

*COP – BIOL 193-C – Evolution and Developmental Biology – Fall 2018 – 4 Units – MWF 9:30am – Rivera*

## Course Description

Special Topics

## Prerequisites

Graduate level standing

## Course Objectives

After successfully completing this course, you will be able to:

**Explanatory:**

Explain the relationship between the fields of Evolution, Development, and Genetics

Explain the basic developmental processes of fertilization, cleavage, gastrulation, regionalization, and patterning.

Explain and give examples of the evolutionary concepts of evolvability, plasticity, constraint, and novelty

Explain and give examples of the genetic concepts of gene regulatory networks and gene expression

**Critical Thinking:**

Critically assess scientific evidence by applying previous knowledge, evaluating logical consistency, and researching external lines of evidence

Present on a scientific topic using multiple primary and secondary sources

Read, summarize, and assess scientific papers and reviews

Contribute meaningfully to a collaborative student resource on Evolution and Development

## Teaching Methodology

This course consists of lectures, discussion, and short computational/microscopy labs. Most course readings will be completed the Sunday before the topic is lectured on in class. Lectures will primarily be given on MW of the first 11 weeks of the course, they will be open to student questions and occasional participation is required. Discussion sessions and intro to homework labs will generally be on Fridays. Reading of any additional Discussion material not covered in lecture will be completed on the Thursday before the discussion.

The final 4 weeks of the course will be student-led topics and student teaching with both oral and written presentations required. These may be done in groups of two or may be solo projects.

## Learning Resources

**Texts:** Endless Forms Most Beautiful: The New Science of Evo Devo by Sean Carroll (available used for $7-$15)

Freaks of Nature: What Anomalies Tell Us About Evolution by Mark S. Blumberg (available used/kindle for $4-$13)

*I highly recommend sharing these books with someone else in the class if you are a fast reader. These books are written for a general audience and the readings benefit from discussion with a partner or group.*

**Other resources:** The primary course resource is the draft of an Open Educational Resource by me that you will be contributing to throughout the semester. This resource is currently available only on your Canvas site though with your help we will be making it free to the public at the end of the semester. There is currently no recently published textbook for this important field of Biology even though it impacts the fields of Human Biology, Evolution, Development, and Genetics.

Canvas contains original text and figures I have created for you, guided readings of your texts (above) and papers I assign you, as well as homework assignments.

## Tentative Course Outline

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|  | Date | ***Forms and Freaks reading assignments are due on the Sunday before class, additional reading assignments are due on the Thursday before discussion. Check Canvas for exceptions and additional assignments.*** |
| Week 1 | Aug 27 | Introduction to Evo Devo, Reading Assignment due August 28th |
| Aug 29 | Introduction to Evo Devo  |
| Aug 31 | Discussion of Introductory Materials, Freaks Ch1, Forms Ch1 |
| Week 2 | Sept 3 | Labor Day – no class. Homework due Sept 4th |
| Sept 5 | Fertilization and Cortical Rotation. Homework due Sept 4th |
| Sept 7 | Discussion of Week 2 readings, Freaks Ch 2 |
| Week 3 | Sept 10 | Cleavage and Gastrulation, clay models  |
| Sept 12 | Cleavage and Gastrulation, microscope lab |
| Sept 14 | Discussion of Week 3 readings, Forms Ch 2 and 3 |
| Week 4 | Sept 17 | Gene Regulatory Networks |
| Sept 19 | Gene Regulatory Networks |
| Sept 21 | Discussion of Habits of Signaling pathways, Forms Ch 4 and 5 |
| Week 5 | Sept 24 | Genetics Catch up and Regionalization |
| Sept 26 | Regionalization |
| Sept 28 | Discussion of Week 5 readings, Forms Ch 6 and 7 |
| Week 6 | Oct 1 | Regionalization and Organizers |
| Oct 3 | Organizers  |
| Oct 5 | Fall break – no class |
| Week 7 | Oct 8 | Discussion of Week 6 readings |
| Oct 10 | Review and Vista lab |
| Oct 12 | Midterm  |
| Week 8 | Oct 15 | Patterning |
| Oct 17 | Patterning and teach-ins |
| Oct 19 | Discussion of Week 8 readings, Forms Ch 8 and 9 |
| Week 9 | Oct 22 | Novelty |
| Oct 24 | Novelty and MEME suite lab |
| Oct 26 | Discussion of Week 9 readings, Freaks Ch 3 |
| Week 10 | Oct 29 | Evolvability |
| Oct 31 | Evolvability and OMIM lab |
| Nov 2 | Discussion of Week 9 readings, j article here |
| Week 11 | Nov 5 | Case study: Ectodermal Appendages |
| Nov 7 | Case study: Bat wings and teach-ins |
| Nov 9 | Discussion of Week 10 readings, Freaks Ch 4 |
| Week 12 | Nov 12 | TBA (student choice) with teach-ins |
| Nov 14 | TBA (student choice) with teach-ins |
| Nov 16 | Discussion. Presentation Draft Due Nov 19. |
| Week 13 | Nov 26 | TBA (student choice) with teach-ins |
| Nov 28 | Student presentations and discussion |
| Nov 30 | Student presentations and discussion |
| Week 14 | Dec 3 | Student presentations and discussion |
| Dec 5 | Student presentations and discussion |
| Dec 7 | Student presentations and discussion |

