

ZOO 4603C - Embryology & Development - Fall 2021

Section 0001: WF 09:00-10:20 am Lecture (BIO 209)

5 Credits

Section 0011: WF 11:00-12:50 pm Laboratory (BIO 211)

Section 0012: WF 01:30-03:20 pm Laboratory (BIO 211)

Instructor: Dr. Cynthia Bayer

In-person (BIO 202D) Office Hours: by appointment only

Communication: Webcourses *Inbox*

Open (Zoom) Office Hours: Tues 10-11am & Thur 11-12noon

Course Description: This course will cover the mechanisms of morphological change during animal development considering examples of developmental processes in several animal model systems. The cellular, molecular, and genetic basis of animal development from gametogenesis to organogenesis, will be examined. The laboratory will consist of microscopic examination of different stages in early embryonic development in frog and chick. We will also observe and conduct experiments with several living organisms representing model systems used in the study of developmental processes.

Prerequisites: A grade of C or better in PCB 3063 (General Genetics) and PCB 3023 (Molecular Cell Bio) or PCB 3522 (Molecular Biology I). Some topics covered in PCB 3063 and PCB 3023 may be reviewed only briefly in this course before expanding into greater depth.

Student Learning Outcomes: Successful students will demonstrate a broad understanding of the basic principles of animal development, an ability to apply information to new scenarios, and recognize connections between these concepts:

- The cellular and chemical interactions of fertilization
- How a single-celled zygote develops into a multicellular organism
- How specialized cells form from undifferentiated precursors
- The factors that direct the formation of ordered structures
- Compare and contrast developmental processes among different vertebrates and invertebrates

In the laboratory, students will learn to:

- Visualize how the anatomy of the embryo changes during early development
- Transform 2D microscopic sections of an embryo into a 3D organism

Students will be evaluated on meeting these objectives via participation in lecture *iClicker* polls, 3 lecture exams, 2 laboratory practical exams and a comprehensive final exam.

Academic Activity - Course Expectations:

- To meet the registrar's requirement for documentation of your participation in this course, please complete the **Course Expectations/Syllabus Quiz**, found in our Webcourse Quiz section, by **5:00 pm Friday, Aug 27**. Failure to do so will result in a delay in the disbursement of your financial aid.
- All students are required to complete the Course Expectations/Syllabus Quiz for points.

Course website & Communication: Access our course website at Webcourses@UCF via the myUCF portal using your NID and password. You will find links to the **Syllabus, Grades, Web Resources, Lecture PowerPoints and Lab Exercises** to bring to lecture and laboratory sessions. I will use Webcourses *Inbox* and *Announcements* for communication with students.

REQUIRED Textbooks:

Developmental Biology, 12th ed., Barresi & Gilbert & (2019) [Oxford University Press](#). Available as an eBook ISBN: 9781605358239, Hardcover print ISBN: 9781605358222, or Looseleaf print ISBN: 9781605358246. Although I strongly recommend the digital resources associated with the 12th edition eBook, such as bookmarks, highlighting, and Text to Speech features and tools for making notes, study guides, and flashcards, you may choose to use the earlier 10th or 11th edition instead.

A Photographic Atlas of Developmental Biology. Shirley J. Wright, 2005. [Morton Publishing](#). Available as a Loose-leaf print text ISBN: 9780895826299

REQUIRED iClicker:

I will use *iClicker* polling daily in lecture for course points. You are required to participate with the *iClicker Student* app on a smartphone, tablet, or laptop. See the Webcourses ***iClicker Instructions*** page to link my *iClicker Cloud* course with your student account.

Grading: **90%** = best 5 out of 6 lecture/lab exams

10% = *iClicker* points

There will be 3 lecture exams, 2 laboratory exams, and a COMPREHENSIVE lecture/lab final exam, each worth 100 points. The lowest score of all 6 exams will be dropped automatically. The score of the Final exam will be dropped if it turns out to be the lowest of your scores, or you may choose to not take the final exam.

