BIO 316/516 DEVELOPMENTAL BIOLOGY
LECTURER: Dr. Bea Holton
Spring 2012 – 3 credits – 3, 1hr lectures per week

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OFFICE HOURS: Tu 1:30-3pm ;W 1:50-3:30pm, or by appointment.
Instructor is SAFE – trained.

LECTURE HOURS: 8:00-9:30am TuTh in Halsey Science 457.

TEXT: Gilbert, Scott F. (2010) Developmental Biology, 9th ed., Sinauer Associates, Inc., Sunderland, MA.

DESCRIPTION:
Developmental Biology concerns the process by which single cells (e.g. eggs, spores, or seeds) become multicellular organisms comprised of different tissue types. This course will first examine the characteristics that set germ cells apart from other cells. Second, events such as early cleavage, gastrulation, neurulation and organogenesis will be compared in diverse organisms so that similarities and differences in strategies of development can be appreciated. Third, we will examine molecular cues that cells may use in order to migrate to proper locations and differentiate into appropriate cell types. We will examine molecular mechanisms that are used to establish polarity, segmentation, and, in short, the developmental plan of embryos. Finally, we will discuss development from an evolutionary perspective. We will periodically discuss papers from the literature to understand how developmental biologists reach the conclusions that they do and to follow developments that have occurred since our text was written.

LEARNING OUTCOMES: 1) Students will learn the fundamentals of developmental biology as well as what we can learn about evolution from developmental biology; 2) Students will improve their ability to write clearly and concisely so that they will be able to describe complex data, results and conclusions; 3) Students will improve their ability to give oral presentations so that they will be able to present complex data, results and conclusions; 4) students will improve their critical thinking skills by analyzing figures, graphs and tables and applying the academic principles learned to the interpretation of these data.

GRADING AND REQUIREMENTS:
Exams - in class, short answer/essay style

Exam #1	**Feb. 28**
Exam #2	**Apr. 11**
Exam #3	**May 7**

Research Papers - Short discussion and analysis of data provided by B. Holton. Please note that we will work on the first of these papers as a team in class so that all will understand how they should be done.

Data given to students:	**Feb. 19**	**Paper due:**	**Mar. 14**
	Apr. 9		**Apr. 25**

I will provide students with selected data from the literature that is relevant to theories discussed in class. Students are to treat the data as their own, as though they wanted to present it to others in their field. Each paper will have 1) an Introduction that gives some background information but mostly outlines questions in the field (that will be addressed by your data) and significance of the work presented; 2) Results section that explains the data: What do the data show?, Why were certain controls done?; and 3) a Discussion section in which a REASONABLE hypothesis is formulated from the data. This sounds like a lot of writing, but, in fact, the maximum page length will be 2 type-written, single spaced pages (point size no less than 12). Most papers can be completed in much less space. The key is to think clearly, write concisely and to say exactly what you mean...no more, no less. Students may discuss the data (and interpretations of the data)

among themselves, and they can ask me questions, preferably in class where all can profit from the questions and answers.

Oral presentations- Everyone will give one oral report. Presentations will be graded and worth 10% of your final grade. Undergraduates may work in pairs, graduate students must present by themselves. Undergraduates should prepare one paper from the scientific literature and discuss it thoroughly (come to me if you have questions about the paper). The presentation should take 20 minutes. Graduate students should prepare two related papers. They must tie them together in a coherent fashion, show the significance of the work and clearly describe how the field advanced from one paper to the next. But, they should not take much more than 20 minutes for their presentation! Precision is everything in science!!

Graduate students – Objectives

1) Graduate students will be graded by a higher standard than undergraduates on exams, papers and presentations.
2) Graduate students are expected to be proficient in writing and speaking. At this point, they should have a good command of scientific vocabulary and use it appropriately. They should understand commonly used scientific techniques and knowledgeably discuss data gleaned from such methods. This will be demonstrated by exams, papers and presentations.
3) Data interpretation by graduate students should show insight into the larger, more general problems being addressed. This will be demonstrated by papers and by the presentation.

Activities for graduate students
1) Graduate students are expected to give their oral presentation alone, and the presentation should include 3-4 papers from the literature. It should be 20-25 min long.
2) The graduate student should also turn in a concise review of the literature surrounding the topic of their presentation. The review should be about 3-5 pages long (single-spaced) and include a list of references.

Distribution of points for undergraduates - Research papers will be worth 45% of your grade, in-class exams will be 45% and oral presentations will represent 10%. The research paper by graduate students will be worth
Distribution of points for graduate students – Research papers will be worth 40%, exams 40%, oral presentation 10% and research paper 10%.
GRADING undergraduate students: 93-100% = A, 90-92 = A-, 87-89 = B+, 83-86 = B, 80-82 = B-, 77-79 = C+, 73-76 = C, 70-72 = C-, 67-69 = D+, 63-66 = D, 60-62 = D-, below 60% = F.
graduate students: 94-100% = A, 90-93 = A-, 88-89 = B+, 84-87 = B, 80-83 = B-, 78-79 = C+, 73-77 = C.
Any grade less than a C (72 or below) will be considered Failing.

Grades will only be "curved", if necessary. Cheating in any form (including plagiarism, excessive and/or undocumented paraphrasing) will NOT be tolerated. Students caught cheating will receive an F in the course and will be reported to the Dean of Students.

LIST OF LECTURE AND DISCUSSION TOPICS:
1. Fertilization - sperm and eggs; how they find each other; the process of egg activation - Ch. 4
2. Early development in selected invertebrates – Ch. 5
3. Axis specification in *Drosophila* – Ch. 6
4. Early development in amphibians and fish – Ch. 7
5. Early development in other vertebrates – Ch. 8
6. Development of the nervous system and epidermis – Ch. 9 and parts of Ch. 10
7. Mesoderm and endoderm - formation of muscles, skeleton, cartilage and gut – parts of Ch. 11 and 12.
8. Developmental mechanisms of evolutionary change – Ch. 19

We can discuss other current topics such as regeneration, aging, environmental regulation of development, sex determination, and so on. Flip through the chapters; TELL ME WHAT INTERESTS YOU!!