

Introduction

Welcome to the Graduate Program in Genetics and Genomics (<http://www.bumc.bu.edu/gpgg/>), at the Boston University School of Medicine. It is an exciting time to be studying Genetics and Genomics, and we are thrilled to be a part of this experience for you. This graduate program is an interdisciplinary, interdepartmental program in the Division of Graduate Medical Sciences. This guide summarizes the requirements for graduate study in this program and provides helpful information. Other documents regarding academic policy, procedure, and registration information are available in the Office of the Division of Graduate Medical Sciences located in L-317, or on-line (<http://www.bumc.bu.edu/gms/>).

Program Directors

Dr. Shoumita Dasgupta is a Professor in the Department of Medicine. As Program Director, she works with the directors of the Genome Science Institute.

The Graduate Program in Genetics and Genomics emphasizes quality teaching and mentoring. Dr. Dasgupta works with the other members of the Program faculty to ensure that the program will be centrally-managed and quality-controlled. She provides continuity to the courses by overseeing them globally as well as teaching. Specifically, Dr. Dasgupta directs the Principles in Genetics and Genomics course and co-directs the integrated first year Foundations in Biomedical Sciences (FiBS) curriculum. Dr. Dasgupta is also responsible for managing the operation of the program by instituting procedural changes as recommended by the various standing committees, and by serving as a liaison between the students and faculty. She reviews requests for substitute credit from advanced degree students, adjusts the curriculum to reflect scientific developments, and evaluates faculty performance based on their teaching evaluations and her in-class observations. Dr. Dasgupta also assists students with putting together qualifying exams and thesis committees that will help each student through these milestones. Finally, Dr. Dasgupta has professional development conversations with the students to assist them in transitioning on to post-doctoral opportunities in a variety of settings from research to writing to teaching, among others. To connect with alumni, students are encouraged to join the LinkedIn Group for GPGG.

Genome Science Institute Overview

The Genome Science Institute (GSI) was established in 2008, in recognition that excellent research in Genetics and Genomics spans many departments and schools, and that an institute connecting these varied investigators would have a synergistic effect. The GSI mission is to expand the understanding of the role of genes in human health by fostering interdisciplinary collaboration, and serve as a resource for Boston University scientists engaged in Genetics and Genomics research and education.

The Genome Science Institute is directed by Dr. Nelson Lau, Professor of Biochemistry (nclau@bu.edu), with Associate Directors Dr. Alla Grishok (grishok@bu.edu), and Dr. Rachel Flynn (rflynn@bu.edu), and has over 120 faculty members from the schools of Medicine, Public Health, and Dental Medicine. The GSI sponsors a seminar series, symposium, and other opportunities for formal and informal interaction among faculty and students. Please look for emails and notices from the GSI (<http://www.bumc.bu.edu/gsi/>). The Genome Science Institute leadership and faculty work closely with

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the Graduate Program in Genetics and Genomics to continually expand and strengthen the opportunities for training and research for students at Boston University interested in Genetics and Genomics. Faculty with an affiliation with GSI have an affiliation with GPGG as well.

Program Faculty

Please follow this link for an updated list: <https://www.bumc.bu.edu/gpgg/faculty/>

Genetics Research outside the Program

Some of our current students are getting their doctorate, in genetics research, in labs outside our core program- We support accepting students from these labs, as we recognize the reach of genetics/genomics into many related fields. New faculty members are actively being recruited into the program.

Each student will complete a minimum of three rotations during their first year in the Program in Biomedical Sciences (PiBS). First year PiBS students who are looking for genetics labs may find the Genome Science Institute research symposium particularly helpful in shopping for labs, It is typically held in November annually. This will be a unique opportunity to learn more about potential rotation labs.

Degree Requirements

Your progression through the Ph.D. program will involve a number of components. As a first-year student, your primary focus will be both coursework and rotations. Participation in laboratory rotations will provide you an opportunity to learn more about the research going on in labs before choosing a dissertation lab. Laboratory research should be taken as seriously as the coursework you will be doing at the same time. General outlines of the course requirements for students joining our Program through various mechanisms are below.

