Program in Neuroscience Student Handbook 2019—2020
Harvard University

Program in Neuroscience

Student Handbook

Program in Neuroscience
Department of Neurobiology
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Overview of the Program in Neuroscience

The Program in Neuroscience ("PiN") is Harvard’s university-wide Ph.D. program in neuroscience. With over 130 research faculty members located at Harvard Medical School, Harvard's Cambridge campus, and the Harvard-affiliated hospitals, it offers comprehensive training and outstanding research opportunities for graduate students.

In the first year, students take the two mandatory core courses of the PiN curriculum: Quantitative Methods for Biologists (NB306QC), an intensive two-week boot camp in August that introduces students to statistics using the MATLAB programming language; and Discipline of Neuroscience (NB215), the year-long, flagship course of PiN that is designed to endow trainees with the broad, cross-discipline conceptual fluency required of neuroscientists.

In consultation with faculty of the Student Advisory Committee, students may also choose to complete additional elective courses during their first year. PiN students must complete four quarters’ equivalence of electives (equaling two full semester courses), of which one quarter must be fulfilled by an advanced quantitative elective (e.g. NEUROBIO 308QC Thinking About Data: Statistics for the Life Sciences). While students are strongly encouraged to take advantage of neuroanatomy course offerings for their electives, neuroanatomy is not required. The PiN curriculum is deliberately designed to provide flexibility in the timing of when electives are taken; however, at least two quarters’ equivalence of elective courses must be completed or in progress at the time of the Preliminary Qualifying Exam taken in the second year. In later years, students will consult with their Dissertation Advisory Committee to select elective courses offered at either Harvard or Massachusetts Institute of Technology to fill gaps in the student’s knowledge or which allow the student to pursue specialized knowledge in subfields that are pertinent to the student’s dissertation research or general interests. Even after the electives requirement is met, PiN strongly encourages students to continue to seek out elective offerings that enhance their knowledge base and technical skills - whether semester courses, quarter courses, or workshop-like “nanocourses” – throughout their graduate career, as they deem appropriate. Students also have the option of enrolling in the PiN Computational Neuroscience Certificate, which requires some extra coursework and supervision by computational neuroscience faculty members. (A more detailed description of the certificate may be found at https://www.hms.harvard.edu/dms/neuroscience/curriculum/certificate.html.)

The other major focus of the first year is finding the right thesis lab. Students are required to complete two, and encouraged to complete three, 8- to 12-week rotations to expose them to different research areas and different mentors. Our goal is for each student to find an area of neuroscience research that they are passionate about, and a lab that is a good match.

The central training experience of the Ph.D. is a focused research project culminating in the dissertation, and usually several substantial research publications. The average time from enrollment to degree is approximately 5½ years. Throughout the dissertation research, advising is provided by the student’s mentor, by a small dissertation advisory committee (DAC) whose members are selected for each student’s particular needs, and by an assigned member of the SAC who will meet with the student annually (or as frequently as the student desires).

Unraveling the Harvard maze of graduate programs. The Program in Neuroscience (“PiN”) has its office at Harvard Medical School in Boston, and the core courses for first-year PIN students are offered at the medical school. PIN awards a Ph.D. degree in Neurobiology through the Harvard University Graduate School of Arts and Sciences (“GSAS”) which is based in Cambridge. PIN is one of the programs that fall under the umbrella of the Division of Medical Sciences (“DMS”), which acts as a liaison between PIN students and all Cambridge offices. In effect, PIN students rarely have to deal with Cambridge directly but may rely on DMS to act as their representative. DMS manages six separate programs: PIN, Virology, Immunology, Biological and Biomedical Sciences (“BBS”), Speech and Hearing Technology, and Bioinformatics. PIN students are regularly invited to social events and seminars for all DMS students.

PIN and the other DMS programs are also members of the Harvard Integrated Life Sciences (“HILS”) program, an umbrella program that covers most of the life sciences graduate programs at Harvard University. Through HILS, graduate students in any of the programs can do their dissertation research in any laboratory in the HILS system – an arrangement that removes arbitrary administrative obstacles and allows students a wide range of research options.
Academics and Research
COURSE OF STUDY

Advisory System

PiN students are advised by members of the Student Advisory Committee (“SAC”). Each student is assigned to a SAC member; the student will to meet with this SAC member from matriculation through graduation. Students are matched with SAC members with whom they have no scientific contact, to ensure that the advisor has no personal interest in the outcome of the student’s research.

Students meet with their SAC advisors in August, December and May of their first year; in September and January of their second year; and once each summer from the third year onward. SAC advisors are always available to meet with students on an as-needed basis throughout the year.

Advisory meetings are designed to help the student progress in a timely manner toward completing the Ph.D. In the early years the focus will be on rotations, finding the proper lab, and preparing for the PQE; in the later years, meetings will focus on the student’s progress, including helping the student deal with any issues that might arise with the thesis advisor or members of the Dissertation Advisory Committee. SAC advisors can help students deal with issues of strategizing the publication of papers, or making sure that the scale of the thesis project is not unreasonable.

In all meetings throughout the student’s enrollment at Harvard, the SAC Advisor will assist the student in identifying career goals, determining what resources are available to meet those goals, and planning the timing of dissertation defense and graduation in relation to accomplishing career goals.

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# Overview — Course of Study

## First Year (G1) (2019-2020)

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**Fall Semester**

- **Winter Break**
- **Spring Semester**
- **Summer Term**

### Courses

- **Med Sci 300** (Conduct in Science) (to be arranged)
- Possible elective quarter course(s)

### Lab Rotation

- Full-time during winter term
- Full-time during spring break
- Full-time during summer term

### Meetings

- SAC meeting
- SAC meeting
- SAC meeting

- Choose lab by 9/1

## Second Year (G2) (2020-2021)

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**Fall Semester**

- Winter Break
- **Spring Semester**
- **Summer Term**

### Courses

- **Neuro 215** (Discipline of Neuroscience (T, Th 9-12))
- Possible elective quarter course(s)

### ROTATION

- Full-time during summer term
- Full-time during spring break
- Full-time during winter term

### Meetings

- SAC meeting
- SAC meeting
- SAC meeting

### Notes

- Choose lab by 9/1
- Complete Preliminary Exam by 3/31
- SAC meeting

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**Full-time lab work—prepare for Preliminary Exam and begin research for dissertation**
First Year of Study

During their first year, students take a series of graduate-level courses and carry out laboratory rotations that serve as the basis for selection of a dissertation advisor.

