

# COMBINED PROGRAM IN THE BIOLOGICAL AND BIOMEDICAL SCIENCES (BBS)

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<https://medicine.yale.edu/bbs>

## **Director**

Craig Roy

## **FIELDS OF STUDY**

The Combined Program in the Biological and Biomedical Sciences (BBS) is intended to enable students to explore their research interests before committing to a Ph.D. program or thesis adviser. To accomplish this aim, students apply to and spend their first year within one of eight scientific homes, called “tracks”:

Biochemistry, Quantitative Biology, Biophysics, and Structural Biology (BQBS)

Computational Biology and Bioinformatics (CBB)

Immunology

Microbiology

Molecular Cell Biology, Genetics, and Development (MCGD)

Translational Molecular Medicine, Pharmacology, and Physiology (TMMPP)

Neuroscience

Plant Molecular Biology (PMB)

There are approximately 450 faculty affiliated with the BBS Program, and they may affiliate with up to two of the tracks listed above. BBS faculty come from departments within the Faculty of Arts and Sciences, School of Medicine, School of Public Health, and School of Engineering & Applied Science.

## **TYPICAL COURSE OF STUDY**

**Year One** From within their track students take two to four courses per semester and conduct two to four lab rotations over the course of the year. Each track has its own course requirements and course recommendations, though students may take elective courses from anywhere in BBS. Although each track also has its own list of participating faculty, with the guidance of the track director, students may rotate in any BBS labs. In the spring of their first year students select a thesis adviser.

**Year Two** Prior to the start of the year students leave their BBS track and formally join one of the Ph.D.-granting programs below that best aligns with the thesis lab and research project:

Cell Biology

Cellular and Molecular Physiology

Computational Biology and Bioinformatics

Experimental Pathology

Genetics

Immunobiology

Interdepartmental Neuroscience Program  
 Microbiology  
 Molecular Biophysics and Biochemistry  
 Molecular, Cellular, and Developmental Biology  
 Pharmacology  
 Translational Biomedicine

Students in year two complete the course requirements for the graduate program they have joined, take a qualifying exam, and begin thesis research. Each BBS student is required to participate in two semesters (or its equivalent) of teaching during graduate school, but no student is expected to teach during the first year of study. Students may begin to fulfill this requirement in the second year.

**Year Three and Beyond** Students focus primarily on thesis research, publishing their results, and presenting their work at scientific meetings. Students also finish fulfilling their teaching requirement. The median time to degree across the twelve BBS-affiliated Ph.D. programs is 5.7 years.

Financial support for BBS students comes from a variety of sources including Yale University fellowships, Gruber Science fellowships, Wu Tsai fellowships, National Institutes of Health (NIH) training grants, external fellowships awarded to students, departmental funds, and research grants from the NIH, NSF, foundations, and companies.

### **MEDICAL RESEARCH SCHOLARS PROGRAM (MRSP)**

Students applying to any BBS track may also apply to participate in the MRSP. See the MRSP description under Non-Degree-Granting Programs, Councils, and Research Institutes. For more information about the program and application process visit <https://medicine.yale.edu/bbs/training/nih-programs/mrsp>.

### **INTEGRATED GRADUATE PROGRAM IN PHYSICAL AND ENGINEERING BIOLOGY (PEB)**

Students applying to the BQBS, CBB, MCGD, TMMPP, or Neuroscience tracks may also apply to be part of the PEB program. See the description under Non-Degree-Granting Programs, Councils, and Research Institutes. For more information about the program and application process visit <https://peb.yale.edu>.

### **COURSES**

#### **B&BS 640a / PATH 640a, Developing and Writing a Scientific Research Proposal**

Katerina Politi

The course covers the intricacies of scientific writing and guides students in the development of a scientific research proposal on the topic of their research. All elements of an NIH fellowship application are covered, and eligible students submit their applications for funding. Enrollment limited to twelve. Required of second-year graduate students in Pathology and Molecular Medicine. Registration allowed by prior authorization from course directors only.

**B&BS 680b / IMED 680b, Topics in Human Investigation** Joseph Craft and Karen Anderson

The course teaches students about the process through which novel therapeutics are designed, clinically tested, and approved for human use. It is divided into two main components, with the first devoted to moving a chemical agent from the bench to the clinic, and the second to outlining the objectives and methods of conducting clinical trials according to the FDA approval process. The first component describes aspects of structure-based drug design and offers insight into how the drug discovery process is conducted in the pharmaceutical industry. The format includes background lectures with discussions, labs, and computer tutorials. The background lectures include a historical perspective on drug discovery, the current paradigm, and important considerations for future success. The second component of the course provides students with knowledge of the basic tools of clinical investigation and how new drugs are tested in humans. A series of lectures and discussions provides an overview of the objectives, research strategies, and methods of conducting patient-oriented research, with a focus on design of trials to test therapeutics. Each student is required to participate (as an observer) in an HIC review, in addition to active participation in class. Consent of instructor required.