STRUCTURAL BIOLOGY

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Courses given in Structural Biology have the subject code SBIO. For a complete list of subject codes, see Appendix B.

The department offers opportunities for course work and research in cell biology. Courses fall into two categories: (1) a series of one quarter courses that treat special topics of current interest in cell biology at an advanced level; and (2) Structure of Cells and Tissues (211), a one quarter course tailored to the needs of medical students that includes both lectures on structure-function relationships of mammalian cells and tissues and a lab on medical histology.

The emphasis of research in the department is on understanding fundamental cellular processes in terms of the structure and function of organelles and molecular assemblies. Techniques used include standard methods of biochemistry, cell culture, fluorescence microscopy, genetic engineering, and image processing and three-dimensional reconstruction from electron micrographs, microinjection of cells and nuclei, nanosecond fluorescence spectroscopy, and x-ray and electron diffraction. The department owns and operates a computing center equipped with advanced time sharing and color graphics systems for data analysis and molecular modeling.

GRADUATE PROGRAMS

DOCTOR OF PHILOSOPHY

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

The graduate program in Structural Biology leads to the Ph.D. degree. The department also participates in the Medical Scientists Training Program in which individuals are candidates for both the Ph.D. and M.D. degrees.

The graduate program is intended to prepare students for careers as independent investigators in cell and molecular biology. The principal requirement of a Ph.D. degree is the completion of research constituting an original and significant contribution to the advancement of knowledge. In addition, students are required to enroll in the series of special topics courses taught by the faculty of the department. Finally, students gain teaching experience by assisting in the one quarter courses offered by all faculty in the department.

Applicants to the program should have a bachelor's degree and should have completed at least a year of course work in biology, mathematics, organic chemistry, physical chemistry, and physics. Application forms must be received by the department before January 1 for notification by April 15. Application to the National Science Foundation for fellowship support is also encouraged. Remission of fees and a personal stipend are available to graduate students in the department. Prospective applicants should write to the Department of Structural Biology for further information.

Current topics of research in the department lie in the areas of gene expression; theoretical, crystallographic, and genetic analysis of protein structure; and cell-cell interaction.

See http://www.med.stanford.edu/school/structuralbio/ for further information.

COURSES

Course and lab instruction in the Department of Structural Biology conforms to the "Policy on the Use of Vertebrate Animals in Teaching Activities," the text of which is available at http://www.stanford.edu/dept/DoR/rph/8-2.html.

SBIO 201. Advanced Immunology I—(Enroll in MI 211, IMMUNOL 201.)
3 units, Win (Chien, Staff)

SBIO 211. Structure of Cells and Tissues—The structural organization of tissues in relation to their function. Topics: blood, bone and cartilage, cardiovascular system, connective tissue, the ear and eye, endocrine, epithelia, exocrine, female and male genital systems, gastrointestinal, light and electron microscopy, lymphoid tissue, muscle, nervous tissue, respiratory, skin, and urinary. Three lectures, two labs, and one review session per week.
7 units, Aut (Cross, Staff)

SBIO 228. Protein and Nucleic Acid Structure, Dynamics, and Engineering—(Same as BIOPHYS 228.) The availability of three-dimensional atomic structures of proteins and nucleic acids allows interpretation of biological processes based on the physical and chemical properties of these molecules. Crystallographic studies include structural themes exemplified by local chain conformation, secondary structure, domains, families of folds, protein folding, and thermodynamic stability. How these structures move is considered by combining the results of experiments with theoretical molecular dynamics simulations: enzyme catalysis. Novel molecules are engineered from the experimental and predictive aspects, using interactive computer graphics programs to illustrate problems. Systems include protein-nucleic acid complexes and antibody-antigen interactions. Prerequisites: knowledge of basic biochemistry and cell biology.
3 units (Staff) not given 2002-03

SBIO 229. The Eukaryote Chromosome—The principles of chromosome structure and function. Topics: structure, dynamics, and topological forms of DNA; units and hierarchies of DNA coiling in chromosomes; centromeres, telomeres, and the basis of chromosome maintenence and sorting in mitosis; the mechanism of gene activation with regard to enhancer, promoter, and terminator sequences; the basis of sequence-specific protein-DNA interaction; organization and assembly of the cell nucleus. Prerequisites: knowledge of basic biochemistry and cell biology.
3 units, Spr (Kornberg)

SBIO 241. Biological Macromolecules—An introduction to the physical and chemical basis of macromolecular function. The forces that stabilize biopolymers with three-dimensional structures and their functional implications. Thermodynamics, molecular forces, and kinetics of enzymatic and diffusional processes and their practical application in experimental design and interpretation. Biological function and the level of individual molecular interactions and complex processes. Case studies. Prerequisite: BIOC 200 or equivalent.
3-5 units, Aut (Puglisi, Block, Herschlag, Kirkegaard, McKay)

SBIO 242. Methods in Molecular Biophysics—(Same as BIOC 242.) Introduces students from diverse backgrounds to the potential utility of physical approaches to research and helps prepare them to evaluate literature that incorporates these methods. Experimental methods in molecular biophysics are from a theoretical and practical standpoint. Emphasis is on x-ray diffraction and nuclear and nuclear magnetic resonance spectroscopy. Fluorescence spectroscopy, circular diochroism, calorimetry, separation methods.
3 units, Win (McKay, Puglisi) alternate years, not given 2003-04

SBIO 260. Supervised Study—Research or advanced tutorial for undergraduates.
1-18 units, any quarter (Staff)

SBIO 299. Directed Reading
1-18 units, any quarter (Staff)

SBIO 399. Individual Research
1-18 units, any quarter (Staff)

SBIO 450. Introduction to Biotechnology—(Enroll in CHEMENG 450, BIOC 450.)
3 units, Spr (Robertson, Swartz)

SBIO 459. Frontiers in Interdisciplinary Biosciences—(Crosslisted in multiple departments in the schools of Humanities and Sciences, Engineering, and Medicine; students should enroll directly through their affiliated department, otherwise enroll in CHEMENG 459.) An introduction to cutting-edge research involving interdisciplinary approaches to bioscience and biotechnology; for specialists and non-specialists. Organized and sponsored by the Stanford BioX Program. Three seminars each quarter address a broad set of scientific and technical themes related to interdisciplinary approaches to important issues in bioengineering, medicine, and the chemical, physical, and biological sciences. Leading investigators from Stanford and throughout the world present the latest breakthroughs and endeavors that cut broadly across many core disciplines. Pre-seminars introduce basic concepts and provide background for non-experts. Registered students attend all pre-seminars in advance of the primary seminars, others welcome. Prerequisite: keen interest in all of science, engineering, and medicine with particular interest in life itself. Recommended: basic knowledge of mathematics, biology, chemistry, and physics.
1 unit, Aut, Win, Spr (Robertson)