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I. BUSM MD/PhD Program History

"The test of a first-rate intelligence is the ability to hold two opposed ideas in mind at the same time and still retain the ability to function. One should, for example, be able to see that things are hopeless and yet be determined to make them otherwise." - F. Scott Fitzgerald

Boston University School of Medicine began its history as the New England Female Medical College, which opened in 1848 as the first institution in the world to offer medical education to women. In 1873, the College merged with Boston University, becoming the first coeducational medical school.

When the graduate school of Boston University was founded in 1912, School of Medicine graduates became the first to receive additional training in disciplines such as anatomy, bacteriology, chemistry, pathology, pharmacology, and physiology. The degree awarded to these candidates was the Ph.D. in Medical Sciences, regardless of the area of their concentration. The first degree went to Brenton Reid Lutz in 1916 for his dissertation entitled *On the Irritability of the Reflect Arc*. Years later, Marielle Payton, graduated from BUSM to become the very first female African-American MD/PhD in the nation.

Over the next half century, both the medical and graduate programs evolved and integrated to contest the rapid advancement in medicine and sciences. In 1976, a joint MD/PhD program was officially sanctioned by the University. Today, almost one-sixth of the students enrolled in the graduate division are in the joint program. Approximately eight students each year are enrolled as MD/PhD candidates for a total of about eighty students today. Unlike their predecessors, these MD/PhD candidates can now receive their graduate degree and training in any of the few dozen departments and training programs, taking advantage of an annual research budget exceeding $140 million.

Aram Chobanian, MD, former Dean and Provost of the Medical Campus, and President of Boston University, fittingly described BUSM, as one component in the “scientific village on the medical campus”. Indeed, MD/PhD candidates not only have the option to conduct research in the School of Medicine, but also in Boston Medical Center, the School of Public Health, or the Goldman School of Dental Medicine. Within the campus, specialized centers such as the Whitaker Cardiovascular Institute, Arthritis Center, Cancer Research Center, Pulmonary Center, Center of Excellence in Women’s Health, and Alzheimer’s Disease Center provide further integration between medicine and scientific research. In addition, nearly 300,000 square feet of research space have been created in the last decade, most of it in BioSquare, a developing biotechnology park that already counts as its first building the School’s Center for Advanced Biomedical Research. The buildings in this park are home to several Advanced Core Services including Mass Spectrometry, a DNA/Protein Core, Macromolecular X-ray Crystallography Facility, NMR Spectroscopy Core, Cryo-Electron Microscope Facility, Confocal Laser Scanning Microscope, Transgenic Facility, Cardiovascular Imaging Suite, and a modern Laboratory Animal Science Center. Most recently, the National Emerging Infectious Disease Laboratory (NEIDL) has been added to this complex.

In addition to the diverse research exposures, BUSM’s MD/PhD candidates also have the opportunity to receive clinical training in a unique setting. This was made possible by the merger of the Boston City Hospital with the Boston University Medical Center Hospital into the Boston Medical Center in 1996. BMC became the hub of urban health care, with emphasis on urban outreach and primary and tertiary care training. The partnership between BUSM and BMC has
led to a truly integrated medical campus with combined strengths in research, clinical training, and community service. Such integration plays an essential role in the training of MD/PhD candidates in becoming successful physician-scientists.

BUSM recognizes the nature and difficulties inherent in the unique goals of becoming a physician scientist. Thus, we strive to integrate the training of its candidates through flexibility, mentorship, and diversity. As proven by its history, BUSM has led the advancement of biomedical research in many frontiers. The goal of the BUSM MD/PhD program is to continue to train daring pioneers to venture into the realm of the unknown and uncertainty with foresight and determination.

II. Administrative Structure

A. Overview

The MD/PhD Program is administered through the Division of Graduate Medical Sciences (Room L-317) in conjunction and cooperation with various other School of Medicine administrative offices that include the Office of the Dean, Office of Admissions, Office of Student Affairs, Office of the Registrar, Office of Student Financial Services, and the Office of Minority Student Affairs. The frequency of interactions with staff in each of these offices is determined by where you are in your studies. While in the medical school curriculum (BUSM I, II, III, and IV) the majority of interactions will be with the Medical School Office of Student Affairs and the Office of the Registrar. Financial Aid issues are handled in the Office of Student Financial Services, although Sherill Ashe, GMS Financial Aid Administrator in Room L-315, is always available to serve as a liaison and facilitator for financial aid concerns. During your research studies, you will interact primarily with the staff in the Division of Graduate Medical Sciences and with your department/program faculty and administrators.

All students in the Program begin their studies at the School of Medicine with a week of medical school orientation before beginning the first year of the medical school curriculum (BUSM I). Since the focus of your efforts this first year is on the medical school curriculum, students in this first year of studies will meet periodically with the Faculty Advisors, Dr. John Schwartz, M.D. and Dr. Steven Borkan, M.D. However, as a “first-year medical student”, the majority of contact and advising will be through the Office of Student Affairs. During this period, Dr. John Schwartz, and Dr. Steven Borkan are available to meet with you in the Division Office or at their offices to discuss concerns regarding your transition to the research curriculum (i.e., laboratory rotations, selection of PhD program, etc.)
Faculty Advisors:

John Schwartz, MD  
Director MD/PhD Program  
650 Albany Street, X-545 or L-317,  
617-638-7321  
jhsch@bu.edu

Steven C. Borkan, MD  
MD/PhD Associate Director  
650 Albany Street, X-546,  
617-638-7330  
sborkan@bu.edu

William Cruikshank  
MD/PhD Associate Director  
72 East Concord St. R  
617-638-5295  
bcrui@bu.edu

B. Office of Student Affairs, School of Medicine  
Suite A-208, 617-638-4166

Angela Jackson, M.D.  
Associate Dean for Student Affairs  
hjackson@bu.edu

Daniel Chen, M.D. M.Sc.  
Assistant Dean for Student Affairs  
Assistant Professor of Medicine  
Associate Clerkship Director – Internal Medicine  
chenda@bu.edu

Paige L. Curren, M.A.  
Assistant Dean for Student Affairs,  
Director, Office of Academic Enhancement  
pkcurran@bu.edu

Kenneth Grundfast, MD, FACS, FAAP  
Assistant Dean for Student Affairs  
kengrund@bu.edu

John Polk, MD  
Assistant Dean for Student Affairs  
jipolkmd@bu.edu

Karen Symes, Ph.D.  
Assistant Dean for Student Affairs  
Associate Professor of Biochemistry  
symes@bu.edu
MD/PhD students should be sure to file their FAFSA and Profile. A per school fee is involved with this process (for details, consult www.collegeboard.com.) Although your financial aid is processed through the Office of Student Financial Services, Sherill Ashe, GMS Financial Aid Coordinator is available to serve as a financial aid liaison and facilitator. In other words, to the best of her ability, she will help you navigate through the complex financial aid maze.

However, students should be aware that MD/PhD institutional scholarships and training grants are entered on each student’s account by this the Graduate Medical Sciences Office (Sherill Ashe or Millie Agosto). Please feel free to check with either Sherill or Millie if you have any questions about your scholarship awards and billing issues.

D. Office of the Registrar (Medical School Registrar)
A-414, 617-638-4160

Ellen J. DiFiore, Registrar
edifiore@bu.edu

Loretta A. Dyson, Program Coordinator
ldyson@bu.edu

Dolores D. Murrell, Assistant to the Registrar
dmurrell@bu.edu

The Office of the Medical School Registrar is responsible for the maintenance and management of medical curriculum academic and attendance records for students and alumni of Boston University School of Medicine.
Services for MD/PhD students include verification of student status and issuing of Medical School transcripts. (Note: Transcripts for the PhD curriculum are recorded on a separate transcript that is issued by the University Registrar at 881 Commonwealth Avenue). In addition, some of the services for alumni include: verification of graduation, documentation for licensure, diploma verification and translation.

BUSB III clerkships are also requested on-line through the Registrar.

