

Why do I teach this course?

"All that stuff I was taught about evolution, embryology, the Big Bang theory, all that is lies straight from the pit of hell."

*U.S. Rep. Paul Broun, R-Ga
September 27, 2012*

Broun, a *medical doctor by training*, believes that the earth is less than 9000 years old and that everything was created in six literal days. He has served on the House Committee on Science, Space and Technology!

We must not expect our leaders to be any better informed or rational than the majority of their constituents. Therefore my overall goal is to help produce informed citizens when it comes to important issues related to science and technology and, in particular, biological science.

In the syllabus, I have listed several major learning objectives toward achievement of that goal. These objectives are far more about learning concepts and ways of thinking than they are about remembering facts. I hope that you will enjoy this approach to learning science and that Bioc 122 becomes one of your favorite courses at Rice.

Very truly yours,



David R. Caprette

Note to prospective BioSciences majors

In addition to the learning goals listed below, an objective of this course is to encourage students with strong interests in biology to consider a major in BioSciences. If you pursue a major in BioSciences you will need to take Introductory Biology (Bioc 201). Because of restrictions on taking both 122 and 201, you will need a special registration request form signed by Dr. Mike Gustin, gustin@rice.edu) in order to register for Bioc 201. He will be happy to sign the form for you.

Course learning goals

Objective 1: Understand the role of evolution, especially common ancestry and natural selection, in biology and biological research

No concepts are more fundamental to biology than common ancestry and natural selection (i.e., evolution). Physical explanations for the formation of the universe, solar system, appearance of life on earth, and origin of species are common themes that will run throughout the course. Regarding these explanations, each student should be able to:

- cite the evidence
- explain how the evidence led to the explanation
- explain the faulty reasoning behind myths and misconceptions surrounding the explanation

Objective 2: Obtain a working knowledge of fundamental concepts in biology

- learn the respective roles of types of macromolecules in living cells
- learn the roles of organelles in the function of cells, tissues, organs, and organisms
- learn the fundamentals of gene expression
- be able to provide the evidence and reasoning behind the theories of common ancestry (a.k.a., descent with modification or, simply, evolution) and natural selection

Objective 3: Develop a solid understanding of the process of science and an appreciation for the credibility of scientific research and theories

- be able to correctly explain what is meant by a scientific theory
- be able to distinguish what is in the realm of science from what is not in the realm of science
- be able to distinguish what a theory claims from what it does not claim
- learn to apply skepticism of a scientist
- learn to distinguish scientific fact from fiction, theory from conjecture, valid from spurious arguments, and to distinguish truth from myth or misconceptions
- be able to cite examples of the slow, deliberate, progressive nature of science
- be prepared to challenge spurious claims and arguments that misrepresent scientific concepts and/or the process of science

Objective 4: Understand the consequences of gene expression

- be able to explain how gene expression leads to phenotypes, including complex and monogenic traits
- be able to explain long term changes in gene expression in the form of evolution of new species
- be able to cite examples of normal changes in gene expression, e.g., during development
- be able to cite examples of how gene expression can go wrong - e.g., cancer as an example of uncontrolled gene expression

Objective 5: Be able to recognize and access credible sources of information in biological and biomedical science

Objective 6: Develop (or reinforce) a strong desire to learn more about biology and to make informed decisions concerning political and social issues related to biology

Learning goals, policies, schedule

Policies, Topics, and Activities for Spring 2016

NOTE: This course syllabus is subject to change; in the event of changes adequate notice will be provided

Most of the learning in this course will take place in class, through hands-on activities, group work, and of course some lecture material. There is no textbook. We will start with an introduction to the light microscope and microscopy laboratory and learn some fundamental biology of cells, tissues, and organs. We will study the process of science, evolution of species on earth, genetics of complex traits, and special topics in biology.

Course instructor

Dr. David Caprette, ABL 327 (Anderson Biological Laboratories, third floor), 713-348-3498, caprette@rice.edu. Please notify Dr. Caprette of any problem concerning attendance, grading, or course materials. For office hours please see the table at the bottom of this page.

