Course Syllabus
MCB 200A/B
Fundamentals of Molecular and Cell Biology
Fall Semester, 2013

Class Meetings: Monday-Friday 9:00-11:00
Location 125 LKS

Course Description: The goal of this course is to provide graduate-level instruction on molecular and cellular biosciences from a highly integrated systems perspective. A collection of approaches, and a focus on critical thinking and problem solving, will be used to show how fundamental, highly significant biological problems are "cracked open." Reading will be assigned from a mix of classic and current peer-reviewed papers selected by the instructors.

What this course aims to achieve:

- to provide exposure to the full breadth of research areas in Molecular and Cell Biology
- to provide enough depth to allow any graduate student to attend and understand any seminar in MCB
- to present material in a conceptual and integrated way that makes connections between apparently disparate research areas
- to demonstrate how an understanding of fundamental molecular and cell biological mechanisms is essential for understanding complex biological systems
- to interest students in research areas they may have not previously considered for their thesis work
- to cover material at the level of sophistication appropriate for a graduate level course, including a discussion of the experimental basis for what is being learned
- to equip students to approach the questions of 21st century biology
- to emphasize the value of basic research for addressing problems of human health and disease
- to emphasize the importance of clear and critical writing in biological research
- to teach students how to critically read and evaluate the primary literature
- to help prepare students for qualifying exams
- to ensure that students have the appropriate quantitative training to pursue cutting-edge research
- to help students become comfortable with asking questions during lectures and discussing science in a group setting

What this course does not aim to achieve:

- to provide a comprehensive coverage of every important topic within each area of MCB (this can be achieved in the Advanced Topics classes in the Spring)
- to provide remedial undergraduate-level training. Necessary background will be covered rapidly and it is expected that every student will have some areas where they will need to refresh or establish their mastery of the fundamentals.
- to provide a disconnected sequence of modules on each research area within MCB

Course Professors:

Dr. Don Rio (DR)
Dr. David Drubin (DD)
Dr. Marla Feller (MF)
Dr. Susan Marqusee (SM)
Dr. Jasper Rine (JR)
Dr. Russell Vance (RV)

Grading will be based on attendance, worksheets, class participation, and presentations during the course.

WORKSHOP PAPERS – There are five workshops, one on a paper from each set of divisional QE papers. The first one (hosted by Prof. Rine) is: Tong et al. 2001 Science 294:2364-2368. "Systematic genetic analysis with ordered arrays of yeast deletion mutants." Everyone is expected to have read the paper before the coming to class. The other papers for later workshops will be announced in class.

SEPTEMBER CLASSICS – during the first month of class, students will be assigned to groups that will prepare and present a 20 min synopsis and critique of a classic paper in the field. Details on preparing the presentation will be discussed in class.

PROBLEM SETS/GRADING – problems and recommended reading will be assigned on a per lecture basis. Each Monday, a set of questions based on the previous week's lectures will be posted on bspace and assigned as a problem set, to be turned in the following Monday. Students are encouraged to discuss the problems with each other; however, it is assumed that what the students hand in will be the results of their own writing. Direct copying of answers is highly discouraged. Students will grade each other's problem sets on a rotating basis.

The following is based on material provided by the Campus to be distributed to students at the beginning of the academic year:

The student community at UC Berkeley has adopted the following Honor Code:
"As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others." The hope and expectation is that you will adhere to this code.

Collaboration and Independence: Reviewing lecture and reading materials and studying for exams can be enjoyable and enriching things to do with fellow students. This is recommended. Students are encouraged to discuss homework problems with each other; however, it is assumed that what the students hand in will be the results of their own writing. Direct copying of answers is highly discouraged.

Cheating: A good lifetime strategy is always to act in such a way that no one would ever imagine that you would even consider cheating. Anyone caught cheating will also be reported to the University Center for Student Conduct.

