Handbook For Undergraduate Students

School of Biology

2011 - 2012

TABLE OF CONTENTS

INTRODUCTION

The School of Biology has approximately 415 undergraduate majors, the largest enrollment of any of the schools in the College of Sciences. Biology faculty members, however, work hard to treat every student as a unique individual. Faculty and students together constitute a mutually supportive intellectual community. All biology majors are encouraged to know and to become known by their professors and instructors. The names, academic interests, and phone numbers of all faculty members and instructors are listed in this handbook, and on the Biology website at http://www.biology.gatech.edu/people/faculty.php

This handbook is intended for the use of undergraduate students in the School of Biology. Its purpose is to provide information supplementary to that contained in the "General Catalog" (http://www.catalog.gatech.edu/) and the "Rules and Regulations" (http://www.catalog.gatech.edu/rules/1.php) in matters that pertain specifically to the School of Biology. Another good resource for information is the School of Biology web page at www.biology.gatech.edu. Information on registering for classes, advisor listings, FAQ's, etc., can be found on the Undergraduate Program page of the Biology web page at http://www.biology.gatech.edu/undergraduate-program/current-students/. This handbook and the Biology web pages are not intended to supersede the "General Catalog" or the "Rules and Regulations". In the case of any conflicts, these latter documents will prevail.

School of Biology Organization

The Interim Chair of the School of Biology is Dr. Terry Snell, who is responsible for the overall operation of the School. The Associate Chair in charge of the Undergraduate Program is Dr. Joseph Montoya. The Associate Chair works directly with the School of Biology Academic Office to insure smooth operation of the Undergraduate Program. Information on the role of the Academic Office and other administrative areas are shown below:

I. **School Chair**: Dr. Terry Snell, Professor, Room 201 Cherry Emerson

II. **Associate Chair for Undergraduate Program**: Dr. Joseph Montoya, Professor, Room 1244, ES&T

III. **Academic Office**:

Academic Advisors: Dr. Mirjana Brockett, Room 323 Cherry Emerson
Dr. Linda Green, Room A104 Cherry Emerson
Dr. Jennifer Leavey, Room A112 Cherry Emerson
Dr. Chrissy Spencer, Room A114 Cherry Emerson

Program Coordinator: Benita Black, Room Clough Commons 474E
Lab Coordinator: Dr. Cara Gormally, Room 307 Cherry Emerson
Lab Manager: Marc Pline, Room 321 Cherry Emerson

The main functions of the **Academic Office** are to:

1. Coordinate undergraduate academic activities in the School.
2. Act as liaison to other schools on campus on matters relating to undergraduate education.
3. Coordinate an active and responsive academic advising program.
4. Provide advice and direction to students about academic programs and careers.
5. Receive, process, and validate all degree petitions for the B.S.
6. Coordinate teaching of introductory biology lab courses.

IV. **Biology Student Advisory Committee advisor: Dr. Jennifer Leavey,** Room A112 Cherry Emerson . See page 17 for information on BSAC.

V. **Tri-Beta Biological Honor Society advisor: Dr. Jeannette Yen**, Room A116 Cherry Emerson. See page 18 for information on Tri-Beta.

THE LONGTERM GOAL:
EMPLOYMENT AND EDUCATION AFTER YOU GRADUATE

You can go to work immediately after graduation. The most frequently asked question is "What can I do with a B.S. in Biology?" You will be pleased to learn that there are excellent employment opportunities for those trained in the life sciences with a BS degree. Starting a career search, however, is a daunting task. You must start the process early in your career at Tech, preferably before the end of your second year. Career Services (Student Success Center, 2nd floor) is a great resource. Check out the resources available on the School of Biology website at http://www.biology.gatech.edu/undergraduate-program/career/ or the Georgia Tech Undergraduate Studies website at http://www.undergradstudies.gatech.edu/. .

You can go to graduate school. A degree in biology gives you flexibility and the world of biology is diverse - you can attend graduate school in any area from molecular biology, to conservation biology, to engineering, to business, to education.

You can go to a health professional school. Georgia Tech biology graduates are regularly accepted into schools of medicine, dentistry, optometry, pharmacy, and veterinary medicine. To find out more about these options, see page 18 for information on how to contact the School of Biology chapter of the premedical society (the AMSA).

THE SHORT-TERM GOAL:
THE B.S. DEGREE REQUIREMENTS

The minimum number of total credit hours required for a Bachelor's degree in Biology is 122.

<u>Required Biology Core Courses</u>

BIOL 1510/1511	Biological Principles/(or Honors)
BIOL 1520/1521	Intro to Organismal Biology/(or Honors)
BIOL 2335/2337	General Ecology/(or Honors)
BIOL 2344/2354	Genetics/(or Honors)
BIOL 3450	Cell and Molecular Biology
BIOL 3600	Intro to Evolution
BIOL 4450	Senior Seminar

Two of these three labs: Ecology Lab (BIOL 2336 or 2338), Genetics Lab (BIOL 2345 or 2355), or Cell and Molecular Biology Lab (BIOL 3451) (each lab must be taken concurrently with lecture course).

<u>Required Quantitative Biology Course</u>

Any one of the following:

BIOL 2400	Mathematical Models in Biology
BIOL 4150	Genomics & Applied Bioinformatics
BIOL 4401	Experimental Design & Biostatistics
BIOL 4422	Theoretical Ecology
BIOL 4755	Mathematical Biology
BIOL 4803	Human Genetics
BIOL 4803	Population Biology
MATH 3770	Statistics & Applications
MATH 3215	Probability & Statistics

The most common courses selected from this list are BIOL 2400 or BIOL 4401. The other courses may be appropriate depending on your interests and strengths. If you wish to take a course other than BIOL 2400 or BIOL 4401 to fulfill your quantitative requirement, you are encouraged to discuss the decision with your advisor.

Required Senior Research Experience

Any one of the following:

BIOL 4590	Research Project Lab
BIOL 4690	Independent Research Project
BIOL 4910	Honors Research Thesis

Required Non-Biology Science Courses

CHEM 1211	Chemical Principles I
CHEM 1212	Chemical Principles II
CHEM 2311	Organic Chem I
CHEM 2312	Organic Chem II
CHEM 2380	Synthesis Lab
MATH 1501	Calculus I
MATH 1502	Calculus II
PHYS 2211/2501	Intro Physics I
PHYS 2212/2502	Intro Physics II

Required Communication and Quantitative Outcomes

ENGL 1101 English Composition I
ENGL 1102 English Composition II.
MATH 1501 Calculus I

Effective Fall 2010, for freshmen entering the USG system Fall 2010, students who have earned 60 hours but have not completed Area A2 must enroll in the next course necessary to make progress toward completing this Area in every semester in which they take classes. Effective Fall 2011, this hour limit is lowered to 45 hours for freshmen entering the USG system Fall 2011, Spring 2012, and Summer 2012. Effective Fall 2012, freshmen entering the USG system Fall 2012 and thereafter, the hour limit is lowered to 30 hours.

Biology Electives

21 credit hours selected from Biol 3XXX level and higher courses are required. A maximum of 9 credit hours can be applied towards the 21 hours from the approved list of courses offered in other departments (see page 44). A maximum of 6 hrs of BIOL 4699 can be applied to 21 total hrs. These courses must be taken for a letter grade.

Humanities and Social Sciences Electives

See "Core Curriculum", Information for Undergraduate Students on the Registrar's website (http://www.catalog.gatech.edu/students/ugrad/core/core.php) for approved courses. All students are required to take one course from HIST 2111, HIST 2112, POL 1101, PUBP 3000, or INTA 1200 to satisfy state requirements regarding United States Perspectives and one course from http://www.catalog.gatech.edu/students/ugrad/core/gp.php to satisfy state requirements regarding Global Perspectives. An additional 6 hours of social sciences and 6 hours of humanities also are required.

Computing Requirement

Students must complete CS 13X1 (transfer course), CS 1301, CS 1315, CS 1371, or COE 1361 (restricted to certain engineering majors, but OK if they change major to Biology).

Wellness Requirement

Georgia Tech requires students to complete HPS 1040 or equivalent.

Free Electives
The remaining credits beyond those listed above are free electives, which can be taken for letter grade or pass/fail (see p. 6 for more on the pass/fail issue).

ACADEMIC ADVISING

Shortly after your arrival at Georgia Tech or when you declare Biology as your major, you will be assigned an academic advisor. Advisor assignments can be accessed through the online advising database (http://undergrad.biology.gatech.edu/student/login.php). Advisors use a web-based scheduling system to arrange advising appointments (http://www.advising.gatech.edu/appointments).

You are responsible for the success of your own career, so keeping track of your progress toward the undergraduate degree is highly recommended. Your advisor is here to help you whenever you seek advice and to provide guidance about Georgia Tech regulations, undergraduate programs, and career opportunities. During the spring semesters of your freshman, sophomore, and junior years, you will be sent a personal invitation to see your academic advisor to review your academic progress. You are strongly urged to consult your advisor to plan and execute your program of study, to discuss career options, and to design an optimal map for achieving your goals. You should make an advisor appointment early, because the discussion of your situation may take some time, and the advisor has other advisees who also need attention. If you have an academic problem, a hold may be placed on your registration forcing you to see your advisor. As a senior, you will need your advisor's approval of your degree petition. Degree petitions are due are due around midterm of your second-to-last semester (specific dates are posted on the registrar's website http://www.registrar.gatech.edu/students/index.php).

Biology majors should bring an updated **Advisor/Student Worksheet** to meetings with their advisor. This form can be completed and printed on the online advising database (http://undergrad.biology.gatech.edu/student/login.php). The worksheet helps you keep track of the courses required for graduation for your specific program of study and keeps your advisor updated on your progress.

Frequently asked questions on advisement issues:

Q. What are the required courses for a B.S. in Biology at Georgia Tech?
A: The B.S. Biology curriculum, including a complete list of required courses, is found at http://www.biology.gatech.edu/undergraduate-program/current-students/advising/requiredcourses.php and in this Handbook. Required courses include core Biology courses, courses in chemistry, math, physics, computing, and English. There are also requirements for social sciences, humanities, and wellness courses; and Biology electives and free electives, for a total of 122 semester credit hours.

Q: Do Biology majors have to repeat courses if they got a "D"?
A: No.

Q. What courses can be taken on a pass/fail basis?
A: Only free electives may be taken on a pass/fail basis. In addition, students with 45-70 Georgia Tech credit hours may only have up to 3 credit hours taken pass/fail. Students with 71-

90 Georgia Tech credit hours may have up to 6 pass/fail credits and students with 91 or more Georgia Tech credit hours may have up to 9 pass/fail credits.

Q: What counts as Undergraduate Research credits?
A: Undergraduates can perform research with Biology faculty for academic credit. Freshmen and sophomores register for BIOL 2699. Juniors and seniors register for BIOL 4699 (1-12 credit hrs). BIOL 2699 credits count towards graduation requirements as free electives. Up to 6 credits of BIOL 4699 can count as Biology electives; additional BIOL 4699 credits count as free electives. Freshmen and sophomores doing research for pay should register for BIOL 2698, juniors and seniors register for BIOL 4698 – these are non-credit, audit-only courses. Students doing research off-campus during the summer should still register for BIOL 2698 or 4698 (there is no charge for these audit-only courses). To perform undergraduate research for credit or pay, students must have permission from the faculty member in whose lab the research will take place. Permission is documented using the Permit Request form available at http://www.biology.gatech.edu/undergraduate-program/current-students/docs/bio-overload-form.pdf.

If a student wishes to conduct research with a faculty member in another School (e.g., Chemistry & Biochemistry or Biomedical Engineering) on a research project that has a biological focus, then it might be possible to get BIOL 2699/4699 credit for this work, if the student and their advisor can get the agreement of a School of Biology faculty member to serve as co-advisor before the start of the research project.

