❖ Miller: Experimental ecology
- ❖ Ronquist: Comparative genomics
- ❖ Winn: Pollination biology

Frequency Offered: Every semester**Prerequisites:** Major prerequisite courses; biological science majors only**Typical Format:** Scheduling of this course is not in the traditional lecture/laboratory format. For specifics in the frequency of meeting times, and the topic of research for each section, check the *Directory of Classes* and/or the bulletin board outside of 204 Conradi.**Lab topics:** Introduction to experimental biology using different types of organisms (depending on instructor). All will include basic techniques for handling the organism, experimental design, data collection, interpretation, and scientific writing. Students will develop and execute individual projects during the term.**Additional Information:** Designated as a required upper division biology course.**BSC 3930****SEMINAR IN BIOLOGICAL FRONTIERS (1 hr)****Instructor:** Granger**Frequency** Annually, spring semester**Prerequisites:** BSC 2011 & BSC 2011L**Typical Format:** One presentation per week; no exams, no final; S/U grade based upon required and recorded attendance**Lecture Topics:** This course introduces biology majors to biological science faculty and their research interests. The sequence and content of the lectures are not fixed. Each week a different faculty member presents a lecture on a research topic of interest. There are between 12 and 14 different speakers each semester.**Additional Information:** Not repeatable for credit toward major requirements.**BSC 3938****CAREERS IN THE BIOLOGICAL SCIENCES (1 hr)****Instructor:** Granger**Frequency Offered:** Annually, fall semester**Prerequisites:** None**Typical Format:** One presentation per week; no exams, no final; S/U grade based upon required and recorded attendance**Lecture Topics:** This course introduces biology majors to the diversity of careers available to those with a background in biological science. Also covers the academic preparation appropriate to such careers. Each week a different speaker will discuss his or her career with the class. There are between 12 and 14 different speakers each semester.**Additional Information:** This course is intended for biological science majors at any point in their undergraduate career, but is most beneficial to those in their first three years. Not repeatable for credit toward major requirements.

BSC 4514 **AQUATIC POLLUTION BIOLOGY (3 hrs)**
Instructor: To be announced
Frequency Offered: Annually, spring semester
Prerequisites: Major prerequisite courses
Typical Format: 3 hours lecture/week; 2 exams and final
Lecture Topics: Aquatic systems; mechanisms of interaction; physical alterations; nutrients and cultural eutrophication; pesticides; heavy metals; petrochemicals; industrial wastes; field analysis; land use and planning concepts; biological organization of lakes, rivers, estuaries, and the deep sea; human impact on aquatic environments; laboratory and field approaches to the study of natural processes.

BSC 4613 **SYSTEMATICS (3 hrs)**
Instructors: Stepan
Frequency Offered: Biennially, even years, spring semester
Prerequisites: Major prerequisite courses
Typical Format: 3 hours lecture/week; 1 exam, oral report, and final
Lecture Topics: Kinds of variations among organisms; nature of categories (species through family); phylogeny and phylogenetic methods; interpretation of evolutionary affinities; principles of nomenclature.

BSC 4833C **RADIATION BIOLOGY (3 hrs)**
Instructor: TO BE ANNOUNCED
Frequency Offered: Biennially, odd years, fall semester
Prerequisites: Major prerequisite courses; instructor's permission
Typical Format: 2 lectures/week, 1 lab lecture/week, 2 hours lab/week; 2 exams and final, other requirements include reading lecture and laboratory manuals and weekly laboratory reports
Lecture Topics: Radiation physics; radiation chemistry; radiation effects on cells and cell organelles; radiation effects on major organ systems of mammals; radiation and immunity; radiological aging; radiation and cancer; radiation and the environment; applied radiation biology.
Lab Topics: Radiation safety; radiation dosimetry; operation of X-ray machines; autoradiography; radiation effects on plant seeds; radiation survival of bacteria; radiation effects on cancer cells in tissue culture.

BSC 4900r **DIRECTED INDIVIDUAL STUDY (DIS) (1-4 hrs)**
Instructors: Numerous research faculty of the department. Research topics vary with instructor.
Frequency Offered: Every semester
Prerequisites: Major prerequisite courses; a minimum-combined 3.0 biology GPA; permission of biological science faculty member; permission of the Undergraduate Advising Office
Typical Format: Varies with instructor
Lab Topic: DIS offers a unique opportunity for undergraduates to perform research at the undergraduate level. Students perform special supervised study or research in the area of the faculty member's research area.
Additional Information: Repeatable course. A maximum of six (6) semester hours of DIS or Research Methods (BSC 4933) may be applied to the biological science major. See an advisor in the Undergraduate Advising Office for the form required to take a DIS.

BSC 4931r **SENIOR TUTORIAL IN BIOLOGICAL SCIENCE (1 hr)**
Instructors: Vary by semester. The following faculty and senior tutorial topics were taught in 2003-2004:

- | | |
|-------------|------------------------|
| ❖ Gaffney | Protein intermediate |
| ❖ Levitan | Habitats and organisms |
| ❖ Quadagno: | Hormones/Risk taking |
| ❖ Roux: | Biotechnology |
| ❖ Travis: | Habitats and organisms |
| ❖ Winn: | Habitats and organisms |

Frequency Offered: Fall and spring semesters

Prerequisites: Major prerequisite courses; senior standing (90+ semester hours) as a biological science major

Typical Format: Varies with instructor; S/U grade

Lecture Topic: Each senior tutorial covers a selected topic in contemporary biological science.

Additional Information: Scheduling of this course is not in the traditional lecture format. For specifics in the frequency of meeting times, and the topic of each senior tutorial, check the *Directory of Classes* and/or the bulletin board outside of 204 Conradi. Senior tutorials have a maximum enrollment of five students. Repeatable to a maximum of two (2) semester hours that may be applied to the biological science major.

BSC 4933r **RESEARCH METHODS (1-4 hrs)**

See Description under BSC 4900r

BSC 4933r **SELECTED TOPICS IN BIOLOGICAL SCIENCE (1-4 hrs)**

Instructors: Vary by course offered

Frequency Offered: To be announced

Prerequisites: Major prerequisite courses; other courses as specified; junior (60-89 semester hours) or senior (90+ semester hours) standing

Typical Format: Varies by instructor and course

Lecture Topics: Varies by instructor and course

Additional Information: Repeatable to a maximum of eight (8) semester hours credit.

INTRODUCTION TO BIOINFORMATICS (3 hrs, 2 without optional lab)

Instructors: Naylor or Swofford

Frequency Offered: Annually, fall semester

Prerequisites: Major pre requisite courses

Typical Format: 150 minutes lecture and demonstration per week (but see note re. possible increase in credit hours above); 120 minutes of optional laboratory work per week; midterm and final project, plus lab reports for those in lab.

Lecture Topics: A general overview survey of the theories, algorithms, and techniques of sequence- and structure-based computational biology.

Additional Information: Also given at the graduate level under BSC 5936. Complete lecture and lab syllabi at: <http://bio.fsu.edu/~stevet/BSC5936.html>

PROGRAMMING SKILLS FOR BIOLOGY AND BIOINFORMATICS (3 hrs)

Instructors: Swofford

Frequency Offered: Annually, fall semester

Prerequisites: Major prerequisite courses

Typical Format: 2 1/2 hours combined lecture/lab per week, midterm exam, final take-home exam, course project, weekly assignments

Lecture Topics: Basic programming concepts; Java overview; program structure, variables, operators, assignment, simple I/O; objects, classes, and methods; basic mathematical calculations; flow control: loops, branches, switches; algorithms; arrays; constructors; encapsulation; polymorphism and inheritance; multidimensional arrays; random number generation and simulation; graphical user-interface programming; graphical output

Additional Information: Also given at the graduate level under BSC 5936.

