

FLORIDA STATE UNIVERSITY DEPARTMENT OF BIOLOGICAL SCIENCE



UNDERGRADUATE HANDBOOK 2016-2017

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 King Life Sciences Building, Biology Unit I, Kasha Laboratory of Molecular Biophysics, and the Biomedical Research Facility. The department consists of 50 faculty members; over 60 administrative, technical, and support staff; 100 graduate students; and 2300+ 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, are our internationally recognized research and graduate training programs in ecology and evolutionary biology, cell and molecular biology, neuroscience, physiology, structural biology, and molecular biophysics.

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 computational biology, 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 in 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, 20 hours are specified by the department as mandatory, and 18 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 seven academic tracks offered by the Department of Biological Science are outlined on pages 6 through 14 of this handbook.

Students are strongly encouraged to meet frequently (i.e., at least once a semester) with one of the department's 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 22 through 24 of this handbook.

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 PLANS

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 plans. As you begin study in the biological science major, you will be assigned to the plan **Pre-Biological Science** (Biological Science - *prerequisites incomplete*). Upon satisfactory completion of the major prerequisite courses outlined below, you will be assigned the major plan **Biological Science**. *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 major plan Biological Science. Procrastination in 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

REQUIREMENTS FOR BEING DESIGNATED MAJOR PLAN BIOLOGICAL SCIENCE 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 1045/1045L and CHM 1046C/1046L or CHM 1050/1050L and CHM 1051/1051L) or acceptable substitutes
3. A minimum 2.0 biology and collateral GPA and no more than the allowed number of unsatisfactory grades (F, D-, D, D+, U)(see below) 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 or repeating the course.
- D. Effective starting Summer C 2011 and Fall 2011 semesters:
A student who *has not yet completed* the prerequisite courses required for upper-division status (CHM 1045 and lab, CHM 1046 and lab, BSC 2010 and lab, BSC 2011 and lab) and earned more than one unsatisfactory grade (U, F, D-, D, D+) in courses required for the major in biological science (biological science, chemistry, physics, mathematics, and statistics) or their prerequisites at Florida State University or elsewhere, whether or not repeated, will not be permitted to graduate from Florida State University with a degree in biological science.

A student who *has completed* the prerequisite courses required for upper-division status (CHM 1045 and lab, CHM 1046 and lab, BSC 2010 and lab, BSC 2011 and lab) and earned more than three unsatisfactory grades (U, F, D-, D, D+) in courses required for the major in biological science (biological science, chemistry, physics, mathematics, and statistics) or their prerequisites at Florida State University or elsewhere, whether or not repeated, will not be permitted to graduate from Florida State University 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 the allowed number of unsatisfactory grades in courses that apply to the major) may request an exception to the required academic performance and standards noted above by meeting with Dr. George Bates, Associate Chairman for Undergraduate Studies (850-645-8443; 1067F Life Sciences).

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 (8) 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 (1 hr)

2. Twelve (12) semester hours of *required* upper division biology courses including:

PCB 3063	Genetics (3 hrs)
BSC 3402L	Experimental Biology Lab (3 hrs)
BSC 3016	Eukaryotic Diversity (3 hrs) or PCB 3134 Cell Structure and Function (3)
PCB 4674	Evolution (3 hrs)

3. Eighteen (18) 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)
PCB 3134	Cell Structure and Function (3 hrs)
PCB 4024	Molecular Biology (3 hrs)
PCB 4253	Animal Development (3 hrs)

Area II: Physiology

PCB 3743	Vertebrate Physiology (3 hrs)
PCB 4723	Fundamentals of Neuroscience (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 (ISC 4253C), four (4) semester hours of Internship (BSC 4941), 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)
MAP 2480: Biocalculus lab (1hr)

And ONE of the following four 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).

COP 3014: Introduction to Computer Programming (3 hrs)

B. Introductory Chemistry: Eight (8) hours.

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

C. Physics and Advanced Chemistry: Twelve (12) to fourteen (14) semester hours.

Students may choose to take either two semesters of organic chemistry (CHM 2210 and 2211) and physics A (either PHY 2048C or PHY 2053C)

OR

One semester of organic chemistry (CHM 2210) and two semesters of physics:

PHY 2048C General Physics A (5 hrs) or PHY 2053C College Physics I (4 hrs)

AND

PHY 2049C General Physics B (5 hrs) or PHY 2054C College Physics B (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 (1 hr)

Additional biology elective course work (from among those approved for the major) to complete the required twelve hours. No more than one (1) credit hour of S/U graded course work can be counted toward the minor. All graded 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**. Other majors affiliated with Biological Science include Computational Biology and Biology FSU-TEACH.

Currently, a minimum of 38 hours in biological science coursework and a minimum of 31 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 seven academic tracks in the following sub-disciplines of biology:

- Cell and Molecular Biology
- Ecology, Evolution, and Environmental Science
- Marine 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.

The field of cell and molecular biology studies 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, plant biology, microbiology, structural biology, nanotechnology and molecular mechanisms of cellular events.

Students following this academic track often pursue careers in research, medicine, the allied health fields, teaching, or graduate study in genetics, cell, or molecular biology.

Elective Courses

BOT 4394 Plant Molecular Biology (3)
BSC 4424 Nanotechnology (3)
MCB 4403 Prokaryotic Biology (3)
MCB 4403L Prokaryotic Biology Laboratory (2)
PCB 3134 Cell Structure and Function (3)
PCB 4109 Cancer Biology (3)
PCB 4233 Immunology (3)
PCB 4233L Immunology Laboratory (1)
PCB 4253 Animal Development (3)
PCB 4424 Biology of Aging (3)

Opportunities for Research & Hands-on Experience

Students are strongly encouraged to gain experience in research through sponsoring faculty and their labs. You can become involved in research in these labs and at local research facilities in three ways:

- Directed Individual Study (BSC 4900) Research or other individual study for credit: Available to students with a GPA of 3.0 in courses that apply to the major. Search faculty pages [here](#) for appropriate mentors.
- Honors in the Major (BSC 4970): A two-semester independent research experience for qualified students. Available to students with a GPA of 3.2.
- Volunteering or internships: Volunteering is a great way to find out if a topic interests you and gain experience even if you can't make a semester-long commitment (though some students do volunteer long-term). Internships provide experience outside of academic labs. For a list of volunteer and internship opportunities read the Department of Biological Sciences Undergraduate Research Opportunities page (which isn't only for research).

Facilities

We have a wide range of facilities to enhance your studies and research experience. The department maintains facilities for DNA sequencing; monoclonal antibody production; microscopy with transmission and scanning EM, confocal and fluorescence capabilities; 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; cell culture; and microarray fabrication and analysis.

The fields of ecology, evolution, and environmental science use principles and quantitative skills from a wide array of disciplines and involving research with a variety of species and habitats. Ecology and environmental science study the relationship between organisms (including humans) and their biotic and abiotic environments. Evolution is the study of how the genetic structure of populations changes over time, with resulting effects on species behavior, morphology, and physiology. Studies in these areas help us to understand the diversity and functioning of organisms in nature and are key to solving pressing current problems, such as how we produce food, manage disease, protect natural resources, and create livable cities. Students in EEES can focus on particular types of organisms or habitats of interest (e.g., plants, marine fishes, long-leaf pine forests), on underlying concepts (e.g. diversity, population growth, complexity, behavior, evolution), or on applied issues (e.g. education, agriculture, wildlife management, fisheries management, disease transmission, conservation).

Students following this academic track are preparing for a wide variety of careers including resource management, environmental consulting, conservation biology, government agencies, teaching and science communication, agriculture, curation of museum collections, epidemiology, wildlife or fisheries biology and basic research. Many of our students go on to graduate study in ecology, evolution, behavior, and environmental science.