NOTE: During registration using OSCAR, default credit for BIOL 2699/4699 is set at 1 credit hour. A student must "change course basis" on the Oscar registration page to change credit hours from 1 to whatever the faculty member and student agree to. When the student registers, he/she should include the "section" of the course on the permit form. The section is the first 3 letters of the faculty member's last name.

Q: How are credit hours calculated for BIOL 2699/4699 Undergraduate Research?
A: Rule of thumb is to treat these courses as laboratories: 3 hrs weekly in lab for each credit hour.

Q: What is the Senior Research Experience?
A: All Biology majors must complete a Senior Research Experience in order to graduate. This consists of BIOL 4590 (Research Project Lab) or BIOL 4690 (Independent Research Project) or BIOL 4910 (Honors Research Thesis). Each of these research-based courses counts for 3 credits; BIOL 4690 or 4910 is taken with a School of Biology faculty member by working in their lab on a project of a student's own design. BIOL 4590 is a lab-based course taught by a Biology faculty member.

Q: When should I take BIOL 4450 Senior Seminar?
A: If a student takes BIOL 4590 (Research Project Lab) to fulfill their Senior Research Experience, then they must take BIOL 4450 (Senior Seminar) during the same semester. If they choose BIOL 4690 (Independent Research Project) or BIOL 4910 (Honors Research Thesis) to fulfill their Senior Research Experience, then they may take BIOL 4450 concurrently, or during the semester immediately after taking BIOL 4690/4910. In the Senior Seminar class, students will be presenting the results of their Senior Research Experience, thus it is not allowable to take Senior Seminar before starting this research.

Q. When does a student have to use an overload request, permit request or prerequisite override form?

A: An overload request form is submitted by a student when a class is full. Use the on-line request form at http://www.biology.gatech.edu/classinfo/overload.php.

A permit request form is submitted by a student when OSCAR either says "Permit required" or the student wants to request that registration restrictions for a course be overridden. Permit request forms may be found outside of rooms 209 or 321 Cherry-Emerson or at http://www.biology.gatech.edu/undergraduate-program/current-students/docs/bio-overload-form.pdf. Have the professor sign the form and return it to Cherry Emerson room 321.

A prerequisite override is submitted by a student if the course instructor agrees that the student is prepared for the course without having taken the listed prerequisite courses – the instructor's signature is required in this case. In other cases, BANNER sometimes does not recognize legitimate prerequisite courses on a student's transcript, and may prevent them from registering for a course. A student doesn't need the instructor's signature for this problem. Submit a prerequisite override form (available at http://www.biology.gatech.edu/undergraduate-program/current-students/docs/bio-overload-form.pdf) directly to Cherry Emerson room 106. Be sure to include contact information.

None of these requests may be made by phone or by email. Allow 24 hours for the form to be processed.

Q: Can students take chemistry, physics, or math courses (or any other courses) at Georgia Perimeter (or other community college)?
A: Maybe. But they have to be careful that the course they take will be accepted as transfer equivalents by the relevant school at Tech (chemistry, physics, math, etc). They can look up the transfer equivalency table on OSCAR (https://oscar.gatech.edu/pls/bprod/wwtraneq.P_TranEq_Ltr), and check with the relevant department to make sure before they take the course elsewhere. A copy of the course syllabus would be helpful. Also, students must be careful of the 36-hr rule (see below). Additionally, many medical schools only accept prerequisite courses taken at four-year institutions. Also, students may not receive transfer credit from a course taken at another institution when concurrently enrolled at Georgia Tech.

Q: How do you check to see if a course will transfer from another university?
A: Go to the web site: https://oscar.gatech.edu/pls/bprod/wwtraneq.P_TranEq_Ltr and choose the college of interest. Scroll through the list of courses and determine if Georgia Tech credit is given for the course. If the college or course is not listed, it must be evaluated for transfer credit by Dr. Jung Choi (jung.choi@biology.gatech.edu). You need to submit the name of the college, course, and class syllabus for the evaluation.

Q: What is the 36-hour rule?
A: The rule states that students must complete the last 36 credit hours of their degree program in residence at Georgia Tech. Exceptions may be granted by petition to the faculty, and approval of the petition by the Institute Undergraduate Curriculum Committee; however approval of this type of petition is rare. It is wise to petition for an exception BEFORE violating the rule.

Q: Can a student substitute course XYZ as a Biology elective?
A: If the course is not an approved Biology elective (see this Handbook or http://www.biology.gatech.edu/undergraduate-program/current-students/advising/requiredcourses.php), then it may still be allowable as a Biology elective if it is a 3XXX or 4XXX level course with pre-requisites <u>and</u> the student's advisor and Associate Chair for Undergraduate Program both agree that it has relevance to the student's major studies.

Q: What courses fulfill the CS requirement for Biology majors?
A: Any course determined by the Institute Undergraduate Curriculum Committee as allowable for the Institute general education CS requirement is OK for Biology majors. Currently, these include CS 13X1 (transfer course), CS 1301, CS 1315, CS 1371, and COE 1361 (restricted to certain engineering majors, but OK if they change major to Biology).

Q: What courses can be used as humanities or social sciences requirements?
A: These courses are listed in the catalog and Registrar's web site (http://www.catalog.gatech.edu/students/ugrad/core/core.php), in the section Information for Undergraduate Students, Core Curriculum, Core Area C (humanities and fine arts), and Core Area E (social sciences).

Q: Is it true that there are no limits on how many hours of 2699/4699 Undergraduate Research credits can be applied to the FREE electives requirement for a BS in Biology?
A: Yes.

Q: How do I petition to graduate?
A: Complete and submit a Petition for Degree form (available at http://www.registrar.gatech.edu/docs/pdf/UGRAD_PETITION_FOR_DEGREE.pdf) to the Degree Certification Office in room 103 of Tech Tower. Undergraduates MUST attach a completed Advisor/Student worksheet to the Petition for Degree. Your academic advisor must audit and approve your degree petition before submitting to the registrar.

Q: How do I get readmitted to Georgia Tech after being out of school?
A: Students who for any reason have remained out of school for two or more consecutive semesters must apply for readmission (http://www.registrar.gatech.edu/students/readmission.php). The readmission application along with any transcripts, petitions, and other supporting information must be submitted to the Readmission Office, in room 103 of the Tech Tower (Administration Building) or mailed to: Georgia Institute of Technology, Office of the Registrar, Readmission, Atlanta, GA 30332-0315.

Q: What are the rules governing student conduct?
A: Georgia Tech has a Code of Conduct to which all students must adhere (http://www.osi.gatech.edu/pdf/Student%20Code%20of%20Conduct%20-%202-22-11%281%29.pdf). In addition, an Honor Code (http://www.honor.gatech.edu/plugins/content/index.php?id=9) governs all academic activities. You should read these and familiarize yourself with your rights and responsibilities.

Q. What is the suggested plan of study for Biology majors?
A: Students need to average 15.3 credit hours per semester to graduate in four years.

BACHELOR OF SCIENCE IN BIOLOGY
2011-2012 DEGREE REQUIREMENTS

FIRST YEAR-FALL	HOURS
GT 1000 FRESHMAN SEMINAR*	1
ENGL 1101 ENGLISH COMPOSITION I	3
MATH 1501 CALCULUS I	4
BIOL 1510 OR 1511 BIOLOGICAL PRINCIPLES	4
CHEM 1211K CHEMICAL PRINCIPLES I	4
TOTAL SEMESTER HOURS	**16**

FIRST YEAR-SPRING	HOURS
ENGL 1102 ENGLISH COMPOSITION II	3
MATH 1502 CALCULUS II	4
BIOL 1520 OR 1521 INTRODUCTION TO ORGANISMAL BIOLOGY[1]	4
CHEM 1212K CHEMICAL PRINCIPLES II	4
TOTAL SEMESTER HOURS	**15**

SECOND YEAR-FALL	HOURS
BIOL 2335 ECOLOGY OR BIOL 2354 HONORS GENETICS[2]	3
BIOL 2336 ECOLOGY LAB OR BIOL 2355 HONORS GENETICS LAB[2]	1
PHYS 2211 INTRODUCTORY PHYSICS I	4
CHEM 2311 ORGANIC CHEMISTRY I	3
FREE ELECTIVE(S)	3
WELLNESS	2
TOTAL SEMESTER HOURS	**15 or 16**

SECOND YEAR-SPRING	HOURS
BIOL 2344 GENETICS OR BIOL 2337 HONORS ECOLOGY[2]	3
BIOL 2345 GENETICS LAB OR BIOL 2338 HONORS ECOLOGY LAB[2]	1
CHEM 2312 ORGANIC CHEMISTRY II	3
CHEM 2380 SYNTHESIS LAB	2
COMPUTING REQUIREMENT	3
QUANTITATIVE BIOLOGY REQUIREMENT[3]	3
TOTAL SEMESTER HOURS	**14 or 15**

THIRD YEAR-FALL	HOURS
BIOL 3450 CELL & MOLECULAR BIOLOGY OR BIOL 3600 EVOLUTION	3
BIOL 3451 CELL & MOLECULAR BIOLOGY LAB	1
BIOLOGY ELECTIVE(S)	3
FREE ELECTIVE	2
PHYS 2212 INTRODUCTORY PHYSICS II	4
SOCIAL SCIENCE ELECTIVE(S)	3

THIRD YEAR-SPRING	HOURS
BIOL 3450 CELL & MOLECULAR BIOLOGY OR BIOL 3600 EVOLUTION	3
BIOL 3451 CELL & MOLECULAR BIOLOGY LAB	1
BIOLOGY ELECTIVE(S)	6
HIST 2111 or 2112 or POL 1101 or PUBP 3000 or INTA 1200	3
HUMANITIES ELECTIVE(S)	3
TOTAL SEMESTER HOURS	**15 or 16**

FOURTH YEAR-FALL	HOURS
SENIOR RESEARCH EXPERIENCE[4]	3
BIOLOGY ELECTIVE(S)	6
FREE ELECTIVE(S)	3
SOCIAL SCIENCE ELECTIVE(S)	3
BIOL 4450 SENIOR SEMINAR	1
TOTAL SEMESTER HOURS	**16**

FOURTH YEAR-SPRING	HOURS
BIOLOGY ELECTIVE(S)	6
FREE ELECTIVE(S)	3
SOCIAL SCIENCE ELECTIVE(S)	3
HUMANITIES ELECTIVE(S)	3
TOTAL SEMESTER HOURS	**15**

TOTAL DEGREE REQUIREMENT HOURS 122

*Not required for graduation

Important notes

[1]4 credit hours of Biology elective may be substituted for BIOL 1520 if a score of 5 was achieved on the AP Biology test

[2]Only 2 of the following 3 core labs are required: BIOL 2336/2338, BIOL 2345/2355, BIOL 3451

[3]Quantitative Biology Requirement: choose one of the following: BIOL 2400 Mathematical Models in Biology, BIOL 4150 Genomics & Applied Bioinformatics, BIOL 4401 Experimental Design & Biostatistics, BIOL 4422 Theoretical Ecology, BIOL 4755 Mathematical Biology, BIOL 4803 Human Genetics, BIOL 4803 Population Biology, MATH 3215 Probability & Statistics, MATH 3770 Statistics & Applications

[4]Senior Research Experience: choose one of the following: BIOL 4590 Research Project Lab, BIOL 4690 Independent Research Project, BIOL 4910 Honors Research Thesis.