Students must complete a total of two required courses and four quarter-course electives. One elective must be a quantitative-based course; PiN strongly encourages students to choose a neuroanatomy course as one of the three remaining electives. Two of these electives must be completed or in progress before the Preliminary Qualifying Exam (which must be completed by March 31 of the second year). The remaining two electives must be completed prior to graduation. PiN strongly encourages students to take electives whenever they feel they need to strengthen their backgrounds or fill in gaps in their training.

The required courses are:

- **Discipline of Neuroscience** (Neurobiology 215)  *(Fall and Spring semesters; T/Thu 9-12)*
- **Quantitative Methods for Biologists** (Neurobiology 306qc) *(August of first year, M/W/F 9-5 for two weeks)*

**Neurobiology 215. Discipline of Neuroscience**
*Course Directors: Lisa Goodrich and John Assad*
*Fall and Spring terms – Tuesdays and Thursdays  9 -11:50*

This course will endow students with the broad conceptual fluency in the discipline of neuroscience required to relate genes to circuit function, metabolism to neurological disease, and cell biology to neural computations. Through a combination of lectures and in-class activities, students will learn to design, quantitatively analyze, and interpret experiments that address a variety of questions spanning molecular to systems neuroscience. During the first semester, students will think critically about the fundamental units of the nervous system within the context of cellular function, electrical conduction, and chemical signaling. The second half of the course builds upon this foundation to focus on broadly defined “networks of neural function” as related to coordinated neural activity, the concerted execution of genetic programs, and anatomically defined structural networks. The course culminates with students writing a grant proposal in the style of the NIH NRSA.

**Neurobiology 306qc. Quantitative Methods for Biologists**
*Rick Born and Michael Springer*
*Summer Boot Camp (Two weeks in early August)*

The goal of this camp is to introduce you to programming in the MATLAB environment and to show you the power this provides for analyzing data and for gaining intuition about the behavior of complex systems through the use of numerical simulations. Some of you, upon encountering in the previous sentence words like "programming" and "numerical simulations," will feel the cold hand of fear grip your stomach, because you have never done any programming and, in fact, have tried to avoid math as much as possible. If so, YOU ARE PRECISELY THE PERSON WE HAD IN MIND as we were planning the course. We are aiming to help you break through this barrier of darkness and fear into the radiant sunshine of quantitative enlightenment. The true beauty of MATLAB, as we will personally demonstrate, is that it allows people who are not mathematically adept (e.g. some of the instructors of this course) to use powerful numerical methods and visualization tools to gain an understanding of concepts that are very difficult to grasp analytically.

**Neurobiology 327. Rotations in Neuroscience**
*Members of the Program in Neuroscience.*

This course is designed to introduce the faculty research activities to new students. The first semester consists of three poster sessions located at central sites: Harvard Medical School, Children’s Hospital Boston, and Harvard University (Cambridge).
Electives (partial list)

Neurobiology Graduate Courses

- NEUROBIO 200 Neurobiology (0.5 credits, half course)
- NEUROBIO 209 [Neurobiology of Disease] (0.5 credits, half course, not currently offered)
- NEUROBIO 230 Visual Recognition: Computational and Biophysical Perspective (0.5 credits, half course)
- NEUROBIO 301QC Nervous System Disorders: Advances in Diagnostics and Emerging Therapies (0.25 credits, quarter course)
- NEUROBIO 305QC Biochemistry and Biology of Neurodegenerative Disease (0.25 credits, quarter course)
- NEUROBIO 308QC Thinking About Data: Statistics for the Life Sciences (0.25 credits, quarter course)
- NEUROBIO 309QC [The Molecular Pathology and Current Therapies for Retinal Diseases] (0.25 credits, quarter course)
- NEUROBIO 310QC Careers in Neuroscience (0.25 credits, quarter course, next offered 2020)
- NEUROBIO 315QC Human Neuroanatomy and Neuropathology (0.25, quarter course, offered as part of NB200)
- NEUROBIO 319QC Neurobiology of Psychiatric Disease: From Bench to Bedside (0.25, quarter course)
- NEURO 120 Introductory Computational Neuroscience (0.5 credits, half course, offered at undergraduate campus)
- MCB 208 Talking about Science (0.5)
- NEUROBIO 317QC Comparative Neuroanatomy (0.25 credits, quarter course)

Other Half Courses (0.5 credits):