 **Final exam:** Wed Dec 12 8am-noon

## Behavioral Expectations

**Attendance:** Strong attendance is crucial for passing this course. If you are sick or have a University event that conflicts with the course, please let me know as soon as possible. If you cannot come in to class but are still available during class time, you will be responsible for coordinating with me a WebEx session so you do not fall behind. Vacations and personal problems (other than mental health issues) are not approved absences.

**Participation:** 15% of your course grade will be based on Participation in Discussions and during lecture. I expect everyone to come in having done the readings and having at least 4 discussion questions answered for class. This is the bare minimum, and will likely earn you a C+/B- in participation. For an A, I expect more active participation during lecture and showing greater effort in discussion – attempting to answer other students’ questions and asking questions not on the discussion list. Additionally, I expect students to be respectful of each other’s work, this include asking respectful questions, giving constructive feedback, and answering questions that student presenters ask.

**Technology statement:** While I personally prefer pen and paper for first draft notetaking, I understand that some students prefer using a laptop, tablet, etc. These are allowed in class as long as they do not interfere with student learning and are not a distraction to other students. If you have a device in class and come across something interesting, please feel free to raise your hand and share it with the rest of the class.

## Evaluation Methodology

The course will be graded out of 1000 possible points of these:

50 points for in-class teach-ins

50 points for lab assignments and participation

150 points for non-lab participation

150 points for online homeworks

150 points for your formal presentation

150 points for the midterm

300 points for the final

Copies of student work may be retained to assess how the learning objectives of the course are being met.

## Grading Scale

I will follow a standard grading scale and may potentially curve the class up (i.e. increase your letter grade relative to your numerical grade) but will not curve down.

93-100 A

90-92 A-

87-89 B+

83-86 B

80-82 B-

77-79 C+

73-76 C

70-72 C-

67-69 D+

63-66 D

60-62 D-

59 and below F

## Policies

***For attendance policy, see above***

***Exam policy:*** No makeup exams or presentations will be allowed. If you are unable to make your presentation date, please swap dates with another student group. If you miss an exam because of an excused absence, I will be willing to prorate your exam. This does not happen automatically, so make sure you see me with appropriate documentation as soon as possible.

***Honor Code:***

The Honor Code at the University of the Pacific calls upon each student to exhibit a high degree of maturity, responsibility, and personal integrity. Students are expected to:

* act honestly in all matters
* actively encourage academic integrity
* discourage any form of cheating or dishonesty by others
* inform the instructor and appropriate university administrator if she or he has a reasonable and good faith belief and substantial evidence that a violation of the Academic Honesty Policy has occurred.

