MOLECULAR BIOPHYSICS AND BIOCHEMISTRY

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https://mbb.yale.edu
M.S., M.Phil., Ph.D.

Chair
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Professors  Karen Anderson (Pharmacology), Susan Baserga, Ronald Breaker (Molecular, Cellular, and Developmental Biology), Gary Brudvig (Chemistry), Sandy Chang (Laboratory Medicine), Enrique De La Cruz, Daniel DiMaio (Genetics; Therapeutic Radiology), Donald Engelman, Mark Gerstein, Wendy Gilbert, Nigel Grindley (Emeritus), Mark Hochstrasser, Jonathon Howard, Michael Koelle, Anthony Koleske, William Konigsberg (Emeritus), Mark Lemmon (Pharmacology), J. Patrick Loria (Chemistry), I. George Miller (Pediatric Infectious Diseases; Public Health), Andrew Miranker, Peter Moore (Emeritus; Chemistry), Karla Neugebauer, Lynne Regan (Emerita), Karin Reinisch (Cell Biology), David Schatz (Immunobiology), Christian Schlieker, Robert Shulman (Emeritus), Fred Sigworth (Cellular and Molecular Physiology; Biomedical Engineering), Dieter Söll (Emeritus), Mark Solomon, Joan Steitz, Scott Strobel, Kenneth Williams (Adjunct; Research), Yong Xiong, Carl Zimmer (Adjunct)

Associate Professors  Julien Berro, Titus Boggon (Pharmacology), Erdem Karatekin (Cellular and Molecular Physiology), Nikhil Malvankar, Matthew Simon, Sarah Slavoff (Chemistry), Seyedtaghi Takyar (Internal Medicine/Pulmonary), Yongli Zhang (Cell Biology)

Assistant Professors  Franziska Bleichert, Allison Didychuk, Luisa Escobar-Hoyos (Therapeutic Radiology), Lilian Kabeche, Wei Mi (Pharmacology), Candice Paulsen, Shaogeng (Steven) Tang, Kai (Jack) Zhang

FIELDS OF STUDY
The principal objective of members of the department is to understand living systems at the molecular level. Laboratories in MB&B focus on a diverse collection of problems in biology. Some specialize in the study of DNA dynamics, including replication, recombination, transposition, and/or functional genomics. Others focus on transcriptional regulation, from individual transcription factors to the control of lymphocyte activation, the interferon response, and organismal development. Other groups study RNA catalysis, RNA-protein interactions, and ribonucleoproteins including spliceosomes and the ribosome. Additionally there are those that emphasize protein folding and design, transmembrane signaling, cell cycle control, cytoskeletal dynamics, and neuroscience. Structural and computational biology is a strong component of many of these research efforts.
To enter the Ph.D. program, students apply to an interest-based track within the interdepartmental graduate program in Biological and Biomedical Sciences (BBS), https://medicine.yale.edu/bbs.

INTEGRATED GRADUATE PROGRAM IN PHYSICAL AND ENGINEERING BIOLOGY (PEB)

Students applying to one of four tracks of the Biological and Biomedical Sciences program may simultaneously apply to be part of the PEB program. See the description under Non-Degree-Granting Programs, Councils, and Research Institutes for course requirements, and http://peb.yale.edu for more information about the benefits of this program and application instructions.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

All first-year students (except M.D.-Ph.D.) perform three laboratory rotations (encompassed by MB&B 650 and MB&B 651, Lab Rotation for BQBS First-Year Students). All students from the BQBS track who affiliate with MB&B are required to take, for credit, six one-term science courses. To obtain the desired breadth and depth of education, students coming from the BQBS track are required to take MB&B 720, MB&B 730, one course in molecular biophysics or quantitative biology, and one course in molecular biology (MB&B 743 is strongly recommended but not required). The credit in molecular biophysics or quantitative biology and the credit in molecular biology may be satisfied by taking appropriate courses from an approved list available each fall and listed in the MB&B graduate handbook. Students originating from a BBS track other than BQBS must discuss their curriculum with the MB&B DGS prior to joining the department to ensure equivalent foundational course work in MB&B topic areas; these students are strongly encouraged to take or audit MB&B 720.

Additional courses, chosen from within MB&B or from related graduate programs, should form a coherent background for the general area in which the student expects to do dissertation research. All students also attend MB&B 676, Responsible Conduct of Research. In their fourth year of study, all students must complete MB&B 677, RCR Refresher for Senior MB&B Students. Students with an extensive background in biochemistry or biophysics are permitted to substitute advanced courses for the introductory courses. There is no foreign language requirement. The student’s research committee (see below) makes the final decision concerning the number and selection of courses required of each student.

All students are required to assist in teaching two terms during their graduate careers, usually during the second and third years. Students who require additional support from the Graduate School must teach additional terms, if needed, after they have fulfilled the academic teaching requirement.

The student selects a research adviser by the end of the second term of residence. At that time two additional faculty members are chosen to form a research committee, with the total committee including at least two MB&B faculty members. The chair of the committee will be an MB&B faculty member who is not the research adviser. Students are required to meet with this committee in the spring of years two and three, and in both the fall and spring of subsequent years. The qualifying examination, usually taken in the fall of the second year, is an oral defense of a research proposal consisting of (1) thesis aims and (2) extended goals on the same topic. The extended
goals should include approaches beyond those in the thesis aims, typically beyond those generally employed by the host lab. Thus, a predominantly molecular biological set of thesis aims should be accompanied by biophysical approaches in the extended goals section, and vice versa. The three-member oral examination committee usually includes at least one of the two members of the research committee excluding the thesis adviser. Requirements for admission to candidacy, which usually takes place after four terms of residence, include (1) completion of course requirements; (2) completion of the qualifying examination; (3) certification of the student’s research abilities by vote of the faculty upon recommendation from the student’s research committee; and (4) submission of a brief prospectus of the proposed thesis research. Completion of the teaching requirement is not required for admission to candidacy. Once final drafts of the thesis chapters have been approved by the research committee, the student presents a dissertation seminar to the entire department, and only afterward may the thesis be submitted. Students must have written at least one first-author paper that is submitted, in press, or published by the time of the thesis seminar.

**HONORS REQUIREMENT**

Students must meet the graduate school’s Honors requirement by the end of the fourth term of full-time study; see Degree Requirements under Policies and Regulations. Students must also maintain an overall High Pass average. Student progress toward these goals is reviewed at the ends of the first and second terms.

**M.D.-PH.D. STUDENTS**

M.D.-Ph.D. students must satisfy the requirements listed above for the Ph.D. with the following modifications: Laboratory rotations are not required but are available. Assisting in teaching of one lecture course is required. Students are required to take MB&B 800 as part of their medical curriculum in addition to the two courses in molecular biophysics described above. Students with weak backgrounds in molecular biology will need to take MB&B 743.

**MASTER’S DEGREES**

**M.Phil.** See Degree Requirements under Policies and Regulations. Awarded only to students admitted to candidacy who are continuing for the Ph.D. Students need not have completed their teaching requirement to receive the M.Phil. Students are not admitted for this degree.

**M.S.** Students are not admitted for this degree. It may only be awarded to a student in the Ph.D. program who is in good standing upon completion of at least two terms of graduate study and who will not continue in the Ph.D. program. A student must receive grades of Pass or higher in at least five courses approved by the DGS as counting toward a graduate degree, exclusive of seminars or research. Students must have taken at least ten courses. A typical schedule would consist of six traditional courses, two terms of MB&B 650 and MB&B 651, and one term each of MB&B 675 and MB&B 676. A student must also meet the graduate school’s Honors requirement for the Ph.D. program and maintain a High Pass average. Students who are eligible for or who have already received the M.Phil. will not be awarded the M.S.
More detailed program materials are available upon request to the Director of Graduate Admissions, Department of Molecular Biophysics and Biochemistry, Yale University, PO Box 208114, New Haven CT 06520-8114.