

# SCHOOL OF MEDICINE

## CHEMICAL AND SYSTEMS BIOLOGY

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Courses offered by the Department of Chemical and Systems Biology are listed under the subject code CSB on the *Stanford Bulletin's* ExploreCourses web site.

In Autumn of 2006, the Department of Molecular Pharmacology changed its name to become the Department of Chemical and Systems Biology. The department has established a new Ph.D. program in Chemical and Systems Biology. Molecular Pharmacology Ph.D. students who enrolled prior to Autumn 2007 have the option of receiving their Ph.D. in either Molecular Pharmacology or Chemical and Systems Biology. Ph.D. students matriculating in Autumn 2007 and thereafter are admitted to Chemical and Systems Biology. Further details about degree requirements are available from the department.

### MASTER OF SCIENCE IN CHEMICAL AND SYSTEMS BIOLOGY

Students in the Ph.D. program may apply for an M.S. degree after having satisfactorily completed the course and laboratory requirements of the first two years. The degree also requires a written thesis based on literature or laboratory research. Postdoctoral research training is available to graduates having the Ph.D. or M.D. degree.

### DOCTOR OF PHILOSOPHY IN CHEMICAL AND SYSTEMS BIOLOGY

University requirements for the Ph.D. are described in the "Graduate Degrees" section of this bulletin.

The Department of Chemical and Systems Biology offers interdisciplinary training to prepare students for independent careers in biomedical science. The main focus of the program is cell signaling, chemical biology, and systems biology.

The program leading to the Ph.D. degree includes formal and informal study in chemical biology, systems biology, drug discovery, biochemistry, and other areas of relevance to the interests of particular students. First-year students spend one quarter in each of three different laboratories, working closely with other graduate students, a professor, and postdoctoral fellows on various research projects. During the fourth quarter, the student chooses a faculty mentor with whom to undertake thesis research, based on available positions and the student's interest. During or before the eighth quarter of study, students must pass a qualifying exam which consists of an oral exam on general knowledge and a defense of a research proposal. Course requirements are fulfilled during the first two years of study; the later years of the four- to six-year program

are devoted to full-time dissertation research. Close tutorial contact between students and faculty is stressed throughout the program.

Research opportunities also exist for medical students and undergraduates. The limited size of the labs in the department allows for close tutorial contact between students, postdoctoral fellows, and faculty.

The department participates in the four quarter Health and Human Disease and Practice of Medicine sequence which provides medical students with a comprehensive, systems-based education in physiology, pathology, microbiology, and pharmacology.

## CHEMICAL SYSTEMS BIOLOGY (CSB)

### UNDERGRADUATE COURSES IN CHEMICAL SYSTEMS BIOLOGY

#### CSB 199. Undergraduate Research

Students undertake investigations sponsored by individual faculty members. Prerequisite: consent of instructor.

*1-18 units, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)*

### GRADUATE COURSES IN CHEMICAL SYSTEMS BIOLOGY

#### CSB 210. Signal Transduction Pathways and Networks

The molecular mechanisms through which cells receive and respond to external signals. Emphasis is on principles of cell signaling, the systems-level properties of signal transduction modules, and experimental strategies through which cell signaling pathways are being studied. Prerequisite: biochemistry and genetics.

*4 units, Win (Ferrell, J; Meyer, T)*

#### CSB 220. Chemistry of Biological Processes

(Same as BIOC 220) The principles of organic and physical chemistry as applied to biomolecules. Goal is knowledge of chemical principles that underlie biological processes, and chemical tools used to study and manipulate biological systems. Prerequisites: organic chemistry and biochemistry, or consent of instructor.

*4 units, alternate years, not given this year*

#### CSB 240A. A Practical Approach to Drug Discovery and Development

Advancing a drug from discovery of a therapeutic target to human trials and commercialization. Topics include: high throughput assay development, compound screening, lead optimization, protecting intellectual property, toxicology testing, regulatory issues, assessment of clinical need, defining the market, conducting clinical trials, project management, and commercialization issues, including approach to licensing and raising capital.

*3 units, alternate years, not given this year*

#### CSB 240B. A Practical Approach to Drug Discover and Development

(Continuation of 240A) Advancing a drug from discovery of a therapeutic target to human trials and commercialization. Topics include: high throughput assay development, compound screening, lead optimization, protecting intellectual property, toxicology testing, regulatory issues, assessment of clinical need, defining the market, conducting clinical trials, project management, and commercialization issues, including approach to licensing and raising capital. Prerequisite: 240A.

*3 units, alternate years, not given this year*

#### CSB 250. The Biology of Chromatin Templated Processes

Topics include mechanisms of DNA replication; gene expressions regulation; DNA damage sensing and DNA repair; chromatin structure and function; and epigenetics and nuclear reprogramming. Prerequisite: working knowledge of molecular biology, biochemistry and genetics, or instructor consent.

*4 units, not given this year*

**CSB 260. Quantitative Chemical Biology**

Current topics including protein and small molecule engineering, cell signaling sensors and modulators, molecular imaging, chemical genetics, combinatorial chemistry, in vitro evolution, and signaling network modeling. Prerequisites: undergraduate organic chemistry, and biochemistry or cell biology.

*4 units, Spr (Staff), alternate years, not given next year*

**CSB 270. Research Seminar**

Guest speakers on current research in pharmacology.

*1-2 units, Aut (Cimprich, K; Wysocka, J), Win (Staff), Spr (Staff)*

**CSB 278. Systems Biology**

(Same as BIOC 278, BIOE 310, CS 278) Complex biological behaviors through the integration of computational modeling and molecular biology. Topics: reconstructing biological networks from high-throughput data and knowledge bases. Network properties. Computational modeling of network behaviors at the small and large scale. Using model predictions to guide an experimental program. Robustness, noise, and cellular variation. Prerequisites: background in biology and mathematical analysis.

*3 units, not given this year*

**CSB 299. Directed Reading in Chemical and Systems Biology**

Prerequisite: consent of instructor.

*1-18 units, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)*

**CSB 370. Medical Scholars Research**

Provides an opportunity for student and faculty interaction, as well as academic credit and financial support, to medical students who undertake original research. Enrollment is limited to students with approved.

*4-18 units, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)*

**CSB 399. Graduate Research**

Students undertake investigations sponsored by individual faculty members. Prerequisite: consent of instructor.

*1-18 units, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)*

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