**E. Office of Diversity and Multicultural Affairs**
A-407, 617-638-4163

**Rafael A. Ortega, MD**
Associate Dean of Diversity and Cultural Affairs
Vice-Chairman of Academic Affairs
rortega@bu.edu

**Samantha Kaplan, M.D., MPH**
Assistant Dean of Diversity and Cultural Affairs
sakaplan@bu.edu

**Alexander Norbash, M.D., MHCM, FACR**
Assistant Dean of Diversity and Cultural Affairs
norbash@bu.edu

**William Cruikshank, Ph.D.**
Assistant Dean of Diversity and Cultural Affairs
bcruiish@bu.edu

**Thea James, M.D.**
Assistant Dean of Diversity and Cultural Affairs
theaj@bu.edu

**Moisès Fernández Via**
Arts Outreach Initiative
moisesfv@bu.edu

**Lance Martin**
Administrative Assistant
lmartin4@bu.edu

**Justin McCummings**
Minority Physician Recruitment Program, Manager
Justin.McCummings@bmc.org

**F. Division of Graduate Medical Sciences Office and the Division Staff**

The Division Office will be an important resource for information throughout your studies. The Division staff provides you with assistance and information that pertain to your first days here at orientation, to registration each semester, and finally through your commencement!
Following is a list of the Division Faculty and Staff and a brief synopsis of who to contact for your specific needs. Please be sure to stop by the office for an introduction. We look forward to helping you succeed in your studies and professional pursuits.

The Division Office occupies a suite of offices in the Instructional Building Annex (L-315 and L-317). Admissions, Financial Aid, Student Registration, and Student Records are located in Room L-315. The Associate Provost and Faculty Advisors may be found in Room L-317.

**Directory of Division Advisors**

**Linda Hyman, PhD**  
Associate Provost  
Room L-317, (Please contact Kayleigh Klegraefe at 617-638-5744 for appointments)

**John Schwartz, MD, PhD**  
Director, MD/PhD Program  
Room L-317, 617-638-7321  
<jhsch@bu.edu>

**Steven C. Borkan, MD**  
MD/PhD Advisor  
Evans-546, 617-638-7330  
Steven.Borkan@bmc.org

**Directory of Office Faculty and Staff**

**Danielle Simeone**  
Executive Assistant to the Associate Provost (Dr. Hyman)  
L-317, 617-638-5138  
dsimeone@bu.edu

**Hee-Young Park, Ph.D.**  
Assistant Dean  
L-317, 617-638-5527  
hypark@bu.edu

**Gwynneth D. Offner, Ph.D.**  
Director M.A. Medical Sciences Program, Associate Professor of Medicine  
L-317, 617-638-8221  
goffner@bu.edu

**Theresa A. Davies, Ph.D.**  
Assistant Director M.A. Medical Sciences Program, Faculty Advisor
L-317, 617-638-5242 (Please call GMS at 638-5255 for appointments.)
tdavies@bu.edu

Mildred (“Millie”) Agosto
GMS Registrar
Room L-315, 617-638-5124
millie@bu.edu

Sherill Ashe
Financial Aid Administrator
Room L-315, 617-638-5216
sashe@bu.edu

Michelle Hall
Associate Director for Admissions
Room L-317, 617-638-5121
natashah@bu.edu

Natasha Hall
Admissions Assistant
Room L-317, 617-638-5217
tashah@bu.edu

Kayleigh Klegraefe
Marketing and Communications Specialist
L-317, 617-638-5138
kayl416@bu.edu

Dianna Puleo
Administrative Assistant
L-315, 617-638-5243
dianna@bu.edu

William (Billy) Mara
Administrative Coordinator
PhD, MD/PhD Combined Degree Program
L-315, 617-638-5123
jshine@bu.edu

Lynese Wallace
Administrative Coordinator
MAMS, STaRS Programs
L-317, 617-638-5704
joneske@bu.edu

Gerard (Jerry) Lavoie
Business Affairs Manager
L-317, 617-638-5771
glavoie@bu.edu
To locate the staff that can help you with a particular concern, please refer to the following table or call the GMS Division Office at 617-638-5255.

<table>
<thead>
<tr>
<th>NEED ASSISTANCE WITH THE FOLLOWING:</th>
<th>WHO IN THE DIVISION OFFICE CAN ASSIST ME? (PRIMARY IN BOLD, BACK-UP IN ITALIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Advising</td>
<td>Dr. John H. Schwartz, Dr. Steven C. Borkan</td>
</tr>
<tr>
<td>Address Changes</td>
<td>In addition to entering this information on Student Link, written notification should be submitted to: Millie Agosto</td>
</tr>
<tr>
<td>Admissions Applications and Interviews (M.D./Ph.D.)</td>
<td>Billy Mara</td>
</tr>
<tr>
<td>Attendance Verifications</td>
<td>Sherill Ashe</td>
</tr>
<tr>
<td>Change of Program (transferring graduate studies department)</td>
<td>Millie Agosto</td>
</tr>
<tr>
<td>Commencement Planning (for PhD hooders/PhD speaker selection, etc.)</td>
<td>Billy Mara</td>
</tr>
<tr>
<td>Course Registration</td>
<td>Millie Agosto will automatically register you for BUSM I, II; however, you will need to submit a registration form for each semester in your graduate years. Students are notified by e-mail and surface mail before each registration period (March and October). Ellen DiFiore, Medical School Registrar will register you for BUSM III and BUSM IV.</td>
</tr>
<tr>
<td>Dissertations – checks for format</td>
<td>Millie Agosto</td>
</tr>
<tr>
<td>Diploma Applications (PhD) (submission/questions)</td>
<td>Millie Agosto; Dianna Puleo</td>
</tr>
<tr>
<td>Dissertation Prospectus (submission)</td>
<td>Millie Agosto; Dianna Puleo</td>
</tr>
<tr>
<td>Division Faculty Committees Liaison</td>
<td>Dr. Hee-Young Park</td>
</tr>
<tr>
<td>Division Liaison with MD/PhD Admissions, Advising, and Executive Committee</td>
<td>Dr. John H. Schwartz, Dr. Steven C. Borkan, Billy Mara</td>
</tr>
<tr>
<td>Drop/Add Forms, a.k.a. Course</td>
<td>Millie Agosto</td>
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<td>Service/Request</td>
<td>Responsibility</td>
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<td>Adjustment Forms (grad years)</td>
<td>Billy Mara</td>
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<td><strong>Faculty Research Interests</strong></td>
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<td>Submission/questions</td>
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<td>Final Oral Defense Schedule</td>
<td>Millie Agosto</td>
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<tr>
<td>Submission/questions</td>
<td>Dianna Puleo</td>
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<tr>
<td>Financial Aid (Institutional)</td>
<td>Sherill Ashe</td>
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<tr>
<td><strong>Financial Aid Liaison and Facilitator</strong></td>
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<tr>
<td>Submission/questions</td>
<td>Sherill Ashe</td>
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<tr>
<td>Graduate Medical Sciences</td>
<td>Billy Mara</td>
</tr>
<tr>
<td>Graduate Student Organization (GMSSO) Division Liaison</td>
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</tr>
<tr>
<td>Payroll coordinator for graduate student tutors</td>
<td>Jerry Lavoie</td>
</tr>
<tr>
<td>Financial Aid (Federal, Private, Training Grants)</td>
<td>Sherill Ashe</td>
</tr>
<tr>
<td>Front Desk in L-315 (manages and staff)</td>
<td>Dianna Puleo</td>
</tr>
<tr>
<td><strong>International Student Verifications</strong></td>
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<td>Submission/questions</td>
<td>Millie Agosto</td>
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<td>Sherill Ashe</td>
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<td>Michelle Hall</td>
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<td>Natasha Hall</td>
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<tr>
<td>Dianna Puleo</td>
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<tr>
<td>Leave of Absence/Withdrawal</td>
<td>MD/PhD students should meet with Dr. Schwartz, Dr. Hyman</td>
</tr>
<tr>
<td>Letter of Enrollment, requests</td>
<td>Billy Mara</td>
</tr>
<tr>
<td>Letter of Recommendation</td>
<td>Billy Mara</td>
</tr>
<tr>
<td>(scholarship/fellowship, and supplemental letters for residency applications).</td>
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<tr>
<td>Orientation Planning</td>
<td>Dr. Park</td>
</tr>
<tr>
<td>Mailbox Assignments (during graduate years)</td>
<td>Millie Agosto</td>
</tr>
<tr>
<td><strong>Publications/Website</strong></td>
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<tr>
<td>Submission/questions</td>
<td>Billy Mara</td>
</tr>
<tr>
<td>Registration Forms (submission/questions about registration)</td>
<td>Millie Agosto</td>
</tr>
<tr>
<td>Reimbursements (i.e., GMSSO, MD/PhD Student Organization)</td>
<td>Billy Mara</td>
</tr>
<tr>
<td>Schedules Appointments with Dr. Hyman</td>
<td>Danielle Simeone</td>
</tr>
<tr>
<td>Scholarship Coordinator (GSRF, Howard Hughes, Wotiz, etc.)</td>
<td>Dr. Hyman</td>
</tr>
<tr>
<td>Special Service Appointments</td>
<td>Dr. Park</td>
</tr>
<tr>
<td>Student Records (graduate)</td>
<td>Millie Agosto</td>
</tr>
</tbody>
</table>
| Student Accounting Issues | Sherill Ashe  
| Millie Agosto |
| Thesis/Dissertation – check for format before final submission | Millie Agosto  
| Dianna Puleo |
| Thesis/Dissertation – Submission of final signed versions for transmittal to Mugar Library | Millie Agosto  
| Dianna Puleo |
| Transfer of Credit Form (submission and evaluation) | Submit to Millie Agosto  
| Evaluated by Dr. Hyman |
| Transcript Requests | MD/PhD students have two transcripts—a medical school transcript and a graduate school transcript. On-line requests of graduate transcripts may be made via the student link (www.bu.edu/link). Medical School transcripts must be obtained from the Office of the Medical School Registrar. |
| Travel Awards (GMS) processes | Jerry Lavoie |
| award applications and reimbursements |