Elective Courses

General Ecology (PCB 3043)	Biogeography (BSC 4821C)
Marine Biology (BSC 3312)	Ornithology (ZOO 4353C)
Ecology Lab (PCB 3043L)	Comparative Vertebrate Anatomy (ZOO 3713C)
Animal Behavior (ZOO 4513)	Herpetology (ZOO 4343C)
Conservation Biology (BSC 3052)	Environmental Physiology (TBA)
Ecology of Infectious Disease (BSC 4933)	Advanced Invertebrate Zoology/lab (ZOO 3205/L)
Plants and Society (BSC 4933)	Biology Of Aging (BSC 4933)
Biomathematics (BSC 4933)	Scientific Diving (BSC 4473C)
Field Botany (BOT 3143C)	

Recommended Electives outside the department (these do not count towards the Biological Science degree)

Many courses outside of Biology are relevant to the EEES track, including courses in EOAS, Statistics, Math, Geography, Chemistry, Political Science, Philosophy, Sociology, and History. Students are encouraged to talk with the Biology advisers and faculty in their area of interest in order to determine the most appropriate courses for their personal goals.

Opportunities for Research & Hands-on Experience

Students in the EEES track are very strongly encouraged to get experience with organisms and habitats outside the classroom. The faculty and graduate students in the FSU Ecology and Evolution Group have active research programs in the lab, greenhouse and field. You can become involved in research in these labs and at local research facilities in three ways:

- Directed Individual Study (BSC 4900) Research or other individual study for credit:
Available to students with a GPA of 3.0 in courses that apply to the major. Search faculty pages [here](#) for appropriate mentors
- Honors in the Major. (BSC 4970):
A two-semester independent research experience for qualified students. Available to students with a GPA of 3.2
- Volunteering or internships:
Volunteering is a great way to find out if a topic interests you and gain experience even if you can't make a semester-long commitment (though some students do volunteer long-term). Internships provide experience outside of academic labs. For a list of volunteer and internship opportunities read the Department of Biological Sciences Undergraduate Research Opportunities page (which isn't only for research) and the FSU Sustainable Campus site and newsletter. Local farms, protected areas such as the St. Marks National Wildlife

Refuge, and institutions such as the FSU Coastal and Marine Laboratory and Robert K. Godfrey Herbarium, the Tallahassee Museum and Gulf Specimens Marine Lab all host volunteers and interns

Facilities

FSU has excellent facilities for research in Ecology, Evolution and the Environment. The department maintains greenhouses and field research areas at the Mission Road Research Facility near campus, Students also have access to scientific equipment through the Biological Science Core Facility, as well as through the Florida State University Coastal and Marine Laboratory at Turkey Point. Importantly the areas near FSU have world-class natural areas in a major biodiversity hotspot allowing field study in a wide variety of habitat types.

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 that follow this academic track are generally preparing for academic, government agency, consulting or conservation-oriented careers, some of which require the B. Sc. Degree, and others of which require a graduate degree (i.e., M.S., Ph.D., or D.V.M.). The department tracks students into marine biology through the Honors in the Major Program plus a careful selection of marine biology related courses as they fulfill the requirements of the Biological Science Major. Explore just some of the careers this track prepares you for [here](#)

Elective Courses

BSC 3312 Marine Biology (3)	BSC 4473 Introduction to Scientific Diving
BSC 4821C Biogeography (4)	ZOO 4343C Biol. of Lower Vertebrates (4)
BSC 3402L Experimental Bio Lab (Marine only) (2)	PCB 3043L Ecology Laboratory (2)
Biology of Elasmobranch Fishes (in Bimini) (3)	ZOO 4513 Animal Behavior (4)
ZOO 4454C Bio. of Fishes (4)	MCB 4403/L Prokaryotic Biology (3)/Lab (2)
BSC 4933 Biomathematics (3)	BSC 4933r Selected Topics (all field courses)
ZOO 3205/L Adv. Invert. Zoo.(2)/Lab (2)	

Recommended Electives outside the department (these do not count towards the Biological Science degree)

OCB 4903 Estuarine and Coastal Ecology	OCB 5930 Coral Reefs
OCE 4011 Principles of Oceanography (3)	OCE 4930 Marine Pollution

Opportunities for Research & Hands-on Experience

Students in the EEES track are very strongly encouraged to get experience with organisms and habitats outside the classroom. The faculty and graduate students in the FSU Ecology and Evolution Group have active research programs in the lab, greenhouse and field. You can become involved in research in these labs and at local research facilities in three ways:

- Directed Individual Study (BSC 4900) Research or other individual study for credit: Available to students with a GPA of 3.0 in courses that apply to the major. Search faculty pages [here](#) for appropriate mentors.
- Honors in the Major: (BSC 4970). A two-semester independent research experience for qualified students. Available to students with a GPA of 3.2.
- Volunteering or internships: Volunteering is a great way to find out if a topic interests you and gain experience even if you can't make a semester-long commitment (though some students do volunteer long-term). Internships provide experience outside of academic labs. For a list of volunteer and internship opportunities read the Department of Biological Sciences Undergraduate Research Opportunities page (which isn't only for research) and the FSU Sustainable Campus site and newsletter. Local farms, protected areas such as the St. Marks National Wildlife Refuge, and institutions such as the FSU Coastal and Marine Laboratory and Robert K. Godfrey Herbarium, the Tallahassee Museum and Gulf Specimens Marine Lab all host volunteers and interns.

Facilities

The department also has two boats (a 16ft and an 18ft Carolina Skiff) available for marine biology research and individual faculty have fully functioning marine research laboratories on campus. Students also have access to scientific equipment (e.g., for DNA sequencing and HPLC) through the Biological Science Core Facility, as well as through the Florida State University Coastal and Marine Laboratory (FSUCML) at Turkey Point. The FSUCML is well-equipped with laboratory and field equipment needed to support research in marine biology, including a flow-through seawater system, a wide array of holding tanks, aquarium systems, experimental tanks, and mesocosm systems, as well as laboratories, greenhouses, environmental chambers, a necropsy room. The FSUCML also has as a fleet of six small vessels between 16 to 28 feet, R/V Apalachee (65ft research vessel), and a scientific diving program. The FSUCML offers shuttle services between the main campus and the lab at no cost to students working at the lab. Importantly the coastal areas near the FSU campus allow easy access to world-class natural areas in a major biodiversity hotspot, and include in a wide variety of habitat types (e.g., estuaries, oyster reefs, salt marsh, sea grass, mudflats, and subtidal hard-bottom reefs).

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, the analysis and integration of information by neural circuits and the neuronal basis of behavioral processes.

Students following this academic track often pursue careers in medicine or research and expect to have competitive entry into professional or graduate schools; such as a veterinarian, physician, nurse, professor, scientific researcher, dentist, pharmacist, or other fields that explore the workings of the body and brain.

Elective Courses

PCB 3134 Cell Structure and Function (3)	PCB 4024 Molecular Biology (3)
PCB 4843 Fundamentals of Neuroscience (3)	ZOO 4513 Animal Behavior (4)
PCB 3743 Vertebrate Physiology (3)	PCB 4024L Molecular Biology Lab (1)
PCB 4701 Human Physiology (3)	

Recommended Electives outside the department (these do not count towards the Biological Science degree)

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

Opportunities for Research & Hands-on Experience

Students are strongly encouraged to gain experience in research through sponsoring faculty and their labs. You can become involved in research in these labs and at local research facilities in three ways:

- Directed Individual Study (BSC 4900) Research or other individual study for credit: Available to students with a GPA of 3.0 in courses that apply to the major. Search faculty pages [here](#) for appropriate mentors
- Honors in the Major (BSC 4970): A two-semester independent research experience for qualified students. Available to students with a GPA of 3.2
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Facilities:

We have a wide range of facilities to enhance your studies and research experience. Physiologists and neuroscientists have specialized equipment in their laboratories and have access to a variety of shared research facilities including the scanning and transmission electron microscope laboratory, the Analytical Biochemistry Lab, the Genomics Sequencing Core, 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

The field of Plant Sciences broadly includes the study of photosynthetic organisms, especially plants and algae. It prepares students to make important contributions to the world in the areas of agriculture, food security, natural resource management, sustainability, policy, and many others. Alumni find jobs in academia, private industry, environmental consulting companies, government agencies, and nonprofit agencies. Many go on to graduate school to study ecology, evolution, systematics, physiology, biotechnology, genomics, biochemistry, molecular biology, structural biology, agriculture, or horticulture. **Explore some of the careers this track prepares you for at the career websites of the [American Society of Plant Biologists](#) and the [Botanical Society of America](#). This is also a helpful [infographic](#).**

Elective Courses

Plants represent an origin of complex multicellularity independent of animals, leading to the strikingly different structure and function of their bodies. We recommend that all students take Eukaryotic Diversity (BSC 3016) at an early stage because it enables students to identify the breadth to which their understanding of a group of organisms (e.g., plants or algae) is applicable across the Tree of Life.

