Biology 349: Developmental Biology

Semester: Spring, 2011

Professor: Steven Vokes
Office hours: Wed 9-10am, Fri 9-10am (and by appointment)
Location: MBB 1.318BA
Phone: 232-8359
Email: svokes@mail.utexas.edu

Textbook: "Developmental Biology", S.F. Gilbert, 9th edition

Lectures: M/W/F, 1-2PM, WEL 2.312

Discussion Sections: Discussion sections are conducted by the Teaching Assistant. You are not required to attend a discussion section, and you are welcome to attend *any* of the listed discussions.
Wed 8-9AM, BIO 301
Wed10-11AM, BIO 301
Wed 12-1PM, RLM 5.114

Course Web site: There is a Blackboard website at http://courses.utexas.edu. You will need your UT EID to access this site. On this site will be posted class announcements, the course syllabus, and lecture outlines. We will also use the discussion section of the site for answering questions. Email will be used as a means of communication with students. The student email notification policy can be found at http://www.utexas.edu/its/policies/emailnotify.php.

Overview

Biology 349 is a one-semester course covering the principles underlying animal development, focusing on embryonic development. The main objectives of this course are to:

- Describe the overall framework and structural features of embryonic development.
- Explore some of the experimental paradigms and model systems most widely used in the analysis of biological development.
- Enable you to read papers, to think critically about the primary data underlying experiments and to analyze and interpret the results. You should be able to propose experiments based on techniques we have learned that allow you to answer scientific questions.
- Examine the cellular and molecular mechanisms that allow the embryonic cells to acquire their unique developmental instructions, and the way in which those instructions determine the subset of genes that a cell will express.

In this course I will discuss developmental concepts, making use of examples from whichever experimental system(s) have proven most useful for studying each step in the process. We will therefore consider embryonic development in a diverse array of species, including some vertebrate animals (*e.g.* frog, mouse, bird, fish) and some invertebrate animals (*e.g.* fruitfly, sea urchin, nematode).

I am a faculty member in the Section of Molecular Cellular & Developmental Biology and a member of the Institute for Cellular and Molecular Biology. My research laboratory focuses directly on understanding how limbs develop (for more information see http://www.sbs.utexas.edu/vokes_lab/). As a developmental biologist, I love this material, and I want you to learn it and to enjoy learning it. If you have suggestions or questions, or if you want more information on a specific topic that interests

you, or if you are struggling with the material, or even if you just want to understand it better, then come talk to me.

Course Organization

BIO349 will consist of three 50 minutes lectures per week accompanied by readings (see below) from "Developmental Biology", S.F. Gilbert, 9th edition. You are encouraged to raise your hand at any time with questions and comments to ensure that you understand the material. In the interest of covering all the ground, I may on occasion defer answering more specific questions until after class or in office hours. I will post preliminary Power point images on the Blackboard web site before the lecture. The images actually used in the lecture will be posted after the lecture. There will be occasional additional handouts that will be posted on Blackboard and distributed in class. There are likely to be changes in reading assignments during the course, and these will be posted on Blackboard.

The lectures are supplemented by Discussion Sections in which the teaching assistant will answer questions and provide help with study questions. Attendance is optional. There are three BIO349 Discussion Sections scheduled per week (see pg. 1), and you may attend any or all of them.

Feedback is an important part of any kind of learning. Without feedback on how well you understand the material, it is more difficult for you to make significant progress. During this course you will give me feedback on your learning in informal and formal ways, such as questions, suggestions, and exams. I want you to let me know when something we discuss is not clear. This kind of communication will enable me to provide additional information when needed or to explain a concept in different terms.

Prerequisites

To enroll, students must have received a grade of "C" or better in BIO325 or 325H (Genetics).
Upper-division courses in cell and molecular biology are advantageous but not required. Though not a formal pre-requisite, a solid understanding of cell and molecular biology is essential for successful completion of this course. Upper division courses in cell and molecular biology are particularly useful.

Examinations

There will be four scheduled in-semester examinations and a final exam (**comprehensive**), worth 100 points apiece. Each in-semester exam will specifically cover the material presented since the last exam, although the later three mid-term examinations will also assume knowledge of general topics that have been emphasized throughout the course. Exams will consist of both multiple-choice and short answer/problem/short essay questions and will follow an identical format except for Exam #4 which will have a higher percentage of multiple choice questions. The final grade will be determined by adding your four best exam scores (this includes the final). If you have taken all four exams during the semester and are happy with your grade, you do not need to take the final exam.

Any material covered in class, in the posted notes, or in the readings accompanying the lectures may be examined. Please note that the lecture handouts on Blackboard will not include additional material mentioned in class or presented on the board during lectures. Students who miss class are responsible for obtaining these notes from one of their classmates.

