Evolutionary Developmental Biology: “Evo-Devo”

Tuesdays, 10:00AM – Noon; room 1201, BRB II/III; enrollment limit = 12; First Meeting Sept 9th

This semester’s topic:  February 2009 marks the 200th year since Charles Darwin’s birth, and the 150th anniversary of his greatest labor, “On the Origin of Species”. In this “Year of Evolution”, this course will focus on the astounding impact of the work of Darwin and Alfred Russell Wallace. A central tenet is that Evolutionary Theory is a comprehensive explanation for all the facts amassed from paleontology, systematics and biology, now including the molecular genetics of developing organisms, organs and tissues. The latter will be our focus this semester.

There has been an explosion in identifying the regulatory circuits and factors that assist embryos in constructing their body plan, tissues and organ systems. The Developmental Biology of various “model” systems, including worm, fly, fish, chick, frog and mouse, has revealed amazing examples of conservation in strategies used during development. But it is the variation within those strategies that is presumed to be the driving force for evolution (Darwin’s “…descent with modification…”). Specifically, natural (or mutational) variation that exists in populations is selected upon, leading to “survival of the fittest”.

The point has been made by some socio-political commentators that there is no evidence for evolution. Over this semester we will delve into just this: what is the evidence that changes in gene function and/or regulation are responsible for variation among species today, and that have been selected upon? Among my goals for this semester: you and I shall have answers the next time the dinner-table conversation touches on evolutionary theory.

General Description: The goal of this seminar course is to foster discussion about general strategies used by cells and organisms to solve fundamental problems during development. This is not a survey course in Developmental Biology. Rather, we focus on an overarching theme for the semester (see above), enabling us to define the issues central to that theme, and explore attempts to uncover solutions using different model systems. Primary research papers are assigned for discussion, and all students are expected to contribute thoughtfully and energetically to the discussion each week. Active participation contributes 2/3 of your grade. This constitutes the first 2/3 of the course. During the last 1/3, groups of students will choose the specific sub-topics and necessary papers, based on areas or issues they found particularly appealing during the first part of the course. Each student group will be primarily responsible for guiding the discussion. Your performance in presentation and in guiding the discussion will be 1/3rd of your grade.

Format Particulars: Each class is 2 hours, with the last 15 minutes reserved to provide background for the next week’s topic.

Prerequisite: A solid foundation in cell and molecular biology. There is no developmental biology prerequisite, but you may need to familiarize yourself with “developmental” concepts, such as induction, determinants, morphogens, etc, as you go along during the class.

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1 Treatments of these are found in: Principles of Development Wolpert et al, Current Biology Ltd., Oxford University Press; Developmental Biology 8th (& earlier) editions., by Scott F. Gilbert, Sinauer Asso.