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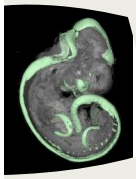
Office hours: M-XX W-XX F-XX
T-XX Th-XX or by appointment

▶Class times: Days, times
Class room: Bldg, Room ##
Lab time: Day, times
Lab room: Bldg, Romm ##



▶ Required text: Glibert, Scott F., and Susan Singer. Developmental Biology, 8th Ed. Sinauer Associates Inc. 2006. ISBN:087893250X

○ Course number | ○ Dept. of Biology | ○ Univ. of Cincinnati ○ Term, year

Developmental Biology

MY DEAR FELLOW… LIFE IS INFINITELY STRANGER THAN ANYTHING WHICH THE MIND OF MAN COULD INVENT. –A CONAN DOYLE (1891)

Have you ever wondered how the basic science you learn in class really helps people? How benchwork and bedside science relate? How principles of biology turn into funtional systems and organisms?

In this course…

Developmental Biology allows you to explore the basic principles behind the development of organisms and delve in to what can go wrong in the development of human beings. Course laboratory techniques used by biologists at the bench will help you to craft your own developmental research project while strengthening your understanding and application of genetics and molecular biology. Developmental biology invites you to discover the wonder that underlies the building blocks of each of us. "In fact it is the profoundest wonder we can still imagine and accept, and at the same time so usual that we have to force ourselves to wonder about the wonderousness of this wonder." (Miroslav Holub)

When you're done you will be able to…

1. **Identify major model organisms and list pros and cons for each model.**
2. **Give a summary of embryogenesis using a model organism as a reference to describe 1) fertilization and cleavage, 2) gastrulation, neurulation, and somitogenesis, and 3) axis formation and segmentation.**
3. **Relate a physical abnormality to its developmental origin and describe the sequence of events from the identified origin to the specific abnormality.**
4. **Distinguish between forward and backward genetics and describe a use of each in developmental biology.**
5. **Design an experiment using developmental laboratory techniques to address a given problem, including identification of a hypothesis and prediction of results based on your hypothesis.**

How it works

This course has a class and a laboratory component. Students will be given topics and thinking questions before each class period which they will research the answers to and complete an online assessment by 7am the day of class. In class, students will go over difficult material from the thinking questions with the professor and small group discussions. These are made to give feedback on the most interesting and complex areas of the course, where students can grow in knowledge and understanding of the material together. Blackboard will have the questions and topics for each class as well as reference material and discussion questions. Laboratory meets once a week, you must come prepared with pre-lab assignments to turn in at the beginning of lab. In lab, students will use model organisms to study the development and class concepts through observation and experimentation.

The little stuff…

It is not birth, marriage, or death, but gastrulation, which is truly the most important time in your life. –Lewis Wolpert

Homework

Students will be given topics and thinking questions to review before the next class in order to spend more class time on discussion and application of the material. This will allow you to learn more relevant and more interesting material.

Though this outside work will not be graded, this policy will change if students routinely fail to prepare for class.

Pre-lab

Students will receive a pre-lab assignment to be turned in at the beginning of lab.

The pre-lab assignment will review the course concepts to which the lab pertains and give an overview of the lab activity. Completion of the pre-lab is essential for student safety and participation in the lab.

If you come unprepared to lab, you may be asked to leave, forfeiting your lab participation that day and jeopardizing your stay in the course (lab attendance policy).

Attendance

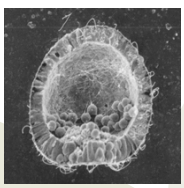
Students are expected to attend classes to participate in discussions and activities.

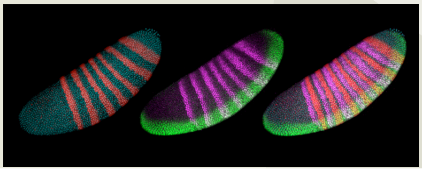
This course relies on in-class components and you will not master the material if you are not in the classroom.