G. MD/PhD Executive Committee

The MD/PhD Executive Committee was established in 1996 to address program issues, student concerns, and to strive to continue to have a first-rate program. The Committee meets monthly and is composed of the Chair of the Committee, the Associate Provost of the Division of Graduate Medical Sciences, the Assistant Dean of MD/PhD Admissions, the MD/PhD Faculty Advisor, faculty representing all PhD programs, and two MD/PhD student representatives. Each student representative is elected by the entire MD/PhD student body, and serves a two-year term. It is expected that the student representatives will meet regularly with the Student Organizing Committee and to convey student concerns each month to the Executive Committee. Ex officio members of the Committee include the Dean of the School of Medicine, the Associate Dean of Student Affairs, the Dean of Medical School Admissions, as well as the Director of the Division of Graduate Medical Sciences.

The MD/PhD Admissions Committee, MD/PhD Faculty Advisor, and the Student Organizing Committee all report to the MD/PhD Executive Committee. In turn, the MD/PhD Executive Committee reports to the Steering Committee of the Division of Graduate Medical Sciences, a committee that is chaired by the Associate Provost of the Division and is composed of Department Chairs, Program Directors, and faculty elects.
The 2014-2015 MD/PhD Executive Committee is composed of the following members:

Karen Antman, MD, *ex officio* (Dean, School of Medicine)
Linda Hyman, PhD (Associate Provost, GMS)
David Atkinson, PhD (Biophysics and Physiology)
Peter Bergethon, MD (Anatomy & Neurobiology)
Marlene Oscar Berman, PhD (Behavioral Neuroscience)
Selwyn Broitman, PhD (Assistant Dean, M.D/PhD Admissions)
Herbert Cohen, MD (Molecular Medicine)
Ronald Corley, PhD (Microbiology)
David Farb, PhD, (Pharmacology and Experimental Therapeutics)
Stephanie Lee, MD, PhD (MD/PhD Faculty Advisor)
Mark Moss, PhD (Anatomy & Neurobiology)
Paul O’Bryan, PhD (Associate Dean for Student Affairs)
Douglas Rosene (Anatomy & Neurobiology)
David Seldin, MD, PhD (Molecular Medicine)
David Harris, PhD (Biochemistry)
Deborah Vaughan, PhD (Assistant Dean of Medical School Admissions)
Benjamin Wolozin, MD, PhD (MD/PhD Faculty Advisor)
James Galagan, PhD (Assistant Professor, Biomedical Engineering)
John H. Schwartz, MD, Executive Committee Chair (Molecular Medicine)
Billy Mara, *ex officio* (MD/PhD Administrative Coordinator)
Dr. Steven C. Borkan, (MD/PhD Advisor)
David Stepien, MD/PhD Student Representative (Year I of II)
Diane Chan, MD/PhD Student Representative (Year II of II)

H. MD/PhD Student Government:

Student governance of the MD/PhD programs is determined by a student constitution that has been approved by the Executive Committee. The MD/PhD students play a very active role in management of the MD/PhD programs. Students elect members for each committee yearly. There are three committees that manage student run affairs, the Student affairs committee, Seminar Committee and Retreat Committee. Students are also elected to serve as representatives for MD/PhD administrative committees. Committees that include elected representatives include the Executive Committee, the Admissions Committee and Student Committee on Medical School Affairs (SCOMSA).

**Student Committee Co-Chairs** - Ian Francis & Omar Mohtar

The Student Committee Co-chairs run the Student Committee meetings, facilitate the planning of the seminars, oversee elections and are generally responsible for forming and mediating a working relationship between administrators, advisors, and students.

**Admissions Committee Representatives** - Edward Kim & Nick Woolf
The MD/PhD Admissions Committee Representatives are responsible for attending Admissions Committee meetings and keeping the MD/PhD student body generally informed about admissions progress while maintaining applicant confidentiality.

**Executive Committee Representatives** – Jake Kantrowitz & Anjali Jacob

The MD/PhD Executive Committee Representatives are responsible for attending the MD/PhD Executive Committee Meetings both to recommend improvements to the program and to keep the MD/PhD student body generally informed about the issues raised during these meetings. They also work with the other elected and volunteer representatives to propose budgets for conferences and events to the MD/PhD Program Director for approval, while announcing relevant MD/PhD student conferences to the student body.

**I. Description of Program Financial Issues**

- **Deans Scholarship – Full MD/PhD Funding**

**J. Scholarships and Awards**

**Martin Luther King, Jr. Fellowship**

The Martin Luther King, Jr. Fellowship Selection Committee annually seeks nominations for this fellowship. Nominees must be African Americans and US citizens. Highest priority is given to students new to Boston University and beginning full-time graduate studies in any graduate of professional school of Boston University. Awards provide a scholarship for up to full-time tuition at the Graduate School of Arts and Sciences rate, plus the George Sherman Union Fee and a stipend for living expenses. The fellowship may be renewed for up to two additional years. The Admissions Committee makes nominations for this award at time of admission. Nominations are then forwarded to the Fellowship Selection Committee at the Charles River Campus for final selection.

**Boston University Women’s Council Scholarship**

Each year in February, full-time female graduate students are invited to apply for a BU Women’s Council Scholarship for the coming academic year. Applicants must be full-time, US citizens in the first year of graduate study. Scholarships are awarded on the basis of academic achievement and demonstrated financial need. Generally, applications are due mid-March. In addition to the scholarship application, the following supplementary information is required: undergraduate and graduate transcripts, personal statement, including, but not limited to, information about your academic pursuits, community, volunteer, and professional activities; and two letters of recommendation of no more than two pages in length. These may be academic or character references.

**Wotiz Family Fellowship**

Each year, tuition fellowships in the amount of $4,500 are awarded to MD/PhD students who will be entering the second year of the medical school curriculum. The awards are based upon academic record and achievement in scientific research. To apply, each July, students who will be entering BUSM II that fall are asked to submit a copy of their medical school transcript...
that includes all BUSM I grades and a one-page summary of their research efforts. Finalists may be invited for interviews.