B.S. DEGREE ENHANCEMENTS

Bachelor of Science in Biology – Research Option

This plan enables students to do 9 credit hours of supervised research with a Biology Faculty member over multiple semesters. With Faculty guidance, students write a brief proposal, perform independent, original research, and write a thesis about their work. The thesis is evaluated by two Biology Faculty members. The first 6 credit hours of the research option are taken as BIOL 2699/4699 (research for credit) or BIOL 2698/4698 (research for pay). Students then take either BIOL 4690 (Independent Research Project; 3 hr) or BIOL 4910 (Honors Research Thesis; 3 hr) in their final semester and two one credit-hour writing courses, LCC 4701 and 4702. These writing courses can be counted as a Biology electives. Note that LCC 4701 should be taken in the semester prior to enrolling in BIOL 4910/4690. The student's research is presented in BIOL 4450 Senior Seminar. Completing this program gives students a "Research Option" designation on their transcripts.

Bachelor of Science in Biology – Business Option

The curriculum and suggested course schedule for the B.S. in Biology – Business Option includes PSYC 2220 (Industrial/Organizational Psychology) and ECON 2106 (Principles of Economics) in partial fulfillment of social science electives. Students must also take MGT 3000 (Accounting) and MGT 3300 (Marketing). One additional management elective course is taken from a list that includes MGT 3062, 3150, 3076, 4191, and 4660. Six of the credit hours from this list of management courses will fulfill requirements for Biology electives, and the other 3 credit hours count as free electives. Biology majors in this option must still fulfill the other requirements for the Biology undergraduate degree.

Bachelor of Science in Biology - International Plan

Georgia Tech has recently introduced an International Plan through the Office of International Education (http://www.internationalplan.gatech.edu/). Successful completion of this plan earns students an International Plan designation on their Georgia Tech degree. The primary purpose of the plan is to offer a challenging and coherent academic program for students to develop global competence within the context of a Biology degree. The requirements include: language proficiency equivalent to at least two years of college coursework (12 hrs), one course in international relations (3 hr), global economy (3 hr), focused study of a region (3 hr), an integrative capstone course synthesizing the international experience (3 hr), and two semesters (minimum of 26 weeks) in residence abroad. Georgia Tech biology courses are taught in Australia/New Zealand (http://www.pacific.gatech.edu/) and Spain (http://web.mac.com/kirkbowman1/Valencia/Valencia.html) as part of the Study Abroad program. In addition, many biology courses are available through Georgia Tech partner universities abroad (http://www.oie.gatech.edu/sa/programs/index.php). Some of these universities teach biology courses in English, such as Hong Kong University, Tokyo Technological University, University of Victoria (New Zealand), National University of Singapore, University of Strathclyde (Scotland), and Bilkent University (Turkey).

MINOR AND CERTIFICATE PROGRAMS

Biology Minor

A minor in biology is available to all non-biology majors. The minor is awarded by the registrar's office and appears on your transcript and diploma. The minor constitutes 15 credit hours of Biology courses, of which 9 hours must be at the 3000 level or higher and of which 3 hours can be Biology Special Topics courses and 3 hours can be BIOL 4699. All courses counting toward the minor must be taken on a letter-grade basis and completed with an overall grade point average of at least 2.00. Students may not double-count courses towards more than one certificate or minor. A course may count towards the student's major and minor if the course:

1. Is not required by name and number for their major
2. Is not fulfilling a core area humanities or social sciences (A-E)

Free electives and technical electives may be used towards minors. Further information is available from School of Biology advisors. To declare a minor in Biology, follow the instructions on the registrar's site: http://www.registrar.gatech.edu/students/formlanding/changeminor.php

Biology Certificates

Certificate programs in Biology are available to students from any major. Certificates are awarded by the School of Biology and do not appear on the transcript or diploma. Each certificate requires 12 credit hours of approved courses from that certificate's list, at least 9 of which must be at the 3000 level or higher. All courses counting toward the certificate must be taken on a letter-grade basis. Major electives can be counted toward certificates, but courses required by name and number in a student's major program of study will not be counted toward certificates. While students may complete more than one certificate, they may not double-count courses towards more than one certificate or minor. Non-Biology majors are required to include at least 9 credits of BIOL coursework for their certificate. Further information is available from School of Biology advisors.

To declare a certificate in Biology, select 12 credits that correspond to the desired certificate. Approved courses are listed below by certificate title. Students must also complete and submit a certificate application found at this link two weeks prior to the end of their last term: http://www.biology.gatech.edu/undergraduate-program/current-students/docs/Biology_Certificate_Application.doc

Certificates offered through the School of Biology

1) Biomedical Science

APPH/BIOL 3751	Human Anatomy and Physiology
BIOL 4015	Cancer Bio/Tech
BIOL 4105	Macromolecular Modeling
BIOL 4150	Genomics

BIOL 4340	Medical Microbiology
BIOL 4401	Experimental Design and Statistical Methods
BIOL 4464	Developmental Biology
BIOL 4570	Immunology and Immunochemistry
BIOL 4650	Bioethics
BIOL 4668	Eukaryotic Molecular Genetics
BIOL 4752	Introduction to Neuroscience
BIOL 4802	Special Topics: Biomedical Entrepreneurship in the Life Sciences
BIOL 4802	Special Topics: Evolutionary Developmental Biology
BIOL 4802	Special Topics: Drug Discovery
BIOL 4803	Special Topics: Human Genetics
BIOL 4803	Special Topics: Virology
BIOL 4803	Special Topics: Endocrinology
BMED 3100	Systems Physiology
BMED 3110	Quant Engr Physio Lab I
BMED 4400	Neuroengineering
BMED 4500	Cell and Tissue Engineering Lab
BMED 4570	Diagnostic Imaging Physics
BMED/CHEM/CHBE 4765	Drug design, development and delivery
CHEM 4511	Biochemistry I
CHEM 4512	Biochemistry II
LCC 2300	Intro Biomedicine & Culture
PSYC 3020	Biopsychology

<u>2) Biomolecular Technology</u>

BIOL 3380	Microbiology
BIOL 3381	Microbiology Lab
BIOL 4105	Macromolecular Modeling
BIOL 4150	Genomics
BIOL 4225	Molecular Evolution
BIOL 4440	Plant Physiology
BIOL 4746	Signaling Molecules
BIOL 4478	Biophysics
BIOL 4608	Prokaryotic Molecular Genetics
BIOL 4668	Eukaryotic Molecular Genetics
BIOL 4802	Special Topics: Drug Discovery
BIOL 4803	Special Topics: Protein Biology
BIOL 4803	Regulatory RNAs
BIOL 4803	Environmental Microbial Genomics
BMED/CHEM/CHBE 4765	Drug design, development and delivery
CHEM 4511	Biochemistry I
CHEM 4512	Biochemistry II
CHEM 4521	Biophysical Chemistry
CHEM 4803	Special Topics: Macromolecular Structure
CHBE 4760	Biocatalysis

<u>3) Computational & Quantitative Biology</u>

BIOL 2400	Mathematical Models in Biology
BIOL 4105	Macromolecular Modeling
BIOL 4150	Genomics
BIOL 4225	Molecular Evolution
BIOL 4401	Experimental Design and Statistical Methods
BIOL 4422	Theoretical Ecology

BIOL 4755	Mathematical Biology
BMED 4477	Bio Networks & Genomics
BIOL 4803	Computational Systems Biology
CS 4400	Introduction to Database Systems
CS 4710	Intro to Computing Concepts in Bioinformatics
MATH 3012	Applied Combinatorics
MATH 3215	Probability & Statistics
MATH 4022	Introduction to Graph Theory
CEE/ISYE/MATH 3770	Statistics & Applications

<u>4) Environmental Science</u>

BIOL 2100	Biogeography of New Zealand
BIOL 3100	Ecology and Evolution of Australia
BIOL 3300	Tropical Ecology
BIOL 3380	Introductory Microbiology
BIOL 3381	Introductory Microbiology Lab
BIOL 4101	Sensory Ecology
BIOL 4221	Biological Oceanography
BIOL 4410	Microbial Ecology
BIOL 4417	Marine Ecology
BIOL 4418	Microbial Physiology
BIOL 4422	Theoretical Ecology
BIOL 4440	Plant Physiology
BIOL 4446	Animal Physiology
BIOL 4471	Behavior Biology
BIOL 4620	Aquatic Chemical Ecology
BIOL 4802	Special Topics: Community Ecology
BIOL 4803	Special Topics: Population Biology
BIOL 4803	Special Topics: Environmental Microbial Genomics
BIOL 4803	Special Topics: Urban Ecology
BIOL 4803	Special Topics: Population & Evolutionary Ecology
CEE 2300	Environmental Engineering Principles
CEE 3340	Environmental Engineering Laboratory
CEE 4300	Environmental Engineering Systems
CEE 4620	Environmental Impact Assessment
CHEM/EAS 4740	Atmospheric Chemistry
EAS 1600	Intro Environmental Science
EAS 1601	Habitable Planet
EAS 2420	Environmental Measures
EAS 2600	Earth Processes
EAS 2602	Earth Through Time
EAS 4110	Resources, Energy & the Environment
EAS 4300	Oceanography
EAS 4350	Paleoclimate & Paleoceanography
EAS 4410	Climate & Global Change
EAS 4602	Biogeochemical Cycles

<u>5) Marine Science</u>

BIOL 4221	Biological Oceanography
BIOL 4410	Microbial Ecology
BIOL 4417	Marine Ecology
BIOL 4446	Animal Physiology
BIOL 4620	Aquatic Chemical Ecology

CEE 3040	Fluid Mechanics
CEE 4225	Coastal Engineering
EAS 3620	Geochemistry
EAS 4300	Oceanography
EAS 4350	Paleoclimatology and Paleoceanography
EAS 4602	Biogeochemical cycles
NS 2323	Navigation

6) Integrative Biology
12 credits chosen from courses represented in four of the other certificates (e.g., 3 credits from each of 4 other certificates = 12 credits total).

For non-Biology majors:

Additional courses that can count towards any of the above certificates are: BIOL 1510/1511, BIOL 1520/1521, BIOL 2335/2337, BIOL 2344/2345, BIOL 3450 (as long as these courses are not required for their major program of study, and only up to 3 credits of courses at the 1xxx-2xxx level can count). At least 9 credits of BIOL coursework are required for each certificate.

Most common minors and non-biology certificates pursued by biology majors

Chemistry – http://www.chemistry.gatech.edu/undergraduate/curriculum/
Psychology –
http://www.psychology.gatech.edu/undergraduate/undergraduateprograms/certificates.php
Management – http://mgt.gatech.edu/programs/under/
Biomedical engineering –
http://acad.bme.gatech.edu/undergraduate/program_ugrad_minor.php

UNIVERSITY RESOURCES

Tutoring Services: Georgia Tech offers several excellent opportunities to seek help in your courses. The Success Center offers tutoring in many courses, and you can elect to have one hour of free tutoring every week! Find out more at http://www.successprograms.gatech.edu/academicsupport/. The OMED program offers tutoring Sunday – Thursday evenings in Chapin; Math, Physics, and Chemistry offer drop-in help sessions (check with your instructor for details); most freshmen residence halls offer tutoring Sunday – Thursday evenings in the hall learning centers. There may be additional tutoring services available, see http://www.successprograms.gatech.edu/academicsupport/ for more information.

Counseling Center: At some point you may develop a problem in academics, in your personal/social life, or involving a career choice. If it would help to have a professional counselor to whom you can talk, you can contact the Counseling Center about your concerns. Their services are described on the website: http://www.counseling.gatech.edu/.

Career Planning: Georgia Tech's Career Services provides the following resources and programs to help students explore, select and pursue a meaningful career: career counseling, majors fair, seminars, resume & job search assistance, practice interviews, a career library, and coordination with campus recruiting. You can find more information at http://www.career.gatech.edu/.

THE COOPERATIVE AND INTERNSHIP PROGRAMS

Cooperative Education, or "Co-op," is a unique partnership among employers, students and the university whereby students work in paid, planned and supervised work experiences in business, industry, education, and government while earning academic credit. Georgia Tech's Cooperative Education Program (http://www.coop.gatech.edu/) is a five-year academic program in which students alternate semesters as a full-time student with semesters of full-time work. In addition to providing experiences outside of academia, the Co-op program can provide the student with full-time research work within a Georgia Tech faculty member's lab if the faculty member is agreeable.