VIROLOGY (3 hrs)

Instructors: Reeves

Frequency Offered: Biennially, odd years, spring semester

Prerequisites: PCB 3063 and MCB 4403

Typical Format: Typical lecture format, 3 hours per week, three examinations and two papers.

Lecture Topics: This is an introductory course in virology. The lectures cover general virology including virus structure and replication cycles. The major families of the bacterial (bacteriophage) plant and animal viruses are reviewed. Human viruses and infectious diseases are emphasized. Subviral particles, prions and viroids, are also discussed.

Additional Information: Also given at the graduate level, MCB 5505.

- BSC 4934r** **SELECTED TOPICS IN APPLIED BIOLOGY (1-4 hrs)**
Instructors: Vary by course offered
Frequency Offered: To be announced
Prerequisites: Major prerequisite courses
Typical Format: Varies by instructor and course; S/U grade
Lecture Topics: Varies based on course.
Additional Information: Repeatable to a maximum of eight (8) semester hours credit. Some sections not for major credit.
- BSC 4940** **RESEARCH INTERSHIP IN MARINE BIOLOGY (3-9 hrs)**
Instructors: Not applicable
Frequency Offered: Summer only
Prerequisites: Major prerequisite courses; PCB 3043; junior (60-89 semester hours) or senior (90+ semester hours) standing; minimum-combined 3.0 biology GPA; a course in the area of research; written approval of the associate chair of the Department of Biological Science
Typical Format: Not applicable
Opportunity: Special supervised study in marine biology at the National Marine Fisheries Service Laboratory in Panama City, Florida.
Additional Information: Students may receive up to nine (9) semester hours of credit, of which four (4) semester hours would apply to the biological science major.
- BSC 4945** **UNDERGRADUATE SUPERVISED TEACHING (1 hr)**
Instructors: Not applicable
Frequency Offered: Annually, fall and spring semesters
Prerequisites: Major prerequisite courses; senior (90+ semester hours) standing; minimum 3.0 biology FSU GPA; selection as a Undergraduate Supervised Teaching Assistantship
Typical Format: S/U grade
Opportunity: Each year, 20-25 outstanding *senior* biological science majors are awarded paid undergraduate supervised teaching assistantships (senior TA's) through the Department of Biological Science. In addition to receiving a stipend, Senior TA's may choose to register for, and receive, 1 hour of credit (BSC 4945) toward the 38-hour biological science coursework requirement. Students who are expecting to continue in graduate study (or are considering a career in teaching) are strongly encouraged to apply for an Undergraduate Supervised Teaching Assistantship, since most beginning graduate students receive teaching assistantships similar those experienced in this program. For additional information on Undergraduate Supervised teaching, see page 31.
Additional Information Students who are interested in undergraduate supervised teaching and fulfill the above noted prerequisites should see an Undergraduate Academic Advisor in 204 Conradi to obtain an application. Students apply, interview and are selected to either staff the Biology Help Center and serve as a tutor in the introductory biological science courses (i.e., BSC 2010 and BSC 2011), or serve as a tutor or a laboratory TA in the liberal studies biology course for nonmajors (i.e., BSC 1005). One (1) semester hour of BSC 4945 may be applied to the biological science major.
- BSC 4970r** **HONORS WORK IN BIOLOGICAL SCIENCE (3 hrs)**
Instructors: Numerous research faculty of the department. Research topics vary with instructor.
Frequency Offered: Every semester
Prerequisites: Admission to the department's Honors In The Major Program (see pages 27 and 28)
Typical Format: Varies with instructor
Lab Topic: Honors work in the major offers a unique opportunity for undergraduates to perform research at the undergraduate level. Students participate in a supervised research problem and the production of a paper (thesis) describing the results of that work.
Additional Information: Repeatable to a maximum of twelve (12) semester hours of which six (6) semester hours may be applied to the biological science major. Intended for advanced undergraduate majors.
- BSC 4937** **SEMINAR IN LIVING MARINE RESOURCE ECOLOGY (1 hr)**
Instructors: Herrnkind
Frequency Offered: Annually, spring semester
Prerequisites: None; instructor permission required for registration
Typical Format: 2 hours lecture/week; weekly summaries of speakers, S/U grade

Lecture Topic: Introduction to currently pressing issues in the discipline of marine biology. Allows a student to interact with scientists and resource managers from various university, state, private, and federal agencies.

MCB 4403

PROKARYOTIC BIOLOGY (3 hrs)

Instructors: Reeves

Frequency Offered: Annually, fall and summer semesters

Prerequisites: Major prerequisite courses; CHM 2210 and PCB 3063

Corequisite: MCB 4403L

Typical Format: 3 hours lecture/week; 3 exams and final

Lecture Topics: History and development of microbiology as a science; prokaryotic structure and function; microbial growth and metabolism (fermentation, respiration, autotrophic metabolism); prokaryotic genetics (transformation, transduction, conjugation); methods for control of microorganisms; taxonomy and classification of microorganisms; viruses and viral replication; medical microbiology (microbial disease mechanisms, defense mechanisms of the human body, important microbial diseases, epidemiology); microbial ecology (role of microbes in the environment, use of microbes to improve the environment); food microbiology (food spoilage and preservation, use of microbes in the production of foods); industrial microbiology.

Additional Information: MCB 4403 and MCB 4403L must both be taken to fulfill an Area I (Cell and Molecular Biology) course.

MCB 4403L

PROKARYOTIC BIOLOGY LABORATORY (2 hrs)

Instructors: Reeves

Frequency Offered: Annually, fall and summer semesters

Prerequisites: Major prerequisite courses; CHM 2210 and PCB 3063

Prerequisite or Corequisite: MCB 4403

Typical Format: Two, 2-hour labs/week; no lectures; 3 exams and final

Lab Topics: Sterile techniques and isolation of microbes; microscopic examination of microbes; growth of microbes (media and media preparation, use of selective and differential media, enrichment cultures); measurement of microbial growth; physiological testing of microbes (degradation of organic compounds, presence of specific enzymatic capabilities); food microbiology (milk testing; production of yogurt, sauerkraut); medical and clinical microbiology (human skin and throat microflora, testing for antibiotic susceptibility); microbial genetics; microbial ecology (role of microbes in elemental cycles); identification of unknown microbes.

Additional Information: MCB 4403 and MCB 4403L must both be taken to fulfill an Area I (Cell and Molecular Biology) course.

MCB 4603

ENVIRONMENTAL MICROBIOLOGY (3 hrs)

Instructor: To be announced

Frequency Offered: To be announced

Prerequisites: Major prerequisite courses; MCB 4403 & MCB 4403L

Typical Format: 3 hours lecture/week; 1 research paper; 2 midterms and a final

Lecture Topics: Basic principles of microbial ecology and biotechnological aspects of microbes and the environment. Biomediation of pollutants, biotreatments of liquid and solid wastes, and microbial control of pests.

PCB 3043

GENERAL ECOLOGY (3 hrs)

Instructor: Miller or Inouye

Frequency Offered: Annually, fall semester

Prerequisites: Major prerequisite courses

Typical Format: 3 hours lecture/week; 2 exams and final

Lecture Topics: Population biology; spatial and age structures of populations; population growth; history of ecology and the concept of community; community processes; succession; nutrient cycling and energy flow; species interactions; competition, predation, and parasitism; ecological efficiency; biogeographic ecology.