Violations will be referred to and investigated by the Office of Student Conduct and Community Standards. If a student is found responsible, it will be documented as part of her or his permanent academic record. A student may receive a range of penalties, including failure of an assignment, failure of the course, suspension, or dismissal from the University. The Academic Honesty Policy is located in Tiger Lore and online at <http://www.pacific.edu/Campus-Life/Safety-and-Conduct/Student-Conduct/Tiger-Lore-Student-Handbook-.html>

***Accommodations for Students with Disabilities:***

If you are a student with a disability who requires accommodations, please contact the Director of the Office of Services for Students with Disabilities (SSD) for information on how to obtain an Accommodations Request Letter.

3-Step Accommodation Process

1. Student meets with the SSD Director and provides documentation and completes registration forms.
2. Student requests accommodation(s) each semester by completing the Request for Accommodations Form.
3. Student arranges to meet with his/her professors to discuss the accommodation(s) and to sign the Accommodation Request Letter

**To ensure timeliness of services, it is preferable that you obtain the accommodation letter(s) from the Office of SSD as early as possible in each term.** After the instructor receives the accommodation letter, please schedule a meeting with the instructor during office hours or some other mutually convenient time to arrange the accommodation(s).

The Office of Services for Students with Disabilities is located in the McCaffrey Center, Rm. 137. Phone: 209-946-3221. Email: ssd@pacific.edu. Online: <http://www.pacific.edu/disabilities>

NOTE: The preceding information is the minimal information required in this section of the course syllabus, instructors are free to expand on the information above and/or add any additional information below. See requirements below for Program Objectives and Course Schedule.

***Preferred Pronouns:*** Knowing and applying the names and pronouns that students wish to use is a crucial part of developing a productive learning environment that fosters safety, inclusion, personal dignity, and a sense of belonging across campus. Please let me know your preferred name and pronoun anytime throughout the semester. You may do this publically or privately.

***Psychological Triggers:***We may cover topics in this course that some students find uncomfortable, for example sex, sexual expression, gender, and violence. I encourage active participation by all students and expect respectful discussion, if a topic is somewhat uncomfortable to you I encourage you to process it with the class and learn more about the biology surrounding it. However, if you find that a topic or activity causes you mental anguish or deep discomfort please let me know as soon as possible so I can excuse you from it and give you an alternative assignment. This includes social and group activities that some students may find anxiety provoking, though I will try my best to keep them fun and interesting.

## Course Goals

The primary goal of this course is to build on students’ current knowledge and give them a broad look at the emerging field of Evolution and Development (Evo Devo). This is an integrative field and students will bring in their knowledge of anatomy, evolution, genetics, molecular biology, and developmental biology to help each other synthesize information into a coherent picture of modern biology.

## Program Outcomes

1. Mastery of general content knowledge from evolution

2. Describe the role of the scientific method and hypothesis-driven research and discovery in the development of scientific knowledge

3. Critically evaluate new knowledge, information, and claims in Evo Devo

4. Demonstrate bioinformatics laboratory skills and integrate knowledge and skills to present a synthesis to peers and instructor

5. Integrate knowledge of Biology with broader knowledge gained through a liberal arts education to engage in productive discussion and teaching of new information

6. Demonstrate oral and written communication skills through essays, group discussion, teaching, and presentations

7. Demonstrate collaborative skills

## University Outcomes

1. Critical Thinking: purposefully engage cognitive tools to interrogate and respond to complex concepts and to integrate disparate information sources.

2. Information Literacy: recognize informational gaps, find, synthesize, and summarize new information to fill those gaps, while considering the source of the information and the likelihood of it being correct.

3. Oral communication: strategically presenting and teaching information to engage listener interest and attention and to convey information in a way that increases understanding.

4. Quantitative reasoning: read and evaluate scientific information to apply it to a general concent of Evo Devo

5. Written communication: present scientific findings and summarize scientific literature in easier to understand language.