Spring 2-1-2017

BIOB 595.06: ST- Concepts in Developmental Biology

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BIOB 595/491 Concepts In Developmental Biology

Seminar Course for Graduate Students and Senior Undergraduates
Spring 2017
Thursdays 11 am-12:30 pm ISB 103b
Instructor: Ekaterina Voronina, ekaterina.voronina@umontana.edu

This course covers key topics in developmental biology through the detailed study of the primary literature. Seminar topics are listed below. With help of the instructor, the students present each topic and lead a discussion each class period based on the assigned research paper and one or two review articles to provide background on the topic and research.

Objectives:

- Learn about developmental mechanisms
- Learn to critically read and discuss scientific literature
- Become fluent in development terminology
- Be able to design and interpret developmental biology experiments

Class Format:

The class is based on presentation and detailed analysis of primary journal articles, which are required reading. Topics and papers for students' presentations will be assigned in advance to allow sufficient time for preparation. The student's presentation should start with introducing the topic drawing on the recent reviews. When presenting the paper, keep in mind the important questions addressed in the reading summaries assignments, and bring them up for discussion in class. Discuss the experiments performed in the paper, with an eye to whether the experiments address the stated question, is the interpretation of the experiments valid, and are proper controls included? It is very important for our own scientific development to look critically at the data, the methods, and the interpretations in published manuscripts.

All students in the class need to read the paper assignments before class in order to productively participate in discussion. You will complete reading summaries assignments for each class in order to encourage this practice. All students will be required to ask questions of the presenter. Participation includes: bringing up significant questions regarding the paper and being able to describe each figure in terms of how the data was generated, and how to interpret it to draw conclusions.

Assignments and Assessments:

1. **Reading Summaries**. Assigned readings can be obtained for free from Pubmed (on campus), or will be distributed to the class by email. Before each session, students will prepare five items regarding the assigned reading:

- What is the major question, problem or a technical issue addressed in the paper?
- What is the hypothesis or idea leading the authors to perform the described experiments?
- What experiment you think is the most interesting or important, and why?

- Do the experiments address the hypothesis?
- Additionally, include two questions to ask of the presenter.

Each of required answers can be 1-2 sentences. Reading summaries are expected of all students, except the presenter of the day.

2. **Oral Assignments**.

Long Presentation: Each student will use PowerPoint or similar presentation software to present the paper, including a brief introduction, figures, and a summary. Students should present a critical analysis of the paper. For each figure, answer the following questions: what is the hypothesis that the authors are addressing? What are the experiments and techniques used to address the question? What are the controls for the experiments? What is the conclusion stated by the authors? Is this conclusion substantiated? Most importantly, students should identify the key figure(s)/table(s) of the paper and the key control experiment(s) for that figure or table.

Conference-Style Presentation. Much cutting-edge research is presented in scientific conferences, where the time allotted for each speaker is quite brief. To gain practice in this presentation format, the last two meetings of the class will be in the format of Developmental Biology Mini-Conference. Each student will select with help from the instructor a recent (within the past 3 years) publication in the field of Developmental Biology, which they will present in the final class session. All presentations will be limited to 10 minutes, with 5 minutes for questions. Presentation will have 1 or 2 introduction slides, 4 figures, and a brief summary.

Syllabus

* = the paper for reading summary

Week 1. Jan 26. Introduction to class, discussion of topics and expectations for presentations

Week 2. Feb 2. Hippo Signaling and Stem Cells

*****DP Sarikaya, CG Extavour. The Hippo Pathway Regulates Homeostatic Growth of Stem Cell Niche Precursors in the *Drosophila* Ovary. PLoS Genet 2015 11(2): e1004962. doi:10.1371/journal.pgen.1004962

KF Harvey, IK Hariharan. The Hippo pathway. *Cold Spring Harb Perspect Biol* 2012 *4*:a011288; doi:10.1101/cshperspect.a011288

Week 3. Feb 9. Embryonic gene expression. EV at a conference; discuss the paper amongst yourselves and submit your analysis by email

*****Z Ali-Murthy, TB Kornberg. Bicoid gradient formation and function in the *Drosophila* pre-syncytial blastoderm. eLife 2016;5:e13222. DOI: 10.7554/eLife.13222

Week 4. Feb 16. **Activation of Development**

*****M Ataeian, J Tegha-Dunghu, DG Curtis, EME Sykes, A Nozohourmehrabad, M Bajaj, K Cheung, M Srayko. Maternal MEMI Promotes Female Meiosis II in Response to Fertilization in *Caenorhabditis elegans*. GENETICS 2016 *vol. 204 no. 4 1461-1477; DOI: 10.1534/genetics.116.192997*

D Chu. Parental Control Begins at the Beginning. GENETICS 2016 *vol. 204 no. 4 1377-1378; DOI: 10.1534/genetics.116.196501*

Week 5. Feb 23. Bacterial Symbiont Essential for Development

*****F Landmann, JM Foster, ML Michalski, BE Slatko, W Sullivan. Co-evolution between an Endosymbiont and Its Nematode Host: *Wolbachia* Asymmetric Posterior Localization and AP Polarity Establishment. PLOS Neglected Tropical Diseases 2014; http://dx.doi.org/10.1371/journal.pntd.0003096

S Gilbert. Developmental Plasticity and Developmental Symbiosis: The Return of Eco-Devo. Current Topics in Developmental Biology, Volume 116; http://dx.doi.org/10.1016/bs.ctdb.2015.12.006

Week 6. Mar 2: Translational control of early development

*****SW Eichhorn, AO Subtelny, I Kronja, JC Kwasnieski, TL Orr-Weaver, DP Bartel. mRNA poly(A)-tail changes specified by deadenylation broadly reshape translation in *Drosophila* oocytes and early embryos. eLife 2016;5:e16955. DOI: 10.7554/eLife.16955

Week 7. Mar 9: microRNAs and Cancer

*****L Wu, LH Nguyen, K Zhou, TY de Soysa, L Li, JB Miller, J Tian, J Locker, S Zhang, G Shinoda, MT Seligson, LR Zeitels, A Acharya, SC Wang, JT Mendell, X He, J Nishino, SJ Morrison, DJ Siegwart, GQ Daley, N Shyh-Chang, H Zhu. Precise *let-7* expression levels balance organ regeneration against tumor suppression. eLife 2015; 4:e09431. DOI: 10.7554/eLife.09431

Week 8. Mar 16. Cytonemes in Developmental Signaling

*****TA Sanders, E Llagostera, M Barna. Specialized filopodia direct long-range transport of SHH during vertebrate tissue patterning. Nature 2013 vol 497 p 628. doi:10.1038/nature12157

Week 9. Mar 23: spring break, no seminar

Week 10. Mar 30. Wound Response and Regeneration

*****O Wurtzel, LE Cote, A Poirier, R Satija, A Regev, PW Reddien. A Generic and Cell-Type-Specific Wound Response Precedes Regeneration in Planarians. Dev Cell 2015; *35*, 632. http://dx.doi.org/10.1016/j.devcel.2015.11.004

M Issigonis, PA Newmark. Heal Thy Cell(f): A Single-Cell View of Regeneration. Dev Cell 2015; *35*, 527. http://dx.doi.org/10.1016/j.devcel.2015.11.019

Week 11. Apr 6. Developmental cannibalism (LAUREN FOLTZ)

*Y Abdu, C Maniscalco, JM Heddleston, T-L Chew, J Nance. Developmentally programmed germ cell remodelling by endodermal cell cannibalism. Nature Cell Bio 2016, vol 18(12) p 1302. DOI: 10.1038/ncb3439

Week 12. Apr 13. Can Aging Be Reversed?

*****A Ocampo, P Reddy, P Martinez-Redondo, A Platero-Luengo, F Hatanaka, T Hishida, M Li, D Lam, M Kurita, E Beyret, T Araoka, E Vazquez-Ferrer, D Donoso, JL Roman, J Xu, CR Esteban, G

Nunez, EN Delicado, JM Campistol, I Guillen, P Guillen, JCI Belmonte. In Vivo Amelioration of Age-Associated Hallmarks by Partial Reprogramming. Cell 2016; *167*, 1719

Week 13. Apr 20: Meet Human-Mouse Chimera (LAUREN FOLTZ)

* MA Cohen, KJ Wert, J Goldmann, S Markoulaki, Y Buganim, D Fu, R Jaenisch. Human neural crest cells contribute to coat pigmentation in interspecies chimeras after *in utero* injection into mouse embryos. PNAS 2016; *113(6)*, p 1570. DOI: 10.1073/pnas.1525518113

Week 14. Apr 27: Students' Presentations. Developmental Biology mini-conference.

Week 15. May 1. (*Monday, not Thursday!)* Meet and Greet with Alexey Arkov, CMMB seminar speaker

***** M Gao, TC Thomson, TM Creed, S Tu S, SN Loganathan, CA Jackson, P McCluskey, Y Lin, SE Collier, Z Weng, P Lasko, MD Ohi, AL Arkov. Glycolytic enzymes localize to ribonucleoprotein granules in *Drosophila* germ cells, bind Tudor and protect from transposable elements. EMBO Rep. 2015; 16, p 379. doi: 10.15252/embr.201439694