Biology majors participating in the Co-op program must plan course schedules very carefully, since courses required for a degree in Biology may not always be offered during the at-school semester. This will be more of a problem when the at-school semester occurs during the summer semester.

The Undergraduate Professional Internship (UPI) Program (http://www.gtip.gatech.edu/) provides practical work experience in a professional setting, on-campus or off-campus, related to the student's field of study. Internships are a partnership among students, employers, and the Georgia Institute of Technology. Internships are single-semester, paid, major-related work experiences designed to help students understand the "real world" applications of their academic studies. Opportunities are available during summer, fall, and spring semesters and require a commitment of full-time employment for a minimum of 18 weeks during the spring and fall semesters or 12 weeks during the summer semester. To contact the upi office email intern@dopp.gatech.edu

AWARDS AND ACTIVITIES IN THE SCHOOL OF BIOLOGY

Awards

Every spring semester, the faculty give several undergraduate awards in Biology. These awards are presented to students demonstrating excellent academic achievement, initiative, and/or service. Some of the awards were designated by donors for students entering specific areas of study.

Biology Faculty Award: An award to a senior majoring in Biology who has demonstrated outstanding scholastic achievement, meritorious character, and significant contributions to the School. The award consists of a check for $500 and the student's name engraved on a plaque permanently displayed in the School of Biology office.

Williams-Walls Award: An award to senior female biology or psychology majors who have a grade point average of 3.5 or higher and who have applied to graduate school for advanced education. The award honors the memory of Frederick Alton Williams, father of the founder of Applied Biology, Inc. The award consists of a check for $500 and the student's name engraved on a plaque permanently displayed in the School of Biology office.

Cherry L. Emerson Research Award: This award is given annually to a junior or senior in the School of Biology in recognition of a significant contribution to science through their undergraduate research. To apply for the award, the student must submit a research manuscript in the format of the journal to which it is likely to be submitted (or has already been submitted/published) to the School of Biology by mid-March and a committee of faculty members will select the winner. Accompanying the manuscript should be a letter from the faculty mentor describing the importance of the findings, and the role the student played in the design and execution of the experiments, as well as preparation of the manuscript. It is acceptable for the student's contribution to be part of a larger research project, but if the manuscript has multiple authors, the student's contributions must be carefully described in the mentor's letter. The award consists of $500, a personal plaque, and the student's name on a plaque permanently displayed in the School of Biology office. This award is named in honor of two members of the Emerson legacy at Georgia Tech: Cherry L. Emerson, Sr. and Cherry L. Emerson, Jr.

John H. Ridley Award: An award to a junior in the School of Biology who plans to apply to medical or dental school, and who has demonstrated outstanding scholastic achievement and interest in research. The award consists of a check for $600 and is intended to support the recipient's academic and research interests in the senior year.

Virginia C. and Herschel V. Clanton, Jr. Scholarship: A financial aid award to a junior in the Schools of Biology or Chemistry who plans to apply to medical school and who has demonstrated outstanding academic achievement, interest in research, and qualifies for financial aid. The award consists of a check for $600 and is intended to support the recipient's academic and research activities in the senior year.

Activities

Biology Student Advisory Committee (BSAC): BSAC (http://www.biology.gatech.edu/undergraduate-program/bsac/) is a student organization open to any biology major. The purpose of this organization is to provide student recommendations on curriculum, advising or any other issue relevant to undergraduate students to the School of

Biology administration. BSAC also facilitates student-faculty interaction by co-sponsoring yearly picnics and poster sessions. Meetings are held monthly.

Beta Beta Beta: Tri-Beta, the national biology honor society (http://cyberbuzz.gatech.edu/bbb/), is a society for students, particularly undergraduates, dedicated to improving the understanding and appreciation of biological study and extending human knowledge through scientific research. Full membership is restricted to students with a GPA of at least 3.0 in their biology courses and completion of at least one biology course beyond introductory biology. Associate membership is available to all students.

Members enjoy a variety of activities including social gatherings and field trips to local regions of biological interest. Recent activities include volunteering at Zoo Atlanta through Team Buzz, a visit to the Georgia Aquarium and a tour of CDC headquarters here in Atlanta.

The national, once-in-a-lifetime membership dues are $45 for regular members or $35 for associate members with a $10 fee to upgrade to regular member; local dues are $10 per year. The national dues also include a two-year subscription to the Tri-Beta quarterly publication Bios. If you are interested or would like further information about Tri-Beta at Georgia Tech, contact the faculty advisor, Dr. Yen (jeannette.yen@biology.gatech.edu).

American Medical Student Association (AMSA): AMSA is a student-governed organization committed to the concerns of students who hope to become physicians. AMSA has a national membership of about 28,000, composed of premedical and medical students, interns and medical residents. Premedical membership is open to any student who attends classes at least 20 clock hours per week and who is preparing to attend medical school. Dues are $20 per year.

The Georgia Tech chapter of AMSA (http://cyberbuzz.gatech.edu/amsa/) has meetings every two to three weeks throughout the school year. Guest speakers include campus premedical advisors, medical school admissions officers from MCG, Emory and Mercer, representatives of MCAT preparation firms and military scholarship recruiters. Every year students from the GT AMSA chapter attend regional and national AMSA meetings in such cities as Washington, Miami and San Francisco.

EMPLOYMENT AS TEACHING ASSISTANT IN THE SCHOOL OF BIOLOGY

The School of Biology occasionally hires Biology majors for part-time work as laboratory teaching assistants. These positions have several requirements and are competitive. Applicants must have already taken at Georgia Tech the course they will teach and received an A or B, they must be at ease in front of a class, and they must submit an application for the position. A student will enroll in a teaching preparatory course, BIOL 4803 UTA, in their first semester as a teaching assistant. Upon completing this course, an experienced undergraduate TA can apply for paid teaching assistant positions when they are available. Jobs involving preparation of materials for the teaching labs are occasionally available and also require an application. Students may also approach faculty for a paid research assistant position. See the section on undergraduate research for tips on finding an opening in a faculty member's lab. Be sure to specify with the professor whether you are seeking a position for pay or for credit.

UNDERGRADUATE RESEARCH - HOW TO GET INVOLVED

Research is the most fulfilling scientific experience of many undergraduate careers and it increases career options after graduation. A Senior Research Experience is required of all Biology majors. The Senior Research Experience is linked to Senior Seminar (BIOL 4450), where your research results are presented to an audience of your peers. To fulfill the Senior Research Experience you must take one of the following: BIOL 4590 (Research Project Lab), BIOL 4690 (Independent Research Project), or BIOL 4910 (Honors Research Thesis). BIOL 4690 and BIOL 4910 require agreement from a professor to join their research group.

You can explore research opportunities anytime starting in your freshman year, taking BIOL 2699/4699 (Undergraduate Research) for credit or BIOL 2698/4698 (Research Assistantship) for pay. Working independently on your own research project teaches you the true nature of scientific investigation. You will learn scientific approaches, fundamental techniques, and how to work effectively in a research environment. It also provides you with experiences that make your résumé stand out.

The following are some suggestions for getting involved in research.

1) Get good grades and make yourself known to your professors. Undergraduate research is competitive and you are more likely to be accepted with the faculty member of your choice if you have a strong record of academic excellence.

2) Choose an area of biology that you find interesting. It should correspond to one of the areas of faculty expertise here at Georgia Tech. One of the best ways to determine the areas of biology in which you are most interested is to reflect upon the courses you have taken, identifying those that you most enjoyed. Then think about how these courses fit in with your career goals - for example, are you seeking a career in medicine, the biotech industry or in environmental protection? Within these or other areas, it is best to identify the faculty member whose research program most closely fits your interests. You can read about faculty research interests and ongoing projects at http://www.biology.gatech.edu/people/faculty.php and towards the end of this Handbook. Recent publications of most biology faculty are listed on faculty members' web pages. You can access scientific research articles published by Georgia Tech faculty and students at the Georgia Tech library or online using the Georgia Tech library resources.

3) After identifying faculty members, tell them about your interest in research and ask to meet with them to discuss their current research projects and your potential participation. At this point it is important to emphasize why you think that an undergraduate research project would be a valuable experience for you and why you would be a good choice for the faculty member. Undergraduate research is a learning opportunity for students AND enables student to make unique contributions to science. So don't forget that you need to think about how your work will benefit other scientists and our understanding of biology in general, not just how you will benefit.

4) Do not be discouraged if the first professor tells you no. There are many reasons why faculty may not want to take on more undergraduate researchers. The most common is that their lab is full and space and equipment are limited, or they may be over-committed with committee assignments or teaching duties. Your chances of being invited to join a research group are better if you get to know a professor. Take his/her classes and show an interest in their work. If you are courteously persistent and demonstrate success in your coursework, an opportunity is likely to come your way.

5) Some undergraduate research positions are paid from a professor's research grant (in this

case students register for BIOL 2698/4698). More commonly, students register for undergraduate research credits (BIOL 2699/4699) and are not paid. Before you register for these courses, you must arrange for a professor to sponsor your work and submit a signed **Permit Request form** for the course to room 211 or 321 Cherry Emerson building.

6) You and your faculty mentor may obtain a President's Undergraduate Research Award (PURA), with up to $1,500 for salary and travel to meetings and conferences, by submitting an application to the Undergraduate Research Office (see http://www.undergradresearch.gatech.edu/funding.php).

7) **BIOL 4910 (Honors Research Thesis)**. This course is available to seniors or other eligible students who have already completed two semesters of research with at least 6 credit hours (BIOL 2698, BIOL 2699, BIOL 4698, or BIOL 4699), or an equivalent internship program (e.g., REU, HHMI, URS) in an area that is close to the proposed research. Students should also have a minimum overall GPA of 3.0 and be accepted by a faculty mentor. BIOL 4910 consists of 10-15 hours per week in the lab performing individual research under the direction of a faculty mentor. Results are presented in written form as an Undergraduate Research Thesis and orally in BIOL 4450 (Senior Seminar). BIOL 4910 counts as the Senior Research Experience.

ADVICE FROM STUDENTS REGARDING UNDERGRADUATE RESEARCH**:**

"I believe that the undergraduate research experience that I have gained has been an invaluable rite of passage into becoming an independent, critical thinking scientist. My experience has also been crucial in helping develop a relatively specific set of research interests that I will pursue in graduate school in the fall."

"Participating in undergraduate research has been one of the best decisions that I could have made during my years at Georgia Tech. More than just doing the experiments, I have enjoyed working with the people. The day-to-day mentoring process is what has helped me more than anything else. I was fortunate enough to work directly with an advisor and numerous graduate students, all of whom took the time to help me develop into a successful scientist."

"I started doing research as a minor activity, however it quickly became more than that. By my junior year the hours that I worked in lab took highest priority on my academic schedule. The research that I was doing was the link between my classes, my future career options and the real world. Working in lab integrated knowledge from all of my classes, and the critical thinking skills that I employed every day in lab were skills that I took to the classroom and to other aspects of my non-academic life."

"Because of the multidisciplinary nature of my research, I was really able to grasp the application of biology much more than I could have from a lecture or lab course. I also gained confidence in my public presentation skills because so much of doing research is presenting and defending it. It encompasses reading numerous journals and articles, running experiments, analyzing results, presenting, getting feedback, hopefully getting published, and having something to be proud of when your research is complete."

ADVICE FROM THE FACULTY

Getting Letters of Recommendation

To get a job or to get into graduate or professional school, you will need letters of recommendation from the faculty. Faculty members are more willing to write recommendation letters and can write stronger letters if they know you well. The most common way to get to know faculty is to do research in their lab. You will likely need at least three letters of reference, so start developing relationships with faculty as soon as possible.