Additional Information: Designated as an Area III (Ecology and Environmental Science) course.

- PCB 3063** **GENERAL GENETICS (3 hrs)**
Instructors: Bass, Bates, Deng, Epstein or J. Fadool
Frequency Offered: Every semester
Prerequisites: Major prerequisite courses
Typical Format: 3 hours lecture/week; at least 3 exams and additional oral or written work at instructor's discretion
Lecture Topics: Introduction to the principles of transmission and molecular genetics of prokaryotes and eukaryotes and the significance of these principles to other aspects of biology.
Additional Information: Designated as a required upper division biology course. Should be taken as soon as possible after the completion of the major prerequisite courses.
- PCB 3134** **CELL STRUCTURE AND FUNCTION (3 hrs)**
Instructors: Gaffney, T. Keller, Roberts or Tang
Frequency Offered: Annually, fall and spring semesters
Prerequisites: Major prerequisite courses
Typical Format: 3 hours lecture/week; 3 exams and homework problems
Lecture Topics: Cellular chemistry and physiology; morphology and function of cellular organelles; cellular motility; cell genome; cellular growth, division, communication, and regulation.
Additional Information: Designated as an Area I (Cell and Molecular Biology) course.
- PCB 3743** **VERTEBRATE PHYSIOLOGY (3 hrs)**
Instructor: Elam, Ellington, D. Fadool, or Freeman
Frequency Offered: Every semester
Prerequisites: Major prerequisite courses
Typical Format: 3 hours lecture/week; 3 exams and final
Lecture Topics: Homeostasis; cellular function including control systems; sensory and motor systems; autonomic nervous system; central integration; endocrine control systems; hematology and immunology; circulation and the heart; respiration; gastrointestinal system; renal regulation of fluid and electrolyte balance; regulation of body temperature; physiology of reproduction.
Additional Information: Designated as an Area II (Physiology) course.
- PCB 4024** **MOLECULAR BIOLOGY (3 hrs)**
Instructors: Bates or Deng
Frequency Offered: Annually, fall semester
Prerequisites: Major prerequisite courses; PCB 3063; PCB 3134 recommended
Typical Format: 3 lectures/week and assigned reading; 3 exams and a final
Lecture Topics: Molecular genetic control of cells; synthesis of proteins and nucleic acids; the genetic code; the controls on RNA synthesis and gene expression; chromosomes and the organization of genes; DNA replication and repair; the cell division cycle; differentiation; cancer and cell growth; the evolution of cells and molecules.
Additional Information: Designated as an Area I (Cell and Molecular Biology) course.
- PCB 4024L** **MOLECULAR BIOLOGY LABORATORY (1 hr)**
Instructors: L. Keller
Frequency Offered: Annually, fall semester
Prerequisites: Major prerequisite courses; PCB 3063; PCB 3134 recommended
Corequisite: PCB 4024
Typical Format: 3.5 hours lab/week, weekly laboratory reports and assigned reading
Lab Topics: Current techniques in cell and molecular biology; centrifugation and cell fractionation; tissue culture of mammalian and plant cells; chromosome preparations and karyotyping; polyacrylamide gel electrophoresis of proteins; plasmid preparation from bacteria; restriction enzyme mapping; gene cloning; polymerase chain reaction; genetic transformation of mammalian cells..

- PCB 4063Lr** **EXPERIMENTAL GENETICS LABORATORY (3 hrs)**
Instructor: To be announced
Frequency Offered: To be announced
Prerequisites: Major prerequisite courses; PCB 3063
Typical Format: To be announced
Lab Topics: Laboratory methods and experiments in molecular, biochemical, human genetics or cytogenetics.
Additional Information: Repeatable to a maximum of six (6) semester hours.
- PCB 4233** **IMMUNOLOGY (3 hrs)**
Instructor: Roux
Frequency Offered: Annually, spring semester
Prerequisites: Major prerequisite courses; CHM 2210, PCB 3063, PCB 3134, or instructor's permission
Typical Format: 3 hours lecture/week; 3 exams and final
Lecture Topics: Non-specific defenses and inflammation; immune response to antigens; anatomy of the immune system; immunoglobulin structure and function; cellular interactions in immunity; histocompatibility and transplantation; complement; immunopathology; AIDS.
- PCB 4233L** **IMMUNOLOGY LABORATORY (1 hr)**
Instructor: Roux
Frequency Offered: Annually, spring semester
Prerequisites: Major prerequisite courses; CHM 2210, PCB 3063, PCB 3134, or permission of instructor
Corequisite: PCB 4233
Typical Format: 3 hours lab/week
Lab Topics: Immunization and bleeding of lab animals; titration; purification of immunoglobulin; gel diffusion techniques; immunoelectrophoresis; enzymatic cleavage of immunoglobulins; tissue grafting, affinity column chromatography; hemagglutination; hemagglutination inhibition; ELISA; immunofluorescence; hybridoma technology.
- PCB 4253** **ANIMAL DEVELOPMENT (3 hrs)**
Instructors: J. Fadoo or L. Keller
Frequency Offered: Annually, spring semester
Prerequisites: Major prerequisite courses; PCB 3063
Typical Format: 3 hours lecture/week; 3 exams and final
Lecture topics: Fertilization; gametogenesis; cleavage; gastrulation; neurulation; organogenesis; morphogenesis; genome constancy; differential gene expression; polarity; cell-cell interactions; cell affinities; induction; hormone action; pattern formation; metamorphosis; regeneration.
Additional Information: Designated as an Area I (Cell and Molecular Biology) course.
- PCB 4253L** **ANIMAL DEVELOPMENTAL BIOLOGY LABORATORY (3 hrs)**
Instructor: L. Keller
Frequency Offered: Biennially, odd years, spring semester
Prerequisites: Major prerequisite courses, PCB 3063
Corequisite: PCB 4253
Typical Format: 3 hours lab/week plus additional time outside of lab; 6 lab reports
Lab Topics: Gametes and fertilization; cleavage; gastrulation; morphogenesis of sea urchin, amphibian, and avian embryos.
- PCB 4514** **ADVANCED GENETICS AND MOLECULAR BIOLOGY (3 hrs)**
Instructor: To be announced
Frequency Offered: To be announced
Prerequisites: Major prerequisite courses; PCB 3063
Typical Format: To be announced
Lecture Topics: Mendelian genetics; transcriptions; DNA repair; plasmids; insertion elements; regulation of gene expression.

