

Lecture Faculty: Mirjana M Brockett (MB)
email: mirjana.brockett@biology.gatech.edu

Samantha Parks (SP)
231 Cherry Emerson Building
email: samantha.parks@gatech.edu

Lab Faculty: Cara Gormally
474D Clough
tel: 404-385-2762
email: cara.gormally@biology.gatech.edu

Prerequisites: A score of 4 or 5 on the AP Biology test, an A or B in Biology 1510/1511, or permission of the instructors.

Description: A focused introduction to organismal biology, with emphasis on physiological processes and integration of growth and development. This course will foster the development of critical scientific skills including hypothesis testing, experimental design, data analysis and interpretation, and scientific communication. Biology 1521 is intended for students with a strong background and interest in biology and includes a greater emphasis on current research and recent advances in biology than Biology 1520.

Textbook: Freeman et. al. (2010), Biological Science, 4th edition. Benjamin Cummings, San Francisco. For the students who already purchased the previous book you may also use: Campbell, N.A. et al. (2008), Biology, 8th edition. Benjamin Cummings, San Francisco. We have arranged special pricing through the bookstore for both hardcover and ebook versions of the textbook bundled with access to the publisher's web content (MasteringBiology.com).

Clickers: A TurningPoint ResponseCard NXT unit ("clicker") is required and will be used for quizzes and interactive lecture sessions, which will contribute to the Participation portion of your course grade. The old PRS clickers are no longer in use at GT—these can be resold to the bookstore for \$5. This course is not set up to use the TurningPoint laptop or mobile device instead of a clicker.

Honor Code: All students are expected to abide by the Academic Honor Code, which can be viewed online at <http://www.honor.gatech.edu>. We take the Honor Code very seriously and are required to report any potential violations. Some specific examples of Honor Code violations that we've encountered include: copying during exams, use of another student's PRS in class, and plagiarism.

Lectures: Lectures are held in Clough Commons 102. Attendance in lecture correlates strongly with performance in Biology 1521. Please complete each reading assignment before class. We will make our lectures available via T-Square and urge you to download and print them for use in taking notes during lecture. The lectures and readings are complementary and some materials will be presented only in lecture. Lecture exams will be based on topics, materials, and discussions presented in class and in the assigned readings.

Please turn off phones and computers while in lecture, unless otherwise prompted.

- Lecture Exams:** Four midterm exams and the final exam. The midterm exams will be held in the evening, are closed-book and will be made up of multiple-choice and short-essay questions. Exams and quizzes will be given in the laboratory as well.
- Missed Exams:** If you miss an exam for any reason, you will receive a grade of 0 (zero) on that exam unless you petition us for a makeup exam within 24 h of the start of the missed exam, *and* we approve your petition. Your petition must be submitted in writing and must include documentation of a legitimate reason for missing the exam. You can, of course, submit your petition before the exam if you know of your scheduling conflict in advance. We will consider each petition individually. Examples of legitimate reasons to miss an exam include illness, illness or death in your immediate family, and participation in official university activities.
- If we approve your petition, we will remove the missed exam from your grade calculation by using the weighted mean of your other exam scores as your grade for the missed exam, making it completely neutral in your final point total. You may also petition for a makeup exam. If we accept your petition, we will administer a makeup exam before the end of the term.
- Recitation:** We will have an optional T-square chat room a couple of days before an exam. Additionally, we will hold optional recitation sessions on Thursday evenings as needed and/or available. This is an opportunity for you to discuss lecture material and text readings.
- Quizzes:** Short quizzes may be administered in lecture, lab and via the web (T-Square and/or MasteringBiology.com).
- Group Activities:** Groups of 4 students will work together to prepare class presentations on two topics related to the lecture syllabus. Each group member is expected to contribute to both presentations, but will deliver only one of the two. You may use various learning aids and we will guide you in the process of assembling an effective presentation. You will also be evaluated by members of your group as to participation and ability to contribute to the teams' success. More details will be posted online.
- Labs:** Labs are held in Clough 473. Note that **labs do not start during the first week of classes**. Laboratory attendance is mandatory and each unexcused absence will lower your final grade by 5%.
- Biology Minute:** This is another opportunity to earn extra credit. Once during the semester, you may present an oral "minute paper," with one PowerPoint slide, to the class. You can earn up to two points, which will be added to your FINAL grade. Your one-minute presentation should summarize any biologically-relevant current issue or topic from *reputable* news sources (newspapers such as AJC and The New York Times, journals such as Science and Nature, or popular magazines such as Scientific American). We will post a sign-up calendar on T-square for you to choose a time slot. Because not everyone will be able to take advantage of this opportunity, in the event that you are unprepared for your chosen time, you will have two points *deducted* from your final grade.