- BCMP 213 Behavioral Pharmacology (0.5)
- BCMP 230 Principles and Practice of Drug Development (0.5)
- BCMP 236 Modern Drug Discovery: From Principles to Patients (0.5)
- BCMP 250 Molecular & Biophysical Mechanisms in Signal Transduction (0.5)
- BE 128 Introduction to Biomedical Imaging and Systems (0.5)
- BE 130 Neural Control of Movement (0.5)
- BIOPHYS 204 Structural Biology from Molecules to Cells (0.5)
- CELLBIO 201 Principles of Cell Biology (0.5)
- COMPSCI 50 Introduction to Computer Science I (0.5)
- COMPSCI 109 Data Science (0.5)
- COMPSCI 152 Programming Languages (0.5)
- COMPSCI 171 Visualization (0.5)
- COMPSCI 181 Machine Learning (0.5)
- COMPSCI 182 Artificial Intelligence (0.5)
- COMPSCI 283 Computer Vision (0.5)
- COMPSCI 304 Statistical Machine Learning (0.5)
- ENG-SCI 111 Introduction to Scientific Computing (0.5)
- ENG-SCI 115 Mathematical Modeling (0.5)
- ENG-SCI 153 Laboratory Electronics (0.5)
- ENG-SCI 155 Biological Signal Processing (0.5)
- GENETIC 201 Principles of Genetics (0.5)
- GENETIC 216 Advanced Topics in Gene Expression (0.5)
- GENETIC 228 Genetics in Medicine - From Bench to Bedside (0.5)
- GENETIC 229 Computational Statistics for Biomedical Sciences (0.5)
- HBTM 200 Pathology of Human Disease (0.5)
- HBTM 235 Principles of Human Disease: Physiology & Pathology (0.5)
- HEB 1310 Hormones and Behavior (0.5)
- HEB 1313 Stress (0.5)
- IMMUN 201 Principles of Immunology (0.5)
- MATH 19A Modeling & Differential Equations for the Life Sciences (0.5)
- MATH 19B Linear Algebra, Probability, and Statistics for the Life Sciences (0.5)
- MCB 112 Biological Data Analysis (0.5)
- MCB 170 Brain Invaders: Building and Breaking Barriers in the Nervous System (0.5)
- MCB 176 Biochemistry of Membranes (0.5)
- MCB 178 Biochemistry of Protein Complexes (0.5)
- MCB 186 Sleep and Circadian Clocks: From Biology to Public Health
- MCB 195: Foundations of Systems Biology & Biological Engineering (0.5)
- MCB 198 Advanced Mathematical Techniques for Modern Biology (0.5)
- MCB 291 Genetics, Genomics, and Evolutionary Biology (0.5)
- MCB 292 Cellular Biology, Neurobiology, and Developmental Biology (0.5)
- MCB 293 Biochemistry, Chemical, and Structural Biology (0.5)
- OEB 223 Topics in Neurogenetics (0.5)
- PHYSICS 141 The Physics of Sensory Systems in Biology (0.5)
- PHYSICS 223 Electronics for Scientists (0.5)
- STAT 102 Introduction to Statistics for Life Sciences (0.5)
- STAT 110 Introduction to Probability (0.5)
- STAT 111 Introduction to Theoretical Statistics (0.5)
- STAT 115 Introduction to Computational Biology and Bioinformatics (0.5)
- STAT 117 Data Analysis in Modern Biostatistics (0.5)
- STAT 120 Introduction to Bayesian Inference and Applications (0.5)
- STAT 121A Data Science 1: Introduction to Data Science (part 1 of 2; 0.5)
- STAT 121B: Data Science 2: Advanced Topics in Data Science (part 2 of 2; 0.5)
- STAT 139 Statistical Sleuthing Through Linear Models (0.5)
- STAT 171 Introduction to Stochastic Processes (0.5)
- STAT 220 Bayesian Data Analysis (0.5)
- SCRB 152 Asking Cells Who They Are: Computational Transcriptomics Using RNA-Seq (0.5)
- SCRB 182 Got (New) Brain? The Evolution of Brain Regeneration (0.5)

School of Public Health Biostats courses:
- BST 201 Introduction to Statistical Methods (0.5)
- BST 222 Basics of Statistical Inference (0.5)
- BST 227 Introduction to Statistical Genetics (0.5)
- BST 230 Probability I (0.5)
- BST 234 Introduction to Data Structures and Algorithms (0.5)
- BST 240 Probability II (0.5)
- BST 247 Advanced Statistical Genetics (0.5)
- BST 249 Bayesian Methodology in Biostatistics (0.5)
- BST 260, 261 Data Science I, II (0.25 each)
- BST 260 Introductory Genomics & Bioinformatics for Health Research (0.25)
- BST 281 Genomic Data Manipulation (0.5)
- BST 282 Introduction to Computational Biology and Bioinformatics (0.5)
- BST 290 Advanced Computational Biology and Bioinformatics (0.5)

Other Quarter Courses (0.25 credits):
- BCMP 308QC Cell Fate Decisions in Development & Disease (0.25)
- CELLBIO 206QC Teaching 100: The Theory & Science of Teaching (0.25)
- CELLBIO 313QC Introduction to Quantitative Microscopy & Image Analysis (0.25)
- GENETIC 302QC Teaching 101: Bringing Effective Teaching Practices to your Classroom (0.25)
• GENETIC 303QC Current Tools for Gene Analysis (0.25)
• HBTM 302QC Imaging and Microscopy Methods in Biology and Medicine (0.25)
• HBTM 202QC [Vision: A System and its Assessment] (0.25)
• IMMUN 305QC Neuro-Immunology in Development, Regeneration & Disease (0.25)
• IMMUN 306QC Systems Immunology (0.25)
• MCB 352 Microscopy (0.25)
• MCB 353 Building your own Microscope (0.25)
• MCB 355 Visualizing, Analyzing and Presenting Macromolecular Structures with PyMOL (0.25)
• MCB 356 Practical Introduction to Robotics (0.25)
• SYSBIO 320QC Quantitative Measurement and Analysis (0.25)

Nanocourses (3 nanos = 1 quarter course):
(Offered 2016-17)
• CRISPR-Cas Systems and the Future of Genome Editing
• Single-Cell Sequencing: Experimental Design, Analysis, and Practical Applications
• Arduino for Neurobiologists: Building Simple Scientific Instruments Using Arduino Microcontrollers
• Making Figures: Designing Professional and Effective Figures for Publication

Rotations

Each student is required to complete at least two laboratory rotations of two to three months length. These rotations are usually not full-time except during the summer, and generally take place while the student attends classes during the first year. They are designed to provide hands-on experience in different techniques and laboratories, and they serve as a basis for the selection of a dissertation advisor. Incoming students have the option of doing an “early start” rotation, beginning on July 1.

To help students choose labs for rotations, PiN sponsors three poster sessions in August and September:

• An all-PiN poster session in the Courtyard Café of the Warren Alpert Building of Harvard Medical School;
• A poster session for the labs in the Kirby Neurobiology Center of Boston Children’s Hospital, held in the Center for Life Sciences building; and
• A poster session at the Center for Brain Science in the Northwest Building of Harvard University in Cambridge.

While students are required to complete two rotations, most PiN students choose to complete three rotations, and some opt to complete four rotations. At the start of each rotation, the student must complete and submit a Rotation Registration form to the PiN office.

Rotations must be completed and students must have been accepted into a lab by September 1 of their second year.
Second Year of Study

The second year of study begins with a meeting between the student and the SAC advisor. At this meeting, the student’s rotation experiences will be reviewed, and the student will update the advisor on his or her choice of a lab. By the time this meeting is held most students have selected and been accepted by a lab in which they will conduct research for their dissertations. Occasionally a student will decide to take a fourth rotation that finishes in September or October of their second year; such “extra” rotations must be approved in advance by the Program Director or Student Advisory Committee. It is anticipated that all students will have been accepted into labs by September 1 of their second year.