- PCB 4674** **EVOLUTION (3 hrs)**
Instructor: Hansen, Steppan, or Travis
Frequency Offered: Every semester
Prerequisites: Major prerequisite courses; PCB 3063, and senior (90+ hours) standing
Typical Format: 3 lectures/week; quizzes and computer lab assignments; term paper; 2 exams and final
Lecture Topics: Scope of evolutionary biology; the historical development of evolutionary biology; patterns of historical evolution (changes in diversity, origins of new groups); evolutionary rates of morphological and physiological change and molecular diversification; genetic basis of evolutionary change; the biology of adaptations; parallel and convergent evolution; the evolution of genome organization; evolution of reproductive isolation; species formation; hybridization, introgression, and the breakdown of isolation; phylogenetic inference; conservation and evolution.
Additional Information: Designated as a required upper division biology course.
- PCB 4723** **GENERAL AND COMPARATIVE ANIMAL PHYSIOLOGY (3 hrs)**
Instructor: Ellington or Moerland
Frequency Offered: Annually, spring semester
Prerequisites: Major prerequisite courses; CHM 2210
Typical Format: 3 hours lecture/week; term paper; 2 exams and final
Lecture topics: Gas exchange; respiratory pigments and gas transport; circulatory systems; metabolic scaling and energy metabolism; water and ion balance; nitrogen excretion; buoyancy mechanisms; temperature regulation; neuronal and effector function; sensory mechanisms; neuronal basis of behavior. Emphasis will be placed on the adaptive mechanisms in aquatic species, particularly marine. **Additional Information:** Designated as an Area II (Physiology) course.
- PCB 4731L** **EXPERIMENTAL PHYSIOLOGY LABORATORY (2 hrs)**
Instructor: To be announced
Frequency Offered: Annually, fall semester
Prerequisites: Major prerequisite courses and at least one course in physics
Typical Format: 1 hour lecture, 3 hours lab/week; 1 exam and final
Lab Topics: Contraction of muscle (skeletal, heart, and smooth); membrane (and external) resting and action potentials of muscle and nerve; generator potentials of sense organs; subjects are selected marine invertebrates as well as fish and amphibians.
- PCB 4843** **FUNDAMENTALS OF NEUROSCIENCE (3 hrs)**
Instructor: Meredith or Haupt
Frequency Offered: To be announced
Prerequisites: Major prerequisite courses, PCB 3134, PCB 3743, or PCB 4723
Typical Format: 2.5 hours lecture/week; series of interactive computer exercises; 3 exams
Lecture Topics: This course emphasizes cellular and molecular approaches to neuroscience and brain function, and includes simple model systems such as invertebrates.
- ZOO 3203** **ADVANCED INVERTEBRATE ZOOLOGY (2 hrs)**
Instructors: TO BE ANNOUNCED
Frequency Offered: To be announced
Prerequisites: Major prerequisite courses; PCB 3043 or PCB 3063 or ZOO 3713C or instructor's permission
Typical Format: 2 hours lecture/week; midterm and final
Lecture Topics: Phylogenetic survey of invertebrate animals (Porifera through Protochordates), with emphasis on structure, function, and classification.
- ZOO 3203L** **ADVANCED INVERTEBRATE ZOOLOGY LABORATORY (2 hrs)**
Instructors: TO BE ANNOUNCED
Frequency Offered: To be announced
Prerequisites: Major prerequisite courses; PCB 3043 or PCB 3063 or ZOO 3713C or instructor's permission
Corequisite: ZOO 3203
Typical Format: 6 hours lab/week; field trips and an individual research project

Lecture Topics: Hands-on examination and study of selected examples from the major invertebrate phyla, including observations of live material, as well as dissections of preserved examples.

ZOO 3713C

COMPARATIVE VERTEBRATE ANATOMY (4 hrs)

Instructor: Erickson

Frequency Offered: Annually, spring semester

Prerequisites: Major prerequisite courses

Typical Format: 3 hours lecture/week; 6 hours lab/week; 3 lecture exams; 3 lab practicals

Lecture Topics: Basic concepts and general chordate structure; protochordates; classes of chordates; early development; skeletal system; muscular system; digestive-respiratory systems; urogenital systems; circulatory system; integumentary system; nervous system.

Lab Topics: Topics similar to lecture, with dissection of organ systems in a lamprey, shark, *Necturus*, and cat; dissection skills and the skills (or power) of observation are developed in this laboratory; dissection kit required; use of stereoscopic microscopes.

ZOO 4204C

BIOLOGY OF HIGHER MARINE INVERTEBRATES (5 hrs)

Instructor: Hernnkind

Frequency Offered: Biennially, odd years, fall semester

Prerequisites: Major prerequisite courses and any one of BSC 3312, PCB 3043, ZOO 3203/L, or ZOO 4513; instructor's permission

Typical Format: 2 days of combined lecture/lab/field trips per week at FSU Marine Laboratory; grade based on 3-4 projects with oral and written reports and terminal special project proposal

Lecture and Lab Topics: Lectures on ecology, functional morphology, and behavior of marine crustaceans, mollusks, and echinoderms. Individual and team projects involve hypothesis-testing studies on local marine species using both field and laboratory approaches. Past projects include predation influence on gastropod distribution, tidal migrations by crustaceans, and shell acquisition and selection in hermit crabs.

ZOO 4232

PARASITOLOGY (3 hrs)

Instructor: To be announced

Frequency Offered: To be announced

Prerequisites: Major prerequisite courses

Typical Format: 3 hours lecture/week; 3 exams and 2 projects

Lecture Topics: Classification, natural history, ecology, evolution, pathogenesis, epidemiology, and control of protozoan and animal parasites of humans.

ZOO 4232L

PARASITOLOGY LABORATORY (2 hrs)

Instructor: To be announced

Frequency Offered: To be announced

Prerequisites: Major prerequisite courses

Corequisite: ZOO 4232

Typical Format: 6 hours lab/week; 2 lab practicals and 2 projects

Lecture and Lab Topics: Morphology and anatomy of protozoan and animal parasites of humans; collection, preservation, and staining of selected parasites of various hosts.

ZOO 4343C

BIOLOGY OF THE LOWER VERTEBRATES (4 hrs)

Instructor: Travis

Frequency Offered: Biennially, even years, fall semester

Prerequisites: Major prerequisite courses

Typical Format: 2 lectures/week, 2 labs/week, field trips during week (lasting all afternoon) and on some weekends; 2 exams and final on lecture material, 1 lab practical exam; lab reports; 1 term paper

Lecture Topics: Origin and diversity of lower vertebrates (fish, amphibians, and reptiles); functional morphology and design of trophic structures and locomotory apparatus; solutions to problems of heat and cold, osmotic stress, and oxygen availability; sensory systems and communication; growth and development; life history and modes of reproduction.

Lab and Field Topics: Identifying freshwater and common marine fishes, amphibians, and reptiles; local zoogeography and habitat associations; communities of ectothermic vertebrates.

- ZOO 4353C** **BIOLOGY OF THE HIGHER VERTEBRATES (4 hrs)**
Instructor: To be announced
Frequency Offered: Annually, spring semester
Prerequisites: Major prerequisite courses; permission of instructor
Typical Format: 2 lectures/week; field trips and laboratory work; oral and written report of independent field project; three exams and final
Lecture Topics: Emphasis is on the systematics, biogeography, and population biology of birds and mammals.
Lab Topics: Field trips to St. Marks National Wildlife Refuge, Apalachicola National Forest, and Tall Timbers Research Station. Exercises in the identification of birds and mammals in the field and as museum specimens; census methods; statistical analysis of data.
- ZOO 4513** **ANIMAL BEHAVIOR (4 hrs)**
Instructors: Herrnkind or Tschinkel
Frequency Offered: Annually, spring semester
Prerequisites: Major prerequisite courses
Typical Format: 3 hours lecture/week, 1 hour movie/week; 2 exams and final; some outside reading required
Lecture Topics: Methods and techniques of study; genetic, developmental and experiential factors shaping behavior; role of sensory and neural processes; motivation and regulation; biorhythms; time-budgets; orientation, movement and migration; communication in non-social invertebrates and social insects; social organization in mammals and birds.
Additional Information: Designated as an Area III (Ecology and Environmental Science) course.
- ZOO 4753C** **HISTOLOGY (4 hrs)**
Instructor: Taylor
Frequency Offered: Annually, fall semester
Prerequisites: Major prerequisite courses
Typical Format: 2 lectures/week and 3 hours lab/week; 2 exams and final; 2 laboratory practicals
Lecture and Lab Topics: The course covers the cytology, histology, and microscopic anatomy of the human body.
- ZOO 4823** **INSECT BIOLOGY (3 hrs)**
Instructor: Tschinkel
Frequency Offered: Biennially, even years, fall semester
Prerequisites: Major prerequisite courses
Typical Format: 3 hours lecture/week; 2 exams and final
Lecture Topics: External and internal morphology; systematics and classification; natural history and behavior; selected insect communities; growth, cuticle and molting; metamorphosis and its endocrine control; nervous system; respiratory systems and respiration; aquatic insects; pterothoracic anatomy, wings and flight; social insects.
- ZOO 4823L** **INSECTS OF NORTH FLORIDA (2 hrs)**
Instructor: Tschinkel
Frequency Offered: Biennially, even years, fall semester
Prerequisites: Major prerequisite courses
Corequisite: ZOO 4823
Typical Format: Lectures are limited to 6 hours during the first three weeks of the semester; other requirements include preparing an identified collection of local insects
Lecture Topics: Insect external morphology, insect systematics, use of keys, collecting insects, preparation and curation of an insect collection.
Lab Topics: External morphology; sorting and keying insects; use of traps; pinning and labeling. These topics will be covered during the first three weeks of the course. Thereafter the student will work on his/her own and submit 10 identified, curated insect families per week.
Additional Information: Grade is determined primarily by the number of correctly identified families submitted, with some credit reserved for neatness and curation.