Plagiarism: To copy text or ideas from another source without appropriate reference is plagiarism and will result in a failing grade for your assignment and usually further disciplinary action. For additional information on plagiarism and how to avoid it, see, for example:
http://gsi.berkeley.edu/teachingguide/misconduct/prevent-plag.html

Academic Integrity and Ethics: Cheating on exams and plagiarism are two common examples of dishonest, unethical behavior. Honesty and integrity are of great importance in all facets of life. They help to build a sense of self-confidence, and are key to building trust within relationships, whether personal or professional. There is no tolerance for dishonesty in the academic world, for it undermines what we are dedicated to doing – furthering knowledge for the benefit of humanity.

Your experience as a student at UC Berkeley is hopefully fueled by passion for learning and replete with fulfilling activities. And we also appreciate that being a student may be stressful. There may be times when there is temptation to engage in some kind of cheating in order to improve a grade or otherwise advance your career. This could be as blatant as having someone else sit for you in an exam, or submitting a written assignment that has been copied from another source. And it could be as subtle as glancing at a fellow student's exam when you are unsure of an answer to a question and are looking for some confirmation. One might do any of these things and potentially not get caught. However, if you cheat, no matter how much you may have learned in this class, you have failed to learn perhaps the most important lesson of all.

MCB200A/B Lecture Schedule Fall 2013

Date		*Lecturer*	Topic
Thursday	29-Aug	*Jasper*	Introduction to the Course; Origins of Life
Friday	30-Aug	*Jasper/Don*	Discovery of central dogma/Nucleic Acid chemistry
Monday	2-Sep	***No class***	**Labor Day**
Tuesday	3-Sep	*Susan/Jasper*	Tree of Life; Covalent chemistry of amino acids
Wednesday	4-Sep	*Marla*	Physics of microscopy
Thursday	5-Sep	*David*	Microscopy: molecular & cellular length scales
Friday	6-Sep	*Jasper*	**Workshop: How to read a paper (Tong et al)**
Monday	9-Sep	*David*	Properties of the cytoplasm +Sept Classic Group 1: Golgi (1906); Cajal (1906) Mentor: MF
Tuesday	10-Sep	*David*	Membrane properties +Sept Classic Group 2: Sturtevant (1913) Mentor: RV
Wednesday	11-Sep	*David*	Membrane protein topology and biogenesis +Sept Classic Group 3: Stanley (1935) Mentor: DR
Thursday	12-Sep	*Susan*	**Workshop: Visualizing and Manipulating Structures** +Sept Classic Group 4: Luria Delbruck (1943) Mentor: JR
Friday	13-Sep	*John Kuriyan*	Guest Lecture: Crystallography +Sept Classic Group 5: Avery & Hershey/Chase (1952) Mentor: JR
Monday	16-Sep	*Russell*	Differentiation, ES/IPS cells (applications, e.g., knockouts) +Sept Classic Group 6: Medawar (1953) Mentor: RV
Tuesday	17-Sep	*Jasper*	Specification of cell types, the yeast model +Sept Classic Group 7: Wat./Crick&Franklin&Wilkins(1953) Mentor: DR
Wednesday	18-Sep	*Don*	DNA replication: concepts and mechanisms +Sept Classic Group 8: Meselson/Stahl (1958) Mentor: JR
Thursday	19-Sep	*Jasper*	Mutation +Sept Classic Group 9: Kornberg (1958) Mentor: DR
Friday	20-Sep	*Susan*	**Workshop: NSF proposal workshop and preparation** +Sept Classic Group 1: Koshland (1958) Mentor: SM
Monday	23-Sep	*Jasper*	Meiosis +Sept Classic Group 2: Jamieson/Palade (1967) Mentor: DD
Tuesday	24-Sep	*Jasper*	Recombination +Sept Classic Group 3: Kandel (1970) Mentor: MF
Wednesday	25-Sep	*Don*	DNA repair pathways and Genome Editing +Sept Classic Group 4: Blobel (1975) Mentor: DD
Thursday	26-Sep	*Susan*	Molecules and how they work; driving forces +Sept Classic Group 5: Gurdon (1975) Mentor: RV
Friday	27-Sep	*Marla*	**Workshop: Introduction to statistics** +Sept Classic Group 6: Englander (1988) Mentor: SM
Monday	30-Sep	*Marla*	Resting/action potential +Sept Classic Group 7: Hartwell (1989) Mentor: DD
Tuesday	1-Oct	*Susan*	Molecules and how they work; driving forces +Sept Classic Group 8: Wickner (1994) Mentor: SM
Wednesday	2-Oct	*Susan*	Molecules and how they work; driving forces +Sept Classic Group 9: Julius (2002) Mentor: MF
Thursday	3-Oct	*Marla*	ion channels/poisson distributions
Friday	4-Oct	*Marla*	**Workshop: Paper TBA**
Monday	7-Oct	*Russell*	Innate immune recognition
Tuesday	8-Oct	*Russell*	Antibodies
Wednesday	9-Oct	*Susan*	Binding and measurement
Thursday	10-Oct	*Don*	Protein-Nucleic Acid interactions
Friday	11-Oct	*Jamie Cate*	Guest Lecture: Translation

