

Biology 120: Concepts in Biology

Fall 2007

Instructor: Dr. Steven Nilsen

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Office Hours: M&W 11:00-12:00 Th 2:00-5:00, F 2:00-4:00

Required Texts

1. Biology: The Unity and Diversity of Life 11th Edition, Starr & Taggart.
2. Laboratory Manual for Concepts in Biology 5th 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:

1. Become capable of making critical assessments of popular media's representation of topics related to biology.
2. Become capable of discussing how we survive as individuals and as species and know the difference.
3. Recognize the humble similarity of your life compared to that of a fruit fly, become fascinated by this and acknowledge the importance of basic science.
4. As with all courses related to biology, develop a greater appreciation for the diversity and complexity of life.

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 see me during my office hours. If you are repeatedly absent or late, I will want to know why.

Mobile phones: During lectures and labs, mobile phones must be turned off and stored away and during exams they must be turned off and given to the proctor.

Food and drink: Please try to come to class satiated as our lecture time is near "lunch time". You may hydrate yourself in the lecture room, provided spills do not become a problem.

Grades: You will be graded on a scale. No plus/minus grades will be given. This is the guideline we will follow:

A: >90%

B: >80% and <90%

C: >70% and <80%

D: >60% and <70%

F: <60%

Point Breakdown

Points	Source	% of grade	Notes
100	exam 1	17%	58% of grade in class
100	exam 2	17%	
150	final exam	25%	
50	lab practical 1	8%	25% of grade in lab
50	lab practical 2	8%	
50	journal entries	8%	
25	journal entries	4%	5 additional out of lab entries
75	research paper	13%	

Most of your grade will come from exam scores. Lecture and final exams will consist mostly of material from lectures (which may not be in your text), assigned reading content I will specifically identify as vital. These exams will focus on your comprehension and application of biological principles. Laboratory practical exams will depend on your recognition and recollection of some of the things we did during the lab sessions, but you will also be asked to observe and describe some novel material in the same style as a journal entry.

A fair portion of your grade will be on writing assignments. There will be one major writing assignment requiring that you investigate an inherited disease or widely divergent phenotype common in human development. This paper will be of a reasonable length and will require source material that you are capable of reading critically. The journal that you will keep will not be focused on developing your powers of observation and deductive reasoning. During each lab session you will write in your journal a description of a fascinating aspect of the lab, as though you were a mid-nineteenth century naturalist. You will also be assigned to make independent forays into the local wilderness where you will pen additional journal entries. The content of these entries will be graded on the presence of biologically relevant commentary and careful description of the subject of observation.

A word on your textbook

Your non-laboratory book contains more topics in it than we will cover in class and we will supplement it with many essays that will be on electronic reserve. You are expected to read supportive chapters from the text that are listed on this syllabus. I will eventually ask for your feedback regarding this book, as there are others publishers I could have selected instead.

I am a strong proponent of *reducing* and *reusing manufactured goods*, so I will not discourage you from buying an older edition or sharing a book with a friend. There is only some light editing and subtle rearrangement of content within sections between the 10th and 11th edition of our text, so either will serve you fine. If you happen upon a 9th edition, it may suffice too but I haven't seen it yet.

We hop all over this book. Clearly these authors and myself do not agree on topic order. Have no fear, the chapters do not actually build on each other and the order is non critical. As for content we do not cover, there simply is not enough time for all of it.

Non-textbook Readings

Several supplementary readings will be put on electronic reserve at our library. These will provide a journalistic or other subjective perspective on topic central to modern biology. The content of these readings will be discussed in class. Some of these writings may come from the books listed below, which sit on a shelf in my office. If you are interested, reading any of these books will increase your knowledge of what is germane to this course.

1. “The Selfish Gene” by Richard Dawkins was *the* book that motivated me to my particular field of study. Dawkins provides, in this book, his manifesto on how evolution works.
2. “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’s a heavy read but anybody who wants to have kids should read this. Period.
3. “Grass Roots” by Paul Gruchow is probably not a famous book, but he’s a enlightening author from MN who explains in this book how the prairie has disappeared and why conventional farming is to blame. Anybody who’s seen the vastness of the heartland knows that the prairie was our heritage. Paul gives back a treatise on how the prairies can be resuscitated if we could all make a simple decision to stop eating beef and choose bison instead.
4. “The Case of the Midwife Toad” by Arthur Koestler made the rounds in the lab a few years ago. This is the amazing account of an early 19th century biologist, who while working on the principals of evolution got entangled in scientific controversy and ultimately took his own life. This is a shocking non-fiction.
5. “The Lives of a Cell” by Lewis Thomas. An inspirational collection of short essays by a great scientist and source of wisdom. He has 3-4 other essay collections are worth reading as well, but this is the first collection.