Please bring to the exams both a pencil (for multiple choice bubble sheets) and a pen (for essays), as well as your photo ID. **All written sections must be answered in pen**. If you accidentally write in pencil, your exam will still be graded but it will not be returned to you. You will be free to look at it during TA office hours but it cannot leave the office. Do not bring a calculator, take out cell phones, your textbook or your notebooks during the exams. It is your responsibility to arrive at the exam on time. Students who arrive late will not be given additional time.

Failing to take a scheduled examination will result in a score of 0 unless there is *documented* evidence of circumstances appropriate to an absence and beyond your control. Acceptable reasons for absence from an exam include:

- Illness - you should have a physician's note indicating that you were not in physical condition to take the exam at the scheduled time. A note from a family member is insufficient.
- Death or grave illness in your immediate family.
- Significant scheduling conflicts such as medical/grad school interviews or athletic participation in NCAA sporting events. Voluntary activities such as running in a marathon do not excuse you from an exam.

This documentation, which is generally issued by the Dean's office, must be presented within one week of the missed exam. In the event of a missed exam for which appropriate documentation of absence has been provided, the final grade will be the sum of the other 4 exams. The only circumstance for which make-up exams will be given is one in which two exams have been missed, both documented, and for acceptable reasons beyond your reasonable control (see above). Under those circumstances, I will administer a make-up exam (worth 100 pts, 25% of the grade). In the event that a student requires a make-up exam to be administered, the form of the exam (written versus oral, or a combination of the two) will be at the discretion of Dr. Vokes.

Grading

This course will use plus/minus grading. Final letter grades will be determined by the cumulative points on your four best exams, and will be based on the following grade scale.

Grades
A = 360 pts or higher (90+%)
A-= 340-359 (85-89.75%)
B+= 320-339 (80-84.75%)
B = 300-319 pts (75-79.75%)
B-= 280-299 (70-74.75%)
C+=268-279 (67-69.75%)
C = 252-267 pts (63-66.75%)
C-=240-251 (60-62.75%)
D+=228-239 (57-59.75%)
D = 212-227 pts (53-56.75%)
D-=200-211 (50-52.75%)
F = 199 pts or fewer (<50%)

In the event that the overall class average for all exams totals less than 280 (70%) for students having taken all five exams, after excluding grades below 50% I will raise all students point totals equivalently by the number of points that will bring the average to 280 (70%).

Please note that following the assignment of a final grade, under no circumstances will I negotiate a grade assignment with a student whose point total falls (even closely) below a cutoff. i.e., if you intend to achieve an A in this class, your total points at the end of the course must be 360 or higher. In order to achieve a B, your cumulative points total will need to be 300 or higher.

We make every attempt to grade all students by fair and uniform criteria. Exams *will not be regraded* except for cases in which there was a clear mistake in the original grading or in the addition of points.

Regrade requests must be submitted to the me within 2 weeks of the date when the exam was handed back to the class. If you pick up your graded exam later than 2 weeks after the date at which the exam was returned in class, you will not be eligible for a regrade. In the event that a regrade is requested, the exam must be accompanied by a separate sheet of paper giving the number of the question(s) to be regraded, and a written explanation as to why the original answer deserved more points than were awarded. For multiple part questions, the entire question will be regraded. The regrade request should not be written on the exam itself, nor should any other alterations have been made. The instructor will reserve the right to regrade the entire exam in the event of a regrade request.

Academic dishonesty

We adhere to the core principles of the university honor code. Academic dishonesty of any sort will not be tolerated in my class. I will prosecute - to the fullest extent allowed by the university - anyone who is caught cheating in my class. With particular relevance to this course, this will include anyone who is caught cheating on an exam or who is caught altering a graded exam in an attempt to obtain additional credit. To protect against dishonest practices, we may photocopy selected portions of all graded exams before they are returned to the class. Please review the University's policy on academic dishonesty at http://deanofstudents.utexas.edu/sjs/acadint.php.

Classroom etiquette

Please avoid any behavior that could disrupt the learning environment of others. Please turn off your cell phones (or set them to vibrate) when you are at class. Students are expected to follow the "Standards of Conduct" outlined by the University: http://deanofstudents.utexas.edu/sjs/conduct.php.

Graduate student enrollment

BIO349 is intended as an upper-division undergraduate course, but may also be appropriate for graduate students who have not had formal instruction in this area. Graduate students will take the same exams as undergraduates, and be graded similarly. For graduate students the exam grades will account for 75% of the final grade. A term paper, the topic of which will be discussed with Dr. Vokes, will account for 25% of the final grade. Graduate students interested in taking this course should speak to Dr. Vokes about how to register appropriately for the course.

Religious observances

I have attempted to schedule the exams to avoid conflicts with those religious holy days of which I am aware. If you have a conflict with a religious holy day and would like accommodation, you must bring it to my attention during the first two weeks of class.

