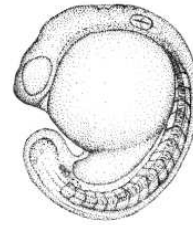


**BZ311 Developmental Biology**  
**Summer 2023**  
Dr. Deborah Garrity



*"Our real teacher has been and still is the embryo, who is, incidentally, the only teacher who is always right."* Viktor Hamburger

**Course Description:** This course investigates cellular and molecular mechanisms that regulate animal and plant development. Topics include fertilization, cleavage, gastrulation, axis specification, organogenesis, morphogens, patterning and stem cells. A module on sex determination mechanisms and evolution explores this topic in depth. Laboratory sessions focus on experimental manipulations of early invertebrate and vertebrate embryos and include student-designed research projects.

**Prerequisite:** BZ310 (Cell Biology) required. BZ350 (Molecular and General Genetics) recommended.

**Learning goals:** Upon completion of this course, students will be able to:

- Describe and contrast the events of gametogenesis, fertilization, cleavage, gastrulation, organogenesis, and body axis specification, and define what they accomplish for the organism.
- Explain and give examples of fundamental concepts related to developmental biology including cell fate, morphogens, morphogenetic gradients, lateral inhibition, homeotic transformation, maternally inherited components, induction, cell signaling, and gene networks.
- Describe the strengths and limitations of major model organisms used to investigate plant or animal development.
- Explain and give examples of the relationships of genotype, phenotype, environment, and developmental timing.
- Give examples of how genetic tools can uncover gene function.
- Describe the relationship of genes and embryonic development to disease or morphological variation.
- Describe common experimental approaches used in developmental biology, and relate them to specific information the approach could provide. Describe modern experimental tools and how they work.
- Counter myths related to sex determination by giving explanations and examples based on biological data.
- Give examples of cutting-edge stem cell work designed to address a problem of development or disease.
- In lab, demonstrate competence in using tools of developmental biology to observe specimens and interpret changes in the organism during embryonic development.
- In lab, design and perform experiments with appropriate controls, acquire and interpret results, and present findings in oral or written format.

**Course instructor:**

Deborah Garrity, Ph.D.

Office: 230 Biology

Email: [Deborah.Garrity@Colostate.edu](mailto:Deborah.Garrity@Colostate.edu) ; also accessible through the Canvas site.

Summer office hours: by appointment.

**Lab Coordinator:**

Alpana Damle

Office: Yates 210

Office phone: 491-0860

Email: [Alpana.Damle@ColoState.EDU](mailto:Alpana.Damle@ColoState.EDU)

**Lab TA's:**

Brandon Hylton – [brandon.hylton@colostate.edu](mailto:brandon.hylton@colostate.edu)

Amanda MacDonald - [amanda.macdonald@colostate.edu](mailto:amanda.macdonald@colostate.edu)

**Class Meetings:** Lectures and labs begin promptly (timing is critical in development).

**Lecture:** 8:00 – 9:45 am Tuesday, Wednesday and Thursday in Biology 136.

**Lab:** 205 Yates

L01 10:30 – 1:50 pm W

L02 2:30 – 5:50 pm W

**Please note: laboratory  
attendance is mandatory.**

**Textbook:** *Developmental Biology*, 12th edition, by Scott Gilbert, recommended. The accompanying website, <http://www.devbio.com/>, can be searched by topic.

**Lab Manual:** Available at the CSU Bookstore, required. You are expected to have read each lab prior to coming to lab.

**Course web site:** BZ311 will use the Canvas website. On this website you have access to the syllabus, lecture powerpoint presentations, study guides, links to videos we see in class, links to developmental biology in the news, glossary of terms, and your grades. Check this site early and regularly.

**Your final grade** will be calculated from your performance on the following assignments:

Lecture 600 points (3/4 of the total)

Lecture exams 1-3	3 @ 120 pts	360 pts
Comprehensive final/Lect exam 4	1 @ 170 pts	170 pts
In class exercises	13 @ 5 pts	65 pts
Reflection	1 @ 5 pts	5 pts

Lab 200 points (1/4 of the total)

See lab syllabus for details

200 pts

**Total possible points:**

**800 pts**

♣ **FINAL GRADES:** There is generally no curve in this course. The lower cut-off's for the grades will be approximately as follows:

♣ **EXAMS:** Exams will be given during class and will cover material presented in lecture and study guides. Exams will have multiple-choice, true-false, fill-in-the-blank, diagrams and essays. The final exam will be comprehensive. 75 pts will cover the new material and 100 pts will cover comprehensive material. For review, emphasize concepts and figures.