Bio 120 Lecture Syllabus
Fall 2007
Dr. Steven Nilsen

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

	<u>I. The joy of biology</u>	<u>Due</u>	<u>Chapters</u>	<u>E-resv.</u>
Th Aug 30 th	Introduction: Principals of life		1	
T Sept 4 th	Process of knowing: Scientific Inquiry	<i>assessment</i>	1	yes
Th Sept 6 th	Human population and Biodiversity		27, 45	yes
T Sept 11 th	Ecosystems, habitats and environments		48-49* or 47-48	
	<u>II. Cellular Life</u>			
Th Sept 13 th	Introduction to evolution	<i>journals</i>	17-19	
T Sept 18 th	RNA, membranes and proteins		2-5	
Th Sept 20 th	and then there was DNA		13, 14	
T Sept 25 th	Early cellular life		4, 21	
Th Sept 27 th	Advancements in cellular life	<i>journals</i>	4	
T Oct 2 nd	Cell division and replication		9, 10	
Th Oct 4 th	<i>Exam 1, parts I and II</i>	<i>assessment</i>		
T Oct 9 th	<i>Fall break</i>			
	<u>III. Life as an individual</u>			
Th Oct 11 th	Overview of body plans		43, 33, 28	
T Oct 16 th	Gas exchange		7, 40	
Th Oct 18 th	Energy, metabolism, digestion	<i>journals</i>	7, 8, 41	
T Oct 23 rd	Circulatory Systems		38	
Th Oct 25 th	Immune System	<i>outlines</i>	39	
	<u>IV. Life as a species</u>			
T Oct 30 th	Reproductive System		44	yes
Th Nov 1 st	Endocrine and Nervous Systems	<i>journals</i>	34-36	yes
T Nov 6 th	Innate behavior		46 or 49	yes
Th Nov 8 th	Genetics		11	yes
T Nov 13 th	Disease, non-disease and senescence		12	yes
Th Nov 15 th	Viruses and other genetic hitchhikers	<i>journals</i>	viruses (21)	yes
T Nov 20 th	<i>Exam 2, parts III and IV</i>			
Th Nov 22 nd	<i>Thanksgiving</i>			
	<u>V. Biomedical science in the news</u>			
T Nov 27 th	Genomics	<i>final draft</i>	--	yes
Th Nov 29 th	Disease and pandemics		--	yes
T Dec 4 th	Molecular "Fountain(s) of Youth"	<i>assessment</i>	--	yes
Th Dec 6 th	Biomedical politics		--	yes
T Dec 11 th	Super seeds	<i>journals</i>	--	yes
T Dec 18 th	<i>9:00-12:00, Final exam will be 50 points on part V and 100 points comprehensive (20% from each part).</i>			

* in the 10th edition of our text.

Bio 120 Lab Schedule
Fall 2007
Dr. Steven Nilsen

Mondays 2:00-5:00		<u>Flies' status</u>
September 10 th	Topic 1, Scientific Investigation	--
September 17 th	Topic 2, Aquatic Ecology	--
September 24 th	Topic 3, Microscopes/Cells	Embryos
October 1 st	Topic 4, Cell Membranes/Transport	Larva
October 8 th	Fall break	<i>pupation</i>
October 15 th	<i>lab practical 1</i>	Adults!
October 22 nd	Topic 5, Digestion	Foraging
October 29 th	Topic 6, Circulation/Respiration	Effect of Age
November 5 th	Topic 7, Reproduction/Development	Death
November 12 th	<i>lab practical 2</i> and planning session	*
November 19 th	Topic 8, DNA purification and analysis	Chr. squash?
November 26 th	Topic 9, Bacteriology	symbiotes
December 3 rd	Topic 10, Behavior 1	*
December 10 th	Topic 11, Behavior 2	*

* A word on fruit flies

Drosophila melanogaster (common fruit fly) is my chief organism of interest. Because of this we will use them as much as possible as auxiliary aspects to our lab topics. Ultimately, we will design some experiments with them that we can conduct and analyze as a group at the end of the semester. Hopefully these experiments will be novel and we can collect enough good data to qualify as a pilot study for a publishable investigation.

How to write in your journal

First, select a good notebook. Your journal should be quadrangle ruled (a grid) or at least lined, but not full of blank pages. The binding should be rugged, not spiral bound. The size should be comfortable enough to write into legibly without the support of a table, a clipboard may be a strong aid.

Your penmanship should be in printing, not cursive, and must be as legible as you can make it. Be thoughtful and consider carefully what you will write. Then write it neatly and use a non-smudging permanent ink pen. When errors are made, it is okay to cross them out with a single line; you should not scribble out errors. Corrected errors do not count against your graded score.

Before any entries are made, the first few pages of the journal should be left blank with enough space to create a table of contents, which you will fill in as you fill in the journal. Page number followed by a very brief description of the content will suffice.

A journal entry should begin with describing the setting: location, date, time of day, weather pattern, and anything conspicuous about the occasion of the day that sent you out to the field. Now leave a few lines of space.

Observations should be recorded as brief objective sentences written in concise English. Shorthand can be used if required and a key for reading your shorthand must exist as an Appendix. Appendixes, as they are added, can be written in the back of the journal moving. The journal can be flipped over to make this easier.

