Developmental Cell Biology (Biol 497A/597A)

Instructor:

- Dr Graham Thomas, 463 N Frear; Tel. 863-0716; Email GXT5@PSU.EDU; Office hours: by appt.

When and where:

- Tue/Thu at 1:00-2:15 pm, 216 Thomas.

Description:

- This course will provide an in-depth look at issues of cell structure and its reorganization in the context of developmental events. We will attempt to answer questions such as: How do cells organize and reorganize their cytoplasm to facilitate patterning events? How do cells migrate to specific locations during development? How do groups of cells reorganize themselves to generate form? How does the structure of differentiated cells permit their specialized function?
- The prerequisites for this course are Biol 230 or BMB 251/252 or their equivalent. It is assumed that the participants have a working knowledge of basic principles in cell biology.
- Instruction will be a combination of lecture and student led discussion of the primary literature. All students are expected to complete all the readings, and each student will be expected to lead a discussion on one or more papers during the course.

General comments:

- **Reference Texts**: there is no assigned textbook for this course; however, basic information in Cell Biology may be found in one of three textbooks: "The World of the Cell" (by W. Becker *et al.*), "Molecular Biology of the Cell" (by B. Alberts *et al.*) and "Molecular Cell Biology" (by H. Lodish *et al.*). Basic information on Developmental Biology can be found in "Developmental Biology" (by S. Gilbert) or "Principles of Development" (by L. Wolpert). Copies of Alberts and Gilbert should be on reserve in the library.
- **Grading:** grades will be assessed from a combination of one take home exam, written assignments, one in class short answer style exam, and the quality of paper presentations as follows:

Take home exam on introductory material	15%
Summaries of Cellular Asymmetry, Cell Shape, Cell Crawling (see **Guidelines for Short Reports**).	10% each
Paper presentation (see **Guidelines for Paper Presentations**)	5%
Final exam (This will Short answer style and cover the material presented in class from November 5th on.)	20%
Term paper (due Dec 10th - see **Guidelines for Term Papers**)	30%

All papers must be typewritten. Check your spelling and grammar! Clarity of writing WILL be a factor in grading essays and exams, illegible or unclear writing will be penalized.

- **Web addresses**. I will be showing numerous quicktime movies during the course. Many of these are publicly accessible on the web and can be accessed *via* my lab web site (www.bmb.psu.edu/faculty/thomas/lab/) under 'Developmental Cell Biology Course Links'.

Course Schedule

Month Date	Day	Topic	Assignments issued / Assignments due
Aug. 27	T	**1. Introductory Discussion** (i) basic concepts, processes and problems in developmental biology pertaining to the course (ii) introduction to model systems to be discussed. (iii) microscopic and analytical techniques used to probe the behavior and structure of living cells	
29	R		
Sep. 3	T		
5	R		
10	T		
12	R		Take home exam on introductory material
17	T	**2. Cellular Asymmetry and Asymmetric Cell Division** (i) apicobasal polarity in epithelia (ii) rhizoid outgrowth in *Fucus* (iii) bud site selection in *Saccharomycese* (iv) neuroblasts in *Drosophila* (v) early cell division in *Caenorhabditis* (vi) control of mating type switching in *Saccharomycese*	
19	R		Take home exam due
24	T		
26	R		
Oct. 1	T		
3	R		
8	T	**3. Cell Shape and cell shape change** (i) axonal outgrowth (ii) apical contraction (iiii) plant cell shape (iv) root hair outgrowth (v) Student led paper discussions	
10	R		Summary of Cellular Asymmetry
15	T		Fall Break
17	R		
22	T		
24	R		

29	T	**4. Cell crawling** (i) lamellipodial extension, cell body contraction (ii) Student led paper discussions	
31	R		Summary of Cell Shape Change
Nov. 5	T	**5 Organizing eggs** (i) Microtubule nucleation *in vivo* (ii) Microtubules in *Drosophila* oogenesis (iii) Cortical rotation in *Xenopu* (iv) Student led paper discussions	Term paper topics distributed
7	R		Summary of Cell Crawling
12	T		Choice of Term paper and Fellowship topics
14	R	**6. Blood** (i) red cell cytoskeleton and haemolytic anaemias (ii) extravasation - signaling to the cytoskeleton (iii) antigen presentation to T-cells (iv) Student led paper discussions	
19	T		
21	R		
26	T	**7. Myosins: Muscle and Hearing** (i) Muscle structure, development, contraction (ii) Cardiomyopathies - defects in contractile apparatus (iii) myosins, hearing and deafness (iv) Student led paper discussions	Term paper outline and fellowship specific aims due
28	R		**Thanksgiving**
Dec. 3	T		
5	R		
10	T	**8. Post Genomic Cell and Developmental Biology** (i) genome projects (ii) large scale analytical techniques	
12	R		Term papers are due in my office (463 N. Frear) 5pm today

Final Exam - Date and time TBA (on modules 5-8; open book)

Guidelines for Short Reports

These reports should contain a brief summary of the material presented for each topic. This should include key concepts presented in both the lectures **and** in the student-led discussions. Each report should be 3-4 pages (double spaced) in length. **NOTE:** in these reports it is important to touch on all the topics covered and to concisely mention key molecules/processes.

Guidelines for Paper Presentations

Readings to be presented will be assigned two weeks before the date of each presentation. Each paper is to be read by ALL course participants, not just the presenting student, since I will be attempting to facilitate a discussion on the paper's content as it is presented. The presentation should answer these four questions: (1) What is the hypothesis being tested? (i.e. what specific questions are the authors trying to answer? And how does this fit into our general understanding of the topic?); (2) How is the hypothesis being tested? (i.e. what are the methods? And how will this address the questions at hand); (3) What are the results of these tests? (4) How did this affect the hypothesis? Your presentation should be designed to last about 20-25 minutes. *You are strongly urged to practice before class*, especially if you have never presented primary literature orally before. Presentations will be assessed on their clarity, accuracy and thoroughness. The classroom has the capability for electronic presentation although this is not compulsory.

Guidelines for Term Papers

Students taking 497A are expected to write a term paper in the second half of the course. This should be a literature review on a specific topic related to the course. A choice of topics will be distributed on November 5st and you must choose one to review by November 12th. An outline is required prior to completion on November 26th. There is no set limit on the length of each paper; however, a minimum of about 10 pages (double spaced; not including citations) is not unreasonable. You are expected to read current journal literature to complete this task: excessive citation of web sites will be penalized. The completed paper is due by 5pm December 12th.