Preliminary Qualifying Examination (PQE):

Each student is required to take a Preliminary Examination (sometimes called “qualifying exam” or “PQE”) on or before March 31 of his or her second year of graduate work. The PQE is a written and oral examination of a specific research proposal which is typically written on the student's proposed dissertation topic. The purpose of the exam is to assess the student’s preparation and ability to embark on an original scientific investigation. The goals of the exam are to demonstrate that the student is able: (1) to define a question in a particular area of research, (2) to review the literature pertinent to that question with an emphasis on what makes the proposed experiments interesting and important, (3) to formulate an experimental plan that would address and answer the question, and (4) to interpret possible experimental outcomes in a manner that indicates awareness of the limitations of the methods used. It should be stressed that preliminary data are not required for the Preliminary Examination. (Any relevant data may of course be included.) The student may discuss the aims and the proposal in depth with his/her advisor or other faculty members. The advisor may read and provide suggestions on drafts for the proposal, as long as the final document is the student’s own work.

See below for detailed guidelines for the format and length of the Research Proposal. The student must deliver the research proposal to each of the Committee members and the Program Office at least 7 days prior to the examination. If the proposal is late or too long, the Chair may request a postponement of the exam. The examination is oral and will typically last about two hours.

The research proposal provides the focus of the PQE, but students are also expected to demonstrate substantial knowledge and understanding in the field of the proposal and in scientific areas that relate to the proposal. Examiners may ask questions about actual or hypothetical results and their interpretation in order to probe the student’s level of understanding.

The Preliminary Exam Committee

The Preliminary Exam Committee will be made up of three examiners. The student should select these examiners in consultation with the student’s dissertation advisor. The student must obtain the Program Director's approval before the three proposed examiners are invited to join the committee. The Committee Chair and at least one other member of the committee must be affiliated with the Program in Neuroscience. These examiners may also serve subsequently on the Dissertation Advisory Committee. The Exam Committee Chair will serve as an examiner, oversee the administration of the exam, and be responsible for assuring that the student receives an oral summary of the outcome and evaluation at the end of the exam. The Chair will also be responsible for filing the Exam Report Form with the PiN Administrator.

Approval of Exam Topic

Before writing the Research Proposal, the student should receive approval from the Exam Committee (and dissertation advisor) for the specific aims and overall direction of the proposal. This can be done by submitting to the Committee, generally by email, a one or two page description of the 2-4 specific experimental aims. This written description should be in the typical “Specific Aims” format of most NIH grant proposals, with a short introduction and a description of each aim. Committee members will either approve the aims or indicate appropriate changes in the aims or scope. If necessary, the student may arrange a meeting with the dissertation advisor and one or more examiners, to discuss the needed changes.
The Outcomes

The student will be asked to leave the room for the deliberations at the beginning and end of the exam. The Exam Committee will decide on one of two outcomes:

1. **Pass.** – This outcome indicates the Exam Committee's opinion that the student is fully ready to initiate work on the proposed projects. In the written report, the Exam Committee will comment on the student’s strengths and weaknesses noted during the exam. At the end of the exam, it should be discussed whether the Exam Committee will serve as the Dissertation Advisory Committee. This is often the case, but the student is free to change the composition of the Committee with the approval of the Program Director. The Exam Committee should recommend the time frame for the first DAC meeting, which should not be later than 9 months after the PQE.

When giving a grade of “Pass” the Examining Committee may recommend work to correct minor deficiencies. This recommendation will be communicated to the advisor, who will supervise the student as appropriate. If the Committee feels that the problems are substantive enough to require re-review by the Committee, then the outcome of the exam should be “Special Committee Review” rather than “Pass”.

2. **Special Committee Review.** – This means that the student’s status will be reviewed within 3 months. The review will be performed by a special committee consisting of the members of the original Preliminary Exam committee, plus the Program Director or Associate Director. This outcome indicates substantive problems in the student’s written proposal, oral presentation, laboratory work on the project prior to the PQE, or coursework. *Any student whose grade point average falls below 3.0 at the time of the exam is automatically given a grade of “special committee review.”* These problems may be the usual sorts of problems that ultimately successful students sometimes experience at this stage, and this outcome should not be viewed as a failure. Instead, it is a mechanism for helping to ensure that all students embarking on a Ph.D. thesis have a strong chance of succeeding in a reasonable amount of time.

If this is the outcome of the exam, the Program Director will send the student a letter describing the goals and expectations for the coming months. This letter will be written in consultation with the committee Chair and the student’s Advisor. The letter may set goals relating to any of the following issues: the written proposal, the oral presentation, research activities, coursework, and professional conduct. The letter may request that the student repeat the exam; however, in some cases, this may not be indicated. Copies of the letter should be sent to the entire Special Committee.

The Special Committee Review meeting should focus on the issues described in the letter. The meeting may represent a “repeat” of the PQE. Alternatively, the meeting may take a different format. The format and goals of the meeting should be tailored to the student’s circumstances, but they should made clear to all participants in the letter.

After the Special Committee Review meeting, the Program Director will determine the student’s status in the program. This decision will be made in consultation with the student’s Advisor and the Associate Dean of Basic Graduate Studies, and it should be decided within 3 days of the meeting.

Proposal Guidelines

The written proposal should include the following sections (using these subheadings):

- **Specific Aims** – 1 page – List succinctly the specific objectives of the proposed project. Two or three Specific Aims are suggested.
- **Background** – 6 to 7 pages - Briefly sketch the background leading to the present application. Critically evaluate existing knowledge, and specifically identify the gaps that the project is intended to fill.
- **Significance** – less than 1 page - Explain the importance of the problem that the proposed project addresses. Identify the gaps that the project is intended to fill. Explain how the proposed project will improve scientific knowledge or technical capability in one or more broad fields.
- **Approach** – 4 to 5 pages - Describe the overall strategy, methodology, and analyses to be used to accomplish the specific aims of the project. Describe how the data will be collected, analyzed, and interpreted. Discuss potential problems, alternative strategies, and benchmarks for success anticipated to achieve the aims. If the project is in the early stages of development, describe any strategy to establish feasibility, and address the management of any high-risk aspects of the proposed work. Preliminary data is optional. Any figures and legends should be included within this page limit.
- **Bibliography** – There is no length limit, but the student is expected to have read all the papers cited in this section.
Dissertation Advisor. Students use rotations to help define their interests and to help in choosing a dissertation laboratory. The Student Advisory Committee, the Program Director and the Associate Program Director all offer informal assistance in selecting a dissertation advisor. Dissertation advisors normally must be faculty members of the Program in Neuroscience.