Ph.D. in PiBS / Genetics and Genomics (Post Bachelor's)

Year One, Fall Semester

1. Principles of Genetics and Genomics, GE 701	4
2. Foundations in Biomedical Sciences I: Protein Structure, Catalysis and Interactions, FC 711	3
3. Foundations in Biomedical Sciences II: Structure and Function of the Genome, FC 712	3
4. Professional Presentation Skills, FC 764	2

Year One, Spring Semester*

1. Foundations in Biomedical Sciences III: Architecture and Dynamics of the Cell, FC 713	3
2. Foundations in Biomedical Sciences IV: Mechanisms of Cell Communication, FC 714	3
3. Foundations in Biomedical Sciences Vg: Translational Genetics and Genomics, FC 715 -or-	2- 3

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Stem Cells and Regenerative Medicine, MM 710	
4. Professional Development Skills, FC 708	2
5. Additional Foundations in Biomedical Sciences Elective(s)	2-3

*Please note that FiBS core courses are not semester long courses! For specific dates for all of the modules, please refer to: Student Link

Year Two, Fall Semester

1. Principles of Genetics and Genomics, GE 701 (If not completed during year 1)	4
2. Genetics and Genomics Colloquium, GE 703	2
3. Statistical Reasoning for the Basic Biomedical Sciences, FC 721	3
4. Additional Elective(s)	2-4

Year Two, Spring Semester

1. Legal and Ethical Issues of Science and Technology, ENG BF 752	4
-or- Social, Cultural, and Ethical Issues in Genetics, GC 716 ¹	3
2. Genetics and Genomics Colloquium, GE 704	2
3. Additional Elective(s)	2-4

Elective Courses²

Year Two, 4 Elective credits total from the following lists (some or all of these credits may be fulfilled in year 1):

<i>Fall:</i>	
Applications in Bioinformatics, ENG BF 527	4
Biological Core Technologies, GMS MM 730	2
Biostatistics with Computing, GMS CI 670	4
Cancer Biology and Genetics, GMS MM 703	2
Cellular Aspects of Development and Differentiation, GRS BI 610	4
Computational Biology: Genomes, Networks, Evolution, ENG BE 562	4
Comprehensive Immunology, GMS MI 713	4
DNA and Protein Sequence Analysis, ENG BE 561	4
Elementary Biostatistics, GMS MS 700	2
Gene Regulation and Pharmacology, GMS PM 880	2
Genetics and Epidemiology of Human Disease, GMS MM 701	2
Human Genetics, GMS MS 781	4
Institutional Racism in Health and Sciences, ENG BF 510	4
Molecular Basis of Neurologic Diseases, GMS MS 783	2
Molecular Mechanisms of Growth and Development, GMS BI 787	2
Pharmacogenomics, GMS PM 832	2

¹ Only offered during spring semesters of even number years. Can be taken during year 1 or 3, if that works better.

² Student interest in taking courses not listed above, for elective credit, will be evaluated on a case-by-case basis.

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Protein Structure and Function, GMS BI 783	2
Receptors and Signal Transduction, GMS BI 790	2
Systems Neuroscience, GMS AN 810	4
Techniques in Molecular Biology, GMS BI 777	2
Translational Bioinformatics Seminar, GMS BF 831	2
<i>Spring:</i>	
Cognitive Neuroscience, GMS AN 811	4
Critical Thinking in Biomedical Research, GMS FC 762	2
Gene Targeting in Transgenic Mice, GMS BI 776	2
Biochemical Mechanisms of Aging, GMS BI 786	2
Biological Core Technologies, GMS MM 730	2
Elementary Biostatistics, GMS MS 700	2
Foundations in Biomedical Sciences Vm: Molecular Metabolism	2
Foundations in Biomedical Sciences Vp: Physiology of Specialized Cells	2
Genetics of Microorganisms, GMS MI 714	4
Genomics Data Mining and Statistics, SPH BS 831	2
Growth Control and Cell Transformation, GMS MI 717	4
Introduction to R, SPH BS 720	2
Intermediate Statistical Analysis and Computing for Clinical Research, GMS CI 671	3
Mass Spectrometry and Functional Genomics, GMS BI 793	2
Molecules to Molecular Therapeutics, GMS MM 710	4
Neuroanatomical Basis of Neurologic Disorders, GMS AN 808	2
Systems Biology of Human Disease: Using AI to Advance Personalized Medicine, ENG BE 700	var
Teaching College Biology, GRS BI 699	2
Teaching Methods in the Biomedical Sciences, GMS AN 804	2
Technology Commercialization: From Lab to Market, MET AD 893	4

Additional information on these courses can be found on the Graduate Program in Genetics and Genomics website (<http://www.bumc.bu.edu/gpgg/graduate-program/gpgg-core-courses/>), on Blackboard (<http://blackboard.bu.edu>), and on the Graduate Medical School website (<http://www.bumc.bu.edu/gms/>). The first year curriculum focuses on foundations in Genetics and Genomics and groundwork in the supporting core subjects: biochemistry, molecular biology, cell biology, biophysics, and critical thinking.

