Biology 141 - Foundations: Cellular Biology
Term 2, 2018

SCHEDULE

Day	Topic	Readings
M 9/24		
9:00-11:00	Introduction to the Course Why become a Scientist?	**#1-Status & Trends Caribbean Coral Reefs**
1:00-3:00	Coral Reefs	
T 9/25		
9:00-11:00	DNA & DNA Replication	Ch 4
1:00-3:00	DNA Replication Introduction to Dog DNA Fingerprint	Ch 15
W 9/26		
9:00-10:00 (Lab)	The Case of the Chewed Shoes (pour gels)	
10:00-11:00 (Lab)	Introduction to Human DNA Fingerprint	
12:30-1:00 (Lab)	The Case of the Chewed Shoes (load gels)	
1:00-2:30	Protein Structure	Ch 3
2:30-3:00 (Lab)	The Case of the Chewed Shoes (view gels)	
	Self-Quiz #1 Status & Trends Caribbean Reefs-9:00 am	
Th 9/27		
9:00-10:00	Enzymes	Ch 8.3
10:00-11:00 (Lab)	Human DNA Fingerprint (cheek cell DNA)	**#2-Knowlton & Jackson 2008**
12:30-2:00	Cell Structure and Function	Ch 7
2:00-3:00 (Lab)	Human DNA Fingerprint (PCR)	
F 9/28		
9:00-10:00	Cell Structure and Function	Ch 7
10:00-11:00 (Lab)	Human DNA Fingerprint (enzyme digestion)	
1:00-3:00	Cell Structure and Function	Ch 7
	Self-Quiz #2 Mullis 1990 Scientific American-9:00 am	
M 10/1		
9:00-10:00	Introduction to Fire Coral	Tepper et al. 2012 Marine Science
10:00-11:00 (Lab)	Human DNA Fingerprint (pour gels)	
12:30-1:15(Lab)	Load Agarorse Gels	
1:15-2:30	Introduction to Fire Coral	
2:30-3:00 (Lab)	View Agarose Gels	
	PCR DNA Homework Assignment Due-9:00 am	
T 10/2		
9:00-10:00	Transcription	Ch 16
10:00-11:00 (Lab)	PCR Amplification of Fire Coral rDNA I	
1:00-3:00	Transcription	Ch 16
W 10/3		
9:00-10:15	Transcription & Translation	Ch 17
10:15-11:00 (Lab)	Agarose Gels-Fire Coral rDNA-I	
12:30-1:15 (Lab)	Run Agarose Gels-Fire Coral rDNA-I	
1:15-2:30	Translation	Ch 17
2:30-3:00 (Lab)	Analyze Agarose Gels-Fire Coral rDNA-I	

Th 10/4

9:00-11:00	**EXAM 1**	
1:00-2:00 (Lab)	PCR Amplification of Fire Coral rDNA II	

F 10/5

9:00-10:00	Cnidarians & Protists	Cnidarian e-handout
10:00-11:00 (Lab)	Agarose Gels-Fire Coral rDNA-II	
12:30-1:15 (Lab)	Run Agarose Gels-Fire Coral rDNA-II	
1:15-2:30	Cnidarians & Protists	
2:30-3:00 (Lab)	Analyze Agarose Gels-Fire Coral rDNA-II	

M 10/8

9:00-10:15	Fire Coral Sequence Data	Tepper et al. 2012 Marine Science
10:15-11:00 (Lab)	PCR Sequencing of Fire Coral rDNA	
12:30-3:00	**Student Pre-Proposal Presentations**	

T 10/9

9:00-11:00	Sequencing Explanation	
1:00-3:00 (lab)	Run Sequencing Gel	
	PCR Data Analysis of Coral rDNA Due 9:00 am	

W 10/10

9:00-11:00	Fire Coral and *Symbiodinium*	Samayoa et al. 2017
	qPCR	Valasek & Repa 2005
12:30-3:00 (lab)	Making Sense of Sequence Data (worksheet & your sequence data)	
	Sequencing Homework Assignment Due 9:00 am	

Th 10/11

9:00-11:00	Symbiosis and Coral Bleaching
12:30-3:00 (lab)	qPCR of Fire Coral/*Symbiodinium*
	Coral DNA Sequence Data Analysis Due 9:00 am

F 10/12

9:00-11:00	Symbiosis and Coral Bleaching
12:30-3:00 (lab)	Making Sense of qPCR Data
	qPCR Homework Assignment Due 9:00 am