DEPARTMENT OF BIOLOGICAL SCIENCE FACULTY

FSU offers undergraduate, graduate, advanced graduate, and professional programs of study; conducts extensive research; and provides service to the public in accord with its statewide mission. The University serves as a center for advanced graduate and professional studies while emphasizing research and providing excellence in undergraduate programs. In accordance with this mission, faculty members have been selected for their commitment to excellence in teaching, their ability in research and creative activity, and their interest in public service. Faculty in the Department of Biological Science seek to provide students excellent scholarship and training in the diverse field of biological sciences, while continuing to build and expand an already strong, and internationally recognized, program of research. Faculty in this department are recognized nationally as well as at FSU for their commitment to teaching, research, and service.

Current Faculty with Academic Honors

Fellow of the American Association for the Advancement of Science

Lawrence G. Abele, Marc E. Freeman, Joseph Travis

Robert O. Lawton Distinguished Professor - The highest honor Florida State faculty can bestow on a colleague.

Joseph Travis

Distinguished Research Professor – Recognizes outstanding research and/or creative activity of Florida State University faculty members. Faculty members already holding an endowed chair, the Robert O. Lawton Award, the Daisy Parker Flory Award, a named professorship or the Distinguished Research Professor Award are not eligible for this award.

Marc E. Freeman, Kenneth A. Taylor, Walter R. Tschinkel

Ross Oglesby Service Award – Honors faculty or staff members who have given distinguished service to students and to the university.

Robert H. Reeves

President's Teaching Award – Recognizes excellence in undergraduate teaching.

George W. Bates, John S. Elam, Lloyd M. Epstein, Piotr G. Fajer, Michael Meredith, Timothy S. Moerland, William H. Outlaw Jr., David M. Quadagno, Robert H. Reeves, Thomas M. Roberts, Joseph Travis, and Walter R. Tschinkel

Developing Scholar Award – Awarded to junior faculty to support initial research.

George W. Bates, Ross W. Ellington, Piotr G. Fajer, Marc E. Freeman, David Houle, Don R. Levitan, Michael Meredith, Timothy S. Moerland, Paul Q. Trombley, and Joseph Travis

President's Continuing Education Award

William F. Herrnkind

Loretta Ellias Teaching Award

Lawrence G. Abele, Lloyd M. Epstein, Laura R. Keller, Thomas C.S. Keller, III, William H. Outlaw, Jr., Robert H. Reeves, Thomas M. Roberts, Kenneth H. Roux

Undergraduate Advising Award

Robert H. Reeves

Named Professorships

W. Ross Ellington

Marc E. Freeman

William F. Herrnkind

William H. Outlaw, Jr.

Thomas M. Roberts

Walter R. Tschinkel

The Michael J. Greenberg Professor of Biological Science

The Lloyd M. Beidler Professor of Biological Science

The Robert K. Godfrey Professor of Biological Science

The Peter H. Homann Professor of Biological Science

The Robert B. Short Professor of Biological Science

The Margaret Menzel Professor of Biological Science

- L. G. Abele** Professor, Academic Vice President, and Provost of the University. [Fellow of the American Association for the Advancement of Science.] Received his Ph.D. from the Rosenstiel School for Marine and Atmospheric Science of the University of Miami in 1972. His interests are in systematics, biogeography, and ecology focusing on crustaceans. This research has involved light and electron microscopy as well as molecular approaches. Recent work has explored molecular systematics of crustaceans by means of nuclear and mitochondrial nucleotide sequencing.
- H. W. Bass** Associate Professor. Received his Ph.D. from North Carolina State University in 1992 and did postdoctoral work at the University of California, Berkeley. His research involves the use of 3-D fluorescence and cytogenetic methods to examine the structure and function of meiotic chromosomes, telomere dynamics, and nuclear organization in higher plants.
- G. W. Bates** Professor and Associate Chair for Graduate Studies [Developing Scholar Award 1988/1989; University Teaching Award 2002/2003]. Received his B.S. in biology from Washington University in 1972 and his Ph.D. in plant physiology from the University of Washington in 1977. He began his career at Florida State in 1982 after doing postdoctoral work at Stanford University and Yale University. Research in Dr. Bates' laboratory centers on plant biotechnology, genetic transformation, and the developmental control of plant gene expression.
- P. Beerli** Assistant Professor. Received his Ph.D. in 1993 from the University of Zurich, Switzerland. His research interests include all aspects of evolutionary genetics/genomics, with particular interest in analyses that involve single species or groups of closely related species and their distribution in space and time. He is developing new approaches for the inference of parameters relevant to understanding of current and past migration patterns and range expansions and plans to develop further methods that use data such as large numbers of single nucleotide polymorphisms and that allow incorporation of additional population genetics forces such as selection and species divergences.
- P. B. Chase** Associate Professor. Received his Ph.D. from the University of Southern California in 1984. His research and professional interests involve the biomechanics of cardiac and skeletal muscle. General research areas include the biophysics of muscle tissue, molecular motor proteins, and calcium regulation of contraction; cellular molecular biomechanics of cardiac and skeletal muscle. He is currently working on the functional consequences of mutations in troponin I that cause hypertrophic cardiomyopathy; molecular and cellular biochemical/biomechanical model of striated muscle—a component of NASA/NSBRI's "digital human."
- F. C. Coleman** Associate Scholar/Scientist. Dr. Coleman received her Ph.D. in 1991 from Florida State University. She is presently Program Director, FSU/NMFS Institute for Fishery Resource Ecology (IFRE), and Coordinator of the FSU-Mote Marine Laboratory William R. and Lenore Mote Eminent Scholar Chair in Fisheries Ecology. Her primary research interest is in the population ecology of reef fishes. This interest led her to explore the effects of fishing on the demography of exploited populations, particularly in its effects on spawning aggregations of fish in the grouper family (Serranidae).
- W-M. Deng** Assistant Professor. Received his Ph.D. in Developmental Biology in 1997 from the University of Edinburgh, United Kingdom. His research interests focus on the molecular mechanisms of cell polarization and cell differentiation, using a combination of genetic, molecular, and cell biological methods in *Drosophila melanogaster* to study the mechanisms by which cell polarity is established and maintained.
- J. S. Elam** Professor [University Teaching Award 1987/1988]. Received his Ph.D. from the University of Minnesota in 1968 and did postdoctoral work at the University of Michigan. Dr. Elam's research is on the intraneuronal transport of glyco-conjugates of normal and regenerating nerve. His interests center on the possible role of this class of

macromolecules in physiological processes including synaptic transmission and facilitation of nerve growth.