In the second year, students will focus on an area relevant to their dissertation research.

During the first year of PiBS, graduate students will focus primarily on the coursework described above and on laboratory rotations. Because one of the rotation mentors will become the dissertation advisor, students should take the rotation experience seriously. Ph.D. candidates are required to participate in a minimum of three laboratory rotations to ensure exposure to a variety of scientific approaches. Due to time constraints, M.D. /Ph.D. students will have the option of joining a dissertation laboratory after two rotations. M.D./Ph.D. students can elect to begin their rotations during the summer between the Med I and Med II years. A second rotation can either be carried out during the Med II Fall Semester or after

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completion of the Med II year over the summer. Both arrangements accelerate the M.D./Ph.D. students' thesis lab placement.

When considering rotation choices, many variables should be evaluated, such as: area of research, availability of mentor, funding status of the lab, lab size and makeup, and publication record of the group. Please feel free to approach Dr. Shoumita Dasgupta for advice.

The placement of the Ph.D. Student in the first rotation occurs during the first weeks of the Fall semester through the PiBS advising structure. This allows the student to have a chance to meet with the Principle Investigator (PI) to discuss potential rotation projects before choosing the first rotation advisor. Subsequent rotation choices are based on information gathered by the student from research seminars, informal meeting with PIs, and the Genome Science Institute Symposium- The program directors and advisors coordinate the placement of students in their top choice of lab, ensures equitable distribution of students throughout the campus, and verifies the PIs time, resources, and interest in training students.

After completion of the third rotation, the candidate's dissertation advisor is chosen from the pool of rotation advisors, and thesis research begins. This is also when students choose which degree-granting program with which to affiliate. You are probably reading this because you are considering joining the Graduate Program in Genetics and Genomics- we hope this document gives you a good sense of what this entails, but please feel free to reach out to the program director, faculty, and current students to get the full perspective. These placements are made no earlier than the midpoint of a Ph.D. student's third rotation, or an M.D. /Ph.D. student's second rotation.

Post-Masters Students

Ph.D. and M.D. /Ph.D. candidates, entering the Program after completing an advanced degree, are eligible to substitute parallel coursework from previous graduate institutions in lieu of any course with the exception of Principles of Genetics and Genomics, Translational Genetics and Genomics, and the Genetics and Genomics Colloquia. These three core Genetics and Genomics courses are required to ensure the quality of the knowledge base upon which students build their graduate studies. The Program Director approves appropriate substitutions upon documentation of similarity in scope and content of the previously completed course. Formal course work accounts for a minimum of 14 of the 32 credits required of Post-Master students and 22 of 32 credits required of M.D. /Ph.D. students. Below is an outline of the curriculum options.

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Request for transfer credit is evaluated on a case-by-case basis by the program director and registrar for courses outside of Genetics and Genomics. The Genetics and Genomics coursework is required at the Boston University School of Medicine, because the foundations curriculum is an integrated series of courses. There is flexibility with elective course requirements waivers.

M.D.-Ph.D. in Genetics and Genomics

Required courses: M.D.-Ph.D. student

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Year One, Fall Semester

1. Principles of Genetics and Genomics, GMS GE 701	4
2. Foundations in Biomedical Sciences I: Protein Structure, Catalysis and Interactions, FC 711	3
3. Foundations in Biomedical Sciences II: Structure and Function of the Genome, FC 702	3
Total credits	10

Year One, Spring Semester

1. Foundations in Biomedical Sciences III: Architecture and Dynamics of the Cell, FC 713	3
2. Foundations in Biomedical Sciences IV: Mechanisms of Cell Communication, FC 714	3
3. Foundations in Biomedical Sciences V: Translational Genetics and Genomics, FC 715	3
Total credits	9

Year Two, Fall Semester

1. Genetics and Genomics Colloquium I, GE 703	2
2. Legal and Ethical Issues of Science and Technology, ENG BF 753	4
-or- Social, Cultural, and Ethical Issues in Genetics, GC 716	3
Total credits	5

Year Two, Spring Semester

1. Genetics and Genomics Colloquium II, GE 704	2
Total credits	2

Elective courses: no additional electives required.

