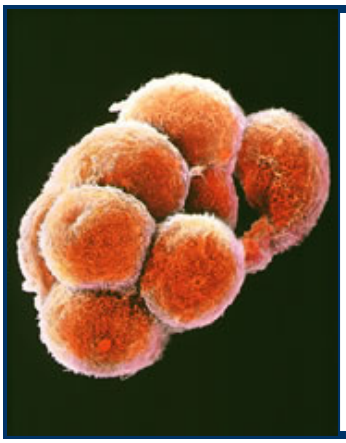

# BIO 304
# Developmental Biology
# Spring 2012

**Overview:** BIO 304 explores the development of organisms from fertilization to near-birth. You will be introduced to several different model organisms, the study of which have provided many insights into the mechanisms underlying human development. All aspects of development are covered from the molecular regulation of gene expression to organogenesis. We will also explore current techniques and applications used in developmental biology research and how the study of developmental biology has furthered the fields of cell biology and medicine.

**Instructor:** Katherine Robertson
217 Hoyt Science Center
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**Office hours:** **M, W: 9:30 – 11:00 AM**

**Lecture:** T, R: 9:20 – 10:50
**Lab:** R : 2:00-5:00PM

**Text:** **Essential Developmental Biology, Ed. 2**
J. M. W. Slack
Blackwell

**Course objectives:** By the end of this course, students should be able to demonstrate their proficiency in the following

- An understanding of the molecular mechanisms that guide cells through growth and differentiation (assessed through exams that test content knowledge and problem solving skills)
- An understanding of the temporal and spatial dynamics of producing a 3D organism (assessed through short answer exam questions)
- An understanding of the techniques used to study embryogenesis, and what inferences can be made from embryos about cell biology (assessed through lab reports and exams)
- An understanding of the mechanistic causes of congenital birth defects and how the study of model organisms impacts medicine (assessed through exams and through a written research proposal)
- An ability to read, analyze and effectively communicate research found in primary scientific literature (assessed through journal club presentations and peer reviews of your presentations)
- An ability to carry out experiments in the lab, to understand and analyze resulting observations and place those observations in context of current knowledge (assessed through lab reports and a written research proposal based on lab #4).
- An ability to write clearly and communicate scientific principles to a mature audience (assessed through lab reports, a written research proposal a formal presentation)

**Course Components:**

**Exams:** There will be three exams during the semester. The first two will be worth 150 points, and will include material covered up to that point. The final exam is worth 200 points, and will be cumulative.

**Journal Club:** Teams of students will be expected to present data from a primary literature source, to the rest of the class at least once during the semester. Their presentation will be graded on their understanding of the material, and their ability to present it clearly, and critique it for others. The presentation is worth 50 points

**Journal club Review and Participation:** Students who are not presenting a journal article at a given time are still expected to participate in the discussion of that article. Each student can earn up to 20 participation points for asking questions or sharing observations with the rest of the class. In addition, for each presenting team there will be a reviewing team who will write a summary and critique of the article for 30 points.

**Lab reports:** Each student will write 6 lab reports, in the style of a short research proposal. Reports will be graded on completeness of data and data analysis and content of the proposal, as well as format and a clear scientific writing style (watch your grammar). The lab reports are worth 25 points each. Information from the lab reports may be included in the formal presentation.

**Research Proposal:** Students will work in teams to write a formal research proposal based on Lab #4. The proposal should include all the following sections: Preliminary experiment and findings, observations leading to proposed study, question addressed in proposed study, justification for study, experimental design, expected outcomes and concluding remarks. Guidelines will be provided; your proposal is worth 80 points.

