BIOPHYSICS

Courses offered by the Biophysics Program are listed under the subject code BIOPHYS on the Stanford Bulletin's ExploreCourses web site.

The Biophysics Program offers instruction and research opportunities leading to the Ph.D. in Biophysics. Students admitted to the program may perform their graduate research in any appropriate department.

The Stanford Biophysics Program is an interdisciplinary, interdepartmental training program leading to the Ph.D. Degree in biophysics. The program centers on understanding biological function in terms of physical and chemical principles. The Program comprises faculty from 16 departments in the Schools of Humanities and Sciences, Medicine, Engineering, and the Stanford Synchrotron Radiation Laboratory. Research in the Program involves two overlapping branches of biophysics: the application of physical and chemical principles and methods to solving biological problems, and the development of new methods.

The Biophysics Program aims to train students in quantitative approaches to biological problems, while also developing their perspective in choosing forefront biological problems. A balanced academic program is tailored to the diverse backgrounds of the students. The program requires graduate-level coursework in physical and biological sciences, participation in seminar series, and most importantly achievement of a high level of proficiency in independent research.

Learning Outcomes (Graduate)

The Ph.D. is conferred upon candidates who have demonstrated substantial scholarship and the ability to conduct independent research and analysis in Biophysics. Through completion of advanced course work and rigorous skills training, the doctoral program prepares students to make original contributions to the knowledge of Biophysics and to interpret and present the results of such research.

Graduate Program in Biophysics

For information on the University's basic requirements for the Ph.D. degree, see the "Graduate Degrees (http://exploredegrees.stanford.edu/graduatedegrees)" section of this bulletin.

Admission

A small number of qualified applicants are admitted to the program each year. Applicants should present strong undergraduate backgrounds in the physical sciences and mathematics. The graduate course program, beyond the stated requirements, is worked out for each student individually with the help of appropriate advisers from the Committee on Biophysics.

The requirements and recommendations for applying to the Ph.D. Program in Biophysics include:

		Units
CHEM 131	Organic Polyfunctional Compounds	3
CHEM 171	Physical Chemistry I	4
CHEM 173	Physical Chemistry II	3
CHEM 175	Physical Chemistry III	3
BIOC 200	Applied Biochemistry	2

Course Requirements

Ph.D. students in the Program in Biophysics are required to complete the following course requirements:

		Units
BIOPHYS 241	Biological Macromolecules	3-5
or BIOE 300A	Molecular and Cellular Bioengineering	
BIOPHYS 242	Methods in Molecular Biophysics (offered every other year)	3
BIOPHYS 250	Seminar in Biophysics	1
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		

Lab Rotation and Settlement

During the first year of graduate school in Biophysics, students are encouraged to complete a minimum two quarters of rotations in any faculty labs of their choice, a third rotation is allowed if necessary. Once the students finish their rotations, they make an official decision on which faculty's lab to settle in. If the faculty is not part of Biophysics, then the student needs to have an additional co-advising faculty member on their committee who is in Biophysics. Once the student settles in a lab, s/he is required to complete the first Individual Development Plan (IDP) and begin forming the reading committee.

Individual Development Plan (IDP)

In light of the benefits to trainee development and the likelihood that the IDP program will be a factor in NIH funding decisions, the Committee on Graduate Admissions and Policy (CGAP) has adopted a new policy requiring all Biosciences Ph.D. candidates and their mentors in the Schools of Medicine and H&S to create and discuss the Individual Development Plan (IDP) (https://biosciences.stanford.edu/current/idp) on an annual basis.

1. Complete the first IDP meeting with the adviser within 30 days of joining the thesis lab.
2. IDP meetings are required annually, in addition to and separate from thesis committee meetings (see below).

Reading Committee

See the "Degree-Specific Requirements (Doctoral Degrees) (http://exploredegrees.stanford.edu/graduatedegrees/#doctoraltext)" section of this bulletin for University rules concerning doctoral degrees. See GAP 4.8 (http://gap.stanford.edu/4-8.html), for further details on the Doctoral Dissertation Reading Committee.

Once a student have chosen a research adviser and begun thesis-related research, s/he is required to select a reading committee. The student's reading committee should be in place no later than Autumn Quarter of the third year in the program. The individuals selected by the student serve as an advising and consultative group for the duration of their graduate studies. They evaluate the student's dissertation proposal and constitute the core of their the defense committee. Students should consult with their research adviser on the selection of their reading committee.

The doctoral dissertation reading committee consists of the principal dissertation adviser and, typically, two other readers. The doctoral dissertation reading committee must have at least three members and may not have more than five members. All members of the reading committee approve the dissertation. At least one member must be from the student's major department. Normally, all committee members are members of the Stanford University Academic Council or are emeritus Academic Council members.