The following is a list of other 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.

Plant Biology Lab (BOT 3015L)	Algal Signal Transduction (BSC 3402L)
Field Botany (BOT 3143C)	Plant Cytogenetics (BSC 3402L)
Plants and Society (BSC 4933)	General Ecology (PCB 3043)
Plant Molecular Biology (BOT 4394)	General Ecology Lab (PCB 3043L)
Plant Physiology (BOT 4503)	Cell Structure and Function (PCB 3134)
Plant Physiology Lab (BOT 4503L)	Molecular Biology (PCB 4024)
Conservation Biology (BSC 3052)	Molecular Biology Lab (PCB 4024L)

Opportunities for Research & Hands-on Experience

Students are strongly encouraged to gain experience in research through sponsoring faculty and their labs. You can become involved in research in these labs and at local research facilities in three ways:

- Directed Individual Study (BSC 4900) Research or other individual study for credit: Available to students with a GPA of 3.0 in courses that apply to the major. Search faculty pages [here](#) for appropriate mentors.
- Honors in the Major: (BSC 4970). A two-semester independent research experience for qualified students. Available to students with a GPA of 3.2.
- Medical Volunteering: Volunteering is a great way to find out if a topic interests you and gain experience even if you can't make a semester-long commitment (though some students do volunteer long-term). Internships provide experience outside of academic labs. For a list of volunteer and internship opportunities read the Department of Biological Sciences Undergraduate Research Opportunities page.

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. FSU's Robert K. Godfrey Herbarium contains 220,000 plant specimens that document over 150 years of plant diversity and distribution. Other local resources such as the privately owned Tall Timbers Research Station provide additional plant research opportunities in fire ecology and conservation.

Academic Track in the Biological Science Major

PRE-PROFESSIONAL HEALTH SCIENCES

The 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. Many also pursue graduate education in biomedical research. The majority of students entering professional schools major in Biology stemming from a genuine interest in human biology, and the rigorous coursework in the natural sciences which is excellent preparation for the MCAT and for the courses taken in medical school. Advising for the pre-professional and allied health sciences is available in the **Biological Science Undergraduate Advising Office and also the Health Professions Advising Office, 2140 College of Medicine (850-644-7678)**. 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.

Elective Courses

Biology of Aging (BSC 4933)
Ecology of Infectious Disease (BSC 4933)
Virology (BSC 4933)
Prokaryotic Biology (MCB 4403)
Prokaryotic Biology Lab (MCB 4403L)
Molecular Biology (PCB 4024)
Molecular Biology Lab (PCB 4024L)
Immunology (PCB 4233)
Immunology Lab (PCB 4233L)
Animal Development (PCB 4253)
Human Physiology (PCB 4701)
Fundamentals of Neuroscience (PCB 4843)
Comparative Vertebrate Anatomy (ZOO 3713C)
Histology (ZOO 4753C)

Recommended Electives outside the department

General Biochemistry BCH 4053
Organic Chemistry II Lab CHM 2211L
Introductory Sociology SYG 1000
General Psychology PSY 2012
Brain and Behavior PSB 2000

Opportunities for Research & Hands-on Experience

Students are strongly encouraged to gain experience in research through sponsoring faculty and their labs. You can become involved in research in these labs and at local research facilities in three ways:

- Directed Individual Study (BSC 4900) Research or other individual study for credit:
Available to students with a GPA of 3.0 in courses that apply to the major. Search faculty pages [here](#) for appropriate mentors.
- Honors in the Major:
(BSC 4970). A two-semester independent research experience for qualified students. Available to students with a GPA of 3.2.
- Medical Volunteering:
Volunteering is a great way to demonstrate your commitment to the health professions and gain important experience. Many of the pre-health clubs and organizations provide lists of opportunities in the surrounding area and state

Facilities

The research facilities available within the Department support the numerous faculty labs conducting biomedical research. The department maintains facilities for DNA sequencing; monoclonal antibody production; transmission and scanning electron microscopy, confocal and fluorescence microscope; the analytical biochemistry laboratory with HPLC's, gel scanning densitometers, ultracentrifuges, and PCR equipment; computerized molecular modeling and gene data base facility; and participates in the Center for Genomics and Personalized Medicine.

Zoology is the natural science concerned with all aspects of animal life, from molecular biology and structure to their ecology and evolution. Areas of specialty include animal diversity, morphology, development, behavior, geographic distribution, and environmental interactions of animals both living and extinct.

Students following this academic track often pursue graduate study in a range of specialties or seek admissions to health professional programs. Students may seek technical careers, laboratory or field positions in government or industry, or environmental consulting. Some students will combine this track with preparation for careers in primary and secondary education.

Elective Courses

Conservation Biology (BSC 3052)	Human Physiology (PCB 4701)
Marine Biology (BSC 3312)	Fundamentals of Neuroscience (PCB 4843)
Biogeography (BSC 4821C)	Advanced Invertebrate Zoology (ZOO 3205)*
Biology of Aging (BSC 4933)	Advanced Invertebrate Zoology Lab (ZOO 3205L)*
Biomathematics (BSC 4933)	Concurrent enrollment required Comparative Vertebrate
Ecology of Infectious Disease (BSC 4933)	Anatomy (ZOO 3713C)
General Ecology (PCB 3043)	Herpetology (ZOO 4343C)
Ecology Laboratory (PCB 3043L)	Ornithology (ZOO 4353C)
Immunology (PCB 4233)	Biology of Fishes (ZOO 4454C)
Immunology Laboratory (PCB 4233L)	Animal Behavior (ZOO 4513)
Animal Development (PCB 4253)	Histology (ZOO 4753C)

Opportunities for Research & Hands-on Experience

Students are strongly encouraged to gain experience in research through sponsoring faculty and their labs. You can become involved in research in these labs and at local research facilities in three ways:

- Directed Individual Study (BSC 4900) Research or other individual study for credit: Available to students with a GPA of 3.0 in courses that apply to the major. Search faculty pages [here](#) for appropriate mentors.
- Honors in the Major: (BSC 4970). A two-semester independent research experience for qualified students. Available to students with a GPA of 3.2.
- Medical Volunteering: Volunteering is a great way to find out if a topic interests you and gain experience even if you can't make a semester-long commitment (though some students do volunteer long-term). Internships provide experience outside of academic labs. For a list of volunteer and internship opportunities read the Department of Biological Sciences Undergraduate Research Opportunities page

Facilities

The Department maintains well equipped instructional and research facilities for studies in zoology. On campus, faculty laboratories are housed in the King Life Science Building and the Biomedical Research Facility, and off-campus at the FSU Coastal Marine Laboratory. Facilities include the Bioanalytical and Molecular Core, the Biological Science Imaging Resource, Sequencing Laboratory, and Mission Road Research Facility, as well as the Center for Genomics and Personalized Medicine. Other local resources such as the Tallahassee Museum of History and the privately owned Tall Timbers Research Station provide additional 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, and whether or not repeated. Continuation, and graduation as a biological science major requires a minimum 2.0 biology GPA.