A : 92%	B+ : 88%	C+ : 78%	D: 60%
A- : 90%	B: 82%	C: 70%	F: <60%
	B- : 80%		

♣ **IN CLASS EXERCISES** should be done **in class** (interactively) for 5 points, or done as a “make-up” (non-interactively) for 2.5 points. Make-ups can only be turned in prior to the next exam.

♣ **RE-GRADE REQUESTS:** When you get an exam back, immediately check the exam key and try to understand why you missed a question. Exam keys will be posted on the website following each exam. Re-grade requests on any exam must be completed before the next exam, and the actual exam must be handed in. Re-grade options are meant to address addition errors, exam mis-scoring, and supported alternative correct answers. They are not meant as an opportunity to argue that the material was not covered “well enough”, that the question is too detailed, or that you did not understand the wording. For any confusion on wording, please ask for clarification during the exam.

♣ **MAKE-UP EXAMS:** Make-up exams are permitted for University-Excused Absences, with appropriate documentation. See Dr. Garrity as soon as possible if you know you must miss an exam.

♣ **LAB: Laboratory attendance is very important.** If you are not in lab, you are missing a significant portion of the information for the semester. Labs are impossible to set up at alternate times, as often times they use living materials. Therefore, if you miss the lab, you miss the points associated with it (e.g., Lab assignment). If you have a legitimate conflict with lab, inform your lab instructor as soon as possible so they can try to arrange your attendance in another scheduled lab section. **You are expected to attend all laboratory sessions.** If you have a university excused absence, please get in touch with your GTA as soon as possible to see what arrangements can

be made. Missing more than ONE laboratory session during the summer course will result in **automatic grade of 0% for the lab**. Due to the nature of this lab, it will be necessary to come in outside of your scheduled lab time to check on experiments later in the week. For some weeks, the lab requires you to return later in the week to follow up. This will not always be the case, and often only one member of the group will need to take the data, so this duty can be traded off.

**Your own work:** Although you will work in teams on some experiments, all Lab Assignments, Practicals and Commentaries should be independently prepared and submitted by each student. Write everything up in your own words with citations where appropriate.

♣ **Land Acknowledgement:**

Colorado State University acknowledges, with respect, that the land we are on today is the traditional and ancestral homelands of the Arapaho, Cheyenne, and Ute Nations and peoples. This was also a site of trade, gathering, and healing for numerous other Native tribes. We recognize the Indigenous peoples as original stewards of this land and all the relatives within it. As these words of acknowledgment are spoken and heard, the ties Nations have to their traditional homelands are renewed and reaffirmed.

CSU is founded as a land-grant institution, and we accept that our mission must encompass access to education and inclusion. And, significantly, that our founding came at a dire cost to Native Nations and peoples whose land this University was built upon. This acknowledgment is the education and inclusion we must practice in recognizing our institutional history, responsibility, and commitment.

**Important information for students:** You must also meet university vaccine or exemption requirements.

All students are expected and required to report to the COVID Reporter (<https://covid.colostate.edu/reporter/>) when:

- You suspect you have symptoms of COVID, regardless of whether or not you are vaccinated and even if your symptoms are mild
- You have tested positive for COVID through a non-CSU testing site, such as home test or test at a pharmacy
- You believe you may have been exposed to COVID go to the COVID Reporter and follow the guidance under "I believe I have been in close contact with someone who has COVID-19." This guidance will depend upon your individual circumstances

You will not be penalized in any way for reporting symptoms or concerns.

Do not ask me as your instructor to report for you. It is your responsibility to report through the COVID Reporter promptly.

As your instructor I may not ask you about vaccination status or if you have COVID but you may freely volunteer to send me information from a public health official if you have been asked to isolate or quarantine.

When you complete the COVID Reporter, the CSU Public Health office is notified. Once notified, that office will contact you and, depending upon each situation, will conduct contact tracing, initiate any necessary public health requirements and notify you if you need to take any steps.

If you do not have internet access to fill out the online COVID-19 Reporter, please call (970) 491-4600.