- Lecture exams will be based only on material covered in lecture, which includes topics not covered in the textbook. Some notes and diagrams presented in lecture are not included in the PowerPoint slides available at the Webcourse website. Therefore, students who routinely skip lectures will be at a disadvantage.
- Lab practical exams will test your knowledge of the prepared specimens observed during laboratory sessions, and your exam grade will reflect the amount of time you spend in lab studying these specimens.

***iClicker* points** are earned from class participation and graded questions. Each day 3 points are earned for participation (= answering at least 75% of the questions) plus additional points for graded questions (1 point for each correct answer and 0.25 point for each incorrect answer). Only a subset of questions will be graded each day. The two lowest *iClicker* day scores will be dropped automatically.

- Students are responsible for keeping track of their grades and identifying issues within 2 days of any grade posting in Webcourses.
- Flat letter grades for the semester will be awarded according to the scale below. Letter grades will adhere to this percentage range with no exceptions. There will be **no curving**.

A = 90-100% B = 80-89% C = 70-79% D = 60-69% F = 59% and below

Taking Exams: All electronic devices must be inaccessible during exams. Use or display of any unauthorized electronic device will result in a zero for the exam, referral to the Office of Student Conduct, and a "Z Designation" on the student's official transcript (see below). All exams will use scantrons that will be provided by me. It is your responsibility to bubble in the scantron answers completely with a #2 pencil and erase clearly. If you arrive late to an exam, you will be allowed to take the exam. However, you must turn in the exam paper at the regular scheduled end of the exam. You will not be allowed extra time unless a documentable emergency has occurred (see below).

Reviewing Exams: Scantrons will not be returned to students. Individual test report sheets with all correct and incorrect responses marked on it will, however, be available. Scores will be posted at our Webcourses site. Exams can be reviewed during lab sections for the period of time up until the next exam (e.g., exam 1 can be reviewed up until exam 2 is given).

Excused Missed Lecture Exams:

- If an exam is missed due to an official, documented, University-accepted absence, a makeup exam will be arranged. Excused absences include special curricular requirements (e.g. field trip, professional conference), official UCF business at which your presence is required (e.g. university sponsored team event), U.S. Military-related business, legal obligation (e.g. jury duty).
 - You must provide to me documentation with your name and the date affected **1 week prior** to the scheduled exam date.
- A makeup exam **may** be permitted if any other legitimate* documented reason that circumstances beyond your control prevented you from taking the scheduled exam (including, but not limited to, your hospitalization or a death in your immediate family)
 - *Official documentation from an appropriate authority* (doctor, police, judge, etc.) must be **provided within 24 hours of the missed exam**, *A doctor's note must be written on letterhead paper with a contact phone number and must document that a medical condition was treated or that a medical procedure or hospitalization occurred.
 - *If I approve your excuse*, I will arrange a time and place for a make-up exam.

Unexcused Missed Lecture Exams: If a student misses an exam for an unexcused event (e.g. forgetting there was an exam, vacations, family gatherings) or *cannot provide acceptable documentation*, then they will receive a score of zero for that exam. This zero score will be dropped as the lowest scoring exam.

Missed Laboratory Exam Policy: Because of their format, there is NO opportunity for a make-up laboratory exam, so be sure not to miss Lab Exam 1 or Lab Exam 2. Your absence will result in your earning a grade of 0 for the missed exam.

Classroom Conduct: By enrolling at UCF, all students have agreed to abide by the *Golden Rule*. Please become familiar with this document at: <http://www.goldenrule.sdes.ucf.edu/> It is assumed that all students will act in a mature manner in the classroom showing consideration for their peers and the instructor. Please also use common courtesy in class by arriving and departing on time, refraining from talking during class, and silencing cell phones and other electronic devices.

In-Class Recording: Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal educational use. A class lecture is defined as a formal or methodical oral presentation as part of a university course intended to present information or teach students about a particular subject. Recording classroom activities other than class lectures, including but not limited to lab sessions, class discussion (except when incidental to and incorporated within a class lecture), academic exercises involving student participation, test or examination administrations, and private conversations is prohibited. Recordings may not include the image or voice of other students in the class, may not be used as a substitute for class participation and class attendance, and may not be published or shared without the written consent of the faculty member. Failure to adhere to these requirements may constitute a violation of the University's Student Code of Conduct as described in the Golden Rule.