The reading committee, as proposed by the student and agreed to by the prospective members, is endorsed by the chair of the major department on this Doctoral Dissertation Reading Committee form (https://stanford.app.box.com/docdiss-reading-committee-form). The student's department chair may, in some cases, approve the appointment of a reader who is not a current or emeritus member of the Academic Council (via the Petition for Non-Academic Council Doctoral Committee Members form (https://stanford.app.box.com/doc-ctte-non-acad-council)), if that person is particularly well qualified to consult on the dissertation topic and holds a Ph.D. or equivalent foreign degree). All examiners must hold a Ph.D. degree (or foreign equivalent). Former Stanford Academic Council members and non-Academic Council members may thus on occasion serve on a reading committee.

Any member of the Academic Council may serve as the principal dissertation adviser. If former Academic Council members, emeritus Academic Council members, or non-Academic Council members are to serve as the principal dissertation adviser, the appointment of a co-adviser who is currently on the Academic Council is required. This is to ensure representation for the student in the department by someone playing a major adviser role in completion of the dissertation. However, a co-adviser is not required during the first two years following retirement for emeritus Academic Council members who are recalled to active service. If the reading committee has four or five members, at least three members (comprising the majority) must be current or emeritus members of the Academic Council.

Qualifying Exam

Once students enter their third year of graduate studies, they are required to arrange a meeting with their committee to present to them a proposed thesis related research project (dissertation proposal). The meeting is called the qualifying exam, and should be completed no later than the end of Autumn Quarter of the student's third year. In anticipation of the exam, the student should prepare an approximately 10-page summary of their proposed research and/or any progress they have made at that time. The precise format (e.g., inclusion of a timeline, methods section, etc.) is flexible, and naturally can conform to the particular style of papers or proposals coming from their thesis lab. The main goal of the written portion is to briefly summarize the student's progress so far and carefully plan out their future thesis research plans with committee feedback and advice.

At the meeting, the student should be prepared to make a 30-45 minute presentation of their research where they discuss their results to date and propose further experiments. Audiovisual aids are not required, but may be useful if available. After completing the qualifying exam, students need to arrange annual thesis committee meetings with their committee members to review academic progress each year. Completing the qualifying exam serves to meet the student's first thesis committee meeting requirement. The thesis committee meetings should be completed once a year during the student's 3rd and 4th years, and twice a year past their fifth year and above.

Candidacy

Admission to candidacy for the doctoral degree is granted by the major department following a student's successful completion of qualifying procedures. Students are expected to be admitted to candidacy by the end of the second year of doctoral study. Candidacy is valid for five years, subject to satisfactory academic progress.

Terminal Graduate Registration (TGR)

Doctoral students who have been admitted to candidacy, completed all required courses and degree requirements other than the University oral exam and dissertation, completed 135 units or 10.5 quarters of residency (if under the old residency policy), and submitted a Doctoral Dissertation Reading Committee form, may request Terminal Graduate Registration (TGR) status to complete their dissertations. Students with more than one active graduate degree program must complete residency units between all active/completed degree programs in order to apply for TGR status. See the "Residency Policy for Graduate Students (http://exploredegrees.stanford.edu/graduatedegrees/#residencytext)" section of this bulletin for additional information.

Dissertation/Oral Exam

The student must prepare a dissertation proposal defining the research to be undertaken, including methods of procedure. This proposal should be submitted by Autumn Quarter of the third 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 Biophysics Program. The candidate must defend the dissertation proposal in an oral examination. The dissertation reading committee normally evolves from the dissertation proposal review committee.
The student must present a Ph.D. dissertation as the result of independent investigation that expresses a contribution to knowledge in the field of biophysics. The student must pass the University oral exam, taken only after the student has substantially completed the dissertation research. The examination is preceded by a public seminar in which the research is presented by the candidate.

Graduate Advising Expectations

Academic advising by our faculty is a critical component of our graduate students' education. The Biophysics Program is committed to providing academic advising in support of graduate student scholarly and professional development. When most effective, this advising relationship entails collaborative and sustained engagement by both the adviser and the advisee. Both the adviser and the advisee are expected to maintain professionalism and integrity.

All matriculating students are assigned the program director as a faculty adviser to help them design their academic program. Before advancing to candidacy for the degree, students are expected to identify a group of at least three thesis advisers (also known as the dissertation reading committee), including a primary thesis adviser. The thesis advisers are selected by the student on the basis of expertise relevant to the thesis project, after undertaking two to three rotations of approximately one quarter in length each.

Thesis advisers meet with students at least once each year to discuss students' Individual Development Plan(s) (IDPs). Additionally, students should meet with their adviser(s) on a regular basis throughout each year for guidance in key areas such as selecting courses, designing and conducting research, developing of teaching pedagogy, navigating policies and degree requirements, and exploring academic opportunities and professional pathways.

As a best practice, advising expectations should be periodically discussed and reviewed to ensure mutual understanding. Graduate students are active contributors to the advising relationship, proactively seeking academic and professional guidance and taking responsibility for informing themselves of policies and degree requirements for their graduate program.

Academic progress and student completion of program requirements and milestones are monitored by the program staff and director, and are discussed at meetings of the executive committee.

Requirements and milestones, as well as more detailed descriptions of the program's expectations of advisers and students, are listed in the Student Handbook, found on the program website (http://med.stanford.edu/biophysics.html).