What can letters of recommendation do for you?
They can point out features of your record, habits, or personality that are important in hiring and admission decisions. They can get you a job or admission to graduate or professional program when your grades are not as high as those of other candidates.

What would a good letter of recommendation say?
To be valuable, the letter must contain information that is not available elsewhere in your written record. The writer should be able to comment on your work ethic, ability to solve problems, creativity, reliability, accuracy, receptiveness to coaching, ability to work independently, and ability to work cooperatively with colleagues.

The letter also should contain details to justify the recommendation. A simple statement that you are a good or smart person is almost meaningless unless it is accompanied by factual information to back up that claim. A lack of details suggests that the writer does not have such evidence and/or does not know much about you.

The reference letter should not be a mere recitation of your good points. No one is perfect, and any attempt to paint you that way will trigger justified doubts in the mind of the reader. It is reasonable for the letter to point out that your record has some weakness, and then to point out how you have overcome the weakness. This converts the negative point into a positive one.

Who should write your letters of recommendation?
Someone who can provide the kind of information described above.

How do you find someone like that?
First, you must start preparing now for the day when you will need the letter. Get to know at least three professors and encourage them to get to know you. You can do this several ways: Visit with them for at least 30 minutes each semester, participate at a high level in their courses (especially those with small class sizes and lots of discussion), or do research in their lab. However you do it, invest the time that is necessary. Only after the professor really gets to know you will he or she be able to write a persuasive letter for you.

Second, you should ask the letter writer if he or she is able to write a good letter. If they hedge in any way, thank them and go elsewhere.

Third, if they feel that they can write a good letter, ask them if they can meet whatever deadline you have. Again, if they hedge, go elsewhere. A good letter that remains unwritten or unsent is no letter at all. Always check back with the letter writer a few days before the letter is due at its destination.

What is your part of the task?
Most importantly, try to be the kind of person about whom a good letter can easily be written.

It is your job to identify appropriate letter writers, and you should start early in your career to cultivate relationships with them. Ask professors and other students to recommend reliable people. Don't be afraid to reject the ones who do not seem promising.

When the time comes to request the letters, give the writer sufficient advanced notice (at least 2-4 weeks) and all of the materials that helps them do a good job: a copy of your résumé and details of the program you are applying for. Since faculty members usually have many students asking for reference letters, you should present them with a typed list of the addresses, and typed envelopes that contain the correct postage. If he or she cannot write the letter in a timely manner, take that as a message to find someone else.

Finally, waiving your right of access to the letter is a signal that you trust the writer. If you do not trust the writer, you should not ask him or her for a letter in the first place.

Problems with a Professor

There may come a time when you get upset with a professor. When this happens you should understand two things: conflicts may occur when people work closely together and there is usually a satisfactory way to resolve the conflict.

As a student you will develop a working relationship with the faculty of Georgia Tech. This relationship is not symmetrical, because faculty members evaluate your performance and decide about your grades. That system is not likely to change, probably for very good reasons. After all, professors have already demonstrated their advanced academic qualifications, and you came to Tech to learn some of the things that they know.

Any relationship that is emotionally and intellectually close, especially an asymmetrical one, may generate stresses. Therefore, we need to anticipate them and find a way to deal with them. The solution you find will almost certainly be imperfect, but there is no reason that it need be unsatisfactory. The more unrealistic your initial expectations are, the more imperfect the solution will be to you. So, start out with this dose of reality; *most problems can be solved, but you may have to compromise.* Talk to your professor about the problem. If you are not satisfied with the result, talk to your advisor and if you still need help, consult the Associate Chair for the Undergraduate Program.

Formal Procedure: If you wish to pursue a formal grievance procedure, you should consult the Georgia Tech Registrar's website at http://www.catalog.gatech.edu/rules/20c.php.

ADVICE FROM FORMER STUDENTS

Take advantage of everything Tech and Atlanta have to offer by getting involved. A great way to meet people is through intramurals, fraternities and sororities, and the Student Government Association (SGA). SGA publishes a Student Handbook of Campus Organizations that includes all of the on-campus organizations. You should have received one in your FASET packet, but they are also available in the SGA office in the Student Services Building. If you have an artistic side, you can fulfill your creative urges with many of the classes offered in the "Options Guide", available in the Student Center Box Office. Some of the activities available are ceramics, pottery, salsa lessons, piano lessons, photography, and drawing classes.

There are many fun things to do and see in Atlanta. The Georgia Aquarium, High Museum of Art, Stone Mountain, Zoo Atlanta, Atlanta Botanical Garden, Fernbank Natural History Museum, and the World of Coca-Cola are definitely worth the entry fees. Six Flags and White Water are fun theme parks in the area. The Robert Ferst Center for the Arts, the Atlanta Symphony

Orchestra, the Fox Theater, the Atlanta Ballet, and the Shakespeare Tavern offer something for everyone. Information and discount tickets are available for activities around town at the Student Center Box Office on the second floor of the Student Center. Experience the numerous restaurants and theaters around Atlanta, and take your student ID; many places offer student discounts. There are many free publications, such as "*Creative Loafing*" magazine, that detail up and coming events in Atlanta, or you can check in the Access Atlanta section of the *Atlanta Journal-Constitution*.

Good time management is the key. Do not schedule so many classes that you do not have time for friends and relaxation. On the other hand, if you schedule only two classes per semester because you want to hang out with your new friends, you will probably never graduate. The right mix will be a balance of work and leisure so that you get good grades, yet thoroughly enjoy yourself. By getting involved and trying new activities, you will soon find your niche. The most successful students have developed good time management skills to include both work and leisure activities.

Be sure to check the Biology website frequently for summer jobs, seminars, and research opportunities. You should attend several Biology seminars before your senior year to get a feel for what is expected when you present your research in Senior Seminar and for what kinds of research careers are available to biologists. Usually you will find that the students with the highest grades are the ones who attend class every day, sit in the front rows and ask questions, and study well in advance for the test.

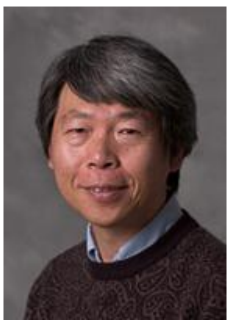
The key to a successful career as a Biology student at Georgia Tech is hard work, focus, good time management, and networking with as many people as possible to create important contacts for the future.

FACULTY OF THE SCHOOL OF BIOLOGY

Yury Chernoff **Molecular & Cell Biology**
Professor

B.S., St. Petersburg University, (Russia), Biology
Ph.D., St. Petersburg University. (Russia), Biology

Yeast molecular genetics: genetic control of protein biosynthesis, folding and aggregation; prions and protein-based inheritance; chaperones and stress response



Jung Choi **Molecular & Cell Biology**
Associate Professor

B.S., M.I.T., Biology
Ph.D., University of CA San Diego, Biology

Plant molecular genetics, protein kinases and cell surface proteins in plant development and regeneration.

Thomas DiChristina **Molecular & Cell Biology**
Professor

B.S., Univ. Rochester, Chemical Engineering
M.S., Univ. de Bordeaux (France), Physical Chem.
Ph.D., Caltech, Environmental Microbiology

Environmental microbiology, geomicrobiology, biogeochemistry, microbial degradation of pollutants, microbial metal reduction.

Meghan Duffy **Ecology, Evolution & Behavior**
Assistant Professor

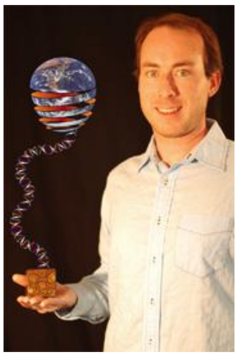
B.S., Cornell University
Ph.D., Michigan State, Zoology and Ecology Evolutionary Biology and Behavior

Evolutionary ecology; community ecology; aquatic ecology; disease ecology; host-parasite interactions; rapid evolution and its effects on ecological dynamics; *Daphnia*

Yuhong Fan **Molecular & Cell Biology**
Assistant Professor

Ph.D., Cell Biology, Albert Einstein College of Medicine

Epigenetic mechanisms crucial for chromatin structure reprogramming and gene expression during mammalian development and cell differentiation.



Eric Gaucher **Ecology, Evolution & Behavior**
Associate Professor

Ph.D., Evolutionary & Biomedical Sciences, University of Florida

Evolutionary synthetic biology, molecular biology, comparative genomics, computational biology, bioinformatics, biomedicine, molecular evolution and origins of life

Gregory Gibson **Molecular & Cell Biology**
Ecology, Evolution & Behavior

Professor

Ph.D. , University of Basel, Switzerland

Genomic approaches to human genetics; variability of gene expression; systems biology of disease; theory of canalization and biological robustness.

Michael Goodisman **Molecular & Cell Biology**
Ecology, Evolution & Behavior

Associate Professor

B.A., Cornell University, Genetics
Ph.D., University of Georgia, Genetics

Sociobiology, behavioral ecology, bioinformatics, molecular evolution, developmental biology, population genetics, evolutionary, genomics.

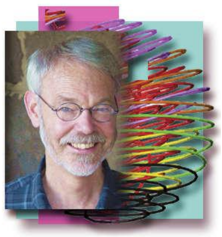
Brian Hammer

Molecular & Cell Biology
Ecology, Evolution & Behavior

Assistant Professor

M.S. , University of Michigan
Ph.D. , University of Michigan Medical School, Microbiology

Bacterial communication and genetics; environmental microbiology; cholera.



Stephen Harvey

Bioinformatics & Computational Biology

Professor
GRA Eminent Scholar in Structural Biology

B.A., University of CA Berkeley, Physics
Ph.D., Dartmouth College, Biophysics

Macromolecular structure and dynamics and the relationship of these to biological function.

Mark Hay

Ecology, Evolution & Behavior

Professor
Linda and Harry Teasely Chair in Environmental Biology

B.A., University of Kentucky, Zoology and Philosophy
M.S., University of CA. Irvine, Biology
Ph.D., University of CA. Irvine, Ecology and Evol. Biology

How consumer-prey interactions, competition, and physical stresses interact to determine community structure and ecosystem function.

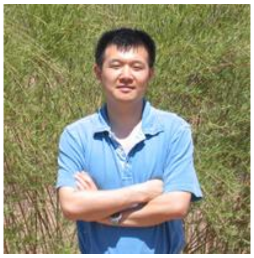
David Hu

Ecology, Evolution & Behavior

Assistant Professor (Joint with ME)

Ph.D. Massachusetts Institute of Technology, Mathematics

Fluid Mechanics: Fluid dynamics, solid mechanics, biomechanics, locomotion, and physical applied mathematics



Lin Jiang **Ecology, Evolution & Behavior**
Assistant Professor

Ph.D. Rutgers University

Community ecology including causes and consequences of biodiversity, interrelationships between food web structure and community dynamics, ecological consequences of environmental noises, biological invasions, and phytoplankton ecology and evolution.

King Jordan **Bioinformatics & Computational Biology**
Ecology, Evolution & Behavior

Associate Professor

Ph.D., Genetics, University of Georgia, 1998

I am interested in understanding evolutionary innovations that have led to the emergence of complexity in eukaryotic lineages, including i-the contributions of transposable elements to host gene regulatory and protein coding sequences, ii-the tempo and mode of gene regulatory and expression divergence and iii-convergent evolution of gene function.

Julia Kubanek **Ecology, Evolution & Behavior**
Associate Professor

B.S., Queen's University (Canada), Chemistry
Ph.D., Univ. of British Columbia (Canada), Organic Chem

Chemical ecology; Chemical communication & signaling; marine natural products chemistry; secondary metabolism; harmful algal blooms; plankton ecology.

Kirill Lobachev **Molecular & Cell Biology**
Associate Professor

M.S., St. Petersburg State University (Russia), Biology & Genetics
Ph.D., St. Petersburg State University (Russia), Genetics

DNA repair, recombination, replication, genome stability.

