

DEPARTMENT OF BRAIN AND COGNITIVE SCIENCES

Graduate Study

The Department of Brain and Cognitive Sciences offers programs of study leading to the doctoral degree in neuroscience or cognitive science. Areas of research specialization include cellular and molecular neuroscience, systems neuroscience, computation, and cognitive science. The graduate programs are designed to prepare students to pursue careers in research, teaching, or industry.

Doctor of Philosophy in Brain and Cognitive Sciences Fields

The doctor of philosophy in brain and cognitive sciences fields (<https://catalog.mit.edu/schools/science/#degreesandprogramstext>) (the PhD program) is normally completed in approximately six years of full-time work, including summers. Institute requirements for the PhD are given in the section on General Degree Requirements (<https://catalog.mit.edu/mit/graduate-education/general-degree-requirements>). Formal coursework for the departmental program (<https://catalog.mit.edu/degree-charts/phd-brain-cognitive-sciences>) is intended to prepare the student to pass the general examinations and do original thesis research. The written general examinations will be due in August of the second year.

All students start with first-year intensive core subjects that provide an introduction to brain and cognitive studies from the viewpoint of systems neuroscience, molecular and cellular neuroscience, cognition, and computation. Incoming graduate students are required to take at least two of these subjects but must take all within the first two years of study. Further coursework will be diversified to give each individual the appropriate background for research in his or her own area.

- **Cellular and molecular neuroscience** coursework emphasizes the current genetic, molecular, and cellular approaches to biological systems that are necessary to generate advances in neuroscience.
- **Systems neuroscience** coursework covers neuroanatomy, neurophysiology, and neurotransmitter chemistry, concentrating on the major sensory, motor, memory, and executive systems in the vertebrate brain. Specific ties to molecular neurobiology or computation may be emphasized, depending upon the research interests of the student.
- **Computation** coursework is intended to give both an understanding of empirical approaches to the study of the brain and animal behavior and a theoretical background for analyzing computational aspects of biological information processing.

Cognitive science coursework covers such topics as language processing, language acquisition, cognitive development, natural computation, neural networks, connectionist models, and visual information processing. Students also choose seminars and

coursework in linguistics, philosophy, logic, mathematics, or computer science, depending on the individual student's research program.

Graduate students begin a research apprenticeship immediately upon arrival with lab rotations in the first year. To familiarize new students with the research being conducted in the department, the department hosts a series of talks in September by faculty whose labs are open for rotations. Students typically choose their first rotation by October 1. Laboratory rotations allow students to get to know several different labs; learn concepts and techniques, and select a laboratory in which they will complete their dissertation research. Students complete three 4–8 week rotations during the first year, registering for 12 units of 9.921 Research in Brain and Cognitive Sciences in both the fall and spring terms; an optional fourth rotation is also available during spring or summer term but must be approved by the rotation coordinator. Students must submit a brief rotation proposal at the start of each rotation, and a brief summary upon completion of each rotation.

At the end of the first year, an advisory committee of two to four faculty members is formed. This committee monitors progress and, with membership changing as necessary, evolves into the thesis committee. Students must pass the oral and written qualifying exams for doctoral candidacy denoted by receiving a 'P' Pass grade in 9.300. Upon passing the exams, students complete at least 222 additional units of 9.921 in preparation for their thesis. Thesis research normally requires 24–48 months of full-time activity after the qualifying examinations have been passed. It is expected that the research embodied in the PhD dissertation be original and significant work, publishable in scientific journals.

In addition to coursework, students are also expected to serve as teaching trainees for two terms and to participate in other professional development activities. Teaching trainees will register for 12 units of 9.919 Teaching Brain and Cognitive Sciences each term. This is typically done once in the second year of the program and again in the third year.

Students must also participate in two department-approved professional development activities, registering for 9.990 during each term of participation. One credit unit will be awarded only upon completion of two activities. A list of pre-approved professional development activities is available on the BCS website. Students may also petition other professional development activities.

Upon successful completion of all program requirements, the student will be awarded the PhD in the corresponding field of brain and cognitive sciences.

Financial Support

Financial assistance is provided to qualified applicants in the form of traineeships, research assistantships, teaching assistantships, and a limited number of fellowships, subject to availability of funds. Prospective students are encouraged to apply for individual

fellowships such as those sponsored by the National Science Foundation and the National Defense Science and Engineering Graduate Fellowship Program to cover all or part of the cost of their education. The department's financial resources for non-US citizens are limited; international students are strongly encouraged to seek financial assistance for all or part of the cost of their education from non-MIT sources.

Inquiries

For additional information regarding teaching and research programs, contact the Academic Administrator, Department of Brain and Cognitive Sciences, Room 46-2005, 617-253-5741, or visit the department's website (<http://web.mit.edu/bcs>).