Academic Integrity: As reflected in the UCF creed, integrity and scholarship are core values that should guide our conduct and decisions as members of the UCF community. Plagiarism and cheating

contradict these values and are serious academic offenses. Students enrolled at UCF are expected to familiarize themselves and uphold the standards of academic behavior defined in the University's *Rules of Conduct* (Section UCF-5.008) in the Golden Rule handbook <http://goldenrule.sdes.ucf.edu>.

Students are prohibited from engaging in **Academic Misconduct**:

1. Unauthorized assistance: Using or attempting to use unauthorized materials, information or study aids in any academic exercise unless specifically authorized by the instructor of record. The unauthorized possession of examination or course-related material also constitutes cheating.
2. Communication to another through written, visual, electronic, or oral means: The presentation of material which has not been studied or learned, but rather was obtained through someone else's efforts and used as part of an examination, course assignment, or project.
3. Commercial Use of Academic Material: Selling of course material to another person, student, and/or uploading course material to a third-party vendor without authorization or without the express written permission of the university and the instructor. Course materials include but are not limited to class notes, Instructor's PowerPoints, course syllabi, tests, quizzes, labs, instruction sheets, homework, study guides, handouts, etc.
4. Falsifying or misrepresenting the student's own academic work.
5. Plagiarism: Using or appropriating another's work without any indication of the source, thereby attempting to convey the impression that such work is the student's own.
6. Multiple Submissions: Submitting the same academic work for credit more than once without the express written permission of the instructor.
7. Helping another violate academic behavior standards.
8. Soliciting assistance with academic coursework and/or degree requirements. The solicitation of assistance with an assignment, lab, quiz, test, paper, etc., without authorization of the instructor of record or designee is prohibited. This includes but is not limited to asking for answers to a quiz, trading answers, or offering to pay another to complete an assignment. It is considered Academic Misconduct to solicit assistance with academic coursework and/or degree requirements, even if the solicitation did not yield actual assistance (for example, if there was no response to the solicitation).

Students are prohibited from **Possessing and/or Providing False and Misleading Information and/or Falsification of University Records**:

1. Withholding related information or furnishing false or misleading information (oral or written) to University officials, university and non-university law enforcement officers, faculty or staff.
2. Possession, use or attempted use of any form of fraudulent identification.
3. Forgery, alteration or misuse of any University document, material, file, record or instrument of identification.
4. Deliberately and purposefully providing false or misleading verbal or written information about another person.
5. Falsification, distortion, or misrepresentation of information during an investigation, the Student Conduct Review Process, including knowingly initiating a false complaint.

Unauthorized Use of Websites and Internet Resources: There are many websites claiming to offer study aids to students, but in using such websites, students could find themselves in violation of academic conduct guidelines. These websites include (but are not limited to) Quizlet, Course Hero, Chegg Study, and Clutch Prep. UCF does not endorse the use of these products in an unethical manner, which could lead to a violation of our University's Rules of Conduct. They encourage students to upload

course materials, such as test questions, individual assignments, and examples of graded material. Such materials are the intellectual property of instructors, the university, or publishers and may not be distributed without prior authorization. Students who engage in such activity could be found in violation of academic conduct standards and could face course and/or University penalties. Please let me know if you are uncertain about the use of a website so I can determine its legitimacy.

Unauthorized Distribution of Class Notes: Third parties may attempt to connect with you to sell your notes and other course information from this class. Distributing course materials to a third party without my authorization is a violation of our University's Rules of Conduct. Please be aware that such class materials that may have already been given to such third parties may contain errors, which could affect your performance or grade. If a third party should contact you regarding such an offer, I would appreciate your bringing this to my attention. We all play a part in creating a course climate of integrity.