John McDonald **Molecular & Cell Biology**
Professor

Ph.D., University of California, Davis

The role of retroviral-like transposable elements as a source of mutational change and their relevance to the genome structure and function. Another interest is the genetic basis of cancer and developing new diagnostics and therapeutics for ovarian cancer.

Alfred Merrill **Molecular & Cell Biology**
Professor
Smithgall Chair in Molecular Cell Biology

B.S., Virginia Polytechnic Institute and State University, Biochemistry
Ph.D., Cornell University, Biochemistry

Cell regulation by sphingolipid mediators; role of cell signaling in pathogenesis, disease prevention and treatment; biomolecular mass spectrometry; biodiversity.

Joseph Montoya **Ecology, Evolution & Behavior**
Professor

B.A., University CA Berkeley, Biology
Ph.D., Harvard University, Biology

Biological oceanography: the nitrogen cycle in pelagic ecosystems, isotope biogeochemistry, nitrogen fixation, denitrification, inorganic N uptake, N excretion, plankton physiology.

Jerry Pullman **Molecular & Cell Biology**
Professor of the Practice

B.S., California State University, Biology
M.S., University of CA Davis, Botany
Ph.D., University of CA Davis, Plant Pathology

Multiplication of high-value trees through somatic embryogenesis, understanding the fundamental physical and chemical factors driving natural plant embryo development, and the creation of tissue culture systems necessary for the genetic engineering of forest trees.

Ingeborg Schmidt-Krey **Molecular & Cell Biology**
Assistant Professor

Ph.D., Biophysics and Structural Biology, Karolinska Institute, 1999

Eukaryotic membrane proteins comprise approximately 60% of all drug targets and are consequently immensely important for biomedical research. My research focuses on the crystallization, structure and function of eukaryotic membrane proteins.

Chong Shin **Molecular & Cell Biology**
Assistant Professor

Ph.D., Genetics and Development, University of Texas Southwestern Medical Center

Generation and regeneration of cells into hepatopancreatic lineages, Bone Morphogenetic Protein (BMP) 2b signaling, Zebrafish genetics, Morphogenesis and organogenesis

Jeffrey Skolnick **Bioinformatics & Computational Biology**
Professor
Director, Center for the Study of Systems Biology
GRA Eminent Scholar

Ph.D., Yale University 1977

Development of tools for the prediction of protein structure and function from sequence; functional genomics; automatic assignment of enzymes to metabolic pathways, prediction of protein tertiary and quaternary structure and folding pathways; prediction of membrane protein tertiary structure, prediction of small molecule ligands for drug discovery.

Terry Snell **Ecology, Evolution & Behavior**
Professor and Interim Chair

B.S., Florida Southern College, Biology
M.S., University South Florida, Ecology
Ph.D., University South Florida, Population Biology

Chemical ecology of zooplankton; mate recognition; evolutionary ecology; aquatic toxicology; gene expression in response to environmental stress; aquaculture.

Frank Stewart

Ecology, Evolution & Behavior
Molecular & Cell Biology

Assistant Professor

Ph.D., Biology, Harvard University

Genome evolution and ecology of microbial symbioses * functional diversity and gene expression in natural microbial communities * molecular evolution through microbial genomics * marine microbiology.

Francesca Storici
Assistant Professor

Molecular & Cell Biology

Ph.D., Molecular Genetics, International School for Advanced Studies, Trieste, Italy

DNA repair, Recombination, RNA-mediated DNA repair, Gene targeting, Gene therapy

Todd Streelman

Ecology, Evolution & Behavior
Molecular & Cell Biology

Associate Professor

B.S., Bucknell University, Biology
Ph.D., University of South Florida, Biology

Cichlid fishes and their relatives, a celebrated assemblage whose richness and diversity are unparalleled among vertebrates, are central to discussions of core evolutionary phenomena (adaptive radiation, modes of speciation, ecological convergence, trophic partitioning, sexual selection), the evolution of cichlid jaws, teeth and color patterns.

Roger Wartell
Professor

Molecular & Cell Biology

B.S., Stevens Institute of Technology, Physics
Ph.D., University of Rochester, Physics.

RNA/DNA complexes and their interaction with RNase H relating to anti-sense control of gene expression. Thermodynamics of RNA and DNA structural motifs. Factors governing RNA structural transitions and function.

Marc Weissburg
Professor

Ecology, Evolution & Behavior

B.S., University of CA Berkeley, Biology
Ph.D., SUNY (Stony Brook) Ecology

Chemical ecology: chemically-mediated orientation and guidance in marine invertebrates, behavioral strategies for orientation in relation to fluid flow in aquatic environments, predator-prey and mating behavior mediated by chemical cues.

Joshua Weitz

Ecology, Evolution, Behavior
Bioinformatics & Computational Biology

Assistant Professor

Ph.D., Physics, Massachusetts Institute of Technology, 2003

Theoretical ecology; evolutionary ecology of microbial & viral communities; biological networks; vascular plants; scaling laws; disease dynamics; interacting particle systems.

Jeannette Yen

Ecology, Evolution & Behavior

Professor

B.A., Bryn Mawr, Biology, Biochemistry
M.S., U. Washington, Radioecology, Biol. Oceanography
Ph.D., U. Washington, Biological Oceanography

Small-scale biological-chemical-physical interactions in the plankton, especially the behavior and signal recognition by marine zooplankton: fluid physics of signal structure, and reproductive strategies - of marine plankton, especially copepods.

Soojin Yi

Bioinformatics & Computational Biology
Ecology, Evolution & Behavio

Associate Professor

B.S., Seoul National University, Biology
M.S., Seoul National University, Science Education
Ph.D., University of Chicago, Ecology and Evolution

Comparative and functional analyses of primate genomes; species differences and new genes, particularly the evolution of human specific traits; evolution of genome location and gene function; patterns and causes of mutation rate variation between different genomes and among genomic regions; sex chromosome evolution.

SCHOOL OF BIOLOGY ACADEMIC PROFESSIONALS AND INSTRUCTORS

Mirjana Brockett **Academic Professional**

B.S. University of Belgrade
M. Sci. University of Belgrade
Ph.D. University of Belgrade

Dr. Brockett earned her doctorate from the University of Belgrade and received research training in Evolutionary Biology and Population Genetics at the University of California – Davis and the University of Georgia. She currently teaches Genetics, Evolution, and Introductory Biology.

David Garton **Lecturer**

B.S. University of Alabama Huntsville
Ph.D. Louisiana State University

Recent courses taught by Dr. Garton include Experimental Design & Statistical Methods, Introductory Biology, and Senior Seminar. He is also the Director of the Pacific Study Abroad Program, which includes courses on the ecology and biogeography of New Zealand and Australia.

Cara Gormally **Academic Professional**

B.S. St. John's College
Ph.D. University of Georgia

Cara Gormally joined the faculty at Georgia Tech in May 2010. She earned her Ph.D. in Plant Biology from the University of Georgia, where she also worked at the Center for Teaching and Learning. Her dissertation research investigated the ecological and evolutionary responses of plant populations to the coastal dune environment. Her research interests in biology education include the design, implementation, and evaluation of courses using active, collaborative learning strategies; the development of novel assessment tools to better understand how to help students learn to do science and to spark their interest in informal science learning; and advancing pedagogical development for future biology instructors.

Linda Green **Academic Professional**

B.S. Dartmouth College
Ph.D. University of Virginia

Linda Green joined the faculty at Georgia Tech in Fall 2008. She previously taught Ecology and Animal Behavior courses at the University of Richmond and Appalachian State University. She earned her Ph.D. in ecology at the University of Virginia in 2006. Her research focuses on anthropogenic changes to the community and ecosystem ecology of high elevation streams. She is also interested in the conservation biology of amphibians. Dr. Green currently teaches in the Ecology, Evolution, and Math Models courses.

Jennifer Kraft Leavey **Senior Academic Professional**

B.S. Georgia Institute of Technology
Ph.D. Emory University

Trained as an experimental immunologist at Emory University and the University of Georgia, Jennifer Leavey came to Tech in July 2005 and currently teaches Cell Biology Lab, Microbiology Lab and Immunology and directs academic advising of undergraduate biology majors. Her research interests include the role of inquiry-based labs on improving understanding of the nature of science and how intrusive academic advising affects retention. .

Chrissy Spencer **Academic Professional**

Ph.D. University of Georgia

Chrissy Spencer joined the faculty at Georgia Tech in June 2010. She earned her Ph.D. in Genetics from the University of Georgia and completed two research post-doctoral fellowships. Her dissertation research investigated the ways that genetic interactions impact aging in the fruit fly model system. Her post-doctoral research at the University of British Columbia focused on what ecological and genetics factors generate and maintain diversity using Escherichia coli experimental evolution. Her current research interests include involving undergraduates in the genetic assessment of stands of Carolina Hemlock in the Southern Appalachians. Dr. Spencer currently teaches Introductory Biology and Math Models.

SCHOOL OF BIOLOGY ACADEMIC PROGRAM COORDINATOR

Benita Black **Academic Program Coordinator**

B.S. Florida A & M University

Benita is your first stop for any questions you have regarding Biology or Georgia Tech. This includes but not limited to: holds, permits, overloads, forms, change of major, textbooks, grade changes, scheduling conflicts, prerequisite overrides, email lists, and finding the right person to solve your particular issue.

benita.black@biology.gatech.edu, Clough Commons 474E - 404.385.7137

FACULTY PHONE NUMBERS AND EMAIL ADDRESSES (all .gatech.edu)

CHERNOFF, Yury	IBB 2304 / 2230	404-894-1157 404-385-1324	yury.chernoff@biology
CHOI, Jung	213/210	404-894-8423	jung.choi@biology
DICHRISTINA, Thomas	EST 1240/1115	404-894-8419 404-385-4433	thomas.dichristina@biology
DUFFY, Meghan	A124/A121/D102	404-894-8426 404-385-2843	meghan.duffy@biology
FAN, Yuhong	IBB 2313/2228/2B	404-385-1312 404-385-1322	yuhong.fan@biology
GAUCHER, Eric	311/222/224/226/2 227	404-385-3265 404-385-8584	eric.gaucher@biology
GIBSON, Greg	Boggs 1-98	404-385-2343	greg.gibson@biology.gatech.edu
GOODISMAN, Mike	A110/C101	404-385-6311 404-385-6312	michael.goodisman@biology
HAMMER, Brian	223	404-894-0519	brian.hammer@biology
HARVEY, Steve	315/319/323A/324/ 325/327/329	404-385-4498 404-385-4499	steve.harvey@biology
HAY, Mark	EST 2102/2185	404-894-8429 404-385-6111	mark.hay@biology
JIANG, Lin	C120/C111/C113	404-385-2514 404-385-7448	lin.jiang@biology
JORDAN, I. King	215/212/217	404-385-2224 404-385-1257	king.jordan@biology
KUBANEK, Julia	EST 2242/2175	404-894-8424 404-385-4437	julia.kubanek@biology
LOBACHEV, Kirill	IBB 2303/2202	404-385-6197 404-385-6198	kirill.lobachev@biology
McDONALD, John	201A/IBB 3314	404-894-3700 404-385-6630	john.mcdonald@biology
MERRILL, Al	IBB 3309/3402	404-385-2842	al.merrill@biology
MONTOYA, Joseph	EST 1244/1125	404-385-0479 404-385-0574	j.montoya@biology
PULLMAN, Jerry	IPST MC 0620	404-894-5307 404-894-4778 (F)	jerry.pullman@ipst
SCHMIDT-KREY, Ingeborg	A118/A120/A122/A 109/A111	404-385-0286 404-385-6673	ingeborg.schmidt-krey@biology
SHIN, Chong	IBB 1313	404-894-0519	chong.shin@biology.gatech.edu
SKOLNICK, Jeffrey	250 14th rm 138	404-407-8975	jeffrey.skolnick@biology
SNELL, Terry	EST 2240/2155	404-894-8906 404-385-4434	terry.snell@biology
STEWART, Frank	ES&T 1242	404-894-5819	frank.stewart@biology.gatech.edu
STORICI, Francesca	331	404-385-3339	patricia.sobecky@biology
STREELMAN, Todd	EST 2244/2165	404-385-4435 404-385-4436	todd.streelman@biology
WARTELL, Roger	IBB 1307/1205	404-894-8421 404-385-1315	roger.wartell@biology
WEISSBURG, Marc	EST 2238/2150	404-894-8433 404-385-0576	marc.weissburg@biology
WEITZ, Joshua	219/214/216	404-385-6169 404-385-8343	joshua.weitz@biology
YEN, Jeannette	A116/C109	404-385-1596 404-385-7492	jeannette.yen@biology
YI, Soojin	IBB 3302/3203/3B	404-385-6084 404-385-7484	soojin.yi@biology