DEPARTMENT OF BIOLOGICAL SCIENCE D/F RULE

A student who *has not yet completed* the prerequisite courses required for upper-division status (CHM 1045 and lab, CHM 1046 and lab, BSC 2010 and lab, BSC 2011 and lab) and earned more than one unsatisfactory grade (U, F, D-, D, D+) in courses required for the major in biological science (biological science, chemistry, physics, mathematics, and statistics) or their prerequisites at Florida State University or elsewhere, whether or not repeated, will not be permitted to graduate from Florida State University with a degree in biological science.

A student who *has completed* the prerequisite courses required for upper-division status (CHM 1045 and lab, CHM 1046 and lab, BSC 2010 and lab, BSC 2011 and lab) and earned more than three unsatisfactory grades (U, F, D-, D, D+) in courses required for the major in biological science (biological science, chemistry, physics, mathematics, and statistics) or their prerequisites at Florida State University or elsewhere, whether or not repeated, will not be permitted to graduate from Florida State University with a degree in biological science.

DROPPING CLASSES

During the first four days of classes in a new semester, 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", withdrawn.

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", withdrawn with deans approval. 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 the specified number of unsatisfactory grades (F, D-, D, D+, U)(see Handbook page 3) 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 CLASSWORK

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 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 become 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	4	BSC 2010 and BSC 2010L
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)
- MAP 2480 (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. Before their initial registration, students should use the one-time-only opportunity to advance their initial college mathematics placement

by taking the Supplemental Math Skills (SMS) test. 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 SMS does NOT require a student to drop below the initial mathematics placement, however, performing well on the test may improve your initial mathematics placement. Therefore, it is strongly recommended that students take the SMS tests before registering for the first time at FSU.

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 2171 for reduced credit. The appropriate forms to take these courses for reduced credit are available in the advising offices for Mathematics (222 Love, 850-644-5868) and Statistics (214 Oceanography and Statistics, 850-644-3218).

Examination	Score	FSU Equivalent Course
SAT/ACT	SAT Quantitative \leq 430 ACT Math \leq 18	Student must take MAT 0024 unless SMS score waives this requirement by advancing math placement into a college-level course.
	$440 \leq$ SAT Quantitative \leq 460 $19 \leq$ 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 1045 and CHM 1045L
AP Chemistry	5	CHM 1045, CHM 1045L, CHM 1046, and CHM 1046L
IB Chemistry	5-7	CHM 1020, CHM 1020L, CHM 1045, and CHM 1045L

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	5, 6, or 7	PHY 2053C and PHY 2054C

FOREIGN LANGUAGE

The Department of Biological Science, within the College of Arts and Sciences, 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 (for Spanish, French or German) 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 (UCC 1200).

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 (UCC 1200; 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. 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 a Drop/Add Permit form from the Biological Science Undergraduate Academic Advising Office (1067 Life Sciences)
- 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 (1067 Life Sciences)
- 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 (1067 Life Sciences)
- 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 Registrar's 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 (1067 Life Sciences)
- 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 Registrar's 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 generated using the online registration system after registration for the upcoming semester closes. **To maximize the chances of getting into a full biological science course, students are encouraged to:**

- Sign the waiting list available on-line through the Course Search System after open registration closes
- 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; 1063B Life Sciences, 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; 1063B Life Sciences) of the Biological Science 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 (1067 Life Sciences)

You must also request both a university graduation check and a college graduation check upon reaching 100 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. For additional information, see the FSU Academic Honor Policy at http://registrar.fsu.edu/bulletin/undergrad/info/acad_regs.htm

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 Suite 1067 of the King Life Sciences Building. The Biological Science Undergraduate Academic Advising Office is open from 8:30 AM to 4:30 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

Four full-time undergraduate academic advisors, Ms. Bonnie Garcia-Gloeckner, Ms. Alicia Weaver, Ms. Sabrina Smith and Ms. Kelsie Patton, and the Associate Chairman for Undergraduate Studies, Dr. George Bates, 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. Nina Flanagan or Ms. Erin Neal, 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 two advisors: a biology undergraduate academic advisor in the **Biological Science Undergraduate 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 at the end of this handbook 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. The advisors see students on a walk-in basis every day from 8:30 until noon and see students by appointment in the afternoons. To make an appointment go to www.biologyadvising.youcanbook.me. The Department of Biological Science undergraduate academic advisors can also be contacted at the following:

- Ms. Bonnie Garcia-Gloeckner 1067C Life Sciences bgarcia@bio.fsu.edu 850-644-3099
- Ms. Kelsie Patton 1067D Life Sciences kpenn@bio.fsu.edu 850-644-4781
- Ms. Sabrina Smith 1067E Life Sciences ssmith@bio.fsu.edu 850-644-9351
- Ms. Alicia Weaver 1067B Life Science kpatton@bio.fsu.edu 850-645-9679

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 Biological Science Academic Advisor for a referral.

Department/Office/School	Telephone	Location	Reason for Contacting
Career Center	850-644-6431	1200 Dunlap Success 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	520 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	364 Diffenbaugh	Placement, testing and evaluation of

Languages and Linguistics			foreign language competency in Arabic, Chinese, French, German, Hebrew, Italian, Japanese, Korean, Russian, and Spanish.
Registrar's 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.
Health and Wellness Center	850-644-6230	960 Learning Way	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. George Bates, Associate Chair for Undergraduate Studies (850) 645-8443; bates@bio.fsu.edu

BIOLOGY STUDY CENTER

The Biology Study Center is located in **1054 Life Sciences**. 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, and **BioMentors**, who offer tutoring and assistance in upper division biology courses and other courses required for the major. 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 8:00 AM to 5:00 PM, Monday through Friday, during the fall and spring semesters (closed during summer).

ACADEMIC COMPUTER LABS

The Academic Computer Labs (1056, 1057, 1058 King Life Sciences) house 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 King Life Science Computer Office in Room 2054. 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) in the King Life Science Computer Office, room 2054.

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. 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

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. Susanne Cappendijk susanne.cappendijk@med.fsu.edu 850-645-1483

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 3008 King Life Sciences. 850-644-4775

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 October 1, with announcements of scholarship winners and an awards ceremony taking place at the end of the fall semester. Guidelines and applications are available on the biology department website <http://www.bio.fsu.edu/undergrad/scholarships.php>. For specific information, watch the bulletin boards by 1067 King Life Sciences for application deadlines, following this link or contact the Biological Science Undergraduate Academic Advising Office (1067 Life Sciences) early 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: An award of up to \$1000 to an outstanding upper-division biological science major. The scholarship is intended to support exceptional undergraduates in pursuing professional careers in biological science. Selection criteria include academic performance, financial need, and potential for undergraduate research.

BIOLOGICAL SCIENCE FACULTY AWARD FOR UNDERGRADUATE SCHOLARSHIP: A scholarship of up to \$1,350 awarded annually to the outstanding senior biological science major. No application. Nominated by faculty.

CHARLES M. MCALLISTER UNDERGRADUATE RESEARCH AWARD: Up to 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 (BSC 4900—Directed Individual Study; BSC4970—Honors in the Major). Selection criteria include academic performance, financial need, and potential for undergraduate research.

FRANCENIA E. FISHER SCHOLARSHIP: A scholarship of up to \$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. A subsequent scholarship of \$5000 may be awarded if the recipient is admitted for graduate study in plant pathology at Michigan State University in East Lansing, MI.

JOHN MARK CAFFREY SCHOLARSHIP: A scholarship of up to \$1,500 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.

KEVIN L. MCKEOWN MEMORIAL SCHOLARSHIP IN BIOLOGICAL SCIENCE: A scholarship of up to \$1,250 awarded annually to an outstanding upper-division biological science major who is a permanent resident of Pinellas County, Florida.