Responses to Academic Dishonesty, Plagiarism, or Cheating: Students should also familiarize themselves with the procedures for academic misconduct in UCF's student handbook, *The Golden Rule* handbook <http://goldenrule.sdes.ucf.edu>. UCF faculty members have a responsibility for students' education and the value of a UCF degree, and so seek to prevent unethical behavior and respond to academic misconduct when necessary. Penalties for violating rules, policies, and instructions within this course can range from a zero on the exercise to an "F" letter grade in the course. In addition, an Academic Misconduct report could be filed with the office of Student Conduct and Academic Integrity <https://scai.sdes.ucf.edu> which could lead to disciplinary warning, disciplinary probation, or deferred suspension or separation from the University through suspension, dismissal, or expulsion with the addition of a "Z" designation on one's transcript.

Being found in violation of academic conduct standards could result in a student having to disclose such behavior on a graduate school application, being removed from a leadership position within a student organization, the recipient of scholarships, participation in University activities such as study abroad, internships, etc.

Let's avoid any potential misconduct or penalty by demonstrating values of honesty, trust, and integrity. No grade is worth compromising your integrity and moving your moral compass. Stay true to doing the right thing: take the zero, not a shortcut

Time commitment: For most students striving for B grades or higher, I recommend scheduling 12-16 hours per week for engaging with this course. Your background knowledge/experience and other variables may require you to spend additional time. Please plan accordingly by scheduling time on your calendar now. Several factors influence student academic performance and long-term learning. Active engagement in all course activities (e.g., lecture and *iClicker* polling, textbook readings, lab preparation and participation, reviewing) will contribute to your learning and to success in this course.

Course Accessibility and Inclusion: It is my goal that this class be an accessible and welcoming experience for all. UCF and I consider the diversity of our students, faculty, and staff to be a strength and critical to our educational mission. UCF expects every member of the university community to contribute to an inclusive and respectful culture for all in its classrooms, work environments, and at campus events. Dimensions of diversity can include sex, race, age, national origin, ethnicity, gender identity and expression, intellectual and physical ability, sexual orientation, income, faith and non-faith perspectives, socio-economic class, political ideology, education, primary language, family status, military experience, cognitive style, and communication style. The individual intersection of these experiences and characteristics must be valued in our community.

If there are aspects of the design, instruction, or experiences within this course that result in barriers to your inclusion or accurate assessment of achievement, please notify me to discuss reasonable options or adjustments. You may also want to contact SAS <http://sas.sdes.ucf.edu> (Ferrell Commons 185; 407-823-2371) to talk about academic accommodations.

Help & SARC: Please ask for help if you need it! I am here to answer your questions. Additionally, help is available through SARC (Student Academic Resource Center, Howard Phillips Hall, Room 113: 407-823-5130; <http://sarc.sdes.ucf.edu>). Students can request a Learning Consultation with a Learning Skills Specialist, or attend Academic Success Workshops to improve study skills & strategies.

Deployed Active-Duty Military Students: Students who are deployed active-duty military or National Guard personnel and require accommodation should contact their instructors as soon as possible after the semester begins and/or after they receive notification of deployment to make arrangements.

UCF Cares: UCF and I care not only about your academic success, but also your overall well-being. Please visit UCFCares.com <http://cares.sdes.ucf.edu> if you are seeking resources or support, or if you are worried about a friend or classmate. Free services and information are included for a variety of student concerns, including but not limited to alcohol use, bias incidents, mental health concerns, sexual harassment or assault, and financial challenges. You can also e-mail ucfcares@ucf.edu with questions or for additional assistance. You can reach a UCF Cares staff member Student Care Services, <http://scs.sdes.ucf.edu>, Ferrell Commons 142, between 8 a.m. and 5 p.m. by calling 407-823-5607.

If you are in immediate distress, please call Counseling and Psychological Services (CAPS), Counseling Center 101 <http://caps.sdes.ucf.edu> to speak directly with a counselor 24/7 at 407-823-2811 or call 911.

Academic Services and Resources: A list of available academic support and learning services is available at [UCF Student Services](#). Click on "Academic Support and Learning Services" on right-hand side to filter.

Non-Academic Services and Resources: A list of non-academic support and services is also available at [UCF Student Services](#). Click on "Support" on the right-hand side to filter.

Campus Safety Statement: Emergencies on campus are rare, but if one should arise in our class, we will all need to work together. Everyone should be aware of the surroundings and familiar with some basic safety and security concepts.

