

## **Biology 120: Concepts in Biology Spring 2008**

Instructor: Dr. Steven Nilsen  
Email: spnilse@emory.edu  
Office: 105 Pierce Hall

Office Phone: 770-784-4678  
Office Hours: 2:00-3:30 Tuesdays and  
Thursdays

### **Required Texts**

- Biology: The Unity and Diversity of Life 11<sup>th</sup> Edition, Starr & Taggart. I am such a strong proponent of *reducing and reusing manufactured goods*, that I will not discourage you from buying an older edition of the text as the content has not changed significantly between the 10<sup>th</sup> and 11<sup>th</sup> edition. I haven't seen the 9<sup>th</sup> edition, but it may be fine too.
- Laboratory Manual for Concepts in Biology 6<sup>th</sup> Edition, various sources, assembled by Oxford College, available for purchase from Ms. Budensiek, for \$15.00 (cash or check only) in Pierce Rm. 107.

### **Course Objectives**

This course is designed for non-science majors, but not as a redux of your high school (HS) biology class. There are three large objectives to this course. First, we will cover the basic principals of molecular biology and use this knowledge to develop a contemporary understanding of evolution, from life's origins to the biological basis of complex social behavior, like homosexuality.

Second, we will examine human life with three large goals: 1) how we survive as individuals, and 2) how we survive as a species, and 3) how our species impacts the world around us. This will be accomplished by studying how we metabolize food to produce biological "energy", how our immune systems keep us from being eaten by bacteria, and how our nervous system gives us the ability to respond to our environment. From the perspective of our species, we will study reproduction, development, the process of aging, a great variety of genetic diseases many people must deal with and the consequences of our medically-enabled long life span. Despite disease, famine and catastrophe, our species has grown to enormous proportion. We will discuss how preserving the human population has inadvertently disrupted the environment and destroyed ecosystems. We will consequently discuss how ecosystems function and what features make them both fragile and robust.

Third, we will develop a greater appreciation for the diversity and complexity of life. This final objective will be accomplished in the laboratory and in the field. In the lab, we will conduct a variety of engaging experiments that will enrich your appreciation for life's complexity as well as develop your appreciation of the scientific method. To appreciate diversity we will all examine the species that make an aquatic ecosystem in our Oxhouse Pond. Additionally, you will enrich your personal appreciation of nature by penning weekly observations into a "nature journal".

## Lecture Syllabus

Tuesdays and Thursdays 11:30-12:45, Room 102

	<u><b>I. What is life made of?</b></u>	<u><b>Reading</b></u>	<u><b>Due</b></u>
Th Jan 17	Introduction & Principles of life	p. 1-10	<b>J 1-2</b>
T Jan 22	Components of Life	p. 18-19, 38-48	
Th Jan 24	Components of Life II	p. 50-59, 76-88	
T Jan 29	Cell Division	p. 144-163, 196-199	
Th Jan 31	Genes and Inheritance	p. 168-175, 179-181; 188, 190-195	
T Feb 5	The Central Dogma	p. 142-143; 210-213, 218-222, 226-234; Ridley preamble	
<b>Th Feb 7</b>	<b><i>Exam I (Principles – Inheritance)</i></b>		
	<u><b>II. How did life come to be?</b></u>		
T Feb 12	Evolution I: Evidence, selection	p. 262-271,274-284,288-299	<b>J 3-5</b>
Th Feb 14	Evolution II: Speciation	p. 300-305,310-315	
T Feb 19	Evolution III: Contemporary view	Ridley article	
Th Feb 21	Life’s Origin and Early Evolution	p. 318-330	
T Feb 26	Photosynthesis & Respiratory Sys	p. 108-115, 702-709	
Th Feb 28	Digestive Sys & Nutrition	p. 722-733	<b>Outline</b>
T Mar 4	Circulatory Sys & Metabolism	p. 658-661, 664-671	
<b>Th Mar 6</b>	<b><i>Exam II (Central Dogma - Nutrition)</i></b>		
<b>Mar 11-13</b>	<b><i>Spring break!</i></b>		
	<u><b>III. On being human</b></u>		
T Mar 18	Nervous System I:	p. 576-585, 588	<b>Paper</b>
Th Mar 20	Nervous System II: Input	p. 600-613	
T Mar 25	Nervous System III: Moods	p. 594-595	
Th Mar 27	Staying in Control & Keeping Alive	p. 674-675, 678-690, 694-697	<b>J 6-10</b>