Though there are not a specific number of excused absences, missing class will affect your grade through lack of participation.

Lab sections are hands-on learning in which your group is counting on your help and participation. Therefore, **attendance in lab is mandatory.** There are no excused absences in the laboratory section. If you miss a laboratory section, you may be asked to drop the course.

Please inform me of absences in advance.





Academic Integrity

The University Rules, including the Student Code of Conduct, and other documented policies of the department, college, and university related to academic integrity will be enforced. Any violation of these regulations, including acts of plagiarism or cheating, will be dealt with on an individual basis according to the severity of the misconduct.

Special Needs

If you have any special needs related to your participation in this course, including identified visual impairment, hearing impairment, physical impairment, communication disorder, and/or specific learning disability that may influence your performance in this course, you should meet with the instructor to arrange for reasonable provisions to ensure an equitable opportunity to meet all the requirements of this course. At the discretion of the instructor, some accommodations may require prior approval by Disability Services.

Contacting the Professor

Please stop by my office during schduled office hours, or contact me by email. Please be sure to use your university email and include your name and course and section number in the email.

Using Blackboard

Blackboard will be used for:

Announcements: updates and reminders

Course Documents: will all be online for easy access, including the course schedule, syllabus, lecture slides, and assignments.

Reviews: review questions and outlines will be posted before the exams

Resources: links to University resources and material that will be helpful in this course

PRS Clickers

Students are expected to register their PRS clicker and bring it to class every day. In-class quizzes and practice problems will use the clickers to assess understanding of the material and to give you practice with application of the course concepts.

PRS Clickers are available at the Unicersity bookstore.

The bigger stuff…

One must show the greatest respect towards any thing that increases exponentially, no matter how small. –Garrett Hardin

In class presentations

This project will allow the class to study the variety of developmental biology techniques available. Group discussions will enlighten students on how to find the most effective model organism and techniques for a given problem. The projects will provide students with a directed study in developmental biology that they will then craft into a presentation to their peers giving the importance of their study.

Presentations will be done in assigned groups. Each group will choose a different model organism and report on the history and current uses for that organism along with interesting facts and distinctions between their organism and other model organisms.

Students may choose from:
Caenorhabditis elegans
Xenopus laevis
Drosophila melanogaster
Danio rerio
Mus musculus
Arabidopsis thaliana
Gallus gallus domesticus

A rubric will be handed out with a detailed project description in class.

Lab notebook and report

Lab notebook: Students must keep a laboratory notebook dedicated to this lab course which will be handed in throughout the semester. Scientists need an accurate and precise record of their work in order to validate and confirm their results. Keeping a lab notebook will allow students to participate in this practice as well as maintain and explain laboratory objectives. This notebook must, therefore, be kept up to date on laboratory observations, experiments, and conclusions.

Lab report: Due at final exam. A scientist's work is worth little if it cannot be effectively communicated to others. Students will write a laboratory report to inform their peers of the research and conclusions they have done in the course. This laboratory report will be constructed as a peer-reviewed journal article in which they will cover the self-directed laboratory project incorporating background, methods, results and conclusions from the project.

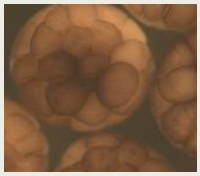
A rubric will be handed out with a detailed project description in class.

Final Project

Basic science requires a component demonstrating its relevance to society. In developmental biology this relevance is usually to a human defect or disorder in which study of the biological developmental origins can enhance the understanding and treatment of the disorder.

In order to better understand the link between basic science research and human disorders, students will individually identify a human birth defect and construct a 10 page article describing this defect and its developmental origin. The article must explain to a broad audience the biological process which resulted in this defect. This includes background of normal development and stage specific abnormalities in the development of this defect.

A rubric will be handed out with a detailed project description in class.