ACADEMIC PROFESSIONAL PHONE NUMBERS AND EMAIL ADDRESSES

BROCKETT, Mirjana	A114	404-385-6885	mirjana.brockett@biology
GARTON, David	333	404-385-1039	david.garton@biology
GORMALLY, Cara	307		cara.gormally@biology
GREEN, Linda	A104	404-385-6517	linda.green@biology
LEAVEY, Jennifer	A112	404-385-7229	jennifer.leavey@biology
SPENCER, Chrissy	A114	404-385-0539	chrissy.spencer@biology

ACADEMIC PROGRAM COORDINATOR PHONE NUMBERS AND EMAIL ADDRESSES

BLACK, Benita	CULC 474E	404-385-7137	benita.black@biology

Biology Course Listings

Undergraduate courses offered in the School of Biology are listed below. (Note: after the title of the class are given the number of lecture hours/week, the number of lab hours/week, and the number of credit hours earned for the completed course.)

BIOL 1510, Biological Principles **3-3-4**

Pre-reqs: none

An introduction to the basic principles of modern biology, including biomacromolecules, bioenergetics, cell structure, genetics, homeostasis, evolution and ecological relationships.

BIOL 1511, Honors Biological Principles **3-3-4**

Pre-reqs: AP Biology 4 or IB Biology 4 or BIOL 1520 Minimum Grade of B or BIOL 1521 Minimum Grade of B

An advanced introduction to the principles of modern biology, including biomacromolecules, bioenergetics, cell structure, genetics, homeostasis, evolution, and ecological relationships.

BIOL 1520: Introduction to Organismal Biology **3-3-4**

Pre-reqs: none

An introduction to biology at the organ and organismal levels, with emphasis on physiological processes and integration of growth and development.

BIOL 1521: Honors Introduction to Organismal Biology **3-3-4**

Pre-reqs: AP Biology 4 or IB Biology 4 or BIOL 1510 Minimum Grade of B or BIOL 1511 Minimum Grade of B

An advanced introduction to biology at the organ and organismal levels, with emphasis on biodiversity, physiological processes, and integration of growth, reproduction and development.

BIOL 2100: Biogeography of New Zealand **3-0-3**

Pre-reqs: none

Introduction to the theory of island biogeography focused on New Zealand's geological history and unique biota. (Study abroad in New Zealand).

BIOL 2335: General Ecology **3-0-3**

Pre-reqs: BIOL 1510 Minimum Grade of D or BIOL 1511 Minimum Grade of D

Introduction to ecological processes at individual, population and community levels that occur in plant, animal and microbial taxa, and their relevance to current environmental problems.

BIOL 2336: General Ecology Lab **0-3-1**

Pre-reqs: BIOL 1510 Minimum Grade of D or BIOL 1511 Minimum Grade of D. Co-Req: BIOL 2335

This course stresses understanding ecological concepts through a combination of lab and field experiments, and computer simulations. Principles of experimental design and statistical analyses are applied to ecological data.

BIOL 2337: Honors Ecology **3-0-3**

Pre-reqs: BIOL 1510 Minimum Grade of B or BIOL 1511 Minimum Grade of B

A problem-based learning course in ecology. Student teams will do research and solve challenges typically faced by ecologists and environmental scientists.

BIOL 2338: Honors Ecology Lab **0-3-1**

Pre-reqs: BIOL 1510 Minimum Grade of B or BIOL 1511 Minimum Grade of B. Co-Req: BIOL 2337

Companion course to Honors Ecology. Student teams will explore solutions to ecological challenges using experiments and mathematical models.

BIOL 2344: Genetics **3-0-3**

Pre-reqs: BIOL 1510 Minimum Grade of D or BIOL 1511 Minimum Grade of D

The principles of inheritance as described by Mendel and by biochemical genetics.

BIOL 2354: Honors Genetics **3-0-3**

Pre-reqs: BIOL 1510 Minimum Grade of B or BIOL 1511 Minimum Grade of B.

A comprehensive genetics course incorporating discussions of primary literature. Topics include molecular genetics and gene action, transfer systems and mapping, cytological, quantitative, and population genetics.

BIOL 2345: Genetics Lab **0-3-1**

Pre-reqs: BIOL 1510 Minimum Grade of D or BIOL 1511 Minimum Grade of D. Co-Req: BIOL 2344

A laboratory course in the fundamental techniques of genetic analysis.

BIOL 2355: Honors Genetics Lab **0-3-1**

Pre-reqs: BIOL 1510 Minimum Grade of B or BIOL 1511 Minimum Grade of B. Co-Req: BIOL 2354

Hands-on introduction to practical techniques, critical thinking, and important concepts in genetics. Students carry out laboratory experiments that explore transmission, population, and molecular genetics.

BIOL 2400: Mathematical Models in Biology **3-0-3**

Pre-reqs: (MATH 1502 Minimum Grade of D or MATH 1512 Minimum Grade of D or MATH 15X2 Minimum Grade of D) and (BIOL 1510 Minimum Grade of D or BIOL 1511 Minimum Grade of D)

Introductory probability and deterministic models in biology, including discrete and continuous probability distributions and dynamic models from molecular and cellular biology to ecology and epidemiology.

BIOL 2698: Research Assistantship **(audit only)**

Pre-reqs: none. Freshmen & Sophomores ONLY. PERMIT ONLY.

Independent research conducted by freshmen and sophomores for pay under the guidance of a faculty member.

BIOL 2699: Undergraduate Research **(1 to 12 credit hrs)**

Pre-reqs: none. Freshmen & Sophomores ONLY. PERMIT ONLY.

Independent research conducted by freshmen and sophomores for credit under the guidance of a faculty member.

BIOL 2801-2815: Special Topics **1-0-1**

Pre-reqs: see Class Schedule Listing

This designation enables the School of Biology to provide new lecture courses dealing with areas of current interest in biological sciences.

BIOL 3100: Ecology and Evolution of Australia **3-0-3**

Pre-reqs: with concurrency: BIOL 2100 Minimum Grade of D

Evolution and ecology of Australian ecosystems, including rainforests, open woodlands, coastal habitats; conservation of endangered ecosystems. To earn Biology elective credit requires a research project. (Study abroad in Australia)

BIOL 3300: Tropical Ecology **1-6-3**

Pre-reqs: BIOL 1510 Minimum Grade of D or BIOL 1511 Minimum Grade of D

Ecological processes in the tropics including community organization, biotic interactions, biodiversity, and coevolution. Students perform research projects in rain forest, cloud forest, and seashore of Costa Rica (Study abroad in Costa Rica).

BIOL 3450: Cell and Molecular Biology **3-0-3**

Pre-reqs: (BIOL 1510 Minimum Grade of D or BIOL 1511 Minimum Grade of D) and CHEM 2311 Minimum Grade of D

An introduction to the structure and function of cells and their organelles with emphasis on eucaryotic cellular processes.

BIOL 3451: Cell and Molecular Biology Lab **0-3-1**

Pre-reqs: (BIOL 1510 Minimum Grade of D or BIOL 1511 Minimum Grade of D) and CHEM 2311 Minimum Grade of D. Co-Req: BIOL 3450

An introduction to experimental methods of cell biology research that will cover some fundamental topics of cell biology.

BIOL 3380: Introductory Microbiology **3-0-3**

Pre-reqs: BIOL 1510 Minimum Grade of D or BIOL 1511 Minimum Grade of D;
Pre-req with concurrency: CHEM 2311 Minimum Grade of D

Basic biology of bacteria, fungi, algae, and viruses, with emphasis on bacteriology.

BIOL 3381: Introductory Microbiology Lab **0-3-1**

Pre-reqs: BIOL 1510 Minimum Grade of D or BIOL 1511 Minimum Grade of D;
Pre-req with concurrency: CHEM 2311 Minimum Grade of D. Co-Req: BIOL 3380

Fundamental laboratory techniques in microbiology.

BIOL 3600: Introductory Evolutionary Biology **3-0-3**

Pre-reqs: (BIOL 2344 Minimum Grade of D or BIOL 2354 Minimum Grade of D) and (BIOL 2335 Minimum Grade of D or BIOL 2337 Minimum Grade of D)

Comprehensive introduction to evolutionary biology. Includes focus on processes (natural selection, genetic drift) and resulting patterns (genome organization, phylogeny) illustrated with prokaryote and eukaryote examples.

BIOL 3751: Human Anatomy and Physiology **3-0-3**

Pre-reqs: BIOL 1510 Minimum Grade of D or or BIOL 1511 Minimum Grade of D or CHEM 1310 Minimum Grade of D

Study of human anatomy and fundamental physiological mechanisms.Topics include nervous, musculoskeletal, and cardiorespiratory systems. Crosslisted with APPH 3751.

BIOL 4015: Cancer Biology & Technology **3-0-3**

Pre-reqs: (BIOL 2344 Minimum Grade of D or BIOL 2354 Minimum Grade of D) and (BIOL 3450 Minimum Grade of D)

This course covers basic concepts of cancer biology and new technologies that are being developed to understand, detect, treat, and prevent cancer.

BIOL 4101: Sensory Ecology **3-0-3**

Pre-reqs: BIOL 2335 Minimum Grade of D or BIOL 2337 Minimum Grade of D

A quantitative analyses of communication channels and information acquisition involving visual, auditory, mechanosensory, and olfactory modalities across a range of species and habitats.

BIOL 4105: Macromolecular Modeling **3-0-3**

Pre-reqs: none. PERMIT ONLY.

Principles and practices in the use of molecular mechanics methods (minimization; molecular dynamics) to study structure-function relationships in biological macromolecules.

BIOL 4150: Genomics & Applied Bioinformatics **3-0-3**

Pre-reqs: (BIOL 2344 Minimum Grade of D or BIOL 2354 Minimum Grade of D) and (CS 1321 Minimum Grade of D or CS 1371 Minimum Grade of D or CS 1301 Minimum Grade of D or CS 1315 Minimum Grade of D)

Retrieval and analysis of biological sequence, gene expression, and proteomics data from public databases and other sources; applying standard bioinformatics tools to investigate biological questions.

BIOL 4221: Biological Oceanography **3-0-3**

Pre-reqs: BIOL 1510 Minimum Grade of D or BIOL 1511 Minimum Grade of D

An introduction to the major biological processes in the ocean including primary production, elemental cycling, food webs, and fisheries.

BIOL 4225: Molecular Evolution **3-0-3**

Pre-reqs: BIOL 3600 Minimum Grade of D

Advanced study of bacteria, protozoa, fungi, and viruses that cause human diseases; emphasis on epidemiology, mechanisms of disease causation, prevention and treatment.

BIOL 4340: Medical Microbiology **3-0-3**

Pre-reqs: BIOL 3380 Minimum Grade of D

Advanced study of bacteria, protozoa, fungi, and viruses that cause human diseases; emphasis on epidemiology, mechanisms of disease causation, prevention, and treatment.

