

<b>Lecture Faculty:</b>	Joseph P. Montoya (JM) Meet on BlueJeans 404-385-0479 montoya@gatech.edu	Office hours by appointment (email 3 times that work)
	Chrissy Spencer (CS) Meet on BlueJeans 404-385-0539 chrissy.spencer@biology.gatech.edu	Office hours T 2-4 pm or by appointment (email 3 times that work)
<b>Lab Faculty:</b>	Colin Harrison CULC 474D email: colin.harrison@biosci.gatech.edu	Office hours by appointment
<b>Lecture TA</b>	Adam Kashlan email: akashlan@gatech.edu	Office hours M 11-1230 Location TBD
<b>Lab TAs</b>	Info on lab Canvas site: BIOS-1207-Lab	

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Lectures:	MWF 9:30 – 10:20 am in Instructional Center 215
Recitations:	Tuesday 6:30 – 7:20 pm in Instructional Center 115 (downstairs!)
Prerequisites:	A good background in high school biology and chemistry.
Description:	<p>BIOS 1207 was designed for Biology majors. This is an <b>active-learning</b> class that will introduce you to basic principles of modern biology, including evolution, ecological relationships, biomacromolecules, bioenergetics, cell structure, and genetics. This course will help you develop critical scientific skills including hypothesis testing, experimental design, data analysis and interpretation, and scientific communication. Class time will include a variety of <b>team-based activities</b> designed to discuss, clarify, and apply new ideas by answering questions, drawing diagrams, analyzing primary literature, and explaining medical or ecological phenomena in the context of biological principles. We will spend class time on building your comprehension of the material you find the most difficult, based on pre-class assessments. You will play a key role in determining the focus of each day's effort. By the end of this term, you will be able to:</p> <ol style="list-style-type: none"> <li>1. Explain fundamental principles of modern biology, including evolution, ecological relationships, biomacromolecules, bioenergetics, cell structure, and genetics.</li> <li>2. Use scientific skills to test hypotheses, design experiments, analyze and interpret data, and communicate scientifically</li> </ol>
Instructional Mode:	<p>This is an unprecedented time. We all agree that the best way for you to learn this material is face-to-face, working in teams. However, we are able to help you learn the course content remotely, if need be. The course modality (in-person versus remote) could change depending upon health status of individuals in the classroom.</p> <p>The public health evidence is that everyone who is able to should wear a mask, correctly covering mouth and nose, and that everyone who is eligible should get vaccinated. <b>Our expectation for you as emerging life scientists is that you will be vaccinated and wear a mask in this classroom and indoors in general.</b></p> <p>Because the delta variant of SARS-CoV-2 is able to spread through vaccinated individuals, weekly asymptomatic surveillance testing should be part of everyone's regular routine, regardless of vaccination status. For details, see: <a href="https://health.gatech.edu/coronavirus/testing">https://health.gatech.edu/coronavirus/testing</a>.</p>