Responsible Conduct of Research Requirement

A University-wide program in the Responsible Conduct of Research (<http://www.bu.edu/orc/rcr/>) is offered on the Medical Campus and the Charles River Campus. The series of four seminars and case discussions introduces students to the complexities of conducting research; including mentor and trainee responsibilities, publication practice and responsible authorship, research misconduct, and research involving animal or human subjects. **Students are required to attend all four meetings prior to graduation.** Each session is offered on both the Medical Campus and once on the Charles River Campus. You should receive an email announcement; registration occurs on-line. This is a requirement for both the Graduate Program in Genetics and Genomics and Graduate Medical Sciences.

Teaching Requirement

Ph.D. students, upon successful completion of the core courses, are required to serve as a Teaching Assistants (TA) for one of the Graduate Program in Genetics and Genomics courses. The TAs lead discussion and review sections, and support exam and homework grading. The Teaching Assistant assignments are made according to academic performance in the courses in question. Serving as a TA in one of Dr. Dasgupta's courses will satisfy the teaching requirement for the Ph.D. degree, but additional

teaching opportunities are available for students interested in developing these skills. For more information, please contact Dr. Shoumita Dasgupta.

The Qualifying Process

Please refer to the Qualifying Exam Student Handbook found on the GPGG website for information

Dissertation Research

Upon advancing to Ph.D. candidacy, graduate students will focus on their dissertation research. The research is conducted under the supervision of their chosen graduate advisor. The student is responsible for conducting a rigorous, in-depth program of investigation into an area of research within the scope of their graduate advisor's expertise and interest. Student progress is continuously assessed by the graduate advisor and annually by a dissertation advisory committee. The dissertation advisory committee is composed of the student's advisor and, at least, four other faculty members - a minimum of three faculty members from the Graduate Program of Genetics and Genomics and one Division faculty member from an outside department. The dissertation committee provides perspectives on the research program and, should the situation arise, mediates disputes between the student and advisor.

Students conducting dissertation research actively participate in Program and Institute seminar series, lab meetings, and research activities of their thesis lab.

Although the period of dissertation research will not be limited in duration, the dissertation advisory committee facilitates expeditious progress towards the Ph.D. degree. Once the research develops into several chapters of publication quality work, the advisory committee asks the student to compile a written thesis, and a date for the Division public seminar and formal dissertation defense is scheduled. The public seminar is delivered to a general audience consisting of Division of Graduate Medical Sciences faculty, students, and researchers. Later that day, the public seminar is followed by a formal dissertation defense occurring behind closed doors in the presence of the dissertation advisory committee. The committee evaluates the student's thesis defense for satisfactory completion of degree requirements. Students typically complete their degree requirements in five to six years.

Funding

The funds for the first-year graduate students are institutional funds granted to the PiBS Program from the Dean of the Medical School and the Division of Graduate Medical Sciences. These funds support student stipends, tuition, health insurance, and fees. After the students first year, stipend support comes from the dissertation advisors' grants, but health insurance, tuition, and fees are still covered by the institution. The Graduate Program in Genetics and Genomics strongly encourages students to apply for pre-doctoral fellowships, especially using their qualifying exam proposal. Fellowships are excellent resources for graduate students. Fellowships can cover stipends, provide funds for travel to meetings, and allow purchase of computers or lab supplies. Also, fellowships look good on resumes! Students assemble applications (research statements, letters of reference, et al) as early as the Fall of their second year.

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GPGG also sets aside funds for students to attend conferences. The emphasis is typically on students presenting either posters or talks, but with many conferences shifting to virtual models, we can also consider registration for these or for local conferences in Boston even if the student will not be presenting. To request this funding, students should indicate which conference they wish to attend, provide evidence of accepted abstract (when relevant), describe how the conference will assist them, and include a budget for their attendance. This information can be submitted to Dr. Dasgupta.

