

# Molecular Endocrinology MCB 135A

UC Berkeley, Fall 2013

MCB 135A, 3 units  
Monday, Wednesday, Friday, 9-10 AM  
Room: 101 Barker Hall

Course webpage: Working on a B-space site

## Instructor Information

Faculty Instructor: Gary Firestone  
Email: [gfire@berkeley.edu](mailto:gfire@berkeley.edu)  
Phone: 2-8319  
Fax: 3-6791  
Office Hours: TBA (likely to start after the labor day holiday)  
**I'm always accessible by email**

Graduate Student Instructor/grader: TBA

Course office hours-TBA based on a class vote

## Course Description

**Prerequisites:** MCB 100A or MCB 102 (biochemistry). Please see me if you have not previously taken or are not concurrently enrolled in either course. At a minimum you will need to demonstrate knowledge of key concepts in biochemistry, such as the difference between major/minor grooves of DNA and an understanding of the three-dimensional structure of proteins. In past years, students have mentioned that Bio1A provided an adequate background to understand the key topics of the course. So having taken Bio1A without MCB102 or MCB100A is OK depending on your confidence level with biochemical/cell biological concepts.

**Overview of Course:** This is a research-based course that focuses on experimental approaches to understanding hormone action at the molecular level. This course is not about memorizing facts and figures. Rather the emphasis is on problem solving, conceptual understanding, and critical thinking. While the content for this course is based on in-depth examination of a limited number of topics in molecular endocrinology, the approaches to studying these topics can be applied to other areas such as cell biology and immunology.

**What You Will Learn in This Course:** You will learn how to critique scientific papers in primary research journals, distinguish good from poor research studies, conduct a review of the literature in a particular area of interest, design valid and reliable experiments, interpret resulting data, draw appropriate conclusions, and develop new directions for future research.

**Methods of Instruction:** Using a combination of lecture and student participation, each class session will focus on learning the fundamentals of molecular hormone action, developing tools to design experiments and interpret results, and creating new models of hormone receptor signal transduction.

**Readings:** There is no required textbook. Course notes, and study questions have been compiled into a Course Manual (Can be purchased at Copy Central, 2576 Bancroft for approximately \$25 including taxes), and primary research papers will be made available on b-space. A pdf file of the course reader will be sent to everyone via bspace.

## **Course Requirements**

### Undergraduate Students

**Exams:** There will be two midterms and one final exam. All exams will be open note. The questions on the exams will provide theoretical data from which you will be asked to design a model and then experimentally test your proposed model. Sample questions will be discussed in class. The actual dates of the midterms will be scheduled during the first several weeks of class. **The final exam is currently scheduled for Thursday, December 19th 2013 from 7 pm-10 pm.** (classroom not determined).

**Review Papers:** There will be one 2-page paper in which you will be asked to identify and critique primary research papers. The paper topics will focus on steroid receptors and/or plasma membrane receptors. Papers are to be submitted in hard copy only. Due dates for the paper will be announced in class, depending on progress with the material. Details about selecting research journal articles and writing critiques will be discussed in class.

### Graduate Students

**Exams:** There will be one midterm exam (different than the undergraduate exam), open notes. The questions on the exam will provide theoretical data from which you will be asked to design a model and then experimentally test your proposed model. Sample questions will be discussed in class. The midterm will be given at the same time as the one for the undergraduates in the class.

**Assignments:** There will be one 2-page paper in which you will be asked to identify and critique three primary research papers in the area of steroid receptors as discussed above for the undergraduates. Your second assignment will consist of a modified version of a postdoctoral fellowship application on a molecular endocrinology-related topic. Your application will include a critical review of the literature and future experiments. An outline of the grant proposal will be due during the first week in November. **The full proposal will be due on Monday December 16, 2013 at noon.** Specific approaches to writing the grant proposal will be discussed in class.

## **Grading Policies (There may be some changes)**

Your grade in this course will be based on a total of 300 points. Undergraduate and graduate students will be graded independently of each other. Note: All assignments and tests must be completed to pass this class or receive a letter grade.