	<u>III. On being human</u>	<u>Reading</u>	<u>Due</u>
T Apr 1	Catch up day		
<b>Th Apr 3</b>	<b><i>Exam III (Circulation – Keeping Alive)</i></b>		
T Apr 8	Fountains of Youth		
Th Apr 10	Death on the Horizon	Gawande article	
	<u>IV. The great dilemma</u>		
T Apr 15	Ecosystems	p. 842-863	
Th Apr 17	Humans versus biodiversity	p. 463-473, 812-819, 822-823, 832-837	
T Apr 22	Agricultural politics	Sharpin article	
Th Apr 24	Biomedical politics	TBA	
T Apr 29	TBA	TBA	<b>J 11-15</b>
<b>T, May 6</b>	<b><i>Final Exam 2:00-5:00 (50% new, 40% comprehensive, 10% magic)</i></b>		

### Lab Syllabus

**Tuesday, 2:30-5:30, Room 119**

Jan 22	Topic 1, Scientific Investigation
Jan 29	Topic 2, Microscopes/Cells
Feb 5	Topic 3, Cell Membranes/Transport
Feb 12	Topic 4, DNA purification and analysis
Feb 19	<b><i>lab practical 1</i></b> and Library Meeting
Feb 26	Topic 5, Digestion
Mar 4	Topic 6, Circulation/Respiration
Mar 11	Spring break!
Mar 18	Topic 7, Reproduction/Development
Mar 25	<b><i>lab practical 2</i></b> and Presentation Day I
Apr 1	Presentations Day II
Apr 8	Topic 8, Aquatic Ecology
Apr 15	Topic 9, Bacteriology
Apr 22	Topic 10, Animal Behavior
Apr 29	<b><i>lab practical 3</i></b>

**A word on fruit flies:** *Drosophila melanogaster* (common fruit fly) is my model organism of interest. Model organisms are studied by large groups of scientists so that their data can be compared and a complete understanding of some forms of life might be synthesized. Because of this we will use them as much as possible as auxiliary aspects to the lab topic.

**Examination Component, and how to prepare:** Most of your grade will come from exam scores. Lecture and final exams will consist mostly of material from lectures; you will be given the lecture slides, but good note taking skills will be strongly rewarded. There will be quizzes given at my discretion, but they will come with at least a few days of notice and none will be worth more than 15 points. I may choose to use fewer points on quizzes than planned and expand the value of an exam, accordingly.

Laboratory practical exams will depend on your recognition and recollection of some of the things we did during the lab sessions. To help assist you in preparing for the lab practical exams, you will have a supplementary review session for each lab conducted by your lab TA, Rachel Abraham. The time of these sessions will be specified on the class conference site by Rachel.

Your textbook contains more topics and information on those topics than we want to cover. Thus, you are expected to study only the content that was covered lecture and found in the chapters of the text that are listed on this syllabus at the level of detail consistent with the lecture. All the chapters go in to further detail than you need to know, so taking good notes and paying careful attention is critical to knowing how to prepare for the exams.

**Written Course Component:** A fair portion of your grade will be on writing assignments. There will be one major writing assignment requiring you investigate an inherited disease or widely divergent phenotype common in human development (10-12 double spaced pages). Via these investigative term papers we will teach each other about a diversity of human genetic conditions, how they manifest, are dealt with and how they impact society. Each person will give a 10 min presentation and answer question about her/his topic.

The journal is focused on developing your powers of observation and deductive reasoning. During lab or outside of the classroom, you will write in your journal as though you were a mid-nineteenth century naturalist, making raw observations and discussing their implications. There will be specific instructions provided and sufficient feedback on your individually graded journal entries, such that this should be an enjoyable personal investigation of the world around you unlike anything you've done before.

**Non-textbook Readings:** Several supplementary readings will be distributed through the classroom or the online class discussion list. These will provide information and perspective on topics central to biology today. Some of these writings come out of books intended for the general audience, but I find many engaging current topic articles published in *The New Yorker*.