Health Insurance

Your health insurance is covered by the Division of Graduate Medical Sciences for the duration of your time as a graduate student. The coverage is offered through Aetna, and, like other insurance plans, has providers located around the city, including on our campus. You are also eligible to go to the Student Health Clinic on the Charles River Campus to avoid the co-pay charge, but many students find the coverage offered through Aetna to be both higher quality and more convenient. If students encounter health-related issues that lead to substantial medical costs, it is possible to request additional support from Graduate Medical Sciences to help defray these costs.

Laptop Perks

Upon acceptance into the GPGG, each student can get access to a new GSI-purchased laptop for the duration of their PhD thesis research. Since genomics absolutely requires sophisticated computational tools to carry out analysis, the GSI's partnership with the GPGG will equip students with a GSI-owned laptop that GPGG students can hold onto during the duration of their PhD work.

Seminars

Research In-Progress

Graduate students in the Graduate Program in Genetics and Genomics and the labs of the Biochemistry department meet regularly to discuss student research, over pizza. Students are asked to present beginning their second year- These talks give graduate students and post-doctoral fellows an opportunity to present ongoing research to a broad audience, to receive useful input and advice, and to inform your colleagues of the research you are doing in Genetics and Genomics. The talks are 20 to 30 minutes long.

Genome Science Institute Seminars

The Genome Science Institute (GSI) sponsors a seminar program featuring prominent guest speakers and speakers from the Boston University Medical School community on the first and third Tuesday of every month. Students have the opportunity to interact with visiting seminar speakers through organized student lunch forums. The advanced graduate students have the opportunity to sponsor formal Genome Science Institute seminars.

Library and Computer Resources

Graduate students can access books, journals, and computerized literature in the Alumni Medical Library of the Boston University School of Medicine (<http://med-libwww.bu.edu/>). The library is physically located at 72 East Concord Street, Boston on the 12th floor of the Instructional Building. Students can also make use of the available computing resources in rotation and dissertation advisor labs. These resources can be accessed around the clock from off-campus locations by utilizing the Virtual Private Network (VPN) software available through Boston University Information Technology (<http://www.bu.edu/tech/accounts/remote/vpn/>). The Genome Science Institute maintains an independent server that runs its own website and is available to students for the creation of individual and lab websites or for the distribution of public data.

Staying Connected

Kimberlin (Kim) Humphrey-Kiger, Genome Science Institute, GPGG and Genetic Counseling Coordinator works with Dr. Shoumita Dasgupta to help you connect with the people and resources you need to have a successful graduate student experience. She is located in the K building. Her e-mail is kchk@bu.edu.

Student ID

Student IDs (<https://www.bumc.bu.edu/2021/03/11/medical-campus-id-services>) are obtained at the Boston University Medical Campus Secure ID Room located at 710 Albany Street. Your student ID will open many doors for you, including multiple Museums in Boston (<http://www.bu.edu/arts/in-boston/>) and the Boston University Fitness and Recreation Center.

E-mail

Email addresses are available in the Alumni Medical Library or on-line (<http://www.bu.edu/webmail/>). Once you have an email address, please let Kim know so she can add you to the various seminar mailing lists.

Student Link

The Student Link (<http://www.bu.edu/students/academics/link/>) gives direct access to public and personal academic, financial, and institutional data maintained in Boston University's central computer files. You can view your unofficial transcript, check your course schedule, or verify your student account status.

Blackboard

Blackboard (<http://blackboard.bu.edu/>) houses the online course resources for Boston University faculty and students. Instructors post course assignments and materials for student access.

City of Boston

Boston University On-line City Guide (<http://www.bu.edu/admissions/bu-basics/why-we-love-boston/>)

MBTA (<http://www.mbta.com/>) Provides information about public transportation in the greater Boston area, including maps, fares, and schedule information.

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Boston University MBTA Semester Pass Program
(http://www.bu.edu/parking/students/semesterpass_fall/)

Boston University students can purchase Massachusetts Bay Transportation Authority (MBTA) passes on-line through Student Link. The Semester Pass program allows students to pre-pay for the Fall semester (September through December) monthly “T” pass, and the Spring semester (February through May) monthly “T” pass at a discounted price.

TranSComm (<http://www.bumc.bu.edu/transcomm/>) provides information on various forms of transportation available to the Boston University community.

Welcome to Boston University

Thank you for joining the Graduate Program in Genetics and Genomics. We encourage you to ask questions and voice concerns. If we can improve upon our Program, we want to know. Best wishes for an exciting and stimulating graduate career!