**Formal presentations:** Each student will be expected to give a formal, Power-Point presentation in the form of a research proposal, which will be based on an experiment done in lab. Students will work in pairs to formulate a question based on data gathered in lab, and to propose a set of experiments to answer their question. This presentation will be graded mostly on content: question, hypotheses, background research, experimental design, etc. and is worth 50 points. In addition, each non-presenting student can earn up to 20 points for participation during the presentations.

| | | | |
|---|---|---|---|
| **A** | >93% | **C** | 73-76% |
| **A-** | 90-92% | **C-** | 70-72% |
| **B+** | 87-89% | **D+** | 67-69% |
| **B** | 83-86% | **D** | 63-66% |
| **B-** | 80-82% | **D-** | 59-62% |
| **C+** | 77-79% | **F** | <59% |

| | |
|---|---|
| Exams | 500 |
| Journal club | 50 |
| J. Club review | 30 |
| Formal presentation | 50 |
| Lab reports (6) | 150 |
| Research Proposal | 80 |
| Participation | 40 |
| **Total** | **900** |

**Academic integrity:** The issue of academic integrity is taken very seriously at Westminster. Students are expected to abide by the College Policy on Academic Integrity. The policy can be found at: http://www.westminster.edu/acad/pdf/undergraduate_catalog.pdf.

Academic integrity is particularly important when dealing with scientific writing. I encourage students to work together, and discuss their assignments. But written assignments must be the students own work. Quotes, data or ideas taken from another source must cite that source fully and correctly. If you don't understand how to do this, please ask. Work that is not the students own, i.e. copied from an external source, a classmate or class material is considered plagiarized, and will receive a score of zero. Note: plagiarism includes extensive, unnecessary quoting from another source, even if it is cited. More than one incident of plagiarism may result in failure of the course. If in doubt – ask.

**Tentative Schedule**:

| Starting (T) dates | Lecture Topic | Labs |
|---|---|---|
| Week 1: 1-17-12 | Intro' to class<br>Chapter 1: Intro to Devo' | Intro' to lab<br>(plant seeds for lab #3) |
| Week 2: 1-24-12 | Cell Properties<br>Cell – Cell Signaling | #1: Embryo anatomy |
| Week 3: 1-31-12 | Regulation of Gene Expression<br>Chapter 2: Features of Devo' | #2: Chemotaxis<br>***Lab Report#1 due*** |
| Week 4: 2-7-12 | Chapter 3: Devo' Genetics<br>**Exam I (R)** | #2 Analysis<br>#3 Plant Cloning |
| Week 5: 2-14-12 | Chapter 4: Experimental Devo'<br>Chapter 5: Embryology Techniques | #3 Cont…<br>J. Club Workshop I<br>***Lab Report#2 due*** |
| Week 6: 2-21-12 | Chapter 6: Model Organisms<br>Chapter 7: *Xenopus* | #3 Cont…<br>J. Club Workshop II |
| Week 7: 2-28-12 | Chapter 8: Zebra Fish<br>Chapter 9: Chickens | ***J. Club Presentations*** |
| Week 8: 3-6-12 | NO CLASS; SPRING BREAK | ***NO LAB*** |
| Week 9: 3-12-12 | Review<br>**Exam II (R)** | #4: Fate Map (No lab report, will be used for project proposal)<br>***Lab Report#3 due*** |
| Week 10: 3-19-12 | Chapter 11: Drosophila<br>Chapter 12: C. Elegans | #4 Cont.. |
| Week 11: 3-26-12 | Chapter 13: Tissues and Stem Cells<br>Chapter 14: Nervous system | #5: IVF of Sea Urchins |
| Week 12: 4-3-12<br>4-5-12 | Nervous system cont…<br>NO CLASS; EASTER | ***NO LAB*** |
| Week 13: 4-10-12<br>4-12-12 | NO CLASS (Monday classes meet)<br>Chapter 15: Mesoderm | #6: Planaria Regeneration<br>***Lab Report#5 due*** |
| Week 14: 4-17-12 | Chapter 16: Endoderm<br>Chapter 17: Imaginal Discs | #6 Cont… |
| Week 15: 4-24-12 | Chapter 18: Aging and Cancer<br>Chapter 19: Regeneration | ***Project Proposal Presentations***<br>***Lab Report#6 due*** |
| Week 16: 5-1-12 | TBA and/or Review | ***NO LAB***<br>***Project proposals Due (T)*** |

**Final Exam: Tuesday, May 8th, 3:00 – 5:30 PM**