BEN AND KAREN THROWER SCHOLARSHIP: A scholarship of \$500 awarded each fall term to provide support for one undergraduate and one graduate student within the Department of Biological Science. Each student receives \$500. Selection is based on academic merit and may be directed to those pursuing research within the department.

VARINA VAUGHN - WINONA JORDAN SCHOLARSHIP: Scholarship of up to \$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, evidence of financial need, and a demonstrated interest in the plant sciences.

ROBERT B. SHORT SCHOLARSHIP IN ZOOLOGY: The Robert B. Short Scholarship in Zoology provides an award of up to \$2,000 to a currently enrolled graduate student or senior undergraduate student at Florida State University in the Department of Biological Science with a career interest in zoology. The scholarship will support the awardee's participation in an off-campus organized research experience or training program, or specialized course of study, such as are offered at the Duke University Marine Station, the Cold Spring Harbor Laboratory, or the Mountain Lake Biological Station. Selection of the awardee is based on academic qualifications, demonstrated interest in a career in zoology, unmet expenses associated with participation in the program, and the relevance of the proposed off-campus experience to the applicant's biological and career interests.

Bachelor of Science in COMPUTATIONAL BIOLOGY

About the Degree

Scientific discovery is the result of creative interplay between inductive and deductive reasoning. Computational models play an increasingly important role in deducing the consequences of explanatory models, yet biologists are routinely hindered by the limitations of models currently available as software. In part this results from a lack of interdisciplinary training in both biological and computational sciences. This program seeks to achieve two goals: 1) to develop an understanding of the issues associated with developing biologically meaningful computational models, and 2) to give students the broad-based education that is needed to create a set of models directed towards solving practical biomedical problems. In the process, it is hoped that the student will learn how to meld biological and quantitative skills. Students participating in this degree program will be better positioned to develop productive careers in the burgeoning fields of computational biology and bioinformatics.

Advising

Students who are pursuing the degree in Computational Biology may choose to work with the undergraduate advisors in either the Department of Biology or the Department of Computer Science, and may find it beneficial to communicate with advisors in both offices. The Department of Computer Science undergraduate academic advisors can be contacted at the following:

Requirements for a Major in Computational Biology

Please review all college-wide degree requirements summarized in the "College of Arts and Sciences" chapter of this *General Bulletin*.

All courses applicable to the major must be completed with a grade of "C-" or better.

- A. Biological Science: 17 hours BSC 2010 + 2010L (3,1) Biological Science I and Lab
BSC 2011+ 2010L (3,1) Biological Science II and Lab
PCB 3063 (3) Genetics
PCB 4674 (3) Evolution
and 3 hours of biological science elective credit chosen from:
BOT 4394, BSC 2010L, BSC 2011L, BSC 4900, MCB 4403/L, PCB 3134,
PCB 3743, PCB 4024, PCB 4233, PCB 4253 and PCB 4843.
- B. Computational Science: 21 hours ISC 3322 (3) Symbolic and Numerical Computing
ISC 3313 (3) Intro to Scientific Computing
ISC 4220 (4) Algorithms for Scientific Computing I
ISC4 221 (4) Algorithms for Scientific Computing II
ISC 4303 (4) Programming for Scientific Applications
ISC4933 (3) Introduction to Bioinformatics
- C. Required research experience ISC4943r or BSC4900r (8, 4 each in two semesters)
- D. Additional Elective Courses (5 hours)
Five (5) additional hours chosen from Biology, Chemistry, Computer Science; Mathematics or Statistics, Physics and Scientific Computing selected from: CDA 3101, COP 4531, COP 4710, COT 4420, and CIS 4900, MAC 2313, MAP 2480, MAP 4481, STA 4102, STA 4103, STA 4202, STA 4203, STA 4442, STA 4502, and STA 4702, CHM1045L, CHM1046L, PHY2054C, PHY2049C, ISC4223, ISC4232
- E. Collateral Courses: 24 hours. All collateral courses must be completed with a grade of C- or better.
- Mathematics/Statistics: 14 hrs MAC 2311 (4) Calculus I
MAC 2312 (4) Calculus II
MAD 2104 (3) Discrete Math I
STA 2171 (3) Biostatistics
- Physics: 4 or 5 hours PHY 2053C (4) General Physics I **OR**
PHY 2048C (5) College Physics I
- Chemistry: 6 hours CHM 1045 (3) General Chemistry 1
CHM 1046 (3) General Chemistry 2

Students who are interested in pursuing a degree in Computational Biology should express this interest to one of the undergraduate departmental advisors (Suite 1067 Life Sciences) to change their major. This will allow advisors to guide students in selecting courses, monitor their progress, and advise them of requirements specific to this degree program.

BULLETIN BOARDS

The department posts a variety of notices, including *BioNotes*, a weekly publication containing departmental news and announcements. The bulletin boards outside of the Biological Science Undergraduate Academic Advising Office in 1067 Life Sciences are for information on changes in requirements and course offerings, scholarships, work opportunities, internships, and careers.

DEPARTMENTAL COLLOQUIUM

The Biological Science Department offers a weekly colloquium on Thursday afternoons at 4:00 PM in 1024 Life Sciences. Coffee is served at 3:30, and a reception (with food!) for the speaker is held before the colloquium. 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 as well as advising staff in Biological Science.

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 regular sections of BSC 2010 are between 143 and 335 students, while the corresponding two honors sections of BSC 2010 in Fall 2012 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 4970: 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. Janie Wulff, Director of Honors In The Major for the Department of Biological Science (4075 King Life Sciences; 850-644-1565).

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 four buildings on campus (King Life Sciences, Biological Science Unit I, Institute of Molecular Biophysics, and Biomedical 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 High Performance Computing center. 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*, the biology website (www.bio.fsu.edu) and/or the bulletin board in 1067 Life Sciences. A more complete description of BSC 3402L is provided on under Course Descriptions in this handbook or on the biology website.

Directed Individual Study (DIS) and Research Methods Courses: Students with significant interest in research should consider taking either a Directed Individual Study (BSC 4900r) 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:

- One of the following major plans - Biological Science, Science Education, or Secondary Science and Mathematics Teaching major; or Computational Biology, 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 1067 Life Sciences. 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 on the biology department webpage (www.bio.fsu.edu/undergrad/researchops.php) or at the Career Center, A4100 University Center (850-644-6431).

UNDERGRADUATE SUPERVISED TEACHING ASSISTANTSHIPS

Each year, 20 to 25 outstanding junior and 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 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:

- Junior or Senior standing as a Biological Science, Science Education, or Secondary Science and Mathematics Teaching major; or Computational Biology, and
- A minimum 3.0 FSU GPA.

Specific questions regarding undergraduate supervised teaching should be addressed to a Biology Academic Advisor (1067C Life Sciences; 850-644-3099) for senior TAs in BSC 2010 and BSC 2011, or to Carolyn Schultz (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 (1067 Life Sciences). Completed applications should be turned into Ms. Bonnie Garcia-Gloeckner (1067C King Life Sciences). Departmental faculty will interview qualified applicants. If selected to be a Senior TA, students must participate in a mandatory, 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.

FSU-TEACH

FSU-Teach is an innovative path to becoming a mathematics or science teacher that allows you to develop deep knowledge of your subject (science or math) as well as developing deep knowledge of teaching--all in a reasonable timeframe.

This program depends on collaboration between scientists, mathematicians and education faculty at Florida State University as well as teaching experts in local schools to simultaneously prepare you for a career in science and teaching. Students who successfully complete this program will receive a double major—in biological sciences and education.

FSU-Teach weaves together all the resources of a research university combined with the real life experiences of the classrooms to provide you with preparation to become an excellent science teacher. Coursework begins with intensive early field experiences via Step 1 and Step 2 courses. In these courses students use research based science curricula to teach elementary and middle school students. The emphasis of these courses is for FSU-Teach students to experience teaching using high quality curricula and for the elementary and middle school students to have an opportunity to further develop their science content knowledge.

