Bi480/580 Evolution of Development

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Course Description

This course is about how developmental mechanisms have evolved. It thus requires the integration of information from embryology, developmental biology, evolutionary biology, population genetics, molecular genetics, genomics, and other areas of research. It is both an old and a new field, and you are among the first few students anywhere to have a formal course in the Evolution of Development. Hopefully, you will be become better prepared at the interface of these two areas than any of the faculty were even a few years ago.

Required Reading

Text: **From DNA to Diversity:** Molecular Genetics and the Evolution of Animal Design by Sean B. Carroll, Scott Wetherbee, Jen Grenier (=CWG)

Papers: Will be available for downloading from the course website or by email.

Assignments:

1. **Journal.** We will ask you to prepare a one page typed analysis (Use a spell checker) of the readings you do for the course. For each reading you should enter:

A . Abstract. A short paragraph summarizing the paper. This paragraph should explicitly address each of the following questions:

- What was the general problem the authors tried to solve?
- What was the specific question(s) the authors addressed?
- What did they do to answer the question?
- What was the result?
- What is the retrospective significance of the work?
- What is the prospective significance of the work?
- Did the authors perform the best experiments to address the problem?
- Did the authors interpret their results appropriately?
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B. Question. A question that arises in your mind from reading the paper. The purpose of this is to give an opportunity for in class discussion of the items that you may need for background, or to identify future research questions that arise from the work.

C. WOW factor: One point you didn't know that's very interesting to you. The purpose of this is to find something that connects to you more personally from the work. Different people will have very different entries for this.

2. **Genomics.** We will learn how to search genomic databases to find homologues of developmentally important genes in several species, and to construct and use phylogenetic trees as an aid to determine which homologues are likely to be orthologues.

3. **Presentation.** You will work in groups of two to investigate a live issue in the evolution of

development. The team will make an oral PowerPoint presentation of the issue to the class.

An issue is a question (with an interrogative word and question mark at the end) on which informed people disagree. The presentation should suggest experiments that would help resolve the issue. It's often fun if one person advocates one side of the issue and another the opposite side. An alternative is that one person provides general background and the other proposes cutting experiments that should be done to resolve the issue.

We will try to have people with predominantly evolutionary interests paired with people with primarily developmental interests. You will hand in a written document that is approximately a script of your presentation, with references.

4. **Proposal**. You will write a research proposal similar to one you'd send to National Institutes of Health on your Presentation topic, due before the time scheduled for the final exam. Detailed instructions will be in a separate sheet. The basic outline will be:

Abstract
Background
Specific Aim 1
Rationale, Experimental design, Expected results and interpretation, Potential problems, Significance.
Specific Aim 2
Rationale, Experimental design, Expected results and interpretation, Potential problems, Significance.
Conclusion

5. **Participation**. We expect active intellectual participation in the class. That means attending class, asking questions, volunteering ideas, contributing to discussions, and so on. For example, you should come to class each day prepared to ask one penetrating question about the reading.

Basis for grading

- Journal of Readings 26% (2% each)
- Genomics 14%
- Presentation Oral 20%
- Presentation Written 20%
- Participation 20% (1% for each class in which student participates in class discussion)

Differentiation of graduate vs. undergrad workload

Each graduate student mentors an undergraduate presentation group. This will involve meeting with the team, chosing and clarifying the issue, finding appropriate evidence, helping to understand background, and helping to prepare a PowerPoint presentation. Each graduate student, in addition, will present their own 20 minute presentation on an issue in EvoDevo.