**Karin Grunebaum Fellowship**

The Karin Grunebaum Cancer Research Foundation provides a fellowship program each year that provides one year of support to students pursuing cancer-related research (interpreted very broadly). The award must take place while the students are still actively engaged in the research portion of their training. Although the application deadline varies each year, to apply for the award, students are asked to submit a one-page summary describing the research program with a resume (include home address/telephone number, lab address/telephone number, e-mail address, Social Security number), and attach a letter of recommendation from your research sponsor. Applications are submitted to the Cancer Research Center, BUSM, K701, Attn: Grunebaum Fellowship Committee. Many of the MD/PhD students have been recipients of this award, and have presented their work to the BUSM Board of Trustees. It also is possible to apply for a second award.

**Competitive National Fellowships**

Students are encouraged to apply for federally funded individual pre-doctoral fellowships (see Appendix G, p. 72). These fellowships were developed to support the need for clinician scientists with medical training and research experience to investigate various problem, including environmentally relevant disease in humans; biomedical and behavioral research on human communication; neurological disorders; mental health, drug abuse and addiction; and alcohol abuse and alcoholism.

**Predoctoral Fellowship Awards for Minority Students**

Minority students are encouraged to apply for the NIH Predoctoral Fellowship Awards for Minority Students (F31) or the Ruth L. Kirchstein NRSA Program for NIGMS Marc Predoctoral Fellowships (see Appendix G, p. 72). The intent of the MARC Predoctoral Fellowship Program is to encourage students from minority groups underrepresented in the biomedical and behavioral sciences to seek graduate degrees, increasing the number of underrepresented scientists who are competitively trained to pursue careers in biomedical or behavioral research.

**NIH Predoctoral Fellowship Awards for Students with Disabilities (F31)**

The NRSA Predoctoral Fellowship for Students with Disabilities will provide up to five years of support leading to the PhD or MD/PhD in the biomedical or behavioral sciences. The intent of this fellowship program is to encourage students with disabilities to seek graduate degrees and thus further the goal of increasing the number of scientists with disabilities who are prepared to pursue careers in biomedical and behavioral research (see Appendix G, p. 72).

**Other Scholarships**

Other scholarships have become available for allocation to MD/PhD students to help defray the cost of the medical school tuition (i.e., Mehos, Carol Ann Najarian, and Tai
Fellowships). Generally and depending upon the amount of funding available for awards each year. These scholarships have been awarded to MD/PhD students who are in BUSM II.

**Graduate Student Research Fellowship**

Each year, the Division of Graduate Medical Sciences announces the annual Graduate Student Research Fellowship Program (GSRF). PhD and MD/PhD students may apply for funds to support their doctoral thesis research projects. Applications may be obtained from the Division Office. Multiple awards will be made each year and only one award will be made to any individual during her/his graduate training. Awards will be made for projects of scientific merit. BUSM pre-doctoral graduate students whose major thesis advisor is a member of the faculty at BUSM is eligible. Although applicants may apply for a GSRF before taking their qualifying exams, no awards can be administered until the qualifying examination has been successfully completed. Awards have ranged from $2,000 to $5,000.

**The Henry I. Russek Student Achievement Awards Program**

The Henry I. Russek Student Achievement Awards Program and scientific celebration is aimed at providing an environment of inspiration and encouragement for young research scientists who are an integral part of the Boston University Medical School community. Applications for this annual program are distributed in February for the April event each year. Up to eight first prize awards of $1500 and eight second prize awards of $500 will be given to PhD and MD/PhD students who have passed their qualifying exams and will normally be enrolled as of April that year in the Division of Graduate Medical Sciences. Up to two nominations will be made by committees consisting of at least three faculty members from each degree-granting department or program. The department or program may set their own standards for excellence.

Materials needed for application include: an abstract; personal statement describing your interests and future goals; letter(s) or recommendation from your research advisor or equivalent supervisor; copies of manuscripts in press or published; CV; and a copy of your graduate transcript

**K. Miscellaneous**

**Mailbox Assignments**

First-year students are assigned mailboxes through the Medical School. These stay with the student until the completion of the program.

**E-Mail Communications**

While you are in the medical school curriculum, to ensure that you receive all pertinent e-mail correspondence generated for your medical school class, please be sure you are registered for the appropriate list serve.

**To automatically receive all electronic notices designed for your class LISTSERV:**
Send an e-mail to: majordomo@bu.edu. In the body of the message, type the following one-line message (depending on your class):

**BUSM I**
subscribe busm-2015-list

**BUSM II**
subscribe busm-2014-list

**BUSM III**
subscribe busm-2013-list

**BUSM IV**
subscribe busm-2012-list

In addition, when you anticipate the completion of your PhD studies and return to the medical school curriculum, you should re-subscribe to the appropriate listserv (the list designated for the year of your expected graduation). It is important to do this so you will receive important correspondence about clerkship selections, class meetings, orientations, etc.

During your research years, GMS e-mail communications may be sent by Millie Agosto; Billy Mara, or directly from your department/program administrator.

**III. Study Sequence and Transitions during MD/PhD studies:**
See: [GMS MD/PhD Program Overview](#)
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IV. Detailed Chronological Description of Studies for MD/PhD Students

A. Summer before BUSM I

Before beginning your first year of medical school, we strongly encourage you to begin your research by doing a rotation in a laboratory. Rotating through laboratories before matriculation helps students to identify laboratories for their graduate research early in the program. This greatly facilitates transitioning into the graduate research phase of the program. This work can ultimately count to any rotation requirements in the particular division you choose. You also will get a chance to get to know the campus before the stress of 1st year med school begins. Choosing a lab for this and later rotations can be facilitated by the Division of Graduate Medical Studies office – so email Billy Mara directly for assistance wjmara@bu.edu. All students completing a summer rotation may earn a summer stipend for living expenses.

B. BUSM I (Med Year I)

BUSM I is the same for both MD and MD/PhD students with the exception of the Integrated Problems course. The MD/PhD students take this class together. While the format is the same as for MD students, this is generally led by a scientist, allowing for discussions to get more ‘nitty gritty’ into the science behind medicine.

During BUSM years I and II, MD/PhD students have the opportunity to take the Integrated Problems (IP) course in a 4-semester progression, the first two semesters in BUSM II as follows:

a. Semester I: MD/PhD students follow the IP format, but the cases are used as a springboard for preparing research proposals related to the scientific aspects of the case. Students report on the case and give short presentations outlining their research proposals. Students work through proposals focusing on clinical studies, biomedical imaging, and molecular genetics. Students learn how to utilize information databases available to scientists.

b. Semester II: Students continue to practice analyzing clinical aspects of the cases and designing research proposals. The focus for the second semester is to go beyond what is known. Students are asked to take their thinking beyond current literature, developing reasonable bench questions that could shed light on the medical cases.

C. Summer between BUSM I and BUSM II (Med Year I and II)

You should begin looking for labs to rotate in for this summer during the winter/spring of BUSM I. Lists of Faculty with ongoing research can be located on the website (Research Opportunities). Faculty are generally eager to have students in their labs, and are approachable by phone or email. While many students decide quickly which investigator they will work with, there is no rush. If you do not have a clear idea, you can learn about the research opportunities through a series of research presentations and seminars which take place during periodic Monday evening meetings. Students are encouraged to ask questions and e-mail professors for further information, from a composite list of the PIs, their lab research, and contact information, which
is given out to each student. A summer stipend is given to students for these lab rotations from the Division of Graduate Medical Sciences.

D. BUSM II (Med Year 2)

BUSM II is also the same for both MD and MD/PhD students with the exception of the Integrated Problems course, in which student will also write a mock research grant proposal.

Students continue to take the MD/PhD IP course sequence as follows:

a. Semester III (first semester of BUSM II) – ‘Bench to Bedside’ – Rather than cases, this semester’s problems begin with basic science observations, asking students to think divergently about how this observation applies to medical science. Like Semester II, the emphasis is on creative and logical thinking.

b. Semester IV (second semester of BUSM II) – The goal in this semester is to develop a student’s skills in finding fundable questions/studies, based upon a clinical or basic problem.