M 10/15

9:00-11:00	Group Meetings-Proposal & qPCR Data Interpretation
1:00-3:00	Group Meetings-Proposal & qPCR Data Interpretation

T 10/16

9:00-11:00	Group Meetings-Proposal & qPCR Data Interpretation
3:00	**Written Research Proposal Due-3:00 PM**
	Lab qPCR Data Analysis Due-3:00 PM

W 10/17 **EXAM 2**

Instructors

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Textbook

There is no required textbook for this class. The chapter **suggested** reading assignments are from Freeman's Biological Science 5th and 6th Editions published by Pearson. I have left my copies in the classroom for your use. Additionally, I have also placed Freeman's 2nd, 3rd and 4th editions of the textbook and other textbooks in the classroom for your use. If you are interested in looking at other introductory biology textbooks, please ask me. I have numerous introductory textbooks in my office that I can loan to students. **Please be sure to return my textbooks at the end of the term**.

Course Goals

In designing this course I thought about two questions. First, I considered courses I took as an undergraduate that really inspired my interest in science and second, I considered why I became a scientist. I quickly concluded that it was **NOT** the introductory biology courses that I took as an undergraduate that led to my decision to pursue a scientific career. The introductory sequence seemed dry, content driven and void of any hands-on creative scientific experimentation. However, I do remember an upper-level course I took in animal physiology in which the professor designed the course around his research interest and allowed us to become involved in his research. The professor's research dealt with how krill (a small crustacean that is a source of food for whales) managed to live in the oxygen minimum layer in the ocean. Not only was this the class that inspired my interest in science, but it was also the course that led to my decision to become a scientist. This professor's enthusiasm for his research was relentless and infectious.

I have designed a BIO 141 course that I hope will show you why I became a scientist and why I love what I do. I have removed some (not all) of the traditional content from the BIO 141 course I have taught in the past and instead, designed a course that will get you involved in the coral biological research I conduct in my lab. The content that I removed from BIO 141 will be covered in BIO 205 (Cell and Molecular Biology) so you do not have to worry about missing any important content. Notice I said that I removed "some" of the traditional content. In order to really understand the research I conduct, there is some content (especially related to DNA) that we must cover. My goal is to show you why science is exciting early in your college career. At the end of the course when you complete evaluations, you can let me know whether I have achieved my goal.

Learning Objectives

- Students will develop skills in critical reading of original scientific literature.
- Students will learn to participate actively in their own education by developing and conducting a research project designed around coral reef biology.
  -Students will design experiments and generate and interpret their own data.
  -Students will understand the relationship between their experiments and concepts covered in class.
- Students will understand the role of subcellular biology in defining biological processes.
- Students will come to understand how their level of understanding of a biological process increases by using a historical approach to science.
- Students will appreciate that recent advances in biology are due to our ever increasing depth of understanding of basic biological processes.
- Students will understand the language of subcellular biology and effectively communicate principles in both written and oral forms.

- Students will solve a variety of problems using creative thinking skills and analytical skills in the lab.

This course supports the Educational Priorities and Outcomes of Cornell College with emphases on knowledge, inquiry, reasoning, communication, and vocation.

Lab

The lab component of the course is designed around a few research questions in coral biology that my lab and other labs around the world are actively investigating. However, in order for you to participate in the research project, you must first become familiar with some basic molecular techniques that DNA researchers routinely use in their labs.

Human DNA Fingerprint Lab

Genetic uniqueness is a fact of life. From generation to generation, characteristics are inherited, combined, and assorted among individuals through a common denominator, the chemical deoxyribonucleic acid or DNA. Differences in DNA sequence between individuals are detected by using a technique called DNA fingerprinting. This technique has wide-ranging applications. I have two labs designed to illustrate some of the uses of DNA fingerprinting. The first lab is a crime scene involving a chewed shoe and four dogs. In the second lab, you will explore your ability to taste phenylthiocarbamide (PTC) by examining your own DNA fingerprint.

Coral Reef Biology

I work with a group of corals called fire coral (*Millepora*). You will be working with coral DNA samples that students have collected from our research trip to Belize and The Bahamas You will be characterizing these coral samples by amplifying and sequencing their ribosomal DNA (rDNA) and determining what specific symbionts live within these coral samples (also determined by examining DNA). The experiments will be explained in class. An explanation and protocols of the experiments are found on Moodle.

