E 115 : Evolutionary Developmental Biology

Harvard College BIOS E-115
Fall 2014

This course considers how mechanisms of animal developmental genetics help explain the scope and patterns of animal diversity. Particular emphasis is placed on major evolutionary transitions, the genetic origins of innovations, and the contribution of evolutionary developmental biology to current debates on evolution.

Instructor: Arkhat Abzhanov (Associate Professor)
BioLabs Room 4105
Phone: 617-496-9704
Email: abzhanov@fas.harvard.edu
Office hour (BL4105): flexible (by email or phone)

Classes: Thursday 5:30-7:30 pm
Museum of Comparative Zoology 101

Website: http://isites.harvard.edu/k105683

Required Texts (Please see recommended texts at the end of syllabus):


Pre-requisites: Biology introductory courses: understanding the basics of genetics and cellular/molecular biology
E-115 Evolutionary Developmental Biology

Section/presentation:
This is a mixed lecture and seminar course. Each lecture will be followed by discussions of usually 2 of some of the most recent and significant “evo-devo” research papers suggested in advance. These will be presented and discussed by students. All students are encouraged to attend and to actively participate in discussion sections.

Presentations should include introductory background and major findings of each paper, last 20 minutes and allow 15 minutes for discussion. The presenter is expected to lead the discussion. Please sign up for the presentation topics in advance. The research papers for each lecture will be posted on the course’s website early in the beginning stages of the course.

Grading:
Grades will be determined on the evaluation of exams, participation and presentation in discussion sections as follows:

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<th>Section</th>
<th>Percentage</th>
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<td>Paper presentation and discussion</td>
<td>50%</td>
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<td>Midterm</td>
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<td>Final</td>
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<td>Lecture</td>
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9 30 Oct (Th)  Midterm Exam

10 6 Nov (Th)  Co-option and the problem of modularity in development: the modular nature of the developing animal embryo – from theory to practice, modularity and the problem of “evolvability” in animal evolution

11 13 Nov (Th)  Developmental changes as a source of variation and variability: What is/are the ultimate sources of diversity on the developmental level? How does the natural selection work on these? Is developmental evolution constrained?

12 20 Nov (Th)  Developmental mechanisms of evolutionary novelty: What is/are evolutionary novelty and/or innovation? The role of changes in embryonic (and post-embryonic) development in generating novelties in animals. Can we recognize novelties on the genetic level?

13 4 Dec (Th)  Developmental Plasticity and Constraints in Evolution: Is evolution constrained or even directed by development? What laws of development evolution has to follow and what are the morphological consequences?

14 11 Dec (Th)  Developmental evolution in the age of genomics and systems biology, unifying ideas of evolution and development, developmental system theory: So, does the ontogeny really recapitulates phylogeny? What the latest advances in development genetics, genomics and evolutionary theory can teach us about the relationship between evolution and development?

15 18 Dec (Th)  FINAL EXAM
Discussion of research papers suggestions:

Presenter:

1. Introduce the species studied;
2. Present background material on the biological questions addressed in the paper;
3. What are the main results?
4. What are the most significant conclusions?
5. Initiate and maintain discussion on the importance of the work for understanding evolution.

Others:

1. Be prepared to ask questions and discuss answers;
2. Discuss what the paper shows and how it addresses the big question(s).

Suggested Texts:

