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BIOC 600.01: Advanced Cellular Biochemistry

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Catalog course description (4 cr.) Exploration on a molecular level the regulation of structure, function, and dynamics of eukaryotic cells. Topics include membranes, cytoskeleton, transcription, translation, signal transduction, cell motility, cell proliferation, and programmed cell death.

Overview

Cell Biology is vast and dense and encompasses biochemistry, biophysics, molecular biology, microscopy, genetics, physiology, computer science, and developmental biology. This course will use as a main text Alberts, et al., Molecular Biology of the Cell, 4th ed. (5th if it is out; Garland Science). This text will be a jumping off point into reading from the scientific literature. We will explore the topics listed below by reading reviews and papers from the primary literature. Papers will be chosen, where possible, that are at the interface between two fields, so a large amount of background reading will be necessary to understand the paper and put it in context. The two main learning goals are 1) to learn about a number of topics in cell biology; and 2) to gain the confidence and skills to attack any scientific paper even if it is in an unfamiliar area.

Format

Presentations will be made by instructors and students. Instructors will introduce a topic with a lecture, and a student presentation of a paper with data will follow in the next session.

The student's presentation should set the stage for the paper being presented with a brief introduction that draws on recent reviews. Keep in mind the following questions when presenting a paper. What is the key question being addressed by the experiments? What are the key experiments that address the question? Do you believe their interpretation, and did they do the proper controls? Many of the methods used to study cell biology and biochemistry are evolving, and far from perfect, so it is important to look with a critical eye at the data, the methods used to obtain the data, and how the data are interpreted.

When tackling any research paper in an unfamiliar area, the best way to start is by reading one or more textbooks (use the index and table of contents) and reviews, looking up unknown concepts mentioned in the paper’s introduction (often reviews are cited there too). Then look at the data in the figures. If you don’t understand the methods, look them up1. Then read the results and discussion, and decide whether the author’s interpretation of the data is the same or different than yours.

Student’s presentation papers will be assigned in advance to allow time for preparation. Students are strongly encouraged to seek instructors’ help. Please ask questions by email, phone, or by stopping by any time (call first to make sure we are around). We intend a relaxed atmosphere where we all ask questions, an no questions are dumb questions. All students will be required to read all papers. It is expected that the student presenting the paper will be better informed on the topic, which will require extra work. While errors and misunderstandings are forgivable, we expect you to make an effort to understand the paper being presented, especially if you are the one presenting it!

Blackboard (http://umonline.umt.edu/) will be used to post course documents such as lecture slides, papers, and assignments. The website has excellent instructions on how to login and use Blackboard.

1 Note: Some methods can be found on the web at: http://www.scienceboard.net/resources/protocols.asp?criteria=
Assessment

The course grade will be assigned based on oral presentations, written assignments, quizzes and exams. One assignment will be a critical review of a paper from the primary literature. The other will be a hypothesis and experimental design to answer a question in cell biology in grant proposal format. There will be two exams in which interpretation of data will be emphasized. Quizzes will be called spontaneously during one class period for the next class period. Written questions from all students (except presenting students) will be required for student presentations. Assignments, presentations, quizzes, written questions and exams will be proportionally used to determine the grade, with class participation added as bonus points. The final exam will be comprehensive.

The Provost's Official Fine Print
All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University.

All students need to be familiar with the Student Conduct Code. The Code is available for review online at http://www.umt.edu/SA/VPSA/index.cfm/page/1321.

Topics
(Note: the order of topics and recent papers are subject to change.)

Cell structure, lipids and membrane traffic (Alberts, Chapters 10, 12, and 13)

Reviews

Primary papers
The cytoskeleton (Alberts, Chapters 16 and 18)

Reviews


Primary papers


Signal transduction and intracellular localization (Alberts, Chapters 15 as well as 12, 13, and 16)

Reviews


Primary papers


**The Cell Cycle (Alberts Chapters 17 and 23)**

**Reviews**


**Primary papers**


**Programmed cell death (Alberts Chapter 17)**

**Reviews**


**Primary papers**


Adhesion and stem cells (Alberts Chapters 19, 21, 24 and 25)

Reviews


Primary papers


Transcription, gene regulation and chromatin remodelling

Alberts et al. (2004) Ch. 4, pp. 191-216; Ch. 6, pp. 299-315; and Ch. 7, pp. 375-415 & pp. 422-435.

Reviews


**Primary papers**


Wang et al. (2005) Mediator requirement for both recruitment and postrecruitment steps in transcription initiation. Mol Cell 17:683-94.


**mRNA processing**


**Reviews**


**Primary papers**


Small RNAs, RNAi and riboswitches


Reviews


Primary papers