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Textbook:	Biological Principles is taught using a flipped classroom model, meaning that <i>you will need to complete your assigned readings and view the included videos before each lecture</i> . The Biological Principles textbook is available at <a href="http://bioprinciples.biosci.gatech.edu">bioprinciples.biosci.gatech.edu</a> . The day-by-day schedule below contains links to each required reading. The day-by-day schedule below contains links to each required reading. Note that you can access any of the readings using the links below the fern.
Learning Catalytics (LC) for Participation and Homework:	To complete your pre-class incoming knowledge evaluation (IKEs), team in-class activities (TICAs), and your weekly homework assignments, students are required to have a <a href="https://learningcatalytics.com/users/sign_up">Learning Catalytics</a> account. Points earned in Learning Catalytics will contribute to the "participation" portion of your course grade. Learning Catalytics can be purchased directly at <a href="https://learningcatalytics.com/users/sign_up">https://learningcatalytics.com/users/sign_up</a> or from the Georgia Tech Bookstore in Tech Square. To participate in class, you will need to bring an internet-ready smartphone, tablet, or laptop to class to earn participation points. Phone and computer use is restricted to class-related material, and off-task use may result in loss of participation points for that day. Your entire Learning Catalytics contribution of IKEs, TICAs, and Homeworks tallies to 20% of the course grade.
LC Incoming Knowledge Evaluations (IKEs)	Before each class, we'll expect you to complete the pre-class readings on the website. Once you've reviewed the material, log in to Learning Catalytics to complete that day's Incoming Knowledge Evaluation (IKE). IKE sessions close before the start of class and will not be reopened for credit, but you can review closed sessions for study purposes. We'll use your responses to guide what we do in class. IKE questions are not often at the same level as you can expect to see on an exam; instead, they ensure that you come to class with effective baseline knowledge to work up to exam-level questions in class.  All IKE and TICA sessions are graded for participation and count equally. We will drop the four lowest IKE/TICA scores from your participation grade.
LC Team In-Class Activities (TICAs)	Attendance in lecture correlates strongly with performance in Biological Principles. We will make our lecture materials available and urge you to download and print them for use in active note-taking during class. Much of the material and application of ideas needed for success in this course will be presented only in lecture and assessed via Learning Catalytics. Questions presented in class are usually at the same level as exam questions. TICA sessions in Learning Catalytics close at the end of class, with a few exceptions, and will not be reopened for credit, but you can review closed sessions for study purposes.  All IKE and TICA sessions are graded for participation and count equally. We will drop the four lowest IKE/TICA scores from your participation grade.
LC Homework:	Homework assignments will be posted each week in Learning Catalytics and are always <i>due at 11:59 pm Sunday</i> . Homeworks close when due and will generally not be reopened for credit, but you can review closed sessions for study purposes.  All homework assignments are graded for participation and count equally (1 HW = 2 IKEs/TICAs). We will drop the lowest homework score from your participation grade.
Staying focused in class:	We've noticed that constant cell and internet access can cause students to be distracted in class. This effect is augmented by remote learning, should that occur. Please do what you can to set up a distraction free work space in class or remotely. This includes putting away texts, social media, internet browsing, and homework for other classes. Spend the class time with us and consider it part of your study time to learn biology and do well on the exams.

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Missed classes:	If you are unable to attend lecture for an excused absence, we can provide a recording from our Fall 2020 class meeting. Please view, then work with a classmate to obtain and review the lecture notes and materials. As a next step, schedule an appointment with the recitation TA to review any content that you would like clarification on.
Exams:	Four midterm exams and the final exam. The midterm exams will be held during class, are closed-book, and will be made up of multiple-choice and short-answer questions based on topics, materials, and discussions presented in class, in the assigned readings, and in the Learning Catalytics assignments. Quizzes may be administered unannounced.
Missed Exams:	If you miss an exam for any reason, you will receive a grade of 0 (zero) on that exam unless you <b>petition us for a makeup exam within 24 h of the start of the missed exam</b> , and we approve your petition. Your petition must be submitted in writing (by e-mail) and must include documentation of a legitimate reason for missing the exam. You are encouraged to 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 either administer a makeup exam or remove the missed exam from your grade calculation by using the weighted average of your other exam scores as your grade for the missed exam, making it completely neutral in your final point total.
Communication:	All course communication will come through your @gatech.edu email account, usually in the form of Canvas announcements. We will announce assignment deadlines, send LC session IDs, let you know about extra credit opportunities, and send test and review sessions reminders, and more. Please make a habit to check your @gatech.edu email every day during the semester so that you are current with this course and other events at Tech. Check your spam and “clutter” folders regularly. Pro Tip: Disable the “clutter” feature in Outlook to prevent course and other important messages from being hidden.
Recitations:	Lecture recitations, led by the recitation TA, occur weekly on Tuesdays at 6:30 pm. Attendance is optional but strongly encouraged, as recitation is designed to improve your understanding of the lecture material, give you the opportunity to ask questions, and to work additional problems.
Group Projects:	Groups of 4-5 students will explore a recent scientific advance related to the topic of one of the course modules and prepare a biography of one of the scientists involved. Each student will be assigned to a group, and each group will produce a video presentation and a Scientist Biographical Sketch for review by faculty and fellow students. Grades will be based on instructors’ scores and peer evaluations. Each group member is fully responsible for all submitted project work and each member will receive the same project grade. Students whose peer reviews show that they didn’t contribute fully will receive a penalty reflecting their contribution. Deadlines are on the schedule below. Additional details will be available after the end of the drop/add period.
Extra Credit Opportunities::	We offer five opportunities to earn extra credit: an exercise on avoiding plagiarism and four Scientist Spotlights, which introduce you to actual scientists working in a compelling way at the forefront of scientific discoveries related to the course content. These opportunities are available to each student and each can contribute up to 1% of your overall course grade. Due dates are on the schedule below and on Canvas. Note that the plagiarism exercise will be open until the middle of the semester, but we urge you to complete it as early in the term as possible.

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Labs:	Lab for BIOS 1207 is a separate grade from the lecture portion of the course. Labs will not meet the first week of class, but please check the Canvas site for the syllabus and important announcements. Lab will begin the week of August 30th, but there will be a short assignment to complete the week before. If you have a laptop, please bring it the first week of lab.
Tutoring:	Georgia Tech offers a variety of free learning and communications support options. Learn about free tutoring resources at <a href="http://www.success.gatech.edu">www.success.gatech.edu</a> or at the Center for Academic Success's tutoring desk in Clough Commons 273. For assistance with revising lab reports or building and polishing a group project presentation, consult the Communications Center (Clough Commons 447 or <a href="http://commmlab.gatech.edu">commmlab.gatech.edu</a> ). All Tutoring and Communications services are also available remotely in Fall 2020.
Academic Integrity:	<p>Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit <a href="https://osi.gatech.edu/content/honor-code">https://osi.gatech.edu/content/honor-code</a>.</p> <p>Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, which will investigate the incident and identify the appropriate penalty for violations.</p> <p>Plagiarism is the unattributed use of the words, works or ideas of others; plagiarism on any assignment, including laboratory reports and the group project, will be referred to the Office of Student Integrity for adjudication. If you have any questions regarding your assignments and plagiarism, we encourage you to consult with any of us before you submit the assignment.</p> <p>Cell phones must be turned off during exams, and access to any website or resource is forbidden. Students in violation of these policies during an exam will be referred to the Honor Council.</p>
Learning Accommodations:	We will gladly make course accommodations for students with disabilities. These accommodations must be arranged in advance and in accordance with the Office of Disability Services ( <a href="http://disabilityservices.gatech.edu">disabilityservices.gatech.edu</a> ).
Inclusivity:	As members of the Georgia Tech community, we are committed to creating a learning environment in which all of our students feel safe and included. Because we are individuals with varying needs, we rely on your feedback to achieve this goal. To that end, we invite you to enter into dialogue with us about the things we can stop, start, and continue doing to make our classroom an environment in which every student feels valued and can engage actively in our learning community. Anonymous feedback can be provided through Piazza.

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**Academic Support:**

Georgia Tech offers a variety of free learning and communications support options. Learn about free tutoring resources at [www.success.gatech.edu](http://www.success.gatech.edu) or at the Center for Academic Success's tutoring desk in Clough Commons 273. For assistance with revising lab reports or building and polishing a group project presentation, consult the Communications Center (Clough Commons 447 or [commmlab.gatech.edu](http://commmlab.gatech.edu)).

Additional resources for academic support include:

- Center for Academic Success <https://success.gatech.edu>
    - 1-to-1 tutoring: <https://tutoring.gatech.edu/tutoring>
    - Peer-Led Undergraduate Study (PLUS)  
<https://tutoring.gatech.edu/plus-sessions>
    - Academic coaching: <https://advising.gatech.edu/academic-coaching>
  - Residence Life's Learning Assistance Program  
<https://housing.gatech.edu/learning-assistance-program>
    - Drop-in tutoring for many 1000 level courses
  - OMED: Educational Services  
<http://omed.gatech.edu/programs/academic-support>
    - Group study sessions and tutoring programs
  - Communication Center (<http://www.communicationcenter.gatech.edu>)
    - Individualized help with writing and multimedia projects
  - Academic advisors for your major: <http://advising.gatech.edu/>
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**Personal  
Support:**

In your time at Georgia Tech, you may find yourself in need of support. Below are some resources available on campus.