E. Choosing a Department or Program

Students must choose their department before the end of BUSM II. The department can be chosen before the laboratory is chosen. Choosing a department to do your PhD research in early is important to ensure that your stipend payment is in line for the upcoming year. Departmental administrators make financial projections for the coming year and need to know who will be in their department the summer before the academic year in order to solidify funding.

V. Chronological descriptions of decisions and advice for making them

The following sections provide insight from students and faculty about important decisions during MD/PhD training. Commentaries on choices an MD/PhD candidate must make are arranged chronologically based on the current curriculum. In addition, contact information for both faculty and students is provided at the end of the section.

Three important decisions when transitioning between MD and PhD years:

a. Choosing labs for rotations
b. Choosing department/program for thesis
c. Starting time for PhD

A. Choosing labs for rotations

Rotations play an important role in your PhD training so take your rotations seriously and make them count! Departments and programs differ in the number and duration of rotations required. In general, rotations are either 4-5, or 8-10 weeks long. The purpose of the rotation is to learn new techniques, to interact with people in the lab and to learn about their on-going projects. This will give you an opportunity to see how happy people are with their progress to date, see how people interact with each other in the lab, and find out the type of mentoring available to the students and the post-docs. It is a good idea to also get in touch with past and present students and post-docs, as well as students that just rotated through the lab before you.
Of course you should also see what projects are available that you might be able to work on for your thesis. It’s important to realize that a rotation project is not necessarily going to be your PhD thesis topic. It’s just a small set of finite experiments to allow you to become familiar with the lab and their interests, learn some new techniques, and to allow the P.I. to evaluate you as a potential student/scientist in his or her lab.

Remember, find a lab that is the right fit for you because these are the people you will be interacting with for the next 3-4 years of your scientific training. Your thesis project will always have its ups and downs, but your experience in the lab should not. A good working environment can play an important role in your happiness and productivity as a PhD student!

B. When to transition into the PhD years

In the BU MD/PhD program there is flexibility in when you initiate your graduate studies. Switching from the medical school to the graduate school is pivotal point in your scientific studies. The decision on whether to transition should depend on how far along you are in choosing your field of graduate study and thesis laboratory. In general, all students are advised to complete the entire BUSM I and II curriculum before transitioning to graduate school. This will allow a student to make an informed decision about their field of study. More information will be gathered by exposure to more of the faculty in the various departments through coursework, as well as through one-on-one discussions with faculty and students over the course of the two years.

Besides the issue of deciding a field of study, there are several practical considerations to the three main options as described below.

Practical considerations on when to begin your PhD work:

1) Traditional Program: enter PhD after 2 years of medical school

This transition option is traditionally a convenient stopping point for medical students and a logical time to shift toward basic science. The majority of MD/PhD programs in the country use this transition point. Upon completing two years of medical school, students following this path are strongly encouraged to take step 1 of the National Board Examination. This should not be left until ‘after’ your PhD. By completing the board exam upon completion of year 2 med school, the information learned will be fresher in your mind, and you will arguably have a better score than if you wait. Students who have not followed this advice find themselves in a tight crunch as they try to compress reviewing medical school year 1 and 2 curriculum while also trying to complete their thesis. The major requirement for this path is that your thesis project must be completed before June of the year you re-enroll in medical school in order to begin third year clinical rotations. Most students feel some anxiety when entering third year clinical rotations because they may feel a little rusty with their clinical skills after being in a lab for the past 3-4 years. Pre-clerkship mini-rotations can be arranged to help with this. Most students make this transition back to medical school without much difficulty.

2) Enter PhD after 1 year of medical school

If you have strong feelings about which lab you would prefer to conduct your thesis in and have made the arrangements, and after consultation with the program director, you may begin your graduate work after your first year of medical school. Usually most students who choose this path have had time to learn about different labs and graduate departments at Boston
University by doing a lab rotation during the summer before the first year of medical school, or from being at BU through the Seven Year Medical, MMEDIC, or MA in Medical Science Programs. An advantage considered by some students to beginning research “early” is that you can re-enter second year med school and take Step 1 of the Boards immediately prior to your clinical clerkships. Given that the Spring courses in BUSM II are in large part designed to prepare you for the clerkships, the immediate juxtaposition of BUSM II and III is considered an advantage by some students. The arguments against taking this option include 1) you won’t have completed two years of medical school, which in itself is an excellent education in Human biology and disease, and will help you to focus your thesis work toward biomedical research; 2) some second year med school courses are required by Departments for the PhD degree programs (e.g., Pharmacology), and so will be taken during graduate school. On re-entering medical school this will create some “down-time” during BUSM II.

Advice for the Ph.D. Years

1. Choosing a thesis lab and project

Although it is natural to dream that your thesis project will lead to a cure for cancer, don’t despair if like 99.9% of graduate students you make a much smaller contribution to science. The most important aspect of your project is to enhance your scientific perspective and therefore prepare you to conduct quality research independently (some day). Some considerations you may want to keep in mind when choosing a thesis project are the mentor and their lab environment, the techniques involved, your personal scientific interest, and the clinical relevance.

The mentor and their lab will serve as your primary resources during your research. It is therefore worthwhile to look into this individual’s background as well as the people they work with, such as the postdoctoral fellows, other students in the lab, and technical staff. In sum, you want to try to get a sense of the lab’s “pulse” and if the style by which this lab operates is a good fit for you.

The research techniques vary from lab to lab. Most graduate students have some previous research experience and can use these lab skills to help learn new more advanced techniques. This previous experience along with your class work will also help direct you toward techniques that align with your scientific interests. It is critical to try to gain a deep understanding on the underlying principles of the experiments you perform. This will help you select the most relevant experiments and also assist us in understanding the strategy behind other investigator’s work.

Your personal interests along with the clinical relevance of your thesis research should be considered as well. These aspects are not critical to your project because the ultimate goal of this training is to be able to formulate questions and design scientifically grounded strategies in which to address them. Therefore a less familiar thesis topic will require you to obtain background information and view this project as objectively as possible. However, being in the MD program prompts students to ask how this research will translate back to the bedside.

2. Managing the timely completion of the PhD

Unlike the PhD degree in isolation, you have chosen to wedge yours in the middle of med school. This puts a bit more pressure than usual on you and the environment you are in to manage your timely completion of doctoral training in order to arrive at the other end in synchrony with the particular med school section you left off with (see table, p. 18). The successful orchestration of timing is critical, and requires good planning and communication.
The Student:
Most students do not recognize that they are the most important determinant of the pace at which they progress through graduate school. There is a common emotional state attained on making the switch from ‘Med’ to ‘Grad’ that can be summed up by most students with the word: “Aaaahhh”, most often stated with their feet kicked up onto the desk, their hands behind their head, their eyes staring dreamingly out the window. The transition from the med school to the PhD years comes with a sense of freedom. For some students, this will be the first time in your life since you were in diapers where you have a prolonged period of time (years) where you are in (almost) complete control of how you spend your days. But remember - you were selected to this highly competitive program because you are a motivated overachiever. While you should kick your feet back and think a bit during you PhD, the key to completing your PhD in a reasonable period of time is to maintain your drive and ambition.

Some specific words of advice:
- When you are settled into a lab, work hard, think a lot, and interact a lot. Learn everything you can from the people around you. This will expand your mind not only scientifically, but also culturally, given the international nature of the biomedical research enterprise. The cross-cultural experience you gain here will also be a great asset on returning to your clinical clerkships at BUMC – an equally international arena.
- Chart your progress. Evaluate periodically what you have accomplished. A common experience for all in research is to feel like large blocks of time pass without progress. Charting your progress monthly will allow you to look back at your time and determine if that emotion is justified.
- Periodically review your progress (or lack thereof) with your thesis advisor. Don’t wait for thesis committee meetings as the only opportunity for this exercise.
- Set deadlines, even if they are rarely followed.
- Schedule your qualifying exams at the earliest possible time so that you can get them out of the way and focus on your dissertation research.
- Work with your advisor to identify your thesis committee and schedule the first committee meeting at the earliest possible time, so that you can use their expertise to help define your thesis early.