BIOL 4401: Experimental Design and Statistical Methods **3-0-3**

Pre-reqs: MATH 1502 Minimum Grade of D or MATH 1512 Minimum Grade of D or (MATH 15X2 Minimum Grade of D and MATH 1522 Minimum Grade of D) and (BIOL 1510 Minimum Grade of D or BIOL 1511 Minimum Grade of D)

Introductory course on experimental design, hypothesis testing and basic statistical techniques commonly applied in biological research.

BIOL 4410: Microbial Ecology **3-0-3**

Pre-reqs: BIOL 3380 Minimum Grade of D

Advanced studies of microbial ecosystems, the specific roles of bacteria in maintaining ecological balance, and the evolution of the ecosystem in response to changing environments.

BIOL 4417: Marine Ecology **3-0-3**

Pre-reqs: BIOL 2335 Minimum Grade of D or BIOL 2337 Minimum Grade of D

An overview of the physical forces and biotic interactions structuring marine communities and of the major threats to these communities.

BIOL 4418: Microbial Physiology **3-0-3**

Pre-reqs: BIOL 3380 Minimum Grade of D and BIOL 3450 Minimum Grade of D

Study of the physiology of growth and metabolic activities of microorganisms.

BIOL 4422: Theoretical Ecology **3-0-3**

Pre-reqs: (MATH 1502 Minimum Grade of D or MATH 1512 Minimum Grade of D or MATH 15X2 Minimum Grade of D) and (BIOL 1510 Minimum Grade of D or BIOL 1511 Minimum Grade of D)

Theoretical foundations of ecology, from the population to the community and ecosystem levels.

BIOL 4440: Plant Physiology **3-0-3**

Pre-reqs: (BIOL 1510 Minimum Grade of D or BIOL 1511 Minimum Grade of D) and (BIOL 1520 Minimum Grade of D or BIOL 1521 Minimum Grade of D or AP Biology 5)

Chemical transformation in photosynthesis, photophysiology and water relationships, organic nutrition and effects of hormones on growth and development of plants.

BIOL 4446: Animal Physiology 3-0-3

Pre-reqs: BIOL 3450 Minimum Grade of D

Systems physiology including nerves, muscles, kidney, digestion, circulation, endocrinology, reproduction, and respiration.

BIOL 4450: Senior Seminar 1-0-1

Pre-reqs: WITH CONCURRENCY BIOL 4590 or BIOL 4690 or BIOL 4910. Restricted to BIO Seniors. Late PHASE I for BIO Juniors If space permits.

Senior students present seminars on recent research topics based on their own research experience and literature research.

BIOL 4464: Developmental Biology 3-0-3

Pre-reqs: (BIOL 2344 Minimum Grade of D or BIOL 2354 Minimum Grade of D) and BIOL 3450

Investigations of cell differentiation and development, using the tools of molecular genetics and cell biology.

BIOL 4471: Behavioral Biology 3-0-3

Pre-reqs: (BIOL 1510 Minimum Grade of D or BIOL 1511 Minimum Grade of D) and (MATH 1502 Minimum Grade of D or MATH 1512 Minimum Grade of D or MATH 15X2 Minimum Grade of D)

An introduction to the study of the principles of behavior of all kinds of organisms, from microbes to mammals.

BIOL 4478: Biophysics 3-0-3

Pre-reqs: PHYS 2211 Minimum Grade of D and (BIOL 2344 Minimum Grade of D or BIOL 2354 Minimum Grade of D or BIOL 3450 Minimum Grade of D)

Biophysical aspects of nucleic acids, proteins and their interactions.

BIOL 4570: Immunology and Immunochemistry 3-0-3

Pre-reqs: BIOL 3450 Minimum Grade of D and (BIOL 2344 Minimum Grade of D or BIOL 2354 Minimum Grade of D)

A survey of modern immunology and its applications.

BIOL 4590: Research Project Lab 1-6-3

Pre-reqs: None. Co-req: BIOL 4450. Restricted to BIO Seniors.

A lab where students design, execute, analyze and report the results of original research. Course themes rotate with instructors. Satisfies the Senior Research Experience requirement.

BIOL 4608: Prokaryotic Molecular Genetics 3-0-3

Pre-reqs: BIOL 2344 Minimum Grade of D or BIOL 2354 Minimum Grade of D

The molecular genetics of bacteria and their viruses, with emphasis in the organization, replication, expression, transfer and experimental manipulation of prokaryotic genes and genomes.

BIOL 4620: Aquatic Chemical Ecology **3-0-3**

Pre-reqs: BIOL 2335 Minimum Grade of D or BIOL 2337 Minimum Grade of D

This course focuses on understanding the chemical mechanisms of aquatic signaling and the cascading effects on population regulation, community organization, and ecosystem function.

BIOL 4650: Bioethics **2-0-2**

Pre-reqs: BIOL 1510 or BIOL 1511

This course will examine the process of scientific inquiry and the ethical implications of research in the biological sciences.

BIOL 4668: Eukaryotic Molecular Genetics **3-0-3**

Pre-reqs: BIOL 2344 Minimum Grade of D or BIOL 2354 Minimum Grade of D

Topics in molecular genetics, including genetic engineering techniques, gene expression and regulation, genetic structure, stability and evolution, with emphasis on eukaryotic organisms.

BIOL 4690: Independent Research Project **0-9-3**

Pre-reqs: Restricted to BIO Seniors. PERMIT ONLY.

Students work on a research project in the lab of a faculty mentor. Satisfies the Senior Research Experience requirement.

BIOL 4698, Research Assistantship **(audit only)**

Pre-reqs: none. Juniors & Seniors ONLY. PERMIT ONLY.

Independent research conducted by juniors and seniors for pay under the supervision of a faculty member.

BIOL 4699: Undergraduate Research **(1-12 credit hrs)**

Pre-reqs: none. Juniors & Seniors ONLY. PERMIT ONLY.

Independent research conducted by juniors and seniors for credit under the supervision of a faculty member.

BIOL 4740: Bio-Inspried Design **3-0-3**

Pre-reqs: BIOL 1520 Minimum Grade of D or BIOL 1521 Minimum Grade of D or BIOL 3600 Minimum Grade of D or BMED 3100 Minimum Grade of D or PHYS 2211 Minimum Grade of D

We examine evolutionary adaptation as a source for engineering design inspiration, utilizing principles of scaling, adaptability, and robust multifunctionality that characterize biological systems.

BIOL 4746: Signaling Molecules **3-0-3**

Pre-reqs: (BIOL 1510 Minimum Grade of D or BIOL 1511 Minimum Grade of D) and CHEM 2311 Minimum Grade of D

The diversity of chemical signals between organisms and their structural specifications will be presented along with chemical and biological methods for isolating signaling molecules.

BIOL 4752: Introduction to Neuroscience **3-0-3**

Pre-reqs: BIOL 3450 Minimum Grade of D or BMED 3160 Minimum Grade of D

Goals are to understand the components of the nervous system and their functional interactions, and appreciate the complexity of higher order brain functions and pathways.

BIOL 4755: Mathematical Biology **3-0-3**

Pre-reqs: BIOL 2400 Minimum Grade of D or MATH 2403 Minimum Grade of D

An introduction to practical applications of mathematical models to help unravel the underlying mechanisms involved in biological processes.

BIOL 4801-4805, Special Topics **1-5**

Pre-reqs: See Class Schedule Listing

This designation enables the School of Biology to provide new lecture courses dealing with areas of current interest in biological sciences.

BIOL 4910, Honors Research Thesis **0-9-3**

Pre-reqs: Overall GPA of 3.0 and 6 credits of undergraduate research (BIOL 2698 or BIOL 2699 or BIOL 4698 or BIOL 4699). PERMIT ONLY.

Writing and submission of an Undergraduate Research Thesis describing research accomplishments under the supervision of a biology faculty mentor. Satisfies the Senior Research Experience requirement.

Courses from other Schools approved for Biology Electives (9 credits maximum)

LCC:

LCC 4701 Undergraduate Research Proposal Writing
LCC 4702 Undergraduate Research Thesis Writing

All APPH 3XXX and higher courses EXCEPT:

APPH 3300 Health Promotion
APPH 3901-3904 Special Problems
APPH 4698 Research Assistantship
APPH 4699 Undergraduate Research

All BMED 3XXX and higher courses EXCEPT:

BMED 4698 Research Assistantship
BMED 4699 Undergraduate Research
BMED 4900-4903 Special Problems

All CHEM 3XXX and higher courses EXCEPT:

CHEM 4601 Chemistry Seminar
CHEM 4698 Research Assistantship
CHEM 4699 Undergraduate Research
CHEM 4901- 4903 Special Problems in Chemistry

All EAS 3XXX and higher courses EXCEPT:

EAS 4651 Practical Internship
EAS 4698 Research Assistantship
EAS 4699 Undergraduate Research
EAS 4900 Special Problems

All MATH 2XXX and higher courses EXCEPT:

MATH 2698 Research Assistantship
MATH 2699 Undergraduate Research
MATH 4080 Senior Project I
MATH 4090 Senior Project II
MATH 4698 Research Assistantship
MATH 4699 Undergraduate Research
MATH 4999 Special Problems

All PHYS 3XXX and higher courses EXCEPT:

PHYS 4601 Senior Seminar I
PHYS 4602 Senior Seminar II
PHYS 4698 Research Assistantship
PHYS 4699 Undergraduate Research

All PSYC 3XXX and higher EXCEPT:

PSYC 4600 Senior Thesis I
PSYC 4601 Senior Thesis II
PSYC 4698 Research Assistantship
PSYC 4699 Undergraduate Research
PSYC 4900-4910 Special Problems

Student /Advisor Work Sheet
2011-2012

Student Name: ______________________________ **ID number:**__________________________

A. General Biology (Required)	Credits	✓
Biol 1510 or 1511 Biol Princ	4	
Biol 1520 or 1521 Organ Bio	4	
Biol 2335 or 2337 Ecology	3	
Biol 2344 or 2354 Genetics	3	
Biol 3600 Evolution	3	
Biol 3450 Cell & Molecular Bio	3	
Biol 4450 Senior Seminar	1	
Choose 2 from:		
Biol 2336 or 2338 Ecology Lab	1	
Biol 2345 or 2355 Genetics Lab	1	
Biol 3451 Cell & Molec Bio Lab	1	
Choose 1 from:		
Biol 2400 Math Models Bio	3	
Biol 4150 Genomics	3	
Biol 4401 Exp Des and Stat	3	
Biol 4422 Theoretical Ecol	3	
Biol 4755 Math Bio	3	
MATH 3770 Stats and Apps	3	
MATH 3215 Prob and Stats	3	
Choose 1 from:		
Biol 4590 Research Project Lab	3	
Biol 4690 Ind. Research Proj	3	
Biol 4910 Honors Res Thesis	3	
Total	**29**	
B. Biology Electives (21 hrs req)	**Credits**	**✓**
Total	**21**	

C. Other Required Courses	Credits	✓
Chem 1211K Chem Princ I	4	
Chem 1212K Chem Princ II	4	
Math 1501 Calculus I	4	
Math 1502 Calculus II	4	
Chem 2311 Organic Chem I	3	
Chem 2312 Organic Chem II	3	
Chem 2380 Synthesis Lab	2	
Phys 2211/2501 Physics I	4	
Phys 2212/2502 Physics II	4	
CS 1301 or 1315 or 1371	3	
HPS 1040 Wellness	2	
Total	**37**	
D.-E. Social Sciences/Humanities	**Credits**	**✓**
History/Political Science	3	
Social Science	3	
Social Science	3	
Social Science	3	
Total	**12**	
English 1101	3	
English 1102	3	
Humanities	3	
Humanities	3	
Total	**12**	
F. Free Electives	**Credits**	**✓**
GT1000 (recommended)	1	
Total	**11**	
Total for Graduation	**122**	