Third Year of Study and Beyond

Dissertation Advisory Committee

After completion of the Preliminary Qualifying Examination, a Dissertation Advisory Committee is formed to oversee the student's dissertation research. This committee is usually the same as the PQE Committee, but substitutions may be made in consultation with the Program Director. Dissertation advisors are not members of the Dissertation Advisory Committee, but are expected to attend Dissertation Advisory Committee meetings.

The Dissertation Advisory Committee (DAC) will meet no less frequently than every 9 months. It is the student's responsibility to arrange these meetings in a timely fashion. Students who are significantly late in arranging DAC meetings will not be permitted to register for the following semester; failure to register means suspension of stipend and health insurance. The DAC Chair will be responsible for sending a report of the meeting to the Program office. The report is then sent to the Division of Medical Sciences, members of the Committee, the thesis advisor, and the student. If there are major concerns about the student, the DAC can suggest review by the Program. In a review, the Program director will meet with the student and the thesis advisor to discuss the issues raised by the DAC, and how to address the problems, and whether the student wants to continue in the Program.

The DAC is responsible to the University to assure that the requirements of the Program and of the Division of Medical Sciences are being met by the candidate. A major role of the DAC is to assist the dissertation advisor and the student in deciding when to close off further experimentation and to begin writing. If a student has questions or problems of any kind, he or she may seek help from the Chair or any member of the committee.

In order for the DAC meeting to be more productive and informative, the student must write a two-page summary of the work completed since the last meeting and submit it to the members of the committee, ideally one week before the meeting and no later than 72 hours before. This summary will also be attached to the DAC Report. Students must email a copy of this summary to the Program Administrator.

When a student enters his or her sixth year of graduate work, they are required to hold a DAC meeting no less frequently than every six months, regardless of the recommendation of the DAC.

Annual Updates and Program Meetings

Students in years G3 and beyond will meet for 30 minutes once a year with the student's SAC advisor. Prior to this meeting, students are asked to fill out an “Individual Development Plan” (or “IDP”) survey which is designed to help guide discussions about progress to degree and career options, and to collect the data routinely needed to renew training grants. Students are encouraged to help set the agenda for these meetings. Students might, for example, want to discuss issues relating to their DAC, their advisor, their ideas for postdoctoral research, or alternative post-graduation options.
Dissertation Preparation and Defense

A Dissertation Examination Committee is formed when the Dissertation Advisory Committee has decided that the student is ready to defend his or her dissertation. At that time, the student makes an appointment with the Division of Medical Sciences to review dissertation requirements and regulations. The Dissertation Examination Committee consists of three examiners plus an alternate examiner and an Exam Committee Chairman. All must be an Assistant Professor or higher in academic rank. PiN recommends that one examiner be from outside Harvard, and the Division of Medical Sciences requires that no more than one person who has served on the student's Dissertation Advisory Committee may serve on the Dissertation Examination Committee. Members of the Dissertation Examination Committee are selected with the help of the Dissertation Advisory Committee, the Director of PiN, the Dissertation advisor, and the student. Students must request approval of the membership of the Dissertation Advisory Committee from Director of PiN before arranging a date or inviting examiners. The names are submitted to the Chair of the Division of Medical Sciences for final approval.

The Chair of the Dissertation Examination Committee arranges the date and time of the examination with the examiners. The student must submit to the Program office at least 3 weeks before the exam the following forms: (i) Application for Degree, (ii) Program Approval of Proposed Examiners, and (iii) Dissertation Information Sheet. After receiving Program signatures on these forms, the student takes them to the Division of Medical Sciences for processing. The completed dissertation must be submitted to the Dissertation Examination Committee at least two weeks before the examination.

Harvard awards official degrees at only three times during the year: March, May, and November. The student should contact the Division of Medical Sciences for specific deadlines related to specific degree dates.

It is the student's responsibility to know and meet all relevant degree filing deadlines.

The candidate gives a one-hour seminar as part of the examination. This is usually given in the Department of Neurobiology on the day of the examination and usually prior to the defense of the dissertation. As soon as the student finalizes the date for dissertation defense, he/she should contact the PiN Administrator to schedule a room for the seminar. The seminar is open to the public.
I decided to start rotating in the fall for two main reasons. First, I had just finished a year of full-time research at another institution, so it seemed natural to keep doing lab work. Second, even though I basically knew which area I wanted to work in when I came to Harvard, I hadn’t completely decided about which labs I wanted to rotate through. Therefore, I wanted to start in the fall to maximize the time available for rotations, as I was unable to start the summer before classes began.

Rotating in the fall did give me extra time, although ultimately I ended up joining a lab early in the next summer instead of doing an extra fourth rotation. There were a few drawbacks to starting in the fall, however. In retrospect, it would have been valuable to have had full days to devote to working in the lab, especially when I first started, instead of having every day broken up with classes. Also, I found the coursework more intense during the fall compared with the spring, so I had less time to work in lab compared with my later rotations. However, I still found the extra time to be valuable, so if I had to do it again, I would most likely make the same decision to rotate early.

— Fifth-year student at Harvard Medical School

Rotations are your chance to “test drive” potential thesis labs. You are not expected to generate lots of data, write a paper, or impress the lab with your wealth of knowledge. If any of these things happen, that’s great. But it’s not expected and not necessary. Take advantage of your rotation to talk to everyone in the lab. Ask lots of questions about life in the lab, the PI’s expectations, whether they’re happy with their experience, and so on. You should definitely work hard, of course! You want to show the lab that you work hard, think hard, happy to learn new things, and able to integrate into the lab’s social structure. Just don’t lose sight of the fact that you are evaluating the lab as much as they are evaluating you, and that this is supposed to be a fun experience, not a painful one.