Course Policies

In lecture, students are expected to:

- **Arrive on time**
- **Come prepared for the class**
- **Ask questions and engage in the material**
- **Be courteous and not disruptive to your peers**

In lab, students are expected to:

- **Attend all lab classes**
- **Dress appropriately for the lab environment (close toed shoes, hair pulled back, long pants, no baggy clothes, etc.)**
- **Not bring food or drinks into lab**
- **Come prepared for the experiments assigned each week**
- **Appropriately use and handle laboratory equiptment**

Grade Determination

Participation 5% (25 points)
Lab notebook and report 10% (50 points)
In class presentations 10% (50 points)
Final project 10% (50 points)
Midterms (2) 20% (100 points) (each)
Final exam 25% (125 points)
Total 500 points

Point scale:
A=465-500,
A-=450-464,
B+=435-449,
B=415-434,
B-=400-414,
C+=385-399,
C=365-384,
C-=350-364,
D=300-349,
F=below 300

Fearfully and wonderfully made

For you created my inmost being; you knit me together in my mother's womb. I praise you because I am fearfully and wonderfully made; your works are wonderful, I know that full well.

Lecture schedule

Week	Topic	Reading
Week 1	Syllabus and basics of Developmental Biology Anatomical Tradition and Comparative Embryology Lifecycles and Patterns in Development	Ch. 1-2
Week 2	Genetics of Development Cell Communication and Signaling Differential Gene Expression	Ch. 4-6
Week 3	Experimental Embryology Cell Specification and Differentiation Midterm 1 DATE	Ch. 3
Week 4	Gametes and Fertilization Cleavage and cell fates Gastrulation and cell movements	Ch. 7-8
Week 5	Axis specification – Anterior/Posterior Axis specification – Segmentation Axis specification – Organizers	Ch. 9-10
Week 6	Axis specification – Chicks and Mammals Axis specification – Hox code Axis specification – Understanding Animals	Ch. 11
Week 7	Ectoderm – The Neural Tube Ectoderm – The Eye Ectoderm – The Epidermis	Ch. 12-13
Week 8	Mesoderm – The Somites Mesoderm – Muscle, Bone, Kidneys Mesoderm – Heart and Blood	Ch. 14
Week 9	Endoderm – Pharengeal arches Endoderm – The Gut Midterm 2 DATE	Ch. 15
Week 10	Limb Specification and Hox Limb Axis Formation Digits and Joints	Ch. 16
Week 11	Chromosomal Sex Determination Germ Cell Maintenance Oogenesis and Spermatogenesis	Ch. 17, 19
Week 12	Metamorphosis Regeneration Aging	Ch. 15
Week 13	Developmental Gene Tracking Teratogens and Babies Adult Onset and Cancer	handouts
Week 14	Descent with Modifications Hox Genes and Homologies Evolutionary Synthesis	Ch. 22
Week 15	Wrap-up and review	
Exam week	EXAM TIME AND DATE	

And the end of all our exploring
Will be to arrive where we started
And know the place for the first time.

T. S. ELIOT (1942)

Laboratory Schedule

Week 1: Intro to laboratory
"Rules and tools"
Week 2: Chick development
"The visible embryo"
Week 3: Chick development
Week 4: Sea urchin development
"The first cell"
Week 5: Sea urchin development
Week 6: Fruit fly development
"Patterning"
Week 7: Fruit fly development
Week 8: Frog development
"Germ layers"
Week 9: Frog development
Week 10: Zebrafish development
"Field theory"
Week 11: Zebrafish development
Week 12: Experiment design
Week 13: Self-directed
Week 14: Self-directed
Week 15: Lab presentations

Resources

Society of Developmental Biology:
http://www.sdbonline.org/index.php?option=com_frontpage&Itemid=1

The Biology Project:
http://www.biology.arizona.edu/

Campus Tutoring center:
Hours and location

Campus writing center:
Hours and location

Supplemental Instruction:
Time and location