- In case of an emergency, dial 911 for assistance.
- Every UCF classroom contains an emergency procedure guide posted on a wall near the door. Please make a note of the guide's physical location and consider reviewing the online version at http://emergency.ucf.edu/emergency_guide.html.
- Familiarize yourself with evacuation routes from each of your classrooms and have a plan for finding safety in case of an emergency.
- If there is a medical emergency during class, we may need to access a first aid kit or AED (Automated External Defibrillator). To learn where those items are located in any building, see <http://www.ehs.ucf.edu/AEDlocations-UCF> (In our building BIO, they are located on the 2nd floor near the elevators.)
- To stay informed about emergency situations, sign up to receive UCF text alerts by going to my.ucf.edu and logging in. Click on "Student Self Service" located on the left side of the screen in the tool bar, scroll down to the blue "Personal Information" heading on your Student Center

- screen, click on “UCF Alert”, fill out the information, including your e-mail address, cell phone number, and cell phone provider, click “Apply” to save the changes, and then click “OK.”
- If you have a special need related to emergency situations, please speak with me during office hours.
 - Consider viewing this video [You CAN survive an active shooter](#) about how to manage an active shooter situation on campus or elsewhere.
-

COVID-19: UCF expects that all members of our campus community who are able to do so get vaccinated, and we expect all members of our campus community to wear masks indoors, [in line with the latest CDC guidelines](#). Masks are required in approved clinical or health care settings.

- **No-cost vaccines** are available daily by appointment at the Student Health Center for faculty, staff, and students. You can make an appointment at <https://studenthealth.ucf.edu/portal/>, or click <https://www.vaccines.gov/search/> to find another vaccine location near you.
- **COVID-19 and Illness Notification** – Students who believe they may have been exposed to COVID-19 or who test positive must contact UCF Student Health Services (407-823-2509) so proper contact tracing procedures can take place. Students should not come to campus if they are ill, are experiencing any symptoms of COVID-19 or have tested positive for COVID-19.
Students should contact their instructor(s) as soon as possible if they miss class for any illness to discuss reasonable adjustments that might need to be made. When possible, students should contact their instructor(s) before missing class.
- **In Case of Faculty Illness** – If the instructor falls ill during the semester, there may be temporary changes to this course, including having a backup instructor take over the course or going remote for a short time. Please look for announcements or mail in Webcourses@UCF or Knights email for any alterations to this course.
- **Course Accessibility** – Accommodations may need to be added or adjusted should this course shift from an on-campus to a remote format. Students with disabilities should speak with their instructor and should contact sas@ucf.edu to discuss specific accommodations for this or other courses.

Embryo Laboratory Schedule

Dates	Topics	Lab Manual References (pages)	Atlas of Developmental Biology
Aug 25 & 27	<u>Lab 0.</u> Introduction and distribution of slides		Handout
Sep 1 & 3	<u>Lab 1.</u> Frog cleavage, gastrulation, & neurulation	77-80, 95-96, 109-115	
Sep 8 & 10	<u>Lab 2.</u> 4 mm frog	143-150	
Sep 15 & 17	<u>Lab 3.</u> 7 mm frog	156-161	
Sep 22 & 24	<u>Lab 4.</u> 10 mm frog & live <i>C. elegans</i>	162-169	
Sep 29 (Wed)	<u>Lab 5.</u> <i>Experimental:</i> Sea urchin fertilization		Handout
Oct 1 (Fri)	<u>Lab 6.</u> <i>Experimental:</i> Live 11 mm frog embryos		Handout
Oct 6 (Wed)	Review for Lab Exam 1		
Oct 8 (Fri)	Lab Exam 1 (frog embryology)		
Oct 13 & 15	<u>Lab 7.</u> Chick cleavage, gastrulation, & neurulation	80-83, 96-101, 116-123	
Oct 20 & 22	<u>Lab 8.</u> 33-hr chick	171-191	
Oct 27 & 29	<u>Lab 9.</u> 48-hr chick	194-199	
Nov 3 (Wed)	<u>Lab 10.</u> <i>Experimental:</i> Set up planarian regeneration		Handout
Nov 5 (Fri)	<u>Lab 11.</u> <i>Experimental:</i> Live 48-hr chick embryos		Handout
Nov 10 & 12	<u>Lab 12.</u> 72-hr chick	201-209	
Nov 17 (Wed)	Review for Lab Exam 2		
Nov 19 (Fri)	Lab Exam 2 (chick embryology)		