- The Division of Student Life: <https://studentlife.gatech.edu> **404-894-6367**  
Smithgall Student Services Building 2<sup>nd</sup> floor
    - You also may request assistance at  
[https://gatech-advocate.symplicity.com/care\\_report/index.php/pid383662?](https://gatech-advocate.symplicity.com/care_report/index.php/pid383662?)
  - Counseling Center: <http://counseling.gatech.edu> **404-894-2575**  
Smithgall Student Services Building 2<sup>nd</sup> floor
    - Services include short-term individual counseling, group counseling, couples counseling, testing and assessment, referral services, and crisis intervention. Their website also includes links to state and national resources.
  - *Students in crisis may walk in during business hours (8am-5pm, Monday through Friday) or contact the counselor on call after hours at 404-894-2204.*
  - Students' Temporary Assistance and Resources (STAR): <https://studentlife.gatech.edu/content/star-services>
    - Can assist with interview clothing, food, and housing needs.
  - Stamps Health Services: <https://health.gatech.edu> **404-894-1420**
    - Primary care, pharmacy, women's health, psychiatry, immunization and allergy, health promotion, and nutrition
  - OMED: Educational Services: <https://www.omed.gatech.edu>  
404-894-3959
  - Women's Resource Center: <https://womenscenter.gatech.edu>  
404-385-0230
  - LGBTQIA Resource Center: <https://lgbtqia.gatech.edu/>  
404-385-2679
  - Veteran's Resource Center: <https://veterans.gatech.edu/>  
404-385-2067
  - Georgia Tech Police: <https://police.gatech.edu/>  
404-894-2500
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Grading: Your final grade will depend on the following combination of scores:

In-class exams:	40%
Final exam:	20%
Incoming Knowledge Evaluations:	5%
Team In-Class Activities	5%
Homework	10%
Group project:	20%
Extra Credit:	5%

Note that these components total 105%, though the maximum score possible is 100%.

We will use the following procedure in calculating your final grade:

1. We will combine your exam, lab, and group activity and other scores into a raw composite score (0 – 100%) using the weights shown above.
2. We will use the mean score earned by the top 5% of the class as a gauge of real student performance in the class.
3. We will normalize your score to actual student performance by dividing your raw composite score by the mean score earned by the top 5% of the class. If you're in the top 2.5% of the class, your score will be 100%.
4. We will assign final letter grades using the following scale:

A:  $\geq 90.0\%$

B:  $\geq 80.0\%$  and  $< 90.0\%$

C:  $\geq 70.0\%$  and  $< 80.0\%$

D:  $\geq 60.0\%$  and  $< 70.0\%$

In recent years, normalized and raw scores have been very similar, but this grading approach allows us to take account of actual class performance in assigning grades, if necessary. Normalization can only improve, not decrease your final course grade, though usually it doesn't change grades.

**Note that we do not constrain the final grade distribution in any way – everyone can earn an A in this class, and we'd be delighted if you all did.**

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Organization: The course is organized into five modules, each of which deals with a major area of modern biology.

Module	Major theme	Teaching Goals
Intro	• Course intro	• Scientific method
1	• Evolution	<ul style="list-style-type: none"> <li>• Earth history</li> <li>• History of life on Earth</li> <li>• Mechanism of evolution</li> </ul>
2	• Ecology	<ul style="list-style-type: none"> <li>• Behavior and evolution</li> <li>• Simple population models</li> <li>• Community structure</li> <li>• Mass and energy flow through ecosystems</li> </ul>
3	• Molecules, Membranes, and Metabolism	<ul style="list-style-type: none"> <li>• Overview of biomolecules</li> <li>• Introduction to bioenergetics: respiration and photosynthesis.</li> <li>• Chemiosmosis in respiration and photosynthesis</li> <li>• Diversity of metabolic pathways</li> </ul>
4	• Genetics	<ul style="list-style-type: none"> <li>• Mendelian genetics</li> <li>• DNA and genomics</li> <li>• Gene regulation in prokaryotes and eukaryotes</li> </ul>
5	• Integrative Biology	<ul style="list-style-type: none"> <li>• Recombinant DNA technology &amp; bioethics</li> <li>• Genetic diseases as model biological systems</li> <li>• Immunology</li> <li>• Course synthesis</li> </ul>