The Thesis Advisor:
Advising a graduate student is a large responsibility that requires time and commitment on the part of the advisor. Here are a few things to keep in mind when evaluating potential advisors:
- They need to understand your unique time constraints. MD/PhD students must re-enter medical school in synchrony with ongoing curriculum, whether they are in the ‘traditional’ (June) or ‘flexible’ (September or January) program. Both the advisor and student should recognize the inflexibility of these dates. Timing your thesis defense and your subsequent re-entry to the medical school curriculum requires forethought from all parties concerned (the student, the advisor and the thesis committee) because a small miss-step could set you back up to a whole year from your originally planned re-entry date. Make sure you and your advisor are both well aware of the significant dates and plan accordingly.
- **Note to the student: Your unique time constraints in no way means that your advisor or your thesis committee is responsible for “getting you out on time.” That is solely your responsibility. Completion of the PhD is dependent on the quality and quantity of your data, the
completeness of your project as a whole, and most importantly, your development as a scientist. You and your advisor must be on the same page when it comes to your project, your progress-to-date and setting up realistic goals and expectations. It is then the job of your advisor to help you in your project to stay focused on your goals so that you can finish on time.

--The time availability of your advisor depends a lot on your needs and expectations as a student. The key here is to be honest with yourself about your strengths and shortcomings. If you are the type of student who is fairly adept at picking up new techniques and can work fairly independently, but just needs more development as a critical thinker, then a relatively hands-off advisor would be great fit for you. However, if you are working in a fairly new field and would prefer to have more guidance in the beginning, or if you are the type of person that needs external deadlines to keep you productive and on track, then you would obviously select an advisor who would have more time and availability to meet with you.

--The advisor should be able to offer you stability and full financial support. This means that by taking you on as a PhD student, your advisor is aware of their responsibility to offer you a stable working environment, with the full intention of seeing you through your years as a trainee in their lab. In addition, by accepting you into their lab, they acknowledge that they have the ability to fully fund you for the duration of your time in the lab.

The GMS Office:
The GMS office needs to ‘stay in the loop’ so that you are properly registered, and your name is on all the right lists as you prepare for re-entry to med school. Each year during your graduate studies you will receive registration materials in October and March. You will need to submit a registration form, and scholarship voucher (obtained directly from your department/program administrator) for each semester. Registration deadlines are published in the yearly GMS Academic Planner. Also, of particular importance, the registrar Millie Agosto should know 6 months or more before your thesis defense about your plans for re-enrollment into med school. Please be sure to keep Millie informed of any address or telephone number changes!

1. Departmental requirements
   Outside of the thesis research, each department has curriculum requirements including courses and qualifying exams. These vary among departments. Current information available from the Department Chairs are provided in the Appendix.

2. Qualifying exams
   Try to initiate the qualifying examination process as soon as possible! The format of the qualifiers differs from one department to the next, so look into the requirements and possible exam dates as early as possible. In some cases, this may affect which classes you register for your 1st year of grad school. The sooner you finish your qualifying exams, the sooner you’ll be able to form your thesis committee.

3. Thesis committee
   Your thesis committee is formed after you have passed your qualifying exams. The professors on your committee are selected based on their expertise. The idea of the thesis committee is that it is there to help guide you and your project in the right direction, and therefore aid you in the timely completion of your thesis research.

Identifying and utilizing clinical experiences during graduate school

All MD/PhD students are encouraged to maintain some clinical contact during the PhD
years. While this is not required, the experience will add a new dimension to your PhD work, keep you in touch with clinical medicine, and add overall to your training as a future physician-scientist. There are infinite ways to do this at BUMC/BMC. A simple way is to attend clinical seminars and case presentations regularly, and read medical journals.

The second is to work on a regular basis with a physician in a clinical setting. MD/PhD students who are in the PhD program and wish to set up a clinical experience, should contact the faculty advisor they were assigned when they entered medical school, or contact the clinical advisor in their academy of advisors (effective 2005) and confer with their advisor about a clinical placement. So far most students have set up their own clinical placements that have been consonant with their research. For those who may wish to make a clinical contact in a different field however, their medical school advisor would be the most appropriate person to consult. If you do not remember who that person is, the Office of Student Affairs keeps those records. After you have this organized, contact the Associate Dean of Academic Affairs, Dr. Shawn Levine of your plans for approval. This is essential in order to assure proper malpractice insurance coverage for the student.

Immediately prior to returning to the clinical clerkships every student who took the ‘2-year option’ is strongly encouraged to take a clinical refresher rotation. This is implemented on an individual basis with a preceptor since there is a great deal of variability in the time that each student has to devote to this activity. Dr. Steven Borkan offers a non-credit rotation, usually in May or June when they can accommodate this, to prepare students for their return to a graded clinical curriculum.

The third opportunity is to take an elective Clinical-Scientist Clerkship for MD/PhD students to be completed during the PhD training. This clinical-scientist clerkship opportunity is available beginning in the 2006-2007 academic year with a duration of a cumulative clinical time of 4 weeks.

The Clinical-Scientist Clerkship was designed with the goal of helping students develop some clinical skills as well as provide them with real-life exposure to the world of the clinician-scientist. Following are the details of the Clinical-Scientist Clerkship:

M.D., Ph.D. Clinical Clerkship (Graduate School Phase)
Course #: GMS MD800 - A1
1. Students will begin their clinical clerkship when they feel that they are roughly 0.5 – 1.5 years from completing their thesis work.
   a. Students will contact Billy Mara, who will coordinate with Dr. Borkan and the medical school. Dr. Borkan will assist in finding an appropriate mentor.
   b. Students will receive credit for one elective rotation, if they do the full clerkship option.
2. Structure of clerkship
   a. Full clerkship: 4 weeks BUSM IV credit.
      i. The clerkship will consist of 40 half-day sessions.
      ii. 1 month after the clerkship commences students will visit OSCE for a standardized clinical experience to gauge their skills.
3. Interactions with Mentor
a. The mentor will be a BMC physician or a physician approved by the MD, PhD directors.
b. Students will interact with patients with the same privileges of 2nd year BUSM students.
c. Students will watch the mentor to see how the mentor interacts with the patients.
d. Students will interview patients to improve their patient communication skills. Students are allowed to be alone with the patient during the interview.
e. Students will pick one patient per afternoon for a detailed exam, under supervision of licensed staff. The exam will include:
   i. Chief complaint
   ii. History of Present Illness
   iii. Physical Exam
   iv. Assessment
   v. The student will present this patient to their mentor (~5 minute presentation) and receive feedback on their presentation.

4. Documentation (for Full and Half clerkships)
   a. The mentor should fill out and sign the clinical clerkship evaluation form.
   b. The student can request a written evaluation, to be sent to Billy Mara.
   c. Upon receipt of this material the graduate registrar will change the grade from incomplete to pass.

VI. MD/PhD Activities Throughout the Years

The MD/PhD Orientation and Retreat

The MD/PhD orientation is held in the middle of August. Activities for the day include a chance to meet the key BU leaders such as the Medical School Dean, Dr. Karen Antman, Associate Provost of the Division of Graduate Medical Sciences, Dr. Linda Hyman, in addition to the Director of the MD/PhD program, Dr. John Schwartz, and the MD/PhD advisers, Dr. Steven Borkan. During orientation, there are also introductions to individual departmental programs and the MD/PhD Student Government. Afterwards, the incoming MD/PhD students are invited to a social outing in Boston.

The MD/PhD retreat is held in late August or early September. The retreat schedule will include a poster session and presentations featuring current students, a guest speaker, student science presentations, and student clinical case presentations.

First year students are encouraged to come for this opportunity to meet with their fellow incoming classmates, as well as to solicit advice from the upperclassmen. Senior students will often attend to share their experiences with newer students. Most importantly, the MD/PhD retreat presents one of the best environments in which to bond with fellow students and research faculty.