FSU-Teach includes the aggressive recruitment of science majors largely via an array of student benefits, including paid tuition for the first two courses; paid work opportunities that provide experience in education, research, and/or community outreach; and a community structure for their university experience.

For more information regarding FSU-TEACH, please contact:

Dr. Ellen Granger
Co-Director of FSU-Teach
1062E King Life Sciences 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 *not* be graded on a satisfactory/unsatisfactory (S/U) basis
- An immunization clearance is obtained from the Health and Wellness 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 (1067 Life Sciences) 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 (1067 Life Sciences) 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 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)**
Frequency Offered: Every semester
Prerequisites or corequisites:
Corequisite:
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)**
Frequency Offered: Every semester
Prerequisite or corequisite: BSC 2010
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)**
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.

BSC2011L **BIOLOGICAL SCIENCE II LABORATORY (1 hr)**
Frequency Offered: Every semester
Prerequisites: BSC2010 & BSC2010L
Typical Format: 3 hours lab/week; lab reports; written and oral presentation of research proposals
Lab topics: Hypothesis generation, measurement and graphing, development, genetics, evolution, and ecology

UPPER DIVISION BIOLOGICAL SCIENCE COURSES FOR UNDERGRADUATE STUDENTS

NOTE: BSC 2010/L, BSC 2011/L, CHM 1045/L and CMH 1046/L are prerequisite courses to all upper division biology courses in the major except for BSC 3930 and BSC 3938. Upper division courses are restricted to majors who have successfully completed the major prerequisite courses and have been assigned the major plan Biological Science

- BOT 3015L** **PLANT BIOLOGY LABORATORY (1 hr)**
Frequency Offered: Every semester
Prerequisites: Major prerequisite courses
Prerequisites or Corequisites: BOT 3015 or BSC 3016
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)**
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 4394** **PLANT MOLECULAR BIOLOGY (3 hrs)**
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.
- BSC 3016** **EUKARYOTIC DIVERSITY (3hrs)**
Frequency Offered: Every semester
Prerequisites: BSC 2010, BSC2010L, BSC2011, BSC2011L
Typical Format: 3 hours lecture/week; 3 exams and final, out of class assignments
Lecture Topics: this course provides an overview of the diversity eukaryotic organisms (protists, plants, fungi, and animals), the evolutionary origin of this diversity, and its societal relevance. Comparisons of exemplar organisms will be used to illustrate broad themes in the anatomy, morphology, development, physiology, behavior, life cycles, and ecologies of eukaryotes.
Additional information: Designated as a required course for undergraduate majors in Biological Science. If you took BSC2011L before Fall 2013 then you are not to take this class. Students who take Eukaryotic Diversity are not to take BOT3015.
- BSC 3052** **CONSERVATION BIOLOGY (3 hrs)**
Frequency Offered: Annually, fall or spring 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 3312 **MARINE BIOLOGY (3 hrs)**

Frequency Offered: Annually, spring 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)**

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 in 1067 King Life Sciences.

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)**

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)**

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 3949 **Cooperative Education Work Experience**

BSC 4424 **NANOTECHNOLOGY (3 hr)**

Frequency Offered: Annually, spring semester

Prerequisites: BSC 2010/L & BSC 2011/L

Typical Format: 3 lectures per week

Lecture Topics: This course provide an introduction to the interdisciplinary nanotechnology for juniors, seniors and graduate students. Students will be provided with a basic understanding of the

relevant aspects of biology, chemistry, physics, engineering, and business to follow a typical lecture at an interdisciplinary nanotechnology conference or work in a small nanotechnology start-up company.

BSC 4473C **SCIENTIFIC DIVING (3 hr)**

Frequency Offered: Each semester when there is sufficient enrollment.

Prerequisites: Open water diver certified by national organization, clear diving medical exam, ability to pass a swimming evaluation. This course is designed for the scientist or scientist in training who plans to use SCUBA diving as a tool for underwater research. Skills covered include dive planning, emergency management, underwater navigation, survey techniques, and instrument deployment and recovery.

BSC 4812 **BIOGEOGRAPHY (4 hrs)**

Frequency Offered: Biennially, even years, fall semester

Prerequisites: BSC2011 & 2011L.

Typical Format: 2.5 hours lecture per week, 1.5 hours in lab (data analysis)

Lecture Topics: Biogeography is the study of the distributions of animals and plants (all organisms) in space and time and the processes that determine those distributions. As the name implies, this field combines elements of biology (especially ecology and evolution) and geography. The distributions are determined by the physical characteristics of organisms, how these characteristics interact with the physical and biotic environment, and by history. The field can be explored by looking at entire ecosystems, physiology of individual species, or evolutionary history of groups of species, among other approaches. This course will cover the full range of biogeography with an emphasis on ecological and evolutionary biogeography, the processes that help determine distributions, and the analytical methods used to describe distributions and test processes. Topics include the physical environment (geology, meteorology), the distribution of ecosystems and biomes across the globe, speciation, common geographic patterns, diversity gradients, island biogeography, and historical (evolutionary) biogeography. There is a laboratory section as part of this course in which student working in groups will analyze geographic data sets to search for patterns and test hypotheses with the scientific method.

Additional Information: This class qualifies for the departmental lab requirement. Familiarity with statistics and general ecological principles is helpful

BSC 4900r **DIRECTED INDIVIDUAL STUDY (DIS) (1-4 hrs)**

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 up to a maximum of twelve (12) hours but only 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)**

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 in 1067 King Life Sciences. 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 **SELECTED TOPICS IN BIOLOGICAL SCIENCE (1-4 hrs)**

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.

BSC 4933 **ECOLOGY LABORATORY (2 hrs)**

Frequency Offered: Each year, fall semester

Prerequisites: Must be taking PCB3043 (general Ecology) concurrently

Typical Format: Typical lab format, 6 hours per week, .

BSC 4934r **SELECTED TOPICS IN APPLIED BIOLOGY (1-4 hrs)**

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 4941 **INTERNSHIP IN BIOLOGICAL SCIENCE (1-4 hr)**

Frequency Offered: Every semester

Prerequisites: major prerequisite courses

Typical Format: S/U graded

This course is intended for students who are doing off-campus work related to biology. It is repeatable up to a maximum of 6 hours but only 4 hours can be counted toward the biology major.

BSC 4945 **UNDERGRADUATE SUPERVISED TEACHING (1 hr)**

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 1067 Life Sciences to obtain an application. Students apply, interview and are selected to either staff the Biology Help Center and serve laboratory TAs 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)**

Frequency Offered: Every semester

Prerequisites: Admission to the department's Honors in the Major Program (see pages 29 and 30)

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.

ISC 3523C **RESEARCH METHODS (1-4 hrs)**

This course is available only to biology majors in the FSU Teach Program. See Description under BSC 4900r