**Suggested Readings:** If you find yourself hankering for a good natural history (or biology) book written for the general public, any of these books are winners and

build on topics we will cover in this course. They are not the most recent, but they each continue to be repressed, but each impacted me deeply when I was in college.

- The Selfish Gene by Richard Dawkins was *the* book that motivated me to my particular field of study. Dawkins provides, in this book, a new manifesto on how evolution works that reduces the organism down to the genes within the genome that designs it.
- Our Stolen Future by Theo Colborn explains why life on this planet is likely to never be as healthy as it was prior to the introduction of plastics. It is quite dense, but anybody who is interested in the currently produced environmental toxins should read this. Although, considering all the other crises the world faces this is only a small part of the puzzle.
- Genome by Matt Ridley. One of the best romps through the human genome I've read. Written by a journalist who is highly praised for his capability to explain complex concepts to popular audience. We will read one chapter from this book.
- Grass Roots by Paul Gruchow is probably not a famous book, but he's a enlightening author from Minnesota who writes beautifully of his experience growing up on a farm and his love for the prairie, which has disappeared. This will teach you about the heartland of the US: how it was cared for better by small farmers before agriculture became dominated a massive conglomerates with only profit on their minds. Over a decade before the re-popularization of the food crisis, it had already been identified and few acted. Do you think people will listen now? We will discuss this topic.
- Sand County Almanac by Aldo Leopold is a lovely portrayal of nature through the eyes of a Wisconsin conservationist. He writes many beautiful entries on the joy and beauty of wilderness. The book culminates with a profound philosophy on the idea of land stewardship and ownership – that it belongs to nobody and needs to be respected by everybody.
- Man Meets Dog by Konrad Lorenz was the first book by Lorenz I ever read. Lorenz is the father of ethology, or the scientific study of animal behavior. He lived his life making brilliant observations of the behavior of any animal he could learn to rear outside of nature, which for him seemed limitless. This book describes canine behavior to the general reader better than anybody has done before and has since. Anyone whose ever enjoyed owning a dog should *definitely* read this book – plus, it's short.

**Honor Code:** You are bound to the declarations of your collegiate Honor Code. Anything in the written word by hand or by email must be free of plagiarism. Specific exam content must not get discussed unless *all* students have taken the exam. Any student violating the honor code is cheating themselves and their peers of their education.

**Attendance policy:** Please read the policy outlined on the separate hand out. Students who are late by a significant margin will be counted as absent on that day. If you need to discuss a planned absence, please contact me prior to the time of class. If you are repeatedly absent or late, I will want to know why.

**Mobile phones:** During lectures and labs, your mobile phone must be turned off. Because mobile phones have become like computers, just like any study material, they may not be carried during exams. Using your cell phone during class can result in a penalty to your grade.

**Food and drink:** Feel free to have a drink with you during lecture, but please try and have a snack before class begins to get you through to lunch. Liquids: okay. Solids: messy.

**Evaluation:** You will be graded on a scale based on your total points. Plus/minus grades will be given. This is the guideline we will follow:

A: 90% or greater  
 B: 80 -89%  
 C: 70-79%  
 D: 60-69%  
 F: less than 60%

Points	Source		% of grade	sum %
225	classroom	3 exams	30%	
45		quizzes	6%	
150		final exam	20%	56%
120	laboratory	3 practical exams	16%	
6		15 journal entries	12%	28%
100	other	term paper	12%	
20		presentation	4%	16%

Bio 120 – Concepts in Biology  
 Spring 2008  
 Dr. Nilsen

<u>Important dates (by calendar spacing)</u>		<u>Workload breakdown</u>
Th Jan 17	First day of class	21% of grade determined in
T Jan 26	Journal entries 1&2 due	
T Feb 7 Jan/Feb	Exam 1	
T Feb 19 Th Feb 21	Lab Practical 1 Journal entries 3-5 due	
Th Feb 28	Outlines due	33% of grade determined in Mar
Th Mar 6	Exam 2	
T Mar 18	Papers due	
T Mar 25 Th Mar 27	Lab Practical 2 Journal entries 6-10 due	
Th Apr 10 T Apr 15	Exam 3 Paper due	19% of grade determined in Apr 20% in final exam, early May
T Apr 22	Lab practical 3	
T Apr 29	Journal entries 11-15 due	
T May 6	Final Exam	
		+6% in quizzes