VII. MD/PhD Student Service Opportunities

1. MD/PhD Admissions Representatives

There are 2 student representatives to the MD/PhD Admissions Committee. Student representatives participate fully in the application selection process. Each student representative is a voting member of the Admissions Committee and thus is required to review each application.
in its entirety. The Admissions Committee meets approximately eleven to twelve times each year with each meeting lasting from 60 to 90 minutes. In addition, the Admissions/Interview Coordinators are in charge of organizing and attending the interview sessions that are held from October to February of each academic year. This involves working closely with the GMS office to make sure visiting applicants have a place to stay, find their way around campus while visiting, receive a tour of campus, and most importantly have all their questions answered honestly. This position is an excellent way to be involved in the BUSM MD/PhD community as you meet all the prospective students and work closely with the faculty on the Admissions Committee in deciding what are the salient features of a successful MD/PhD.

2. MD/PhD Steering Committee Representative

MD/PhD Executive Steering Committee Representatives are responsible for attending the monthly meeting of the PhD Steering Committee. The representative gives a monthly report to the Executive Committee of student items and concerns, attend Student Organizing Committee meetings to keep students informed, as well as obtain student feedback. Due to confidentiality issues, these student representatives do not attend Executive Committee discussions and portions of the meetings when a student has requested to withdraw from the Program. Each representative is in the graduate years and holds a two-year term.

3. MD/PhD Student Seminar Committee

As MD/PhD Student Committee Seminar Chair/Coordinators these students are responsible for organizing seminars to address the interests and needs the BU MD/PhD student community. This position is the responsibility of people who volunteer/or are elected during the general Student Committee meeting. They target speakers (MD/PhDs) around the Boston community to share their professional and personal experiences. Topics addressed range from specific research for student rotation opportunities and enhancement of general scientific knowledge to exploration of career development and various pathways/opportunities for MD/PhDs. In addition to basic research issues, concerns about clinical training and specialty fields are discussed. In addition, the Coordinators also arrange Student Presentations, where current MD/PhD students have the chance to present their research or a case presentation to the group. These seminars serve as an additional resource for students as we develop into medical-scientists.

4. MD/PhD Social Committee

This committee meets regularly to discuss issues and plan student-run-event

APPENDIX A

SPECIFIC DEPARTMENTAL/PROGRAM REQUIREMENTS

MD/PhD Questionnaire
Anatomy and Neurobiology

1. What courses are required (and how many credits for each) for MD/PhD students starting their PhDs after one year, one and a half, and two years of Medical School?
28

First year of Medical School satisfies Department requirements -
Plus one department course: 
GMS AN 704 Experimental Design and Statistical methods, 2 credits

2. How many elective courses/credits are required (not including research credits?)

At least three graduate courses offered by the faculty of the Department

3. What are the research requirements (number of semesters, etc.)? Is there a publication requirement?

   a) Completion of a minimum of 36 course credits
   b) Publication not required at present

4. What is required for the qualifying examination? When is the qualifying exam taken?

   The qualifying exam is an authentic grant writing evaluation in which each candidate writes an NRSA grant for submission and evaluation, with an oral defense as the qualifying experience.

5. What are the requirements for advising meetings with Graduate Studies Director of Program, Advisor, and Dissertation Committee?

   a) A Research Committee
   b) Recommended to meet with Research Committee at least every six months, or more frequently

6. In addition to the 8-10 week rotation required by the MD/PhD Program (usually taken in the summer after BUSM I), how many laboratory rotations (and how long for each) are required outside of the thesis laboratory?

   No formal rotations required

7. What, if any, teaching requirements do you have?

   Yes, teaching is required in departmental courses

8. How does the training program develop oral research presentation skills? Is this a requirement of your program?

   a) Journal Club and teaching obligation
   b) Yes, this is a requirement

9. Are there any non-credit courses/seminars that students are required to attend? If so, please give details.

   a) Yes
   b) Department Seminars/Journal Club when not taken for credits
   c) Audit other graduate courses offered by the Department - not for credit
10. Are there any differences between these requirements and those for students enrolled as purely PhD candidates?

No

MD/PhD Questionnaire
Behavioral Neuroscience

1. What courses are required (and how many credits for each) for MD/PhD students starting their PhDs after one year, and two years of Medical School?

- Human Neuropsychology I (4 credits)
- Human Neuropsychology II (4 credits)
- Neuropsychological Assessment I (4 credits)
- Research (varies)
- Elementary Biostatistics or Biostatistics (4 credits)

2. How many elective courses/credits are required (not including research credits?)

Varies—depending on the student’s interests.

3. What are the research requirements (number of semesters, etc.)? Is there a publication requirement?

Minimum of four semesters. No publication requirement.

4. What is required for the qualifying examination? When is the qualifying exam taken?

Written and Oral Qualifying exams in five required specialty areas. The qualifying exams can be taken only after required courses are completed, usually in the 3rd graduate year in the Program.

5. What are the requirements for advising meetings with Graduate Studies Director of Program, Advisor, and Dissertation Committee?

As needed. Formal meetings are required prior to qualifying exams and prior to submission of the dissertation proposal.

6. In addition to the 8-10 week rotation required by the MD/PhD Program (usually taken in the summer after BUSM I), how many laboratory rotations (and how long for each) are required outside of the thesis laboratory?

As needed; depends on the student.

7. What, if any, teaching requirements do you have?

None, but TAs are available (as work without compensation).
8. How does the training program develop oral research presentation skills? Is this a requirement of your program?

Yes, the development of research presentation skills is required in our Program.

Oral presentations are required as part of the Qualifying Exam and prior to submission of the dissertation proposal. Another oral exam is required as the Final Dissertation defense. Additionally, throughout the graduate years, students are encouraged to submit posters/abstracts/papers to outside professional organizations and within BU (e.g., Henry I. Russek Student Achievement Day).

9. Are there any non-credit courses/seminars that students are required to attend? If so, please give details.

No non-credit courses are required, but students are encouraged to attend the Memory Disorders Research Center Colloquia, Neurobehavior Rounds, and meetings of the Society for Neurology and Psychiatry. Students are also advised to join societies such as the Mass. Neuropsychology Society, Society for Neuroscience, etc.

10. Are there any differences between these requirements and those for students enrolled as purely PhD candidates?

Yes. Additional courses are required for Ph.D. students (e.g., Neurosciences, and Neuroanatomy).

MD/PhD Questionnaire
Biochemistry

1. What courses are required (and how many credits for each) for MD/PhD students starting their PhDs after one year, and two years of Medical School?
GMS MS 753 Cell Biology (4 credits)
GMS BI 782 Molecular Biology (4 credits)
GMS BI 854 Biochemistry Seminar (2 credits)
GMS BI 759 Integrative Biochemistry (4 credits)
GMS MS 700 or GMS MS 570 Biostatistics (2 credits)

2. How many elective courses/credits are required (not including research credits?)
One elective advanced course (2 credits) is required. This elective course can be chosen from a list of courses offered by the Department of Biochemistry or, upon approval of the Student Affairs Committee, a related course in another department within the Division of Graduate Medical Sciences can be substituted.

3. What are the research requirements (number of semesters, etc.)? Is there a publication requirement?
All graduate students within the Department of Biochemistry are required to maintain a research program that will eventually lead to the dissertation. The research advisor and the Thesis Advisory Committee will judge an acceptable research program. There is no specific publication requirement but all students are encouraged to publish their results.
4. What is required for the qualifying examination? When is the qualifying exam taken?
All Ph.D. candidates will take the Qualifying Exam in 2 parts:
   1) The written examination emphasizes basic biochemistry.
   2) The oral examination emphasizes advanced knowledge of biochemistry and its
      application to research problems. An Examination Committee comprised of Department faculty
      will give individual oral examinations to each student.

M.D./Ph.D. students who enter after their first or second year of medical school will be required
to take both the written and oral examinations at the end of their first year of residence within the
Department of Biochemistry.