- MCB 4403** **PROKARYOTIC BIOLOGY (3 hrs)**
Frequency Offered: Annually, fall and summer semesters
Prerequisites: Major prerequisite courses; CHM 2210 and PCB 3063
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.
- MCB 4403L** **PROKARYOTIC BIOLOGY LABORATORY (2 hrs)**
Frequency Offered: Annually, fall and summer semesters
Prerequisites: Major prerequisite courses
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.
- PCB 3043** **GENERAL ECOLOGY (3 hrs)**
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 3043L** **ECOLOGY LABORATORY (2)**
Frequency Offered: Annually, fall semester
Prerequisites: Major prerequisite courses
Prerequisite or Corequisite: PCB 3043
Typical Format: 3 hours lab/week, required field trips on weekends
Lab Topics: Students will be introduced to common questions and methods from basic and applied ecology using both lab and field exercises. These include quantifying effects of density, competition, and predation on populations, understanding food webs and trophic interactions, as well as the biogeography of movement and species ranges, succession in long-leaf pine forests, local stream biomonitoring, and foraging ecology.
- PCB 3063** **GENERAL GENETICS (3 hrs)**
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)**
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 4022C.** **INTENSIVE MODERN MOLECULAR BIOLOGY (4 hrs).**
Frequency Offered: Fall semester every other year.
Prerequisites: PCB 3063 and PCB 4024.
Lab Topics: This course will teach modern molecular biology methods in a cohesive single project. Working with a single gene students will design overexpressing clones to be transfected into human cells. Additionally, using CRISPR gene editing students will knock that gene out of cells. RNA will be isolated from each experiment and full transcriptomes will be sequenced and analyzed
- PCB 4024** **MOLECULAR BIOLOGY (3 hrs)**
Frequency Offered: Annually, fall semester
Prerequisites: Major prerequisite courses; PCB 3063. PCB 3134 is recommended but not required.
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)**
Frequency Offered: Annually, fall semester
Prerequisites: Major prerequisite courses; PCB 3063
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 4109** **CANCER GENETICS (3 hrs)**
Frequency Offered: every other year, fall semester.
Prerequisites: Major prerequisite courses and PCB 3063.
This course introduce students to a range of cancer related topics from the cancer related mutations and signaling pathways to the cutting-edge research that offers attractive development for new anti-cancer drugs and therapeutic strategies. From tumor-inducing viruses to multi-steps of tumorigenesis, students learn the history of cancer and how it has shaped contemporary research.
- PCB 4233** **IMMUNOLOGY (3 hrs)**
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)**
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 4244

BIOLOGY OF AGING

Frequency Offered: Biennially, even years, fall semester

Prerequisites: PCB 3063

Typical Format: Typical lecture format, 3 hours per week, daily homework assignments, two examinations and one paper, and one oral presentation.

Lecture Topics: This course provides an introduction to multi-disciplinary questions and approaches in the biology of aging. Both molecular and evolutionary mechanisms will be discussed, but the course will be student-centered. That is, many of the topics and readings will be chosen collaboratively by the instructor and the students. Part of the reason for this approach is practical. The biology of aging encompasses an enormous range of disciplines, questions, and methods, ranging from molecular biology to evolutionary biology to demography.

PCB 4253

DEVELOPMENTAL BIOLOGY (3 hrs)

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

DEVELOPMENTAL BIOLOGY LABORATORY (3 hrs)

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 4402

ECOLOGY OF INFECTIOUS DISEASE (1 hr)

Frequency Offered: Annually, fall semester

Prerequisites: BSC2010, BSC2011, MAC2311

Typical Format: seminar, 1 hour per week

Typical Topics: Infectious diseases are caused by biological agents including bacteria, viruses, fungi, and protozoans. Biological agents of disease and their hosts constitute a form of predator-prey interaction, which is a topic studied by ecologists interested in the causes of distribution and abundance of organisms. This course will explore how concepts and tools of basic ecology can and have been used to understand the dynamics of infectious disease, and contribute to our ability to predict, prevent, and control disease outbreaks. We will consider diseases of humans and their domesticated plants and animals, as well as the role of disease in natural systems. Students will be expected to read extensively in the primary and secondary literature, and to contribute to regular class discussions. Students will also research and present information on specialized topics such as the role of conservation corridors in the spread of disease, possible responses to pandemics and bioterrorism, and sources of new emerging diseases.

PCB 4674

EVOLUTION (3 hrs)

Frequency Offered: Every semester

Prerequisites: Major prerequisite courses; PCB 3063, and junior or senior 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 4701** **HUMAN PHYSIOLOGY (3 hrs)**
Frequency Offered: Every semester
Prerequisites: Major prerequisite courses
Pre- or corequisites: PCB 3134 or PCB 3063
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 4843** **FUNDAMENTALS OF NEUROSCIENCE (3 hrs)**
Frequency Offered: To be announced
Prerequisites: Major prerequisite courses and PCB 3134 or PCB 4701
Typical Format: 2.5 hours lecture/week; 4 exams
Lecture Topics: This course emphasizes cellular and molecular approaches to neuroscience and brain function, and includes simple model systems such as invertebrates.
- ZOO 3205** **ADVANCED INVERTEBRATE ZOOLOGY (2 hrs)**
Frequency Offered: To be announced
Prerequisites: Major prerequisite courses; BSC 3312 or Animal Diversity Laboratory (BSC 4933L) 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 3205L** **ADVANCED INVERTEBRATE ZOOLOGY LABORATORY (2 hrs)**
Frequency Offered: To be announced
Prerequisites: Major prerequisite courses; BSC 3313 or Animal Diversity Laboratory (BSC 4933L) or instructor's permission
Corequisite: ZOO 3205
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)**
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 4343C** **BIOLOGY OF LOWER VERTEBRATES (4 hrs)**
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 HIGHER VERTEBRATES (ORNITHOLOGY) (4 hrs)

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.

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)

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)

Frequency Offered: Annually, fall semester

Prerequisites: Major prerequisite courses, PCB 3134

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.

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 and Staff with Academic Honors

Fellow of the American Association for the Advancement of Science.

P. Bryant Chase, Gregory M. Erickson, David M. Gilbert, David Houle, Don R. Levitan, Joseph Travis

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

Joseph Travis, Walter Tschinkel

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.

Kenneth A. Taylor

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

George W. Bates, Lloyd M. Epstein, Piotr G. Fajer, Michael Meredith, Thomas E. Miller, Trisha Spears, Joseph Travi, and Nora Underwood

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

George W. Bates, Wu-Min Deng, Ross W. Ellington, Gregory M. Erickson, Debra A. Fadool, Piotr G. Fajer, David Houle, Thomas A. Houpt, Don R. Levitan, Michael Meredith, Hengli Tang, Joseph Travis, and Paul Q. Trombley

Graduate Faculty Mentoring Award

Deborah A. Fadool, Thomas Keller III, Don R. Levitan

Loretta Ellias Teaching Award

Emily H. DuVal, Lloyd M. Epstein, Gregory M. Erickson, Debra A. Fadool, Laura R. Keller, Thomas C.S. Keller III, Nora Underwood

J. Herbert Taylor Distinguished Professor

David M. Gilbert

Named Professorships

W. Ross Ellington

Kenneth A. Taylor

The Michael J. Greenberg Professor of Biological Science

The Donald L. D. Caspar Professor of Biological Science

- 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 Undergraduate Studies. 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.
- S. Burgess** Assistant Professor. Ph.D., University of Queensland, 2011. ecological and evolutionary principles to study the population biology of coastal marine invertebrates.
- B. P. Chadwick** Assistant Professor; Ph.D., University College London, 1997; Assistant Research Professor, Duke University Medical Center, Durham, NC; X chromosome inactivation; chromatin organization; epigenetic gene regulation. Dosage compensation; how mammals balance the levels of X-linked gene expression between the sexes.
- P. B. Chase** 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."
- H. Cui** Assistant Professor. Received his Ph.D. from Pennsylvania State University in 2003. Postdoc , Duke University, Durham, NC. His current research focuses on cell fate specification and reprogramming in plants; evolutionary and developmental biology; plant-environment interaction; genomics and epigenetics; proteomics; molecular genetics. Works mainly with the plants *Arabidopsis thaliana* and *Physcomitrella patens*.
- W-M. Deng** 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. H. Dennis** Assistant Professor. Received his Ph.D. from the University College London in 2001. Postdoc, Massachusetts General Hospital and Harvard Medical School, Boston, MA. His current research focuses on applying and developing state-of-the-art techniques to large-scale detailed analysis of chromatin structure, thereby revealing the relationship between the regulation of chromatin architecture and cellular processes and clarifying the role of chromatin in the origin and mechanisms of disease.
- K.A. Dixon.** Teaching Faculty II. Received his M.S. in Zoology from the University of Oklahoma in 1987 and his Ph.D. in Ecology and Evolution from the University of Chicago in 1993. After a year as a lecturer at the University of Chicago and DePaul University he took a position as adjunct Assistant Professor/Assistant Research Scientist at Arizona State University West in 1994 where he remained until 2000. In 2001 he took a position as an academic professional coordinating courses and labs in the School of Integrative Biology at the University of Illinois. In 2008 he began his current position as Assistant in Biology at Florida State. His professional focus is on teaching undergraduate biology with special interests in teaching field biology and incorporating socially relevant material into biology education.
- E. H. DuVal** Assistant Professor. Received her Ph.D. in Integrative Biology in 2005 from the University of California – Berkeley. Her current research interests focus on exploring the evolution of social behavior in animals, particularly birds, with an emphasis on cooperation, sexual selection, and reproductive strategies. She combines field studies of behavior, demography, and morphology

with genetic analyses of the relationships between individuals to test hypotheses about the forces that create and maintain social complexity.