For the latest information about the University's COVID resources and information, including FAQs about the spring semester, please visit the CSU COVID-19 site <https://covid.colostate.edu/>.

**Special Needs Statement:** Students with disability are encouraged to contact Student Disability Center (SDC) at 970- 491-6385 or <https://disabilitycenter.colostate.edu/> to arrange for accommodations and support services.

**Gender Inclusive Restrooms:** There gender inclusive restrooms are located on the first, fourth, and fifth floors of the behavioral sciences building.

## **Service Animals & Support Animals:**

### **Service Animal**

A **service dog (or mini-horse) is considered necessary for access, much like a wheelchair**. An emotional support animal is considered an accommodation to allow someone the ability to benefit from housing. **Subject to some limitations, a service dog may generally accompany students throughout campus, such as classrooms**, recreational facilities and campus residences. It is expected that a service dog be identifiable to others through a visible signifier (e.g., vest or harness) although it is not required. The service animal must behave unobtrusively and always be under the handler's direct control. Students with non-apparent disabilities who use a service dog are strongly encouraged to use the Student Disability Center (SDC) as a means of verifying the need as an accommodation while on campus. **Misrepresenting a dog as a service dog is a violation of Intentional Misrepresentation of Entitlement to an Assistance Animal, Colo. HB16-1426.**

### **Emotional Support Animal**

In some instances, **students with a verifiable disability** may be allowed to have an emotional support animal within campus housing facilities, *but it may not be allowed to enter classrooms*. Requests for accommodations beyond the residential scope will be assessed on a case-by-case basis by the Student Disability Center (SDC). All requests for emotional support animals as an accommodation in campus housing facilities must be approved by the Student Disability Center.

For additional information on disability documentation guidelines and/or the accommodation process, go to Accommodation Process or call the Student Disability Center at (970) 491-6385.

### **Title IX:**

CSU's Discrimination, Harassment, Sexual Harassment, Sexual Misconduct, Domestic Violence, Dating Violence, Stalking, and Retaliation policy designates faculty and employees of the University as "Responsible Employees." This designation is consistent with federal law and guidance, and requires faculty to report information regarding students who may have experienced any form of sexual harassment, sexual misconduct, relationship violence, stalking or retaliation. This includes information shared with faculty in person, electronic communications or in class assignments. As "Responsible Employees," faculty may refer students to campus resources (see below), together with informing the Office of Support and Safety Assessment to help ensure student safety and welfare. Information regarding sexual harassment, sexual misconduct, relationship violence, stalking and retaliation is treated with the greatest degree of confidentiality possible while also ensuring student and campus safety.

Any student who may be the victim of sexual harassment, sexual misconduct, relationship violence, stalking or retaliation is encouraged to report to CSU through one or more of the following resources:

- Emergency Response 911
- Deputy Title IX Coordinator/Office of Support and Safety Assessment (970) 491-1350
- Colorado State University Police Department (non-emergency) (970) 491-6425

Confidential victim advocates are available 24 hours a day, 365 days a year to provide support related to the emotional, physical, physiological and legal aftermath of interpersonal violence. Contact the Victim Assistance Team at: 970-492-4242.

## **Academic Integrity (From the CSU catalog <http://www.catalog.colostate.edu>) The CSU Honor Pledge**

The foundation of a university is truth and knowledge, each of which relies in a fundamental manner upon academic integrity and is diminished significantly by academic dishonesty. Academic integrity is conceptualized as doing and taking credit for one's own work. A pervasive attitude promoting academic integrity enhances the sense of community and adds value to the educational process. All within the University are responsible for and affected by the cooperative commitment to academic integrity. As such CSU has instituted an Honors pledge that you will all be asked to sign, which states that you pledge your honor not to give or receive unauthorized assistance on assignments and exams in this course.

Academic dishonesty (see examples below) undermines the educational experience at Colorado State University, lowers morale by engendering a skeptical attitude about the quality of education, and negatively affects the relationship between students and instructors.

Instructors are expected to use reasonably practical means of preventing and detecting academic dishonesty. Any student found responsible for having engaged in academic dishonesty will be subject to academic penalty and/or University disciplinary action.

Students are encouraged to share responsibility for the academic integrity of the University by reporting incidents of academic dishonesty.

