

**PhD Degree Learning Goals and Assessment in the Graduate School-New
Brunswick and Graduate School of Biomedical Sciences – New
Brunswick/Piscataway**

Neuroscience

Learning Goals

The Neuroscience Graduate Program trains students to be able to assume next-stage careers as researchers in highly-competitive academic and industrial post-doctoral positions. A major emphasis is on multidisciplinary training, which is reflected by both the academic requirements of the program as well as in research projects exemplified by a continuing program project grant with several Neuroscience faculty investigators, several additional multi-investigator grants listing Neuroscience faculty, and ongoing joint publications between students with two or more Neuroscience training faculty as co-authors.

During training, the different program requirements are intended to ensure that graduating Ph.D. students:

Goal 1. Demonstrate knowledge of neuroscience as reflected by successful completion of course

Goal 2. Develop the ability to critically evaluate the scientific literature in several areas as one part of the qualifying exam

Goal 3. Demonstrate an ability to develop and articulate an original thesis research proposal

Goal 4. Publish peer-reviewed original results from that proposal.

During the course of study, students demonstrate competence in several core areas including broad technical expertise, scientific knowledge, and communication skills, while also receiving training in the ethical conduct of scientific research.

To be awarded a Ph.D. in Neuroscience, the candidate must complete:

- A) Required course work
- B) A qualifying examination and a dissertation proposal defense
- C) An original research project under the supervision of a faculty advisor

Most students require 4-6 years of full time graduate study, including the dissertation research, to complete the requirements for the Ph.D. degree. Students earning the PhD degree in the Joint Graduate Program in Neuroscience will receive the degree jointly from Rutgers Graduate School of Biomedical Sciences and Rutgers Graduate School New Brunswick. New mechanisms are in place to maximize likelihood that the dissertation requirements are completed in ~5 years in most cases.

While doctoral requirements vary with the area of specialization, a total of 72 combined credits are required for the PhD degree. Of the 72 credits, at least 28 course credits (at a minimum “B” grade average) are required, of which 24 must be at the 500 level or above, including 8 seminar credits of Advanced Studies in Neuroscience and 1 credit of Ethical Scientific Conduct. Up to 44 research credits are also required to bring the required total to 72.

Implementation/Assessment of Goals

Goal 1.

The broad range of courses provides student-specific background experiences to students in our program and also provides the flexibility that is commented on positively by students and faculty alike in the confidential surveys. There is also thematic integration across courses and curricula. The revamped Advanced Studies course of our curriculum (in essence a rigorous 2 credit hour journal club) has a different topic focus each term. This course prepares students to present and teach by requiring them to read and interpret papers, speak before a class, and lead a discussion while learning to critically evaluate specific papers in a clear and precise manner. Students must also complete out of class assignments that can include paper writing. Importantly, different faculty (2-3), participate each term so that students get to interact with 10-12 active program members representing the broad range of disciplines represented in our program during the 4 semesters of required participation.

Course evaluation occurs for each course, with students usually asked to respond to Student Instructional Rating Survey forms distributed by The Center for Teaching Advancement and Assessment Research at Rutgers; these forms include questions about both faculty and content. These anonymous surveys are reviewed by course directors, with input provided to the faculty, and are then submitted to the Center. In some instances, individual faculty develop evaluation forms that include specific questions more relevant to each course.

To further enhance presentation skills, our program's students formed The NeuroConnections Club which aims to unite students in the Graduate Program in Neuroscience, is recognized and supported by the Rutgers GSA, and provides a platform for students to showcase their own research in student-led seminars attended by the university community. In the fall, we hold a new student orientation with several participating faculty (often junior faculty) giving talks that all current students must attend. After the faculty presentations, there is a poster session presented by current students that allows incoming students to learn about the research being done in our program. In the spring, we hold another poster session as part of our recruitment effort. Throughout the year, students are encouraged to attend the many seminars given by Rutgers on both the Piscataway (Busch) and New Brunswick (College Avenue) campuses as well as specific seminars organized by the Graduate Student Association (GSA).

Goal 2.

The **Neuroscience Qualifying Examination** is administered in two parts that typically are taken in the second and third years of graduate study. The first part examines that ability to think critically about several topics after a period of reading primary publications on different topics with several faculty members. The second part is an oral defense of a thesis proposal that will serve as the foundation for completing dissertation research. These formats are described in more detail below:

The **first** part of the qualifying exam consists of a written portion (open-book), lasting one week, during which a student is asked to design experiments to test hypotheses posed and/or to evaluate strengths and weaknesses of an area of the scientific literature. The student has had the opportunity to establish familiarity with this area by reading and discussing the reviews and primary literature with selected faculty members.

For this written exam, each committee member provides a question to the program director or program administration, who will then assemble the exam and provide the entire exam to the student at one time. The student then has 7 days to answer all questions and send each back to the individual faculty for comments (cc'ing the Program Director and/or Program Administrator with each answer). Committee members, after reading the written responses to the Examination, will communicate any comments or concerns directly to the student, the student's major advisor, and the program director. Committee members are required to evaluate the written responses within three weeks of exam completion though an earlier response is highly encouraged.

Goal 3.

For the **second** part of the Qualifying Examination, the student will submit a written thesis proposal to the Committee based on preliminary results obtained in the thesis laboratory. The student is required to provide the written thesis proposal to all committee members no later than two weeks prior to the scheduled Oral Examination. The student will then defend the thesis proposal in an Oral Examination. This part of the Qualifying Examination is to be completed no later than the end of the sixth semester, though it may be taken earlier.

When both Written and Oral parts of the Qualifying Examination have been judged by the student's committee to have been completed successfully, the student will be considered to have passed the Qualifying Examination and will then be advanced to candidacy and proceed to complete his/her dissertation research project.

Goal 4.

When the student's research has achieved the goals agreed upon by the committee and his or her advisor, a dissertation describing the results of the work is to be written according to the guidelines established described in the Graduate Student handbook (<http://rwjms.rutgers.edu/education/gsbs/programs/neuroscience/resources/index.html>) for students, distributed to the committee for their evaluation, and presented in a lecture open to the public. Following the public discussion, the committee may examine the student on issues related to the research in closed session. Formal acceptance of the dissertation requires approval of a majority of the members of the committee. If such approval is not obtained, revisions to the dissertation, or additional research may be required before the degree is granted. A Report of Final Examination/Dissertation Defense must be submitted

(<http://rwjms.rutgers.edu/education/gsbs/programs/neuroscience/resources/index.html>) While there is no formal publication requirement for the program, publication of peer-reviewed papers is expected. 28 degree students are currently in our program and a total of 89 peer-reviewed papers were published by students in the past five years, with 46 listed as first authors.