— Fifth-year student at Brigham and Women’s Hospital
**List of Faculty—by Location**

<table>
<thead>
<tr>
<th>Beth-Israel Deaconess Medical Center</th>
<th>MEEI</th>
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<tr>
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Some institutions are represented more than once due to the presence of multiple locations within them.
The majority of labs in which PIN students rotate or work are located in the Longwood Medical Area of Boston. This includes labs of Harvard Medical School and Harvard Institutes of Medicine, as well as labs located in adjacent teaching hospitals: Children’s Hospital, Dana Farber Cancer Institute, Beth Israel Deaconess Medical Center, Brigham and Women’s Hospital, and Joslin Diabetes Center.

These labs are within walking distance of many parts of Brookline and Boston, and are within a 20– to 30-minute ride from Cambridge on the free shuttle provided to Harvard students.
A number of labs are located on the undergraduate campus in Cambridge.

Most of the neuroscience labs affiliated with PIN are members of the Center for Brain Science. The Center for Brain Science includes junior and senior faculty doing research on topics such as songbird learning, retinal physiology, human motor control, large scale reconstruction of neural circuitry, fly olfaction, inhibitory circuitry development, rodent decision-making, zebrafish vision, and fMRI studies of human memory. CBS is also developing an imaging facility that will continue to rely on state-of-the-art optical techniques.
Massachusetts General Hospital is the oldest and largest hospital in New England. MGH conducts the largest hospital-based research program in the country, with an annual research budget of approximately $500 million. It is the oldest and largest teaching hospital of Harvard Medical School, where nearly all MGH staff physicians serve on the faculty.

MGH runs a free shuttle service between Longwood, the MGH Main Campus, and MGH-East (located in the Charlestown Navy Yards in east Boston). There is an MBTA redline stop immediately adjacent to the MGH main campus, just three stops away from Harvard Square.
McLean Hospital

McLean Hospital is the largest psychiatric affiliate of Harvard Medical School. Founded in 1811, it moved to its current Belmont site on grounds designed by Frederick Law Olmstead in 1895. McLean houses the Harvard Brain Tissue Resource Center, the world’s largest “brain bank.” In 2001 the Neuroimaging Center opened; as the third building on campus exclusively devoted to research, it houses a 4.0 Tesla magnet, one of less than 20 magnetic resonance scanners in the world with this field strength.

McLean Hospital is easily reached from Cambridge by car. For students relying on public transportation, McLean runs a free shuttle from the hospital to Waverly Square in Belmont. Waverly Square can be reached either by commuter train, or by the MBTA Red Line to Harvard Square and the #73 bus from Harvard Square to the end of the line in Belmont.
Students talk about working in labs outside the Longwood Medical Area ...
Student Life
STUDENT LIFE

PIN students have access to a student lounge (Goldenson Building, Room 132) in the Department of Neurobiology. The office has a small kitchen, conference table, couches, computers, and a printer. While all PIN students have access to this lounge, generally it serves as a home base for the first-year students who are welcome to use it for study sessions, meals, naps, or general socializing. The Department also provides mailboxes for each student, as well as access to a copier and a fax machine. These facilities are located on the 4th floor of Goldenson, just outside the Department of Neurobiology office.

PIN students are invited to all formal and informal activities of the Department of Neurobiology. These include lunch-time and late afternoon seminars, evening meetings where individual research groups offer detailed presentations of their recent results, and various social activities (department parties, teas and Friday afternoon Beer Hour). The Program also provides funds for student organized dinner meetings where more advanced students can present their research or topics of concern can be discussed.

The Program office prepares a weekly listing of area neuroscience seminars and the Department keeps a calendar of its activities on the door of the lunchroom. There are also various bulletin boards around the Department on which are posted a range of seminar notices. Students are strongly encouraged to attend as many seminars as possible, especially those given in the department.

**Nocturnal Journal Club:** The student-organized Nocturnal Journal Club meets six times each semester. Students volunteer to present papers and lead discussions. Dinner is provided. Journal Club provides a friendly environment for students to hone their presentations skills and scientific interests. Attendance by first-year students is strongly encouraged.

**Computational Methods Club:** A group of students and postdocs meet biweekly to discuss and learn about methods in computational and theoretical neuroscience and machine learning. The topics discussed are varied and have included control theory, compressed sensing, reinforcement learning, sparse coding and Bayesian networks.

**Fall Retreat:** The Fall Retreat is an informal student-organized weekend that takes place in September (the first weekend after Labor Day) at the Marine Biological Laboratories in Woods Hole. Students stay in cottages, organize and cook their own meals, and hear talks from more advanced students.

**Spring Symposium:** The biennial Spring Symposium, also organized by students, is a more formal event which includes everyone in the Program. A students committee selects a developing or very active area of neuroscience investigation and invite 3 or 4 prominent scientists working in that area to come and present their research. The Symposium is open to the scientific community and there is a dinner and small group discussions open to Program faculty and students only.

**Poster Session.** PiN students put on a poster session each September. PiN rents the Courtyard Café in Warren Alpert Building from 5:00 to 8:00 and provides appetizers and drinks for attendees. Posters are presented by 40-50 PiN-affiliated labs.

**Student Mentor Program.** Each incoming student is matched with a pair of current students. The current students make themselves available to the new student to answer questions by email or phone; after the new student arrives on campus, they’ll take the new student out to lunch or dinner to show the new student a bit of Boston. The older students remain available to the new student throughout the year to answer questions that might arise about rotations or courses.
**Student Groups:** PiN encourages students to form student groups, whether for academic or social purposes. Current active student groups include:

- **Underrepresented Students in Neuroscience:** USN seeks to provide community support for students who are underrepresented minorities or who come from underrepresented/non-academic backgrounds. By providing strong peer support and faculty mentorship, USN hopes to combat actively “imposter syndrome.” USN additionally seeks to help students strengthen academic backgrounds that might be weak in a particular area by helping such students find tutors or study groups, or by setting up practice PQEs or talks.

- **Women in Neuroscience:** WIN was formed over two decades ago, when women struggled to move into academic positions. The original purpose of the group was to give students a private place to discuss issues such as work-life balance, how to deal with unconscious bias, etc. While these topics are still regularly discussed, the group has expanded its focus and has welcomed male students to attend its functions.