Grading:

Your final grade will depend on the following combination of grades:

In-class exams & quizzes:	40%
Final exam:	20%
Group project:	10%
Participation:	10%
Laboratory:	25%

Note that these components total 105%. The maximum overall score we will allow in this course is 100%, so this scheme includes 5% of extra credit. We will assign final letter grades based on your scores using the following scale:

A:	$\geq 90\%$
B:	$\geq 80\%$ and $< 90\%$
C:	$\geq 70\%$ and $< 80\%$
D:	$\geq 60\%$ and $< 70\%$
F:	$< 60\%$

Biology 1521 Module Themes and Teaching Goals

Module	Major theme	Teaching Goals
1	<ul style="list-style-type: none">Biodiversity	<ul style="list-style-type: none">Evolutionary history of life on EarthMetabolic diversityBiological diversity
2	<ul style="list-style-type: none">Growth and Reproduction	<ul style="list-style-type: none">DifferentiationSexual and asexual reproductionReproductive strategies
3	<ul style="list-style-type: none">Chemical and Electrical Signals	<ul style="list-style-type: none">HormonesNeurons and integrationSensory systemsEffectors
4	<ul style="list-style-type: none">Nutrition and Transport	<ul style="list-style-type: none">Metabolic diversityNutrient acquisitionCirculatory systems (plant and animal)
5	<ul style="list-style-type: none">Materials Balance	<ul style="list-style-type: none">Gas exchangeWater, ion, and mass exchangeHomeostasis

Date	Lecture Topics	Campbell 8 reading	Freeman 4 reading	Lecturer
9 Jan	Course overview Introduction to instructors			All
=> M1	Start Module 1: Biodiversity			
11 Jan	<PRECAMBRIAN>Beginnings of Life on Earth Origin and earliest signs of life Precambrian: prokaryotes, endosymbionts Ediacaran fauna	25: review 505-525 26: 548-553 27: 557-573 28.1: 575-579	27: review 474-479 27: 479-488 28: 504-512 29: 526-532	SP
13 Jan	<CAMBRIAN → SILURIAN>Cambrian Cambrian explosion Body plans and diversity of marine life (Ordovician & Silurian) Gondwana. Jawless and jawed fishes. Plants, arthropods, and apsid colonize land.	32: 654-664	27: 486-492 30: 549-55, 566-567 32: 601-617 33: 623-630 34: 650-652	SP
16 Jan	Holiday: MLK Day			
18 Jan	<DEVONIAN → PERMIAN> Devonian Age of fishes, first tetrapods Vascular plants, glomeromycetes Plants, arthropods, and vertebrates colonize land. Carboniferous Amniote egg and Gymnosperms appear. Pangaea, Panthalassa Ocean and Tethys Sea Conifers and insects diversify End-Permian mass extinction	29: 600-615 32: 654-664	27: 488-492 30: 550-551, 556-561 31: 586-589 33: 637-643 34: 653-659	SP
20 Jan	<MESOZOIC> Mesozoic Dinosaurs dominate on land Mammals and angiosperms diversify Extinctions at end of Triassic and Cretaceous.	29: 600-615 31: 642, 644 34: 698-713	30: 561-565 34: 660-668	SP
23 Jan	<CENOZOIC> Diversification of mammals, angiosperms, grasses. Climate variability.	34: 713-720 30: 612-625	30: 561-565	SP
25 Jan	<MODERN PROKARYOTES>	33: 684-692	Chapter 28	SP
27 Jan	<MODERN EUKARYOTIC DIVERSIFICATION>	30: 625-632 34: 716-727	Chapter 29 30: 564-577 31: 582-599 32: 603-621	SP
30 Jan	<MULTICELLULARITY>	30: 625-632 34: 716-727	Chapter 29 30: 564-577 31: 582-599 32: 603-621	SP
1 Feb	Group Presentations			SP

