

Structural Biology

Courses offered by the Department of Structural Biology are listed under the subject code SBIO on the (<http://explorecourses.stanford.edu/CourseSearch/search?view=catalog&catalog=&page=0&q=SBIO&filter-catalognumber-SBIO=on>) Stanford Bulletin's (<http://explorecourses.stanford.edu/CourseSearch/search?view=catalog&catalog=&page=0&q=SBIO&filter-catalognumber-SBIO=on>) ExploreCourses web site (<http://explorecourses.stanford.edu/CourseSearch/search?view=catalog&catalog=&page=0&q=SBIO&filter-catalognumber-SBIO=on>).

The department offers course work and opportunities for research in structural biology.

The emphasis of research in the department is on understanding fundamental cellular processes in terms of the structure and function of biological macromolecules and their assemblies. Techniques used include standard methods of biochemistry, cell culture, single-molecule fluorescence spectroscopy, genetic engineering, and three dimensional structure determination by x-ray diffraction, nuclear magnetic resonance spectroscopy and electron microscopy, coupled with the development of computational methods.

Doctor of Philosophy in Structural Biology

University requirements for the Ph.D. are described in the "Graduate Degrees (<http://exploreddegrees.stanford.edu/graduatedegrees>)" 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 (MSTP) in which individuals are candidates for both 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.

The requirements and recommendations for applying to the Ph.D. program in the Department of Structural Biology include:

		Units
CHEM 131	Organic Polyfunctional Compounds	3
CHEM 171	Physical Chemistry I	3
CHEM 173	Physical Chemistry II	3
CHEM 175	Physical Chemistry III	3
BIOC 200	Applied Biochemistry	2

Ph.D. students in the Department of Structural Biology are required to complete all the following requirements:

		Units
SBIO 241	Biological Macromolecules	3-5
SBIO 242	Methods in Molecular Biophysics	3
MED 255	The Responsible Conduct of Research	1
AND, 4 graduate level courses in physical or biological science, with		
at least 1 course in physical science		
at least 1 course in literature-based biological science		

1. Training in a major with connections to biophysics (e.g., physics, chemistry, or biology, with a quantitative background equivalent to that of an undergraduate physics or chemistry major at Stanford).

2. Opportunities for teaching are available during the first nine quarters at the discretion of the advising committee.
3. The student must prepare a dissertation proposal defining the research to be undertaken including methods of procedure. This proposal should be submitted by the end of summer quarter of the second year, and it must be approved by a committee of at least three members including the principal research adviser and at least one member from the Department of Structural Biology. The candidate must defend the dissertation proposal in an oral examination. The dissertation reading committee normally evolves from the dissertation proposal review committee.
4. The student must present a Ph.D. dissertation as the result of independent investigation and expressing a contribution to knowledge in the field of structural biology.
5. The student must pass the University oral examination, taken only after the student has substantially completed the research. The examination is preceded by a public seminar in which the research is presented by the candidate.

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 December 15 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 contact 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 Stanford's School of Medicine (<http://www.med.stanford.edu/school/structuralbio>) web site for further information.

Chair: William I. Weis

Associate Chair: Michael Levitt

Professors:

- K. Christopher Garcia
- Theodore Jardetzky
- Roger D. Kornberg
- Michael Levitt
- Peter Parham
- Joseph D. Puglisi
- Soichi Wakatsuki
- William I. Weis

Associate Professor (Research):

- Yahli Lorch

Assistant Professor (Research):

- Elizabetta Viani Puglisi

Assistant Professor:

- Adam de la Zerda

Courtesy Professor:

- Axel Brunger
- Vijay Pande

Courtesy Associate Professor:

- Zev Bryant

Courses

SBIO 199. Undergraduate Research. 1-18 Unit.

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

SBIO 225. Biochips and Medical Imaging. 3 Units.

The course covers state-of-the-art and emerging bio-sensors, bio-chips, imaging modalities, and nano-therapies which will be studied in the context of human physiology including the nervous system, circulatory system and immune system. Medical diagnostics will be divided into bio-chips (in-vitro diagnostics) and medical and molecular imaging (in-vivo imaging). In-depth discussion on cancer and cardiovascular diseases and the role of diagnostics and nano-therapies.
Same as: EE 225, MATSCI 382

SBIO 228. Computational Structural Biology. 3 Units.

Interatomic forces and interactions such as electrostatics and hydrophobicity, and protein structure in terms of amino acid properties, local chain conformation, secondary structure, domains, and families of folds. How protein motion can be simulated. Bioinformatics introduced in terms of methods that compare proteins via their amino acid sequences and their three-dimensional structures. Structure prediction via simple comparative modeling. How to detect and model remote homologues. Predicting the structure of a protein from knowledge of its amino acid sequence. Via Internet.
Same as: BIOPHYS 228

SBIO 241. Biological Macromolecules. 3-5 Units.

The physical and chemical basis of macromolecular function. Topics include: forces that stabilize macromolecular structure and their complexes; thermodynamics and statistical mechanics of macromolecular folding, binding, and allostery; diffusional processes; kinetics of enzymatic processes; the relationship of these principles to practical application in experimental design and interpretation. The class emphasizes interactive learning, and is divided equally among lectures, in-class group problem solving, and discussion of current and classical literature. Enrollment limited to 50. Prerequisites: Background in biochemistry and physical chemistry recommended but material available for those with deficiency in these areas; undergraduates with consent of instructor only.
Same as: BIOC 241, BIOPHYS 241, GENE 241

SBIO 242. Methods in Molecular Biophysics. 3 Units.

Experimental methods in molecular biophysics from theoretical and practical standpoints. Emphasis is on X-ray diffraction, nuclear magnetic resonance, and fluorescence spectroscopy. Prerequisite: physical chemistry or consent of instructor.
Same as: BIOPHYS 242

SBIO 274. Topics in Nucleic Acid Structure and Function. 2 Units.

Principles of nucleic acid structure and function. Methods for investigating nucleic acid structure. Limited to graduate students and postdoctoral fellows in structural biology. Prerequisite: consent of instructor.

SBIO 299. Directed Reading in Structural Biology. 1-18 Unit.

Prerequisite: consent of instructor.

SBIO 370. Medical Scholars Research. 4-18 Units.

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 projects.

SBIO 399. Graduate Research. 1-18 Unit.

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

SBIO 801. TGR Project. 0 Units.

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SBIO 802. TGR Dissertation. 0 Units.

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