### Undergraduate Students

Course components will be weighted as follows:

**Total midterms: 100 points**

**Paper: 50 points**

**Final Exam: 150 points**

(Note some changes may be made in the point totals)

### Graduate Students

Course components will be weighted as follows:

**Midterm: 70 points**

**Paper: 30 points**

**Grant Proposal: 200 points**

## **Course Policies**

- In consideration of other students, please turn off your cell phone during class time.
- Anyone eating in class must share their food with all other students.
- If you have a conflict with the midterm or due dates of assignments, please see me in advance.
- For unexpected emergencies, please email or phone me.
- You may discuss your paper topics with other students, but the paper you submit must be completed on your own.

## **Academic Honesty**

I expect you to do your own work and to uphold the standards of intellectual integrity. If you are having trouble with an assignment or studying for an exam, or if you are uncertain about permissible and impermissible conduct or collaboration, please come see me with your questions.

## Course Topics

The topics below will be discussed in order though the amount of time devoted to each topic will vary. If new research is published relevant to course topics, the information will be discussed in class during the semester.

- a. Experimental approaches to examine properties of receptor-steroid interactions, activation of receptors, and issues of receptor localization.
- b. Cloning and molecular genetic analysis of functional and structural domains within steroid receptors.
- c. Experimental analysis of steroid receptor-defective variants and genetic contributions to elucidate early events in steroid hormone action.
- d. Steroid regulation of transcription, use of inducible egg white proteins and mouse mammary tumor virus as model systems for examining hormone regulated gene expression.
- e. Steroid receptor-DNA interactions, detection of sequence-specific high affinity DNA binding sites.
- f. Functional and mutagenic analysis of receptor DNA binding sites, GRE vs. ERE DNA binding sites, role of spacing and orientation.
- g. Positive and negative regulation of gene expression by steroid receptor/transcription factor interactions, receptor/coactivator and receptor/corepressor interactions; heterodimer and homodimer formation of steroid receptors, formation of transcriptional complexes.
- h. Relationship of steroid receptor DNA binding sites to enhancer elements and chromatin structure.
- i. Biosynthesis of steroid hormones, thyroid hormones.
- j. Familial hypercholesterolemia and LDL receptors as a model system to examine the expression and cellular utilization of protein hormone receptors.
- k. Cell surface protein hormone receptors, structure and function.
- l. Mechanism of insulin action.
- m. Protein kinase activity and molecular genetic analysis of the structural domains of insulin and EGF receptors, receptor binding proteins, SH2/SH3 domains.
- n. Signal transduction by protein hormone receptors, Protein kinase cascades.
- o. Transcriptional regulation by protein hormones and cAMP.
- p. Membrane signalling systems, activation and inhibition of adenylate cyclase, GTP-binding regulatory components and second messengers, ras oncogene mediated signaling, activation pathway of MAP kinase.
- q. Hormonal control of cell growth and cell cycle control, mechanisms of cross talk between steroid and protein hormone pathways.
- r. Relationships between cellular oncogenes, growth factors and protein hormone receptors (structure and function, signal transduction pathway).
- s. Biosynthesis and processing of protein hormones and receptors

## **Key Dates**

Due dates for papers and midterm: TBA depending on progress with the material. Midterm #1 likely to be sometime between Oct 18<sup>th</sup> to the 23<sup>rd</sup>.

Due Date for grant proposal  
(Graduate Students Only) Dec. 16th, noon

Final Exam  
(Undergraduates only) Thursday, Dec. 19th, 7-10 pm

## **Resources**

All key resources needed for the class are in the Course Manuals or will be distributed as extra handouts in class.

In the space below, feel free to write the names and contact information for two or three classmates, in case you need notes from a missed class or wish to form a study group:

## **Statement on Accommodation**

If you need accommodations for any physical, psychological, or learning disability, or if you want me to have emergency medical information, or if you want to discuss emergency procedures for evacuating the building, please speak to me privately, either after class or during my office hours.

If there are any conflicts with the due dates of the exams or assignments for religious reasons, travel for campus sponsored extracurricular activities, medical and graduate school interviews or for other reasons, please contact me right away.

## **Evaluation of the Course**

Please let me know how things are going during the course by email, in person or voice mail. Sometime during the middle of the semester I will likely be soliciting your feedback more formally on what is working well and what needs to be changed. Also, if you see me around campus (or at any sports events or other activities), feel free to let me know how everything is going with the class, or ask me any questions. In addition, I request that you complete the end-of-course questionnaire designed by the MCB department.

## **Fine Print**

The course and syllabus are subject to change at the whim of the professor.