Examples of academic dishonesty include (but are not limited to):

1. *Cheating in the Classroom* -- Cheating includes using unauthorized sources of information and providing or receiving unauthorized assistance on any form of academic work. Examples include copying the work of another student on an exam, problem set, or quiz; taking an exam or completing homework for another student; possessing unauthorized notes, study sheets, answer codes, programmed calculators, or other materials during an exam, and falsifying exams or other graded paper results.
2. *Plagiarism* -- Plagiarism includes the copying of language, structure, ideas, or thoughts of another, and representing them as one's own without proper acknowledgment. Examples include a submission of purchased research papers as one's own work; paraphrasing and/or quoting material without properly documenting the source.
3. *Unauthorized Possession or Disposition of Academic Materials* -- Unauthorized possession or disposition of academic materials includes the unauthorized selling or purchasing of examinations or other academic work; stealing another student's work; unauthorized entry to or use of material in a computer file; theft or mutilation of library materials; and using information from or possessing exams that an instruction did not authorized for release to students.
4. *Falsification* -- Falsification encompasses any untruth, either verbal or written, in one's academic work. Examples include receiving unauthorized assistance or working as a group on a take-home exam, independent exam, or other academic work without authorization, or lying to avoid taking an exam or turning in other academic work.

Furthermore, falsification of any University document is a violation of academic integrity. Examples include student identification numbers, transcripts, grade sheets, credentials, University status, or letters of recommendation. Forging a signature is another specific example of falsification.

5. *Facilitation of Cases of Academic Dishonesty* -- Facilitation of any act of academic dishonesty including cheating, plagiarism, and/or falsification of documents also constitutes violation of Colorado State University's academic integrity. Examples include knowingly discussing specifics of the content of a test or examination you have taken with another student who has not yet taken that test or examination or facilitating, by sharing one's own work, a student's efforts to cheat on an exam or other academic work.

The use of online "homework helper" sites including, but not limited to, Chegg, NoteHall, Quizlet, ChatGPT, and Koofers is not permitted in this course. Please reach out to your instructor to discuss if a specific service you are thinking about using for this course is acceptable.

Use of these types of resources will be considered receiving unauthorized assistance and, therefore, a violation of the student conduct code. Using them may result, at the discretion of the instructor, in a zero for the course, assignment, quiz, or exam. All incidents of this type will be referred to the CSU Student Resolution Center and may be subject to additional University disciplinary action.

If an instructor has evidence that a student has engaged in an act of academic dishonesty, the instructor will notify the student of the concern and make an appointment to discuss the allegations with the student. The student will be given the opportunity to give his/her position on the matter. If the student admits to engaging in academic dishonesty or if the instructor judges that the preponderance of evidence supports the allegation of academic dishonesty, the instructor may then assign an academic penalty. Examples of academic penalties include receiving a reduced grade for the work, a failing grade in the course, or other lesser penalty as the instructor deems appropriate. If, after making reasonable efforts, the instructor is unable to contact the student or collect all relevant evidence before final course grades are assigned, they shall assign an interim grade of incomplete and notify the student of the reason such grade was given.

If the student disputes the allegation of academic dishonesty he/she should request a hearing with Conflict Resolution and Student Conduct Services. The University Hearing Officer will determine whether or not a preponderance of evidence exists in support of the allegation of academic dishonesty.

If the University Hearing Officer finds insufficient evidence or clears the student of the charges, the instructor will determine a grade based upon academic performance and without reflection of the academic dishonesty charge and change any previously assigned grade accordingly. If the University Hearing Officer finds the student culpable, the Hearing Officer may impose additional University disciplinary sanctions.

Instructors should report to Conflict Resolution and Student Conduct Services all cases of academic dishonesty in which a penalty is imposed. Instructors may recommend that a hearing be conducted to determine whether additional University disciplinary action should be taken.

Information about incidents of academic dishonesty is kept on file in Conflict Resolution and Student Conduct Services. No further action is initiated unless the incident constitutes a major infraction, the student has a prior record of University infractions, or there are subsequent reports of misconduct.

Information regarding student rights, administrative hearing procedures, classifications and definitions of University disciplinary action, University Discipline Committee, appeal procedures, and the maintaining of disciplinary records is contained in the "Student Rights and Responsibilities" document available through the Vice President for Student Affairs' Office.

In BZ311 incidents of academic dishonesty will result in a score of zero for any assignment, or examination on which academic dishonesty occurs.