F21	Class	Who	Lecture Topics	Website Reading
M 1			Start Module 1: Evolution	
23 Aug	1.1	Both	Strong Inference: What is science? What is the scientific method? What are data?	<a href="#">Strong Inference</a>
25 Aug	1.2	JM	What is life? What is evolution? An evolutionary framework for biology	<a href="#">What is life?</a> <a href="#">What is evolution?</a>
27 Aug	1.3	CS	Evolution by natural selection Evidence for evolution Common misconceptions	Evolution by Natural Selection
30 Aug	1.4	CS	Other mechanisms of evolution Mutation, drift, selection	<a href="#">Other mechanisms of evolution</a>
1 Sep	1.5	CS	Population Genetics Genetic variation Hardy-Weinberg equilibrium	<a href="#">Population Genetics</a>
3 Sep	1.6	CS	Species and speciation What is a species Mechanisms of speciation Reinforcement & hybridization Allopatric & Sympatric speciation	<a href="#">Speciation</a>
5 Sep			Scientist Spotlight 1 due at midnight	Extra credit assignment
6 Sep			HOLIDAY	
8 Sep	1.7	JM	Earth history Fossil record & radiometric dating Life in the remote past Life and changes in the physical environment	<a href="#">Earth History</a>
10 Sep	1.8	JM	Origin of life, RNA world History of life on Earth Patterns of biological diversity over time Key events in the history of life	Earth History <a href="#">Origin of Life</a>
13 Sep			Module 1 Exam (covers Module 1 content only)	
M 2			Start Module 2: Ecology	
15 Sep	2.1	JM	Intro to Ecology Physical Environment	<a href="#">Intro to Ecology</a>
17 Sep	2.2	CS	Behavioral ecology	<a href="#">Behavioral Ecology</a>

F21	Class	Who	Lecture Topics	Website Reading
20 Sep	2.3	JM	Population ecology	<a href="#">Population Ecology 1</a>
22 Sep	2.4	JM	Structure, dynamics, & regulation of populations Life histories Human populations through history Population management	Population Ecology 2
24 Sep	2.5	JM	Community ecology	<a href="#">Community Ecology 1</a>
26- Sep			Scientist Spotlight 2 due at midnight	Extra credit assignment
27 Sep	2.6	JM	Competition, Predation, parasitism, mutualism Keystone species Island Biogeography	<a href="#">Community Ecology 2</a>
29 Sep	2.7	JM	Ecosystems	<a href="#">Ecosystems 1</a>
1 Oct	2.8	JM	Energy and material flow through ecosystems Biogeochemical cycles Human impact on ecosystems	<a href="#">Ecosystems 2</a>
4 Oct			<b>Module 2 Exam (covers Module 2 content only)</b>	
	<b>M 3</b>		<b>Start Module 3: Molecules, Membranes, Metabolism</b>	Chemistry Review
6 Oct	3.1	CS	Biomolecules Small molecules Major classes of macromolecule	<a href="#">Biomolecules</a>
8 Oct	3.2	JM	Cellular Structure Lipid bilayer membranes Membrane composition Membrane transport (passive, active, facilitated)	<a href="#">Cells</a> <a href="#">Membranes and Transport</a>
10 Oct	SUN		<b>VIDEO PROJECT PLANS DUE (must be uploaded by midnight)</b>	
11 Oct			<i>HOLIDAY</i>	
13 Oct	3.3	JM	Energetics and enzymes Thermodynamics and free energy Catalysis and kinetics, and enzymes feedback regulation Redox reactions Membrane potential	<a href="#">Energy and Enzymes</a>