Special needs

The policy of UT Austin is to provide appropriate accommodations for students with disabilities. To receive such accommodations, students must present me with a letter prepared by the Division of Diversity and Community Engagement, Services for Students with Disabilities (471-6259). This letter must be given to Dr. Vokes at least **one week prior** to the first exam, or during the first week of classes if accommodations are required for the lectures.

Services for Students with Disabilities: http://www.utexas.edu/diversity/ddce/ssd/
Accommodation Letter: http://www.utexas.edu/diversity/ddce/ssd/accommodation_ltr_request.php

Suggestions on how to succeed in BIO349

- This is an upper division college science course, and you are not likely to get a good grade if you do not attend lectures.

- Final letter grades will be determined solely by exam scores. There will be no opportunities for 'extra-credit' ... it will not be possible to make up for poor exam performance after the fact. If you find that there are things that you do not understand, **ask questions** in class, go to discussion sections and **ask questions**, go to office hours and **ask questions,** or post the question on the Discussion Board section of Blackboard (Dr. Vokes will check this daily).

- Everyone learns differently, and you should try to find a learning/studying strategy that works for you. My general advice is that you should make an effort to take good notes in class, then study for exams by first going back over the lecture notes (the notes you take in class and the ones I post) and reviewing the main topics from each lecture. Pay special attention to the study questions that are provided each week. Rather than simply memorizing the answers, you need to understand the underlying concepts and how to apply them to new scenarios. If concepts aren't clear, go to the discussion sections and **ask questions** or go to the office hours and **ask questions**.

- It is my expectation that you not only learn important facts but that you can use that knowledge to solve questions pertaining to developmental biology. Therefore, on your exams you will be asked to apply the knowledge that you've gained in the lectures.

Lecture List: This is a tentative lecture schedule. Lecture topics, dates and assigned readings are subject to change. All handouts and papers will be posted on Blackboard.

DATE	TOPIC	READING
Part 1: A blueprint for building an organism		
Jan 19	Intro to Developmental Biology	37-47
Jan 21	Developmental diversity - Endless forms most beautiful	14-17
Jan 24	Fertilization I - Activating germ cells	121-155
Jan 26	Fertilization II - The making of a zygote	121-155
Jan 28	Early Development I – Cell cleavage	160-163 & Handout
Jan 31	Early Development II – Regulating development	164-178
Feb 2	Early Development III – Regulating development	192-199
Feb 4	Invertebrate patterning I - Front or back (the dorsal-ventral axis)	203-233
Feb 7	Invertebrate patterning II - Heads or tails (the anterior-posterior axis)	203-233
Feb 9	Invertebrate patterning III - Hox genes and domain specification	234-237
Feb 11	**Exam 1**	
Part 2: The early body plan		
Feb 14	Early vertebrate patterning I - Making mesoderm	241-244
Feb 16	Early vertebrate patterning II - Gastrulation	241-267
Feb 18	Early vertebrate patterning III – Generating positional identity	311-319
Feb 21	Neural development I	334-343
Feb 23	Neural development II	343-345 & Paper
Feb 25	Neural crest cells - the fourth germ layer	373-383
Feb 28	Craniofacial formation	383-392
Mar 2	Neuronal pathfinding	392-404
Mar 4	Somite formation I - Making muscles	413-416; 420-428
Mar 7	Somite formation II - The somite clock	417-419
Mar 9	Somite formation III	417-419
Mar 11	**Exam 2**	

Mar 14-19	**SPRING BREAK**	
Part 3: Organogensis		
Mar 21	Heart development	445-456
Mar 23	Vascular development	456-465
Mar 25	Kidney development	434-442
Mar 28	Limb development I	485-495
Mar 30	Limb development II	495-504
Apr 1	Limb development III – Bone formation	428-431
Apr 4	Limb development IV – Comparative evolution	None
Apr 6	Endoderm I – Specification, the lung and liver	None
Apr 8	Endoderm II - Pancreatic development	None
Apr 11	Endoderm III – Regenerating Beta cells	Paper
Apr 13	**Exam 3**	
Part 4: Applications for Developmental Biology		
Apr 15	Regenerative biology I – The humble Planarians	Handout
Apr 18	Regenerative biology II – Limb development	561-566
Apr 20	Regenerative biology III Class discussion of paper (read ahead!)	Paper
Apr 22	Regenerative biology IV Heart development	None
Apr 25	Sex determination I - How germ cells find their way	592-594;
Apr 27	Sex determination II - Molecular strategies	511-534
Apr 29	Programming and reprogramming the nucleus I - Cloning embryos	Handout
May 2	Programming and reprogramming the nucleus II - Life after ES cells	Handout (as above)
May 4	TBD	
May 6	**Exam 4**	

FINAL EXAM: MAY 16th 9:00-12:00 noon Location TBD*

*UT Final exam locations will be posted at approximately three weeks prior to the end of the semester at: https://utdirect.utexas.edu/registrar/exam_schedule.WBX