Honor code policy

Students must work individually on all assignments posted in Tests & Quizzes, with no collaboration or other assistance unless otherwise noted. All assignments are otherwise "open resource," meaning that students may have access to their notes, posted resources and other reference materials while working on an assignment. You must answer homework questions in your own words. **Do not plagiarize.** For example, you must not answer a question with a quotation from a web site. Please consult the document on academic integrity that I've posted in Resources if you are not sure what constitutes acceptable behavior.

Absences, late arrivals, and late assignments. The honor code applies to requests to be excused from participation or for permission to submit an assignment late. Legitimate excuses for missing class include circumstances beyond your control such as illness, death in the family, travel for athletics, graduate school interviews, etc. Students arriving late to class without an acceptable excuse will receive partial credit for attendance. Any student experiencing a problem submitting an assignment must contact the instructor immediately. Ten percent of the available score will be deducted per day an assignment is late.

Learning activities

In class we will conduct group work, discussions, and hands-on activities to go along with the lecture material. We will also use "clicker slides" with an audience response system to check your understanding of concepts and to address misconceptions. Every student is expected to arrive on time each day with a working i>Clicker+ handset. NOTE: To promote full participation in class and to avoid distractions, the instructor may ask you to silence or shut off electronic devices and/or to keep your laptops closed.

Each pre-class preparation assignment, day's attendance, and minute question counts equally toward your learning activity score.

Pre-class preparation. Many classes will require completing a pre-class assignment in Tests & Quizzes. The questions are designed to make you think and to ready you for a classroom discussion. Some of the pre-class assignments will be graded and a score recorded. Graded assignments will be identified as such.

- You will receive full credit for a pre-class assignment if you complete all of the questions (correctly, if the assignment is graded) **and** attend the corresponding class
- If you complete a pre-class assignment but miss the corresponding class, then the assignment will not count toward your course grade
- If you fail to complete a pre-class assignment a zero will be recorded

Attendance and participation. Your on-time attendance and full participation in class activities are essential. You will receive a score of 100% for each day that you arrive in class on time and give the class your full attention and effort.

Minute questions. In many classes you will be given 1 to 3 minutes to answer a question on an index card that will be passed out some time during class, often at the very start. Minute questions will be graded and will count toward your final grade in the class. Because minute questions assess students' retention of material presented in the prior class, students missing a class due to illness or family emergency will not be held responsible for correctly answering a minute question during the following class. Students missing class due to travel or other planned absences are expected to review the missed material on their own, and will be responsible for the corresponding minute question.

Homework assignments

All homework assignments will be completed on Owl-Space and will become available at least one week before they are due. Questions will be a mix of short answer/essay and multiple choice questions. The due date for each homework assignment is posted in the course syllabus. It is advisable to start early in case there is a connection failure. The assignments are not timed and answers can be saved and an assignment re-visited repeatedly prior to submission. I will do my best to grade each assignment within a week of submission and will provide feedback on most of the questions (and all answers that do not receive full credit) when I release the grade.

All HW assignments are to be completed individually, with answers written in your own words and with no help from any other individual – no collaboration. You may access your own notes, the PowerPoint presentations, texts, web resources, etc. If you do use an outside source then write the answer in your own words and if the information is not considered to be common knowledge, cite the source.

Exams

The two midterm exams will be given in class. The final exam will be not be cumulative, however some questions will revisit principles that were brought up earlier in the course. A student must provide at least a week's advance notice if he/she will miss an exam due to circumstances beyond his or her control. In such cases the student may take the exam early at an alternative time and place. Only in the case of a sudden illness, family emergency, or other unexpected event will a makeup exam be given after an exam is missed. The instructor reserves the option of providing makeup exams that are different from the corresponding scheduled exams.

Students with disabilities

Any student with a documented disability needing adjustments or accommodations is requested to speak with the course coordinator during the first two weeks of class. All discussions will remain confidential. Such students should also contact Disability Support Services in the Ley Student Center.

Course grade

Please check for feedback on homework assignments (Tests & Quizzes) and on your score for learning activities (Gradebook). You will receive feedback on learning activities at three to four week intervals so that you can correct any errors.