5. What are the requirements for advising meetings with Graduate Studies Director of
Program, Advisor, and Dissertation Committee?
The role of the Thesis Advisory Committee is to advise the student and to assess his/her progress
throughout the research component of the program. Ultimately, the Thesis Advisory Committee
will be responsible for determining the acceptability of the candidate’s research. Within 6
months of successful completion of course work and the qualifying examinations, a student, in
collaboration with his/her research advisor and the Student Affairs Committee, will set up a
Thesis Advisory Committee. The Thesis Advisory Committee will meet annually with the
student (or more frequently if determined by the Thesis Advisory Committee). In preparation for
the first committee meeting, the student is required to prepare a formal written research proposal
detailing the Background, Objectives, Specific Aims, and Experimental Approaches of the
dissertation.

For all additional Thesis Advisory Committee meetings, the student will submit a brief written
summary of the research accomplished and planned. The final meeting of the Thesis Advisory
Committee will be to formally approve the student for writing the dissertation.

6. In addition to the 8-10 week rotation required by the MD/PhD Program (usually taken in
the summer after BUSM I), how many laboratory rotations (and how long for each) are
required outside of the thesis laboratory?
Students are required to conduct 2 laboratory rotations prior to deciding on a research advisor.

7. What, if any, teaching requirements do you have?
We have no teaching requirements.

8. How does the training program develop oral research presentation skills? Is this a
requirement of your program?
All students are present orally during some of the courses (Cell Biology, Molecular Biology,
Biochemistry Seminar). Moreover, the students give oral presentations to their Thesis Advisory
Committee at least once per year and the dissertation defense includes a seminar. In addition,
most lab groups meet to discuss progress and different formats, some more formal than others,
are adopted for this. Lastly, many students have the opportunity to present at scientific
conferences.

9. Are there any non-credit courses/seminars that students are required to attend? If so,
please give details.
All students are required to attend our departmental seminars.
10. Are there any differences between these requirements and those for students enrolled as purely PhD candidates?
There are some differences in coursework depending upon whether the student is enrolled in the Ph.D. program in the Department of Biochemistry or the Cell and Molecular Biology Program.

**MD/PhD Questionnaire**

**Department/Program: Biomedical Engineering**

The graduate program in Biomedical Engineering at Boston University is one of the handful of elite programs in the country, as evidenced by the fact that we are one of only three program to receive the Whitaker Foundation's highest honor, the Leadership Award. This is the largest, and one of the highest-ranked, BME departments in the country. The Department has 31 primary faculty, all of whom have active labs with significant research funding, which also makes this the most scientifically diverse program, with a broad array of different research opportunities for doctoral candidates. A large number of adjunct faculty add a broad range of additional research opportunities. Students are advised to browse the faculty web pages, accessible through http://www.bu.edu/bme/

MD/PhD candidates interested in Biomedical Engineering for their PhD should have a strong math background, including multivariate calculus, differential equations and linear algebra, as well as basic undergraduate courses in physics and chemistry, and an interest in a quantitative approach to biomedical research. An undergraduate degree in engineering, physics or chemistry is generally preferred.

BME students in the MD/PhD program obtain their training in biology at the School of Medicine, and thus are excused from taking BE 505 and BE 706. Medical school courses can be counted for two of the four required courses beyond the Core Curriculum. Total Credits: 48 credits.

1. What courses are required (and how many credits for each) for MD/PhD students starting their PhDs after one year, one and a half, and two years of Medical School?

Regardless of how many years of Medical School:

**All New Graduate Students:**
BE 790 *Biomedical Engineering Seminar* (0 credits)

**During the semester that a PhD candidate is a Teaching Fellow:**
SC 850 *Graduate Teaching Seminar* (2 credits) NOTE: GTFs are limited to registering for a total of no more than 10 credits.

**Core curriculum - MD/PhD students have course requirements similar to Post-M.S. Ph.D. Students:**

* BE 505 *Molecular Bioengineering I*. MD/PhD candidates generally receive equivalency waiver for this course because they have had prior coursework that overlaps substantially with this material, albeit less quantitative.

* BE 706 *Quantitative Physiology for Engineers*. As above, MD/PhD candidates generally receive equivalency waiver for this course because they have had prior coursework that overlaps
substantially with this material, albeit less quantitative.

* Two courses from the four other BME core-curriculum courses. Students should take these courses in the first year, to prepare for the BME qualifying exam. The four options are BE 703 (Numerical Models and Methods in BME, taught in fall); BE 567 (Nonlinear Systems in BME, fall); BE 506 (Molecular Bioengineering II, spring); and BE 747 (Advanced Signals and Systems for BME, spring). These courses are offered every academic year.

**Elective courses and research credits:**
* Three technical electives (at least two from BME). MD/PhD students often receive equivalency credit for one electives, depending on their med school coursework.

* Research-credit courses (BE 900 Research). A minimum of 8 research credits (BE 900) are required for Post-Master’s Ph.D. and MD/PhD students. These are easily fulfilled during the student’s dissertation research.

* In total, MD/Ph.D. students must complete 32 credits (formal courses plus research credits) at BU.

2. How many elective courses/credits are required (not including research credits?)

see above

3. What are the research requirements (number of semesters, etc.)? Is there a publication requirement?

See above. No publication requirement other than the PhD dissertation.

4. What is required for the qualifying examination? When is the qualifying exam taken?

**Two qualifying exams:**

**Applied Mathematics Ph.D. Qualifying Examination** – This examination is administered twice each year, in January and April/May, by the College of Engineering Graduate Committee. Students have two chances to pass this exam and are required by the College of Engineering to pass four sections of the exam by the end of their 2nd semester (on the Charles River Campus). Once a given section is passed, the student is not required to re-take it. At the discretion of the BME Departmental Graduate Committee, students may allowed to gain credit for 1-2 failed sections by taking (and passing) classes from a specified list.

In this examination, students must select questions from four of the following areas:
1. Fourier Series and Fourier Transforms
2. Ordinary differential equations
3. Linear algebra
4. Vector analysis
5. Partial differential equations
6. Complex variables and series
7. Probability and statistics
8. Discrete mathematics
9. Algorithms
Copies of previous math examinations may be obtained from the College Graduate Office, MEB 204 (48 Cumington St).

The BME Ph.D. Qualifying Examinations – Students must demonstrate basic understanding of their core curriculum and that they have an appropriate level of preparation for doctoral research, by passing the BME Qualifying Examination. The Oral Qualifying Examination is taken during the summer (May – August) following the first academic year in the graduate program. It is preferred that this be done during the first half of the summer. Material in the BME qualifier is tied to the core curriculum. All students are tested in Molecular Bioengineering and Quantitative Physiology, and choose two additional topics from among the four optional core courses. The qualifier exam is meant to assess the student’s ability to integrate fundamental knowledge from these courses, rather than as a “second final exam” in each topic, and they will be expected to understand how that knowledge relates to their chosen area of research. The department will provide guidance to the students to help in preparing for the qualifier exam. Results from the BME qualifier are evaluated by the BME Graduate Committee. In the event that a student fails all or part of the exam, potential outcomes include remedial coursework; a repeat oral exam on all or part of the material; or, in extreme cases, removal from the Ph.D. program.

5. What are the requirements for advising meetings with Graduate Studies Director of Program, Advisor, and Dissertation Committee?

Each student is initially assigned an academic advisor who advises on course selection and approves registration. Student and advisor are expected to meet at least twice per semester. After the first academic year, when the student has settled in the research lab of a specific professor, the research advisor, that professor typically also becomes the academic advisor (unless the research advisor is not a member of the primary BME faculty). It is assumed that students meet regularly (at least weekly) with their research advisors. The Associate Chair for Graduate Studies, and any member of the Graduate Committee, are always available for consultation regarding any matter of concern to graduate students.

6. In addition to the 8-10 week rotation required by the MD/PhD Program (usually taken in the summer after BUSM I), how many laboratory rotations (and how long for each) are required outside of the thesis laboratory?

Students are expected to do three lab rotations during their first year in BME. If they have chosen a lab for their dissertation research by the second rotation, the third rotation may be waived.

7. What, if any, teaching requirements do you have?

All PhD candidates in BME are assigned as Teaching Fellows for one semester, during either the second or third semester of their PhD program.

8. How does the training program develop oral research presentation skills? Is this a requirement of your program?

In addition to the oral Qualifier Exam, PhD candidates also must do an oral Prospectus Defense by their 5th