Most weeks, the Wednesday lab session will begin with a presentation of the objectives for the week. After that, students have the rest of the Wed lab plus the Fri lab to examine their slides of prepared specimens. Students may study individually (using individual microscopes) or in small groups (using microscopes equipped with a large monitor). *Laboratory attendance is mandatory.* Students will sign in each lab session. Be mindful of the fact that your lab exam grades will correlate with the amount of time you spend in lab. Many students who have performed well on the lecture exams have missed out on earning an A for this course because they did not put enough effort into their lab work. Remember that the lab exams will amount to **40% of your final course grade.**

You will examine prepared specimens of sequential stages of frog and chick embryonic development. Most of these specimens are two-dimensional sections. Do not attempt to merely memorize the structures within individual sections. Instead, learn to identify the position of each structure within the three-dimensional embryo, recognize its origin, and track how each structure (and the entire embryo) changes over time.

Supplementary Materials for the Laboratory

You will be provided with a complete set of microscope slides with multiple sections of prepared embryos and a compound microscope. You will be sharing your assigned slides with a student from the other lab section. Please handle with care all slides, microscopes, and lab equipment that you use. Open the slide box only after placing it on your bench with the **lid on top**; otherwise the slides may fall out and break. If you damage a slide you may be required to replace an entire set (\$50 and up). Always carry the microscope using both hands. Ask the instructor for help if you need assistance with the proper use of the microscope. You may be held financially responsible for any equipment that you break or damage because of negligence. Notify the instructor immediately if you find any damaged slides or supplies.

Embryo Fall 2021 Lecture Schedule

Aug 25: *Introduction, Chapter 1 - Questions*

Aug 27: Chapter 1, 2 - *Patterns & Commitment*

ADD/DROP deadline

Fri, Aug 27 11:59pm

Sep 01: Chapter 2

Sep 03: Chapter 7 - *Fertilization*

Sep 08: Chapter 7

Sep 10: Chapter 10, 8 - *Invertebrates - Sea Urchins & Snails*

Sep 15: Chapter 10, 8

Sep 17: Chapter 8 - *Nematodes*

Sep 22: Chapter 8

Sep 24: Lecture Exam 1 (Chapters 1, 2, 7, 8, 10)

Sep 29: Chapter 11 - *Vertebrates - Amphibians*

Oct 01: Chapter 11

Oct 06: Chapter 12 - *Birds*

Oct 08: Chapter 12 - *Birds / Mammals*

Oct 13: Chapter 12 - *Mammals*

Oct 15: Chapter 13, 14 - *CNS*

Oct 20: Chapter 13, 14 - *CNS*

Oct 22: Chapter 15, 16 - *PNS*

Oct 27: Lecture Exam 2 (Chapters 11, 12, 13, 14, 15, 16)

Oct 29: Chapter 15 - *Neural Crest*

WITHDRAWAL deadline

Fri, Oct 29 11:59pm

Nov 03: Chapter 17, 18 - *Mesoderm*

Nov 05: Chapter 17, 18, 20 - *Mesoderm / Endoderm*

Nov 10: Chapter 20, 6 - *Endoderm / Sex Determination*

Nov 12: Chapter 6, 9 - *Sex Determination / Drosophila*

Nov 17: Chapter 9 - *Drosophila*

Nov 19: Chapter 9 - *Drosophila*

Nov 24: **THANKSGIVING BREAK**

Nov 26: **THANKSGIVING BREAK**

Dec 01: Chapter 9 - *Drosophila*

Dec 03: Lecture Exam 3 (Chapters 15, 17, 18, 20, 6, 9)

Dec 10: Comprehensive Final Exam (Friday 7:00-9:50am but must be confirmed by registrar)

Note that the instructor reserves the right to make changes to the syllabus or other aspects of the course at any time. These changes will be announced in class.