Date		*Lecturer*	Topic
Monday	14-Oct	*David*	Complex machines; microtubule dynamic instability/kinesin/dynein
Tuesday	15-Oct	*David*	Complex machines; the mitotic spindle: function and fidelity
Wednesday	16-Oct	*Russell*	Microbiota 1
Thursday	17-Oct	*Russell*	Microbiota 2
Friday	18-Oct	*Russell*	**Workshop: Winter et al**
Monday	21-Oct	*Russell*	Infection
Tuesday	22-Oct	*Russell/Don*	Ig recombination/biochemistry of RAG proteins
Wednesday	23-Oct	*Jasper/Don*	Epigenetics/Chromatin remodeling and modifications
Thursday	24-Oct	*Susan/Jamie Fraser*	**Workshop: Computational sequence analysis**
Friday	25-Oct	*Marla*	**Workshop: Real world of science: grants, money**
Monday	28-Oct	*Don*	Enzymology: purification, characterization, and mechanisms
Tuesday	29-Oct	*Susan*	Timescales of conformational changes 1
Wednesday	30-Oct	*Susan*	Timescales of conformational changes 2
Thursday	31-Oct	*A. Martin*	Molecular Machines/Allostery
Friday	1-Nov	*Susan*	**Workshop: Agard alphalytic protease**
Monday	4-Nov	*Jasper*	Genetic approach to transcription regulation
Tuesday	5-Nov	*Don*	Molecular mechanisms of transcription
Wednesday	6-Nov	*Don*	RNA processing and function
Thursday	7-Nov	*David*	Complex machines: principles of actin assembly/myosin activity
Friday	8-Nov	*David*	Complex machines: actin-based cell motility, Brownian ratchets
Monday	11-Nov	***No class***	**Veteran's Day**
Tuesday	12-Nov	*Don*	Transposition, retroviral integration, and site-specific recombination
Wednesday	13-Nov	*Mike Levine*	Development
Thursdsay	14-Nov	*Marla*	Development of the brain
Friday	15-Nov	*Russell*	**Workshop: How to give a talk (Bonus: myth of scientific method?)**
Monday	18-Nov	*David*	Single cell analysis
Tuesday	19-Nov	*Michael Rape*	Guest lecture: Networks and signaling
Wednesday	20-Nov	*Susan*	Synthetic Biology
Thursday	21-Nov	*Marla*	Synapses
Friday	22-Nov	*David*	**Workshop: Dynamic Instability**
Monday	25-Nov	*Marla*	Learning as a cell signaling process
Tuesday	26-Nov	*Marla*	Pick a sensory system
Wednesday	27-Nov	***TBD***	**TBD**
Thur	28-Nov	***No class***	**Thanksgiving**
Friday	29-Nov	***No class***	**Holiday**
Monday	2-Dec	*Don*	**Workshop: Paper**
Tuesday	3-Dec	*Iswar Hariharan*	Guest Lecture: Cancer
Wednesday	4-Dec	*Russell*	Choose your own adventure
Thursday	5-Dec	*Nipam Patel*	Guest Lecture: Evo/Devo
Friday	6-Dec	*Wrap session – and plan for a party in the evening (TBD)*	
	Dec 9-Dec 13	*STUDENT MICROSYMPOSIUM PRESENTATIONS (9-12pm)*	