- W. R. Ellington** Michael J. Greenberg Professor of Biological Science. 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. 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.
- G. M. Erickson** 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 giantism, 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** Professor and Associate Chair for Graduate Studies. 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** Associate 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. 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.
- J. Feng** Assistant Professor. Received his Ph.D. from UCLA in 2007. He did postdoctoral research at UCLA and the Icahn School of Medicine at Mount Sinai. He joined the faculty at Florida State in 2015. His research interests concern the epigenetic regulation of neuropsychiatric disorders.
- 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. M. Gilbert** J. Herbert Taylor Distinguished Professor. Received his Ph.D. from Stanford University in 1989 and did postdoctoral training at the Faculté de Médecine in Strasbourg, France and at the Roche Institute of Molecular Biology. His research interests include the mechanism of transcriptional induction by the human estrogen receptor expressed in yeast and the initiation of DNA replication in mammalian cells.

- D. E. Granger** Teaching Faculty III 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.
- D. Houle** Professor. 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** Professor. 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.
- K. A. Hughes** Professor; Ph.D., University of Chicago, 1993; Postdocs at UC Riverside, Chicago Zoological Society; Assistant professor at Arizona State University West, Phoenix, then University of Illinois at Champaign-Urbana. Her research uses many different experimental techniques including field experiments, population and quantitative genetics, molecular kinship analysis, and genomic analysis of gene expression on several different organisms including fruit flies, honey bees, and guppies.
- B. D. Inouye** Associate 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.
- K. M. Jones** Assistant Professor; Ph.D., University of Chicago, 2001; Postdoc in Department of Biology at Massachusetts Institute of Technology, Cambridge, MA. Her research focuses on several fundamental questions about rhizobial/plant symbiotic interactions: how do plants respond to rhizobial determinants, which rhizobial determinants are important for invasion and how do they function, and what plant factors/pathways are required for rhizobial invasion? Answers to these questions will provide insights into how bacteria invade and survive within eukaryotic cells, and modulate regulatory and signaling pathways to induce host cell morphological changes and differentiation.
- L. R. Keller** Associate Professor. 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. 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.
- E. C. M. Lemmon** Assistant Professor; Ph.D., University of Texas, Austin, 2007; Postdoc, University of California, Davis, CA; Phylogenetics, speciation, behavioral ecology, sexual selection, phylogeography, and population genetics of amphibians. Her principal study organisms are chorus frogs.

- S. Lenhart** Assistant Professor; Ph.D. (Dr. rer. nat.), University of Münster, 2004; Postdoc, Institute for Nanotechnology in the Forschungszentrum Karlsruhe, Germany; Lipid membranes; cell-surface interactions; bionanotechnology.; (1) how do biological molecules organize and interact on supramolecular levels to carry out a particular function, and (2) can we recreate and control that function synthetically?
- D. R. Levitan** Professor . 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.
- L. C. Lyons** Associate Professor; Ph.D., University of Houston, 2000; Postdoc, University of Houston, Houston, TX; Signaling and circadian modulation regulating associative memory. Works mainly with the California sea slug, *Aplysia*.
- L. M'Gonigle** Assistant Professor. Ph.D, University of British Columbia, 2012. He joined the faculty at Florida State in 2014. His research concerns theoretical and statistical approaches to understanding species interactions and how these interactions direct their future evolution.
- A. Mast** Associate Professor, and director of the Robert K. Godfrey herbarium. 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.
- S. Marks** Teaching Faculty I; Responsible for teaching BSC2010. Received his PhD from Columbia University in 2010 and did post-doctoral research at Florida State University's College of Medicine. His research interests are in signaling pathways and the regulation of cell division.
- S. J. McCoy** Assistant Professor. Ph.D. University of Chicago, 2014. She joined the faculty at Florida State in 2015. Her research focuses on community ecology of macroalgae and seagrasses, particularly the links between biology, environmental conditions and water chemistry.
- K. M. McGinnis** Assistant Professor; Ph.D., Arizona State University, 2000; Postdoc at Washington State University, Corvallis; Assistant Research Scientist, University of Arizona. Her current research focuses on how identical genomic sequences can be interpreted to cause distinct expression patterns and phenotypes. She is particularly interested in the regulation of epigenetic modifications that heritably alter the expression of endogenous and transgenic loci, and in the presence and function of alternative transcripts in plants. These phenomena have been shown to be key elements in the growth , development, and gene regulation of a broad range of organisms. She studies them predominantly in maize.
- M. Meredith** Professor. 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** 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.

- L. M'Gonigle** Assistant Professor. PhD, University of British Columbia, 2012.
- D. R. Rokyta** Associate Professor; Ph.D., University of Idaho, 2006; Postdoc at University of Idaho, Moscow; Molecular and statistical properties of adaptive evolution. Uses virus to study the effects of adaptation on an organisms genes.
- C. Schultz** Instructional specialist I, Director of the nonmajors biology program, coordinates teaching of BSC1005 and BSC1005L. Received her BS in Biological Science from Florida State University, MS in Early Childhood Education from Michigan State University, and completed the first two years of medical school at the University of Florida. Ms. Schultz is interested in bringing active learning concepts into the nonmajors biology classrooms.
- T. Terebelski** Teaching Faculty III, Director of the 2000-level lecture courses for Biological Science majors. Received her PhD from Florida State University (1998) and carried out postdoctoral studies in the same field at FSU. Dr. Spears is currently a lecturer in the Department of Biological Science. Her research interests lie in the field of crustacean molecular systematics and evolution.
- A. Rassweiler** Assistant Professor. Marine ecology.
- S. J. Steppan** 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.
- M. E. Stroupe** Assistant Professor; Ph.D., Scripps Research Institute, 2002; Postdoc at Howard Hughes Medical Research Institute at Brandeis University, Waltham, MA; Developmental biology and gene expression, 3-D electron microscopy and x-ray crystallography of protein complexes involved in mRNA and sulfur metabolism in bacteria and plants.
- Y. Su** Scientific Research Specialist. Responsible for teaching BSC2085 & BSC2086, Anatomy and Physiology. Received his PhD. From Florida State University in 2002.
- H. Tang** Associate 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** Donald L. D. Caspar Professor of Biological Science. 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** Professor. Robert O. Lawton Distinguished Professor. 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. 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.

- N. Underwood** Associate 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 and Associate Chair for Curriculum. 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** Associate 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.
- H. G. Yu** Associate Professor. Received his Ph.D. in 2000 from the University of Georgia. He did postdoctoral research at the Carnegie Institution. His research interests include chromosome dynamics; the molecular basis of chromosome morphogenesis and its role in chromosome segregation; and genome integrity.
- F. Zhu** Associate Professor. Received his Ph.D. from Wuhan University in 1995. He conducted postdoctoral research at the University of Pennsylvania and the University of Medicine and Dentistry of New Jersey. His research interests include viral-host interactions; cellular targets that involve host innate antiviral defenses; and Kaposi's sarcoma associated herpes virus (KSHV), specifically the role of KSHV ORF45 in viral immune evasion and replication.