F21	Class	Who	Lecture Topics	Website Reading
15 Oct	3.4	JM	Cellular respiration Oxidation of food and reduction of an e-acceptor Electron transport chain Chemiosmotic generation of ATP Aerobic vs anaerobic respiration	<a href="#">Respiration, chemiosmosis and oxidative phosphorylation</a>
18 Oct	3.5	JM	oxidative pathways glycolysis, substrate-level phosphorylation pyruvate oxidation citric acid cycle regeneration of NADH, fermentation	<a href="#">Oxidative pathways</a>
17 Oct			Avoiding Plagiarism Exercise due at midnight	Extra credit assignment
20 Oct	3.6	JM	Evolution of mitochondria and eukaryotes Amino acid and lipid breakdown Consequences of defects in metabolism	<a href="#">Fermentation</a>
22 Oct	3.7	JM	Photosynthesis Overview: reduce CO <sub>2</sub> to organic C Pigments and light absorption Origin of photosynthesis: single PS, cyclic photophosphorylation	<a href="#">Photosynthesis</a>
24 Oct			Scientist Spotlight 3 due at midnight	Extra credit assignment
25 Oct	3.8	JM	Carbon fixation	<a href="#">Carbon fixation</a>
27 Oct	3.9	JM	Photosynthetic strategies C <sub>3</sub> and C <sub>4</sub> photosynthesis Recap: compare and contrast respiration & photosynthesis, mitochondria & chloroplasts.	<a href="#">C<sub>4</sub> plants</a>
29 Oct			<b>Module 3 Exam (covers Module 3 content only)</b>	
	<b>M 4</b>		<b>Start Module 4: Genetics</b>	
1 Nov	4.1	CS	Chromosomes and Cell Division Mitosis Meiosis	Mitosis and Meiosis
3 Nov	4.2	CS	Mendelian genetics	<a href="#">Mendelian genetics</a>
5 Nov	4.3	CS	Mendel's model genetic system Monohybrid and dihybrid crosses	<a href="#">Chromosome theory of inheritance</a>

F21	Class	Who	Lecture Topics	Website Reading
7 Nov	SUN		<b>VIDEO PROJECTS DUE (must be uploaded by midnight)</b>	
8 Nov	4.4	CS	Sex-linkage and pedigree analysis Probabilities of genetic outcomes Genetics of human disease	<a href="#">Patterns of Inheritance</a>
10 Nov	4.5	CS	DNA as the basis of inheritance Experimental evidence for role of DNA DNA structure Semi-conservative replication of DNA	<a href="#">DNA</a>
12 Nov	4.6	CS	Gene expression: DNA to protein Basics of transcription and translation	<a href="#">Gene expression</a>
14 Nov			Scientist Spotlight 4 due at midnight	Extra credit assignment
15 Nov	4.7	CS	Gene Regulation	<a href="#">Gene regulation</a>
17 Nov	4.8	CS	Prokaryotic and eukaryotic genomics Genome size and organization Mammalian genomes Genome evolution	<a href="#">Genomes</a>
	<b>M 5</b>		<b>Start Module 5: Integrative Biology</b>	
19 Nov	5.1	CS	Recombinant DNA	<a href="#">Recombinant DNA</a>
22 Nov			<b>Module 4 Exam (covers Module 4 content only)</b>	
24 Nov			<i>THANKSGIVING BREAK</i>	
26 Nov			<i>THANKSGIVING BREAK</i>	
29 Nov	5.2	CS	Stem Cells	<a href="#">Cloning and Stem Cells</a>
1 Dec	5.3	CS	Adaptive Immunity	<a href="#">Adaptive Immunity</a>
3 Dec	5.4	CS	Human Health and Evolution	<a href="#">Human health and evolution</a>
6 Dec	Synth	Both	Review Day	
10-Dec			<b>Final Exam (cumulative)</b>	<b>8:00 – 10:50 am</b>