- W. R. Ellington** Michael J. Greenberg Professor of Biological Science [Developing Scholar Award 1985/1986]. Received his Ph.D. from the University of Rhode Island in 1976 and did postdoctoral research in biochemistry at Pomona College. Dr. Ellington serves on the editorial boards of the *American Journal of Physiology*, *Journal of Comparative Physiology*, and *Comparative Biochemistry and Physiology*. He has served on eight grant advisory panels for the National Science Foundation. He is also Chair of FSU's Council on Research and Creativity. His research efforts focus on the structure, function, and evolution of enzymes. Current studies center on a family of enzymes known as phosphagen (guanidino) kinases that play a central role in energy transactions in muscle cells, neurons, transport epithelia, photoreceptors, and spermatozoa.
- L. M. Epstein** Associate Professor and Associate Chair for Curriculum. [University Teaching Award 2002/2003; Loretta Ellias Award for Excellence in Teaching 1998/1999] Received his M.S. in biology from the University of Illinois in 1979 and his Ph.D. in genetics from Indiana University in 1983. After postdoctoral work at the Carnegie Institution of Washington's Department of Embryology, he joined the faculty at FSU in 1986. The research in his lab focuses on an unusual repetitive DNA transcript from the newt, which catalyzes its own site-specific cleavage. His work addresses a number of interesting questions, including the role of catalytic RNA during the evolution of macromolecular systems, the mechanism of RNA catalysis, and the evolution of the highly repetitive component of the eucaryotic genome.
- G. M. Erickson** Assistant Professor. Received his Ph.D. in Integrative Biology from the University of California at Berkeley in 1997. Dr. Erickson was a National Science Foundation postdoctoral scholar hosted by both Stanford and Brown Universities. He joined the Biological Science faculty of FSU during the spring of 2000. He is a comparative evolutionary morphologist with research focusing on the form, function, development, and evolution of the vertebrate skeleton. Both extant and fossil taxa are studied in integrative research that bridges multiple disciplines including paleontology, biomechanical engineering, and comparative developmental and evolutionary biology. Current projects focus on the evolution of vertebrate dwarfism and gigantism, the biomechanical changes that have facilitated transitions to land by fish and tetrapods, growth rates in dinosaurs, and the role mechanical material properties have played in vertebrate diversification.
- D. A. Fadool** Associate Professor. Received her M.S. in zoology and chemistry from the University of Rhode Island in 1989, and her Ph.D. in zoology from Whitney Laboratory of the University of Florida in 1993 and did postdoctoral work in biochemistry at Brandeis University. Dr. Fadool served for three years on the faculty of Auburn University before coming to Florida State in 1999. Her research is focused on chemical senses. She uses electrophysiology combined with molecular techniques to study the structure and function of ion channels, modulation of ion-channel activity by phosphorylation, and signal transduction cascades involved in encoding general and specialized (pheromone) odorants. This research contributes to the understanding of electrical signaling in the brain and nervous system.
- J. M. Fadool** Assistant Professor. Received his Ph.D. in Zoology from Michigan State University in 1992. He did postdoctoral research at the Whitney Marine Laboratory of the University of Florida and later was a NIH postdoctoral fellow at Harvard University. Dr. Fadool was appointed to the faculty at FSU in 1999. His research interests are in cellular and molecular mechanisms regulating the development and degenerative diseases of the visual system and in the development of novel transgenic technologies for identification of transcriptionally active regions of the genome using the zebrafish as a model organism.

- P. G. Fajer** Professor and Director of the Graduate Program in Molecular Biophysics [University Teaching Award 1997/1998 and Developing Scholar Award 1997/1998]. Received his Ph.D. in biophysics from the Leeds University (England) in 1983. He did postdoctoral research at the University of Minnesota, where he joined the faculty as a Research Professor in 1987. Dr. Fajer was appointed to the Florida State faculty in 1990. His research interest is in muscle biology and biochemistry, what makes muscle contract, and how muscle knows when to contract.
- M. E. Freeman** Lloyd M. Beidler Professor of Biological Science [Fellow of the American Association of Advancement of Science, Distinguished Research Professor 1995, Developing Scholar Award 1980/1981]. Received his Ph.D. from West Virginia University in 1970 and did postdoctoral work at Emory University. Two major research projects are ongoing in Dr. Freeman's laboratory. Each involves the determination of the way a particular area of the brain, the hypothalamus, controls the secretion of reproductive hormones from the pituitary gland of female mammals. One project involves the control of luteinizing-hormone secretion from the pituitary gland; the other involves a description of the way the brain controls the release of prolactin. Both projects have used *in vivo* and *in vitro* approaches. Dr. Freeman has served as an editor of the journal *Endocrinology* and as a member of the Biochemical Endocrinology study section of the NIH.
- B. J. Gaffney** Professor. Received her Ph.D. from Stanford University in 1966. Her research interests include the structure and function of the lipoxygenases, cellular fatty acid diversity, multifrequency EPR of nonheme iron proteins (phenylalanine hydroxylase, transferrin, lipoxygenases), computer simulation of metallo-EPR spectra, and cellular selectivity for metals.
- D. E. Granger** Associate in Biological Science and Director, Office of Science Teaching Activities. Received her Ph.D. from FSU in 1987 (Program in Neuroscience). Her professional interests include academic programs in science, at both the undergraduate and K-12 levels, and contemporary issues in the education of scientists and science teachers. She is director of the Secondary Science and/or Mathematics Teaching program in the College of Arts & Sciences. This program offers a baccalaureate degree and can be a primary or secondary major for students interested in a science-teaching career.
- T. F. Hansen** Assistant Professor. Dr. Hansen received his Ph.D. from the University of Oslo in 1997. His major research interests are in theoretical evolutionary biology using mathematical and statistical modeling tools. He currently studies the interface between evolutionary genetics and trait adaptations. He is interested in the extent to which the observed genetic variation of a character is available to build adaptations and the extent to which it is constrained by conflicting selection pressures and pleiotropic interactions with other characters, the properties of new mutations and how they affect adaptation, how the effects of genes and mutations depend on the genetic background, the relationships between mutational properties and genetic architecture, how the variational properties of organisms evolve, and what makes a character evolvable and how evolvability evolves.
- P. C. Hayward** Associate Vice-President for Academic Support. Received her Ph.D. from FSU in 1985. Dr. Hayward was Coordinator for Introductory Biology beginning in 1972. She was also the Director of the Office of Science Teaching Activities from 1983 until 1992, when she became Associate Dean of the College of Arts and Sciences. In 1995 she moved to her present position in the Office of the Provost.
- W. F. Herrnkind** Robert K. Godfrey Professor of Biological Science [President's Continuing Education Award 1994]. Received his Ph.D. in marine biology from the University of Miami in 1968. He is interested in behavioral ecology of marine animals. Field experiments using scientific diving and telemetry, combined with laboratory analyses, are used to study the migration and ecology of the spiny lobster. Past research on lobster migrations has been the subject of specials by National Geographic and Jacques Cousteau. Since coming to FSU in 1967, he has led shipboard and manned undersea habitat research

missions, directed the FSU Marine Laboratory, and advised agencies managing lobster fisheries. His students have published on such topics as hermit-crab shell acquisition, horseshoe-crab breeding and migrations, and endocrine and environmental control of lobster reproduction.