Date	Lecture Topics	Campbell 8 reading	Freeman 4 reading	Lecturer
2 Feb	Exam #1 (evening)	Module 1		SP
=> M2	Start Module 2: Growth and Reproduction			
3 Feb	Intro to reproduction and development Differentiation and colony formation Ontogeny \neq phylogeny, but they're linked.	40: 852-860	Chapter 21	SP
6 Feb	Plant Development Tissue development, differentiation and function Role of meristems, secondary growth	35: 738-761	Chapter 23 Ch 29: 533-536	SP
8 Feb	Animal development Cleavage patterns, polarity, differentiation Coelom formation and body plans	32: 655 47: 1021-1044	Chapter 22 Ch 32: 604-607	SP
10 Feb	Reproduction Mitosis, meiosis, and ploidy Alternation of generations	28: 587-589 29: 602-603 33: 671-673	Chapter 21	SP
13 Feb	Reproduction in vascular plants Double fertilization, seeds, fruits Vegetative growth	30: 618-632 38: 801-811	557-558 30: 560-565 40: 783-801	SP
15 Feb	Animal reproduction Asexual reproduction (budding and parthenogenesis) Gametogenesis, hermaphroditism	46: 997-1003	48: 950-956 32: 615-617	SP
17 Feb	Human reproduction Spermatogenesis, oogenesis Ovarian and uterine cycles Hormonal control	46: 1003-1016	48: 957-971	SP
20 Feb	Group Presentations			SP
=> M3	Start Module 3: Chemical and Electrical Signals			
22 Feb	Intro to chemical signaling and signal transduction Hormones and pheromones Quorum sensing, biofilm formation in microbes	11: 206-207 39: 821-824 51: 1125	8: 139-145 47: 929-935 8: 145-146	SP
23 Feb	Exam #2 (evening)	Module 2		SP
24 Feb	Plant Hormones and Defenses	39: 821-835	39: 755-781	MB
27 Feb	Hormones controlling growth, dormancy, germination Responses to injury, chemical defenses.	39: 845-847		MB
29 Feb	Animal hormones	45: 975-994	47: 929-947	SP
2 Mar	Hormone effects, production, distribution Insect development Vertebrate endocrine system			SP
5 Mar	Neurons and Nervous System	48: 1047-1061	45: 885-889	MB
7 Mar	Anatomy and function Ion channels, synapses, neurotransmitters, integration	49: 1064-1069 1078-1080		MB
9 Mar	Sensory Systems	50: 1087-1105	46: 907-920	MB
12 Mar	Sensory cells & organs, specificity Mechano- and photoreception Information processing			MB

Date	Lecture Topics	Campbell 8 reading	Freeman 4 reading	Lecturer
14 Mar	Effectors Movement: role of cilia, flagella, muscles, skeletons	6: 114-116 50: 1105-1117	7: 123-128 46: 920-926	MB
15 Mar	Exam #3 (evening)	Module 3		MB/SP
16 Mar	Group Presentations			MB
19 Mar 23 Mar	Spring Break (no classes)			
=> M4	Start Module 4: Nutrition and Transport			
26 Mar	Microbial nutrition Autotrophy, heterotrophy, mixotrophy	27: 564-565	28	MB
28 Mar	Plant nutrition Nutrients and soil processes, N ₂ -fixation	37: 785-798	38: 737-752	MB
30 Mar 2 Apr	Plant transport processes Uptake of water and minerals Xylem and evapotranspiration Phloem, sieve tubes, and translocation	36: 764-782	37: 717-735	MB MB
4 Apr 6 Apr	Animal nutrition Nutrient requirements and energy acquisition Digestive organs: structure and function	41: 875-896	43:841-858	MB MB
9 Apr 11 Apr	Animal circulation Evolution of circulatory systems Human vascular system, hormonal regulation	42: 898-915	44: 874-883	MB MB
13 Apr	Group Presentations			MB
=> M5	Start Module 5: Materials Balance			
16 Apr 18 Apr	Gas Exchange and Transport Principles of diffusion Lungs and gills Mechanisms for transporting O ₂ and CO ₂	42: 915-927	44: 861-883	MB MB
19 Apr	Exam 4 (evening)	Module 4		MB
20 Apr 23 Apr	Ion and water balance in animals Excretory mechanisms and systems Adaptations to different environments	44: 954-972	42: 822-838	MB MB
25 Apr	Plant homeostasis and responses to the environment Photosynthetic strategies and water conservation Water, temperature, wounds, pathogens	10: 198-203 36: 776-778 39: 835-847	10: 187-190 37: 720-721	MB
27 Apr	Physiological Ecology and course wrap-up		41: 815-819	All
30 Apr 2 May	Final Exams (see exam schedule for date and time)	Comprehensive		