Word descriptions are often very nice, but illustrations that emphasize the features of interest can be more communicative than photos. Cartoons can be detailed or simple. For instance, you can draw a line of dots from one location on the ground to another location on a tree, but it's not necessary for the dots to look like ants or the tree to look like a certain type of tree. On the other hand, explaining the geometry of the ants' path in words would be tedious. So, cartoon whenever appropriate and label the important features of these illustrations clearly.

Where and when will you write in your journal?

The objective of the non-lab journal entries is to explore your environment as a peaceful observer. An obvious choice may be to explore in the woods or neighborhoods near campus. If you choose to explore early in the day you may notice things that you would not at mid-day or at night. Around dusk you can observe bats and in the cool of the morning you might see an owl. Moth diversity is easily appreciated on any given night.

You may find yourself being more contemplative of the world around by virtue of your new setting on this semi-rural place or by nature of your enrollment in this class. Then you may want to keep your journal handy at all times, so when something catches your interest, you are ready to observe and record.

There is always something to observe. Be it the plant diversity, an insect, a flock of birds at a bath or feeder, there is really no end to the material. What's important is that the moment you are making recordings of an observation is that you are present, focused and contemplative of your surroundings. Be prepared for surprises and be prepared to devote some time to the matter at hand; turn off your cell phone and tune into nature.

In the lab, you should not find yourself pressed to find a journal worthy subject matter. It may be that you will want record and discuss the class experiment, but your

goal should be to find a smaller aspect of the days activities that you want to jot down and mull over. A peculiar option would be to make your own private observations of your peer's behaviors during lab or elsewhere. We are probably the most entertaining of all animals to observe, but any such observations should reduce each person to a descriptive level, without mentioning any names. If the lab subject matters are limiting, we can discuss the possibility of trading in more non-lab entries.

What will you write in your journal?

You can use various tactics to communicate something of interest through your journal, but they will be based on descriptive science followed by an discussion with inferences based on deductive or inductive reasoning. One method is to do multiple similar observations, identify their differences, and then comment on potential explanations.

Here are three examples:

1. Make a primary observation of a biological phenomena,
 - a. Follow a butterfly for 10 minutes, make note of where it went, what it did and how it looked
 - b. Describe the number of different plants on a square foot of forest floor
 - c. Notice that some large black ants walking up your leg. Take note of them and let them explore.
2. Then make comparative observation(s)
 - a. Do the same for a different butterfly
 - b. Note the plant number/diversity on a different piece of forest floor
 - c. While not moving, describe other small dark brown ants are busy rearranging the soil near the black ants.
3. Identify what made your observations different from each other
 - a. Where the butterflies different size, stopping at different plants, moving further, or
 - b. Did one section of soil have more light than the other? Were different tree types above the soil plots?
 - c. Notice how the black and brown ants are doing different things and weather they interact differently with each other than with the other type.
4. Finally draw some conclusions. How could the differences or similarities between the observations be explained? Reason as objectively as possible and do not be afraid to suggest hypotheses that are naïve.
5. What sort of questions do your observations stir in you mind? The end of an entry should always be devoted to how one little piece of knowledge can prompt deep inquisitions.

How much time should I devote to an entry?

You should take all the time you need to get this done, but it is my estimation that an hour per entry (total) should be your maximum. Your goal is to write something concisely that could be read in just a few minutes. During lab you can record your observations, think about them and finish off your entry later in the day.

BIO 120: IMPORTANT DATES

TUESDAY, SEPTEMBER 4	INITIAL ASSESSMENT DUE
WEDNESDAY, SEPTEMBER 5	LAST DAY FOR CHANGING COURSES
THURSDAY, SEPTEMBER 13	JOURNALS DUE (LAB 1 + 1) *
THURSDAY, SEPTEMBER 27	JOURNALS DUE (LABS 1-3 + 1)
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OCTOBER	
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THURSDAY, OCTOBER 4	EXAM 1 &
THURSDAY, OCTOBER 4	2 ND ASSESSMENT DUE
FRIDAY, OCTOBER 12	LAST DAY TO DROP CLASSES
MONDAY, OCTOBER 15	LAB PRACTICAL EXAM 1
THURSDAY, OCTOBER 18	JOURNALS DUE (LABS 1-4 + 2)
THURSDAY, OCTOBER 25	PAPER OUTLINE DUE
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NOVEMBER	
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THURSDAY, NOVEMBER 1	JOURNALS DUE (LABS 1-6 + 2)
MONDAY, NOVEMBER 12	LAB PRACTICAL EXAM 2
THURSDAY, NOVEMBER 15	JOURNALS DUE (LAB 1-7 + 3)
TUESDAY, NOVEMBER 20	EXAM 2
TUESDAY, NOVEMBER 27	PAPER DUE
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DECEMBER	
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TUESDAY, DECEMBER 4	FINAL ASSESSMENT DUE
TUESDAY, DECEMBER 11	JOURNALS DUE (LABS 1-11 + 5)
TUESDAY, DECEMBER 18	FINAL EXAM (9:00 AM)

* IN PARENTHESIS IS THE MINIMUM CONTENT OF YOUR JOURNAL BY THIS DATE.
 “+1” INDICATES AT LEAST ONE ADDITIONAL NON-LAB ENTRY REQUIRED, AND
 SO FORTH.