- Learning activities, 20%
 - Each pre-class preparation assignment, day's attendance, participation score, and minute question counts equally toward the total.
- Homework assignments, 30%
 - Each homework assignment counts equally toward the total
- Exams, 50%
 - Both midterm exams count for 15%
 - The final exam counts for 20%

Grade cutoffs are as follows: $\geq 97\%$ = A+; 93-97 = A; 90-93 = A-; 87-90 = B+; 83-87 = B; 80-83 = B; 77-80 = C+; 73-77 = C; 70-73 = C-; 67-70 = D+; 63-67 = D; 60-63 = D-

Schedule

BIOC 122 will meet Tuesdays and Thursdays from 10:50 am to 12:05 pm in Rayzor Hall Rm. 123 except for Thursday Jan 14, when we will meet in the laboratory in ABL 141.

Resources. Each Powerpoint presentation listed in the syllabus will be posted as a pdf (slides only) immediately following the corresponding presentation. Links to web resources and additional files such as "handouts" may also be posted in the Resources section.

Green – to be completed before class

Blue – assignment due by the end of the day (midnight)

Red – holiday or break

Day/date	Topic	Assignment(s)	Resource(s)
Tues Jan 12	Day 1: Introduction to the course, instructor, active learning, activities for the first two weeks	<ul style="list-style-type: none"> • Have an i>Clicker+ handset ready to go before class; register your clicker (Tests & Quizzes) 	Academic_integrity.pdf, 01_Introduction.pdf
Thurs Jan 14	Day 2: Microscopy laboratory, ABL 141	<ul style="list-style-type: none"> • Peruse the resources in advance of class • Complete "Day 02 preparation" (feedback to be released at noon Jan 19) 	Why_we_don't_drink.pdf Elite_8_handout.pdf
Tues Jan 19	Day 3: Preparation for the "Elite eight" debate, including group behavior exercise, research on cell organelles, organelle draft	<ul style="list-style-type: none"> • Peruse the resource in advance of class • Bring a laptop and/or general biology text if available, and your notes on organelles 	Elite_8_handout.pdf
Thurs Jan 21	Day 4: Organelles "Elite 8" tournament	<ul style="list-style-type: none"> • Review your notes and be ready to debate! 	Elite_8_handout.pdf
Tues Jan 26	Day 5: Review of organelles, phylogeny of prokaryotes & eukaryotes, roles of organelles in metabolism	<ul style="list-style-type: none"> • Complete "Day 05 preparation" (feedback: noon Jan 28) 	Thin_air.pdf

Thurs Jan 28	Day 6: Properties and biological importance of water	<ul style="list-style-type: none"> Complete "Day 06 preparation" (feedback: noon Feb 1) 	Sixty_percent.pdf
Tues Feb 2	Day 7: Bone, blood, circulation	<ul style="list-style-type: none"> HW1: Cells & organelles (feedback: noon Feb 5) 	Red_stuff.pdf
Thurs Feb 4	Day 8: The process of science	<ul style="list-style-type: none"> Complete "Day 08 preparation" (feedback: noon Feb 8) 	Science.pdf
Tues Feb 9	Day 9: Origin of species – evidence for descent with modification	<ul style="list-style-type: none"> Complete "Day 09 preparation" (feedback: noon Feb 11) 	Change.pdf
Thurs Feb 11	Day 10: Origin of species – evidence for natural selection	<ul style="list-style-type: none"> HW2: Water, bone, blood, and circulation (feedback: noon Feb 15) Complete "Day 10 preparation" (feedback: noon Feb 15) 	Fitness.pdf
Tues Feb 16	Day 11: Natural selection continued		Fitness.pdf; Case_studies.pdf
Thurs Feb 18	Day 12	<p style="text-align: center;">FIRST MIDTERM EXAM Exam will include material from all topics up to and including descent with modification; there will be no questions on natural selection</p>	
Tues Feb 23	Day 13: Evolution of altruistic behavior		Altruism.pdf
Thurs Feb 25	Day 14: Genetics pt. 1 – Phenotypes, genotypes, and chromosome theory	<ul style="list-style-type: none"> Complete "Day 14 preparation;" start early - you may have to do some background research (feedback: noon Feb 29) 	Dodger.pdf
Tues-Thurs Mar 1 and 3	SPRING BREAK (NO SCHEDULED CLASSES)		
Tues Mar 8	Day 15: continue Genetics pt. 1		Dodger.pdf
Thurs Mar 10	Day 16: Genetics pt. 2 – Discovery of DNA	<ul style="list-style-type: none"> HW3: Natural selection and altruism (feedback: noon Mar 14) 	Photo_51.pdf
Tues Mar 15	Day 17: Genetics pt. 3 – DNA replication, transcription, translation, and the central dogma	<ul style="list-style-type: none"> Complete "Day 17 preparation" with the aid of the recommended on-line videos (feedback: noon Mar 17) 	Dogma.pdf
Thurs Mar 17	Day 18: Genetics pt. 4 – Mutations, human genetic diseases, pedigrees	<ul style="list-style-type: none"> Complete "Day 18 preparation" (feedback: noon Mar 21) 	Woody.pdf

Tues Mar 22	Day 19: Genetics pt. 5 – An introduction to gene regulation; Belyaev's arctic fox experiment	<ul style="list-style-type: none"> • HW4: Genetics pts 1 through 4 (feedback: noon Mar 24) • Complete "Day 19 preparation" (feedback: noon Mar 24) 	lac_operon.pdf, Altitude.pdf, Foxes.pdf
Thurs Mar 24	Day 20: Developmental biology pt. 1	<ul style="list-style-type: none"> • Complete "Day 20 preparation" (feedback: noon Mar 28) 	Immortality.pdf
Tues Mar 29	Day 21	<p>SECOND MIDTERM EXAM Exam will include questions on natural selection, altruism, and genetics parts 1-4; there will be no questions on genetics parts 5 or 6 or on developmental biology</p>	
Thurs Mar 31	MIDTERM RECESS (NO SCHEDULED CLASSES)		
Tues Apr 5	Day 22: Developmental biology pt. 2		Sex.pdf
Thurs Apr 7	Day 23: Neuroscience pt. 1	<ul style="list-style-type: none"> • Complete "Day 23 preparation" (feedback: noon Apr 11) • HW5: Genetics parts 5 and 6 (feedback: noon Apr 11) 	Animal_electricity.pdf
Tues Apr 12	Day 24: Neuroscience pt. 2		Learning.pdf
Thurs Apr 14	Day 25: Neuroscience pt. 3	<ul style="list-style-type: none"> • HW 6: Development pts. 1 and 2 (feedback: noon Apr 21) 	Perception.pdf
Tues Apr 19	Day 26: Bacteria, viruses, and antibiotics	<ul style="list-style-type: none"> • Complete "Day 26 preparation" (feedback: noon Apr 21) 	Resistance_is_futile.pdf
Thurs Apr 21	Day 27: Personal Genomics		Who_are_you.pdf
TBA		<p>FINAL EXAM Questions will be based on genetics part 5 through personal genomics; no questions will specifically address prior material, however you may need to apply principles introduced earlier in the course</p>	

Instructor office hours

Week beginning	Monday	Tuesday	Wednesday	Thursday	Friday
Jan 11	10 am - noon	1 - 3 pm	10 am - noon	1 - 3 pm	no office hrs
Jan 18	MLK	1 - 3 pm	10 - 11 am	1 - 3 pm	no office hrs
Jan 25	10 am - noon	1 - 3 pm	10 - 11 am	1 - 3 pm	no office hrs
Feb 1	10 am - noon	1 - 3 pm	10 am - noon	1 - 3 pm	no office hrs
Feb 8	10 am - noon	no office hrs	10 am - noon	1 - 3 pm	no office hrs
Feb 15	10 am - noon	1 - 3 pm	10 am - noon	1 - 3 pm	no office hrs
Feb 22	10 am - noon	1 - 3 pm	10 - 11 am	1 - 3 pm	no office hrs
Feb 29	SPRING BREAK				
Mar 7	10 am - noon	no office hrs	10 - 11 am	no office hrs	no office hrs
Mar 14	10 am - noon	no office hrs	10 am - noon	no office hrs	no office hrs
Mar 21	10 am - noon	2 - 3 pm	10 am - noon	2 - 3 pm	no office hrs
Mar 28	10 am - noon	no office hrs	10 - 11 am	no office hrs	no office hrs
Apr 4	10 am - noon	no office hrs	10 am - noon	no office hrs	no office hrs
Apr 11	10 am - noon	1 - 3 pm	10 am - noon	1 - 3 pm	no office hrs
Apr 18	10 am - noon	no office hrs	10 - 11 am	1 - 3 pm	no office hrs