Office Hours:

I am usually in my office at 8:00 AM until about 6:00 PM and you are free to stop by my office at any time. I can also arrange to meet with you in the evenings and/or on weekends. If you are having problems with the material covered in class, please see me as soon as possible.

Lecture:

Slides used in lecture and lab are posted on the college's network. Open assignments on 'srv2'(K:), open CTepper, open 141 and finally open lecture. The slides can also be found in Moodle (BIO 141). **I recommend that you either bring your computer or a copy of the slides to class each day**.

Assignments and Points:

Self-Quiz #1	W	9/26	10 pts
Self-Quiz #2	F	9/28	10 pts
Homework #1	M	10/1	25 pts.
Exam 1 (lectures & labs)	Th	10/4	100 pts.
Pre-proposal Group Presentations	M	10/8	50 pts.
Homework #2	T	10/9	20 pts
Homework #3	W	10/10	25 pts
Homework #4	Th	10/11	25 pts
Homework #5	F	10/12	25 pts
Homework #6	T	10/16	15 pts.
Group Research Proposal Paper	T	10/16	50 pts.
Exam 2 (lectures & labs)	W	10/17	100 pts
TOTAL			**455 pts.**

90-100%	A
85-89%	A-
80-84%	B+
75-79%	B
70-74%	B-
65-69%	C+
60-64%	C
55-59%	C-
50-54%	D+
45-49%	D

Homework

There are **six** homework assignments that must be completed (typed) and submitted at 9:00 am on the date indicated in the syllabus. The homework assignments assess your understanding of the material we are covering in class and assess your ability to interpret results and draw cocnlusions from our experiments.

Self Quizzes

There are **two** self-quizzes that cover reading assignments that will help you select a topic for your research proposal. Due dates for the self-quizzes are indicated in the syllabus. You need to read the papers and ask and answer **five different questions** based on your understanding of the assigned paper. These self-quizzes are worth 10 points each for a total of 40 points. For each question and answer, you can earn 1 point for the question and 1 point for the answer. Points earned for the questions will be awarded based on the quality and complexity of the question. Straight memorization questions like "What is bleaching" will not earn any credit. However, the question "What are the processes involved in coral bleaching?" will earn credit. Answers will be awarded credit based on the quality and correctness of your answer. The self-quizzes must be submitted (typed) at 9:00 am on the due date.

Exams:

Exams last approximately 2 hours and will be a combination of short answers (a paragraph of writing) and essay questions. Exams will cover material in both the lecture and lab. If you understand the material and convey that understanding in a clear and concise manner, you will score well on the exams. You will be asked to synthesize and apply biological concepts to new problems. Copies of old exams are found on my Web page (http://people.cornellcollege.edu/ctepper/141.html) or Moodle.

Attendance:

Students are expected to attend all lectures and labs. If you have a legitimate reason for missing class or a deadline, send me an e-mail **before class begins**. For each unexcused absence (no notification before morning or afternoon class begins), 10 points will be deducted from your final grade.

Review Sessions:

Informal review sessions are scheduled the evening before each exam. These review sessions are for you to ask questions concerning the material covered in class. In order to take advantage of these sessions, come prepared with questions.

Drop Policy:

You may drop the course at any time in the first three days**.** In order to drop the class on the fifteenth day you must have attended all classes, completed all assignments, and based on my analysis of your work, put the appropriate effort into learning the material.

Academic Honesty Expectations:

Cornell College expects all members of the Cornell community to act with academic integrity. An important aspect of academic integrity is respecting the work of others. A student is expected to explicitly acknowledge ideas, claims, observations, or data of others, unless generally known. When a

piece of work is submitted for credit, a student is asserting that the submission is her or his work unless there is a citation of a specific source. If there is no appropriate acknowledgement of sources, whether intended or not, this may constitute a violation of the College's requirement for honesty in academic work and may be treated as a case of academic dishonesty. The procedures regarding how the College deals with cases of academic dishonesty appear in The Compass, our student handbook, under the heading "Academic Policies – Honesty in Academic Work."

Students with Disabilities:
"Cornell College makes reasonable accommodations for persons with disabilities. Students should notify the Coordinator of Academic Support and Advising and their course instructor of any disability related accommodations within the first three days of the term for which the accommodations are required, due to the fast pace of the block format. For more information on the documentation required to establish the need for accommodations and the process of requesting the accommodations, see http://www.cornellcollege.edu/academic-support-and-advising/disabilities/index.shtml."