**Outreach Opportunities:** PiN students do not have to fulfill a teaching requirement to earn their degrees, but PiN strongly encourages students to participate in some sort of teaching or outreach experience. The organizations listed below represented a small number of the opportunities available to PiN students.

- **Health Professions Recruitment and Exposure Program (HPREP).** HPREP is an HMS-sponsored high school enrichment program organized by graduate students to recruit high school students from underprivileged backgrounds into careers in science and medicine. Students participate in seven half-day Saturday sessions from November to February. Sessions include interactive disease-based lectures, a research project, college mentoring, and ethics discussions.

- **The Journal of Emerging Investigators (JEI).** JEI is an open-access journal that publishes original research in the biological and physical sciences written by middle and high school students. JEI provides students, under the guidance of a teacher or advisor, the opportunity to submit and gain feedback on original research and to publish their findings in a peer-reviewed scientific journal. Much of this original work comes from classroom-based projects, science fair projects, or other forms of mentor-supervised work.

- **Science in the News (SITN).** SITN is a graduate student public service organization that aims to increase scientific literacy. They use a variety of formats to explain and discuss current high-profile scientific topics with members of the public without exaggeration or oversimplification.

- **Science Club for Girls (SCFG).** SCFG, winner of the 2009 Non-Profit of the Year awarded by the City of Cambridge, looks for female volunteer/mentors to lead hands-on science clubs. SCFG's mission is to increase the self-confidence and science literacy of K-12th grade girls belonging to groups that are underrepresented in the sciences, through free after-school and Saturday programs.

**Finances:** The DMS stipend for graduate students in the 2019-2020 academic year is $39,528 ($3,294/month). Entering students receive from DMS a $1000 allowance for expenses such as moving costs, books and/or healthcare expenses. Additional support is available to defray the cost of attending Program-approved scientific meetings. Students who receive competitively-awarded external fellowships may be eligible to receive a supplemental educational allowance in the first two years. Qualified students are able to supplement their stipend by working as a T.A. or T.F.; since PiN does not have a teaching requirement for its students, anyone serving as a T.A./T.F. may be paid for the work.

**Housing:** The Harvard Housing Office has a wide variety of housing options available to students, from dormitory rooms in Longwood or Cambridge to one- and two-bedroom off-campus apartments. Some students choose to take part in the Harvard Resident Tutor Program, in which graduate students may earn free housing and a limited meal plan in exchange for providing a variety of services to undergraduate students.
**Transportation:** Students use a wide variety of modes of transportation: MBTA/subway, buses, bicycles, Zip cars, Uber/Lyft, the Masco/Harvard free shuttle, and of course, their feet. All Harvard students may get a discounted MBTA pass during the academic year. Both Harvard Medical School and Harvard University have locked storage for bicycles. If a student needs to rent a car, there are discounts at Enterprise and Avis through the Harvard Travel Portal.

**Health and Welfare:** Harvard offers a wide variety of resources to students facing challenges.

- **Academic Resource Center:** ARC will open in August 2019 and will replace the 70-year institution of the Bureau of Study Counsel. As their name implies, they will focus on offering students support and assistance in all aspects of academic achieve, from time management, to tutoring, to support during the process of writing a thesis.
- **Office of Counseling and Mental Health Services:** For students who are challenged by depression, anxiety, grief due to a recent loss, or any other mental health issue, the Office of Counseling and Mental Health Services is dedicated to supporting and helping students heal.
- **Accessible Education Office:** Students dealing with permanent or short-term disabilities will find real help at the AEO. They work with students and advisors to come up with options for students who find themselves medically challenged, whether recovering from ACL surgery, dealing with a flare-up of a chronic disease, or discovering they're allergic to something in the lab.
- **GSAS Office of Student Services:** Whatever the problem is, GSAS Student Services is there to help. No one on campus has a better command of resources for helping students!
**Miscellaneous Information for New Students**

**Free transportation:** Harvard provides many free shuttle buses for the Harvard community. The M2 shuttle (run by Masco) circles between HMS, M.I.T., and Harvard Square in Cambridge. MGH and MGH-East can be reached by a shuttle run by Partners Healthcare. The Longwood Medical Area is situated between two subway stops: the MBTA Green Line (D Train) stops at the Longwood station on Longwood, west of Riverway; the Green Line (E Train) stops at the Longwood Medical Station on Huntington Avenue. Finally, for students who live within a one-mile radius from Vanderbilt Hall, there is a free taxi service from Vanderbilt to your home between the hours of 9:00 p.m. and 3:00 a.m.

http://www.mbta.com/ (Info re: the T and CharlieCards)
http://www.partners.org/ourhosp/ourhosp_shuttle.html (Partners shuttles)
http://masco.org/transit/plsM2_WeekdaySchedule.htm (M2 schedule)
http://tinyurl.com/26rrr4l (Vanderbilt taxi escort service)

**Alternatives to owning a car:** For students who come to Harvard from car-centric cities (such as Los Angeles), it can be a shock to learn that cars are often an unnecessary annoyance in Boston. Parking is expensive and hard to find, and it can be difficult to rent an apartment that offers parking (particularly in Brookline, where it is illegal to leave your car parked on the street overnight). Public transportation makes a car virtually unnecessary during the work week. For weekend driving and day trips, there are alternatives to owning a car in Boston. Renting a car from an established business like Hertz or Enterprise is one good option; it can actually be cheaper to rent a car several times a month than it is to own one in Boston. Students receive a discount for rental cars through the Harvard travel portal: http://travel.harvard.edu/. Another attractive option is buying a membership in Zip cars, a company that offers time sharing in a fleet of autos, rather than rentals. Harvard students receive a discount on Zipcar’s yearly membership fees. http://www.zipcar.com/

**Tax Information:** Incoming students need to be aware that for at least the first two years of graduate study for tax purposes their stipends are not considered wages. Students will not receive year-end W-4 forms or 1099 forms. Each student must log into PeopleSoft to download information necessary for filing taxes. Additionally, students need to understand that taxes will not be withheld from their monthly checks. Most students will need to file quarterly tax returns with the federal government and with their state of residence (i.e., wherever they intend to file their tax returns). Most students will transition to employee status some time in their third years, at which point they will be asked to fill out a W-2 and taxes will be withheld. The Program and Harvard do not offer students advice about filing taxes. Each student should confer with his or her accountant. Online resources include:

www.irs.gov (federal tax forms/information)
www.mass.gov/dor (Massachusetts tax forms/information)

**Updating your information:** If you move, marry, divorce, change your phone number, or change your alternate email address, it’s important that you update your information with Harvard. Please go to https://my.harvard.edu/ to change your address and other information.