- D. Houle** Associate Professor. [Developing Scholar Award 2003/2004] Received his Ph.D. in 1988 from the State University of New York at Stony Brook. His primary area of research is the mutation-selection balance hypothesis for the maintenance of genetic variation. His other projects are studies of the constraints on life-history evolution, the genetic basis of marker-associated heterosis, and the maintenance of sexual reproduction in a varying environment.
- T. A. Houpt** Associate Professor. [Developing Scholar Award 2004/2005] Received his Ph.D. from Harvard University in 1991. His work involves the use of conditioned taste aversion to explore the molecular, neurological, and behavioral aspects of learning and memory.
- B. D. Inouye** Assistant Professor. Received his Ph.D. from Duke University in 1998. The major goals of his research are to elucidate the roles of spatial and temporal variation in population and community ecology and to link theoretical and empirical approaches. Making connections between theory and data requires a mathematical background, knowledge of experimental design and statistical analysis, and an understanding of natural history. His current projects include studies of (1) the effects of spatial variation in host-parasitoid interactions, using models and field-work with an agricultural pest (*Lygus hesperus*) and its specialist egg-parasitoid (*Anaphes iole*); (2) the community ecology of cynipid gall-wasps on oak trees and their parasitoids; and (3) the role of edaphic spatial variation in patterns of plant and insect biodiversity at four nested spatial scales, from 1 m up to several kilometers, in the central coast range of California.
- L. R. Keller** Associate Professor. [Loretta Ellias Award for Excellence in Teaching 2000/2001] Received her Ph.D. from the University of Virginia in 1980. After post-doctoral training at Yale University, she came to FSU in 1986. The research focus of her lab is regulation and coordination of flagellar protein gene expression in the eukaryotic green alga *Chlamydomonas*. Her specific research interests include determining DNA sequences that control expression of several flagellar genes, identifying protein factors that interact with these DNA regulatory sequences, and delineating the calcium-dependent signal transduction pathway leading to changes in flagellar gene induction using molecular and genetic approaches.
- T. C. S. Keller III** Associate Professor. [Loretta Ellias Award for Excellence in Teaching 2002/2003] Received his Ph.D. from the University of Virginia in 1981 and did postdoctoral work at Yale University. He investigates structure and function relationships in cytoskeletons. Dr. Keller's lab is currently using biochemical and molecular-biology techniques to investigate the actin-based cytoskeleton of the intestinal epithelial cell brush borders and human blood platelets. These studies should contribute to a greater understanding of the multiple roles of the cytoskeleton in nonmuscle cells.
- C. C. Koenig** Research Associate. Dr. Koenig received his Ph.D. in 1975 from Florida State University. His major research interests are in the field of marine ecology and specifically concern the effects of fishing on the demographics of groupers and snappers and the habitats that support them. He is presently engaged in the characterization and mapping of shelf-edge grouper spawning habitat on the west Florida shelf and the restoration of the deep-water *Oculina* coral banks off the central east coast of Florida. He is on the Board of Directors of the Institute for Fishery Resource Ecology (IFRE) and the Diving Control Board of the Academic Scientific Diving Program (ASDP).
- D. R. Levitan** Professor [Developing Scholar Award 2000/2001]. Received his Ph.D. in 1989 from the University of Delaware and did postdoctoral research at the University of Alberta and

the University of California, Davis. His research interests include the population biology and life- history evolution of marine organisms. Ongoing research projects include the ecology and evolution of reproductive strategies in sea urchins, mating success of coral-reef fish, and the population biology of clonal invertebrates.

- A. S. Lumsden** Associate in Research. Received her Ph.D. from FSU in 1989. Dr. Lumsden teaches in the non-major biology program at Florida State and coordinates the Liberal Studies Biology courses. She also directs the annual teaching/learning workshop for new graduate students in the department. Dr. Lumsden is presently on the Executive Board of the National Association of Biology Teachers; she serves on the Boards of the National Association of Science Teachers, Society of College Science Teachers, and of the Association of Biology Laboratory Educators. Her interests center on the improvement of undergraduate teaching in the biological sciences.
- A. Mast** Assistant Professor. Received his Ph.D. in 2000 from the Department of Botany at the University of Wisconsin-Madison. His research focuses on the ecological diversification in the Australian genus *Banksia*, morphological and anatomical shifts in the evolution of buzz pollination in *Dodecatheon*, and null models in biogeography.
- M. Meredith** Professor [University Teaching Award 2002/2003; Developing Scholar Award 1989/1990]. Received his Ph.D. from the University of Pennsylvania in 1974. He conducted postdoctoral study at Rockefeller University and the Foundation for Experimental Biology. His research studies are on chemical sensory systems. His laboratory studies three sensory systems using electrophysiological, anatomical, and behavioral methods: (1) the olfactory system, especially the patterns of neural activity in the brain that result from odor stimulation, as measured by electrical recordings and compared with the predictions of a computer model of the neural circuits involved; (2) the vomeronasal chemosensory system, especially its influence on mating in male hamsters as a result of hormonal and behavioral changes induced by chemical signals; and (3) the nervus terminalis, a nerve that exists in humans but is particularly prominent in sharks and rays in which he investigates the neural circuits and interactions with the olfactory system.
- T. E. Miller** Associate Professor. Received his Ph.D. from Michigan State University in 1985. After postdoctoral research at the University of East Anglia, England, and the University of Chicago, he came to FSU in 1989. Dr. Miller's research interests include general community ecology and plant evolutionary biology. Current projects include quantifying evolution of plants in different types of competitive situations; attempting to understand the relative importance of competition, herbivory, and disturbance in determining community composition on barrier islands; and the maintenance of community patterns in the invertebrate communities living in pitcher plants.
- T. S. Moerland** Professor and Chairman, Department of Biological Science [University Teaching Award 1999/2000; Developing Scholar Award 1996/1997]. Received his Ph.D. from the University of Maine in 1984. He joined the faculty at FSU after conducting postdoctoral research at the Harvard Medical School. Dr. Moerland's research interests are in the energetics of muscular contraction and NMR spectroscopy of muscle and in biochemical and physiological mechanisms of temperature adaptation. His current research efforts concentrate on adaptation of muscle with regard to both contractile performance and energy metabolism and on the regulation of adaptive responses. Specific projects include biochemical and physiological adaptations to temperature in the muscle of poikilothermic vertebrates and the responses of muscle to long-term diabetes.
- G. Naylor** Associate Professor. He earned his Ph.D. at the University of Maryland in 1989. Formerly of Iowa State University, he studies the mechanisms underlying biological diversification at both the organismal level and the molecular level. A major project in the lab involves reconstructing the evolutionary tree for sharks and rays based on DNA sequence comparisons

- W. H. Outlaw Jr.** Peter H. Homann Professor of Biological Science [University Teaching Award 1993/1994 and 1998/1999; Loretta Ellias Award for Excellence in Teaching 1993/1994]. Received his Ph.D. from the University of Georgia in 1974. He conducted postdoctoral studies in the Biochemistry Department at Michigan State University and was a Research Instructor at the Washington University School of Medicine. Subsequently, Dr. Outlaw was on the faculty in the Biology Department at Washington University and conducted research at the C. F. Kettering Institute and at Erasmus University. Dr. Outlaw joined FSU's faculty in 1980. He has been a U.S. Senior Scientist at Munich Technical University and at the University of Tübingen, and a Visiting Scientist at Beijing Agricultural University. He has held a joint appointment with the University of Florida. Currently, work in his laboratory is directed toward posttranslational regulation of a key enzyme in guard cells, a new mechanism of stomatal aperture-size regulation, and molecular responses of guard cells to a stress hormone, abscisic acid.
- D. M. Quadagno** Professor [University Teaching Award 1987/1988 and 1994/1995]. Received his Ph.D. from the University of Illinois in 1969 and did postdoctoral research at the Brain Research Institute at the UCLA Medical School. Later, he conducted research at Cambridge University in the area of reproductive biology. Dr. Quadagno's main research interests are in the areas of behavioral neuroendocrinology, and current studies include investigations of women at risk for HIV infection in south Florida and psychoneuroendocrine agents of violent behavior.
- R. H. Reeves** Associate Professor and Associate Chairman for Undergraduate Studies [Ross Oglesby Service Award 1996; University Teaching Award 1993/1994; University Advising Award 2003/2004; Loretta Ellias Award for Excellence in Teaching 2003/2004; University Graduate Teaching Award 2004/2005]. Dr. Reeves first came to FSU in 1971 as an Assistant Professor of Chemistry (Biochemistry) and has both a B.A. (University of California) and a Ph.D. (1969; New York University) in biochemistry. He has received several NIH and NSF grants, including a NIH Career Development Award. His current interests are bacterial phylogenetics and the structure of ribosomal RNA gene clusters in bacteria.
- T. M. Roberts** Robert B. Short Professor of Biological Science [University Teaching Award 1993/1994; Loretta Ellias Award for Excellence in Teaching 1992/1993]. Received his B.A. from Lafayette College, his M.A. from Boston University, and his Ph.D. from the University of Notre Dame (1976). He completed postdoctoral fellowships at Harvard and at the Carnegie Institution of Washington before joining the FSU faculty in 1981. He has published a number of papers on the roles of the plasma membrane and the cytoskeleton in amoeboid locomotion and is currently investigating a new type of biological motor found in the amoeboid sperm of nematodes.
- T. Ronquist** Associate Professor. Received his doctorate from Uppsala University, Sweden, where he was employed there before coming to FSU. His research involves applying computational and theoretical phylogenetics to phylogeny, systematics, and evolution of cynipoid wasps.
- K. H. Roux** Professor and Director of the Hybridoma and Molecular Biology Facilities. [Distinguished Research Professor 2004/2005; Loretta Ellias Award for Excellence in Teaching 1995/1996] Received his Ph.D. from Tulane University (1971) and engaged in postdoctoral studies at the University of Illinois Medical Center. Since 1978, Dr. Roux has been teaching Immunology and conducting research on the biochemistry and molecular genetics of the antibody molecule at FSU. A related line of research involves the use of immunoelectron microscopy to study the structure and function of antibodies, HIV-1 envelope glycoprotein, gp120, and other macromolecules of immunological interest.
- S. J. Stepan** Associate Professor. Received his Ph.D. in 1995 from the University of Chicago. He held postdoctoral fellowships in both the Mammal Division and the Laboratory of

Molecular Systematics of the Smithsonian Institution. His research revolves around systematics and evolutionary biology, predominantly from species-level phenomena to macroevolution. His current projects include molecular and morphological phylogenetic studies of the squirrel family and South American mice, comparative analyses of multivariate evolution, and the extrapolation of developmental or genetic constraints to understanding macroevolutionary patterns.

D. L. Swofford Francis Eppes Professor. Dr. Swofford received his Ph.D. in Genetics in 1986 from the University of Illinois. His major research interests are in the theory and methodology of phylogenetic inference from molecular and morphological data, comparison of optimality criteria used to evaluate evolutionary trees, methods of combining molecular and morphological data using maximum likelihood, and assessing robustness of maximum-likelihood methods to model variation.

H. Tang Assistant Professor. Received his Ph.D. from the University of California, San Diego, in 1998. His research interests are virus-host cell interactions concerning human immunodeficiency virus (HIV) and hepatitis C virus (HCV). Currently, the molecular and cell biology of HCV replication is the main focus of his lab.

K. A. Taylor Professor. [Distinguished Research Professor 2002/2003] Received his Ph.D. from the University of California, Berkeley, in 1995. He spent four years doing postdoctoral research at the MRC Laboratory of Molecular Biology in Cambridge, England. He joined the faculty at FSU in 1995. His research involves the 3-D structural analysis of muscle and muscle proteins using high-resolution electron crystallography of 2-D protein arrays, 3-D imaging of single-protein molecules and protein assemblies, and electron tomography of whole muscle rapidly frozen at intermediate stages of contraction.

J. Travis Robert O. Lawton Distinguished Professor [Fellow of the American Associate for the Advancement of Science; University Teaching Award 1991/1992, and Developing Scholar Award 1984/1985]. Received his Ph.D. from Duke University in 1980. His research is in ecological genetics and the study of how selection molds the phenotypic and genetic variation within and among populations of a species. Most of his work has focused on how life history traits in fish and amphibians are molded by predation, intraspecific competition, and abiotic stress. Most recently, he has begun to investigate whether different regimes of population regulation can produce and maintain genetically divergent life histories in a freshwater fish.

P. Q. Trombley Associate Professor. [Developing Scholar Award 2002/2003] Received his Ph.D. from the University of Oregon in 1990. Following postdoctoral and faculty research at Yale University School of Medicine, he joined the FSU faculty in 1995. Dr. Trombley's long-term research goals are to understand the mechanisms underlying synaptic transmission and its modulation. His work focuses on synaptic circuits that use glutamate, GABA, and glycine amino acids which dominate synaptic transmission throughout the central nervous system. Neuronal pathways that use these transmitters not only are critical for the normal function of the brain, such as for learning and memory, but also are affected by many neuropathological processes such as Alzheimer's disease and epilepsy. The regions of the nervous system studied in Dr. Trombley's lab include the olfactory system, hippocampus, and hypothalamus. The methods include primary neuronal culture and patch-clamp electrophysiology.

W. R. Tschinkel Margaret Menzel Professor of Biological Science. [Distinguished Research Professor 2003/2004; University Teaching Award 1992/1993]. Received his M.S. and Ph.D. (1968) from the University of California, Berkeley, and did postdoctoral research at Cornell University and Rhodes University (South Africa). Dr. Tschinkel's research interests are in the social biology of ants, especially fire ants. Currently, he is working on the founding, development, and population dynamics of fire-ant colonies, including the allocation of labor and resources during colony growth. In addition, he conducts ongoing research on the biology of the arboreal ant *Crematogaster ashmeadi* and the

ant community to which it belongs. Other recent projects have included the ontogeny of worker polymorphism, control of queen fertility, efficiency of sperm use, desiccation resistance, ecological range, colony temperature regulation, investment in sexuals, foodsharing, larvalfeeding and broodraiding.

N. Underwood Assistant Professor. Received her Ph.D. in 1997 from Duke University. Dr. Underwood's research interests are in the ecology and evolution of plant-insect interactions, with her primary focus on how genotypic and phenotypic variation among individuals affects the long-term spatial and temporal dynamics of populations.

A. A. Winn Associate Professor. Received her Ph.D. in 1984 from Michigan State University and did postdoctoral research at the University of Chicago. Her research interests fall within the areas of plant population biology and evolutionary ecology. Current research projects include investigation of the ecological and evolutionary consequences of phenotypic plasticity, measurement of natural selection and genetic variation in plant populations, and the ecology and genetics of marine angiosperms.

J. L. Wulff Assistant Professor. Received her Ph.D. in 1986 from Yale University. Her research interests are studying the roles of predators, physical disturbance, and competition in shaping sponge faunas.