Additionally, the program adheres to the advising guidelines and responsibilities listed by the Office of the Vice Provost for Graduate Education (https://vpge.stanford.edu/academic-guidance/advising-mentoring) and in the Graduate Academic Policies (https://gap.stanford.edu/handbooks/gap-handbook/chapter-3/subchapter-3/page-3-3-1).

For a statement of University policy on graduate advising, see the "Graduate Advising (http://exploredegrees.stanford.edu/graduatedegrees/#advisingandcredentialstext)" section of this bulletin.

Emeritus:

- Philip C. Hanawalt (Biology, Dermatology)
- Harden M. McConnell (Chemistry)
- Stephen J. Smith (Molecular & Cellular Physiology)

Director:

- KC Huang (Bioengineering)

Professors:

- Russ Altman (Bioengineering, Genetics, Medicine - Biomedical Informatics)
- Steve M. Block (Applied Physics, Biology)
- Steven Boxer (Chemistry)
- Axel Brunger (Molecular & Cellular Physiology)
- Wah Chiu (Bioengineering)
- Gilbert Chu (Oncology, Biochemistry)
- Steven Chu (Physics, Molecular & Cellular Physiology)
- John O. Dabiri (Civil and Environmental Engineering, Mechanical Engineering)
- Hongjie Dai (Chemistry)
- Mark Davis (Microbiology & Immunology)
- Sebastian Doniach (Physics, Applied Physics)
- James Ferrell (Chemical & Systems Biology, Biochemistry)
- Daniel Fisher (Applied Physics)
- Judith Frydman (Biology, Genetics)
- Chris Garcia (Molecular & Cellular Physiology, Structural Biology)
- Gary H. Glover (Radiology)
- Miriam Goodman (Molecular & Cellular Physiology)
- Daniel Herschlag (Biochemistry)
- Keith O. Hodgson (Chemistry)
- Theodore Jardetzky (Structural Biology)
- Peter S. Kim (Biochemistry)
- Brian Kobilka (Molecular & Cellular Physiology)
- Eric Kool (Chemistry)
- Ron Kopito (Biology)
- Roger D. Kornberg (Structural Biology)
- Craig Levin (Radiology)
- Michael Levitt (Structural Biology)
- Richard Lewis (Molecular & Cellular Physiology)
- Sharon Long (Biology)
- Todd Martinez (Chemistry)
- Tobias Meyer (Chemical & Systems Biology)
- W. E. Moerner (Chemistry)
- Vijay Pande (Chemistry)
- Norbert Pelc (Bioengineering, Radiology)
- Beth Pruitt (Mechanical Engineering)
- Joseph D. Puglisi (Structural Biology)
- Stephen Quake (Bioengineering, Applied Physics)
- Jianghong Rao (Radiology)
- Edward I. Solomon (Chemistry)
- James A. Spudich (Biochemistry)
- Julie Theriot (Biochemistry, Microbiology & Immunology)
- Alice Y. Ting (Genetics)
- Shreyas Vasanawala (Radiology)
- Anthony Wagner (Psychology)
- Thomas Wandless (Chemical & Systems Biology)
- William I. Weis (Structural Biology, Molecular & Cellular Physiology)
- Richard Zare (Chemistry)

Associate Professors:

- Annelise Barron (Bioengineering)
- Zev Bryant (Bioengineering)
- Lynette Cegelski (Chemistry)
- Jennifer Cochran (Bioengineering)
- Bianxiao Cui (Chemistry)
- Rhiju Das (Biochemistry)
- Ron Dror (Computer Science)
- Alexander Dunn (Chemical Engineering)
- William Greenleaf (Genetics)
- Pehr Harbury (Biochemistry)
- KC Huang (Bioengineering)
- Michael Kapiloff (Ophthalmology)
- Jin Billy Li (Genetics)
- Jan Liphardt (Bioengineering)
- Merritt Maduke (Molecular & Cellular Physiology)
- Mark Schnitzer (Biology, Applied Physics)
- Jan Skotheim (Biology)
- Andrew Spakowitz (Chemical Engineering)

Assistant Professors:

- Raag Airan (Radiology)
- Lacramioara Bintu (Bioengineering)
- Alistair Boettiger (Developmental Biology)
- Onn Brandman (Biochemistry)
- David Camarillo (Bioengineering)
- Ovijit Chaudhuri (Mechanical Engineering)
- Adam de la Zerda (Structural Biology)
- Liang Feng (Molecular & Cellular Physiology)
- Polly Fordyce (Genetics)
- Possu Huang (Bioengineering)
- Anshul Kundaje (Genetics, Computer Science)
- Lingyin Li (Biochemistry)
- Manu Prakash (Bioengineering)
- Ingmar H. Riedel-Kruse (Bioengineering)
- Manish Saggar (Psychiatry & Behavioral Sciences)
- Julia Salzman (Biochemistry)
- Sindy Tang (Mechanical Engineering)
- Mary Teruel (Chemical & Systems Biology)
- Bo Wang (Bioengineering)