**Pets:** If you are moving to Boston for the first time and you are bringing a pet with you, please be aware of certain issues. Cats should not be allowed outdoors, particularly at night. Boston and the outlying suburbs host a very healthy coyote population, and cats are particularly vulnerable. (If you live in Cambridge you’ll get used to seeing signs posted on telephone poles, advertising for information about missing cats.) Dogs are vulnerable to diseases that are not found in other parts of the country, most particularly heartworm disease.
and Lyme disease. If you bring a dog from another state (particularly the southwest United States), find a vet as soon as possible and have your dog put on monthly medications. Ask your vet about locations where Lyme disease is particularly prevalent, such as the North Shore and the Cape.

**Discounts:** Harvard offers innumerable discounts to students; some of the most important discounts involve purchase of computers or software. Additionally, many businesses offer discounts for all sorts of things. Many businesses give discounts to holders of CharlieCards, or AAA members. You can save some money by getting into the habit of asking for discounts at restaurants and bars.
### Museums you can visit for free with a Harvard ID

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### Things you can do for free around Boston

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<td>Castle Island</td>
<td><a href="http://www.mass.gov/dcr/parks/metroboston/castle.htm">http://www.mass.gov/dcr/parks/metroboston/castle.htm</a></td>
</tr>
<tr>
<td>Coit Observatory (BU) (free on Wednesday nights)</td>
<td><a href="http://www.bu.edu/astronomy/events/public-open-night-at-the-observatory/">http://www.bu.edu/astronomy/events/public-open-night-at-the-observatory/</a></td>
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<tr>
<td>Bunker Hill Monument</td>
<td><a href="http://www.nps.gov/bost/historyculture/bhm.htm">http://www.nps.gov/bost/historyculture/bhm.htm</a></td>
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<tr>
<td>Harpoon Brewery tour</td>
<td><a href="http://www.harpoonbrewery.com">http://www.harpoonbrewery.com</a></td>
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</tbody>
</table>

### Things you can do for cheap around Boston

<table>
<thead>
<tr>
<th>Activity</th>
<th>Website</th>
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</thead>
<tbody>
<tr>
<td>Mapperium (Christian Science Church)</td>
<td><a href="http://www.marybakereddylibrary.org/exhibits/mapparium">http://www.marybakereddylibrary.org/exhibits/mapparium</a></td>
</tr>
<tr>
<td><strong>Note:</strong> bikes can be rented at The Bike Stop in Arlington</td>
<td><a href="http://www.yelp.com/biz/the-bike-stop-arlington">http://www.yelp.com/biz/the-bike-stop-arlington</a></td>
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You can't do all these things every day. You can, however, make sure that you do all of them regularly. They really, truly make a difference in your state of mind while you're in grad school!

1. **Get sleep.** Get enough sleep. Really. This is serious. Don't pull all-nighters unless absolutely necessary. Don't live on caffeine. And if you notice that you can't sleep, or that you're sleeping way too much, talk to someone about it — sleep disturbances may be a sign of a growing depression or a medical problem that's easily treated. Remember that physical exhaustion can feel the same as depression, and don't get so tired you're completely burned out!

2. **Get exercise.** You don't have to train for the Boston marathon; you just have to move, and it's better if moving is fun. At the very least, leave the lab for breaks and walk up and down the stairs, or down Longwood for a cup of coffee with a friend. Take a Zumba class! Try extreme Frisbee! Take a trapeze class at the Circus Arts Center in Somerville!

3. **Get outside.** Boston isn't known for a lot of sunshine and daylight in the winter; make sure you get as much as you can. Seasonal Affect Disorder is a real issue. And for the rest of the year ... it's beautiful around here! Get outside every day and enjoy it. Observe animals and plants, even if it's just the spider on your windowsill or the fish skeleton on the beach. Remind yourself what made you curious about biology in the first place.

4. **Get involved.** Helping others is a terrific way of keeping things in perspective and reminding you that you're not the only person with stress and problems. Volunteer formally with a group like HPREP or Science in the News. Or come up with a way to “volunteer” informally — go out of your way to ask people how they’re doing, so that they don’t feel isolated or alone.

5. **Get a hobby.** Sure, you don't have any free time ... but it pays to have a hobby or activity that has nothing to do with science. Even if you only get to do it every three months, it'll remind you that there's more to life than lab experiments. Try knitting. Try making your own beer. Find a group of people to play board games with. Have fun!

6. **Get curious.** Challenge yourself to learn new things, even if they don't seem immediately related to your project — even if they aren't related to science at all. Learning new things reminds you that your brain is powerful and the world is full of wonder.

7. **Get informed.** Read papers and attend seminars unrelated to your project. It keeps things in perspective, and it might help you make a leap of intuition that other people (in your lab or in your field) might not be making.

8. **Get support.** Keep in touch with old friends, even if they're not scientists; keep in touch with new friends from PiN as they defend and move away. Scientists are gypsies, and it's easy to lose touch with people as they move to a different city. If you hold on to good friends, you can be a life-long support system for each other. And if you're struggling during your grad school experience, reach out and talk to people; there's no reason to suffer in silence. Let the people around you help you find solutions!

9. **Get away from screens.** Constantly staring into smartphones, tablets and computer screens can wreak havoc with your mental health and suck up all of your free time before you know it. Look up — look at the real world. Don't take a photo of the moment — enjoy it instead, at least for a little while. Don't text if you can talk face-to-face.

10. **Get a sense of perspective.** Remember that doing science is a privilege, even when it's a pain in the neck. Scientists are paid to learn things and investigate whatever makes them curious. People are paying you for you to earn a Ph.D. from Harvard; revel in it! You're earning a degree that will keep you employable for the rest of your life (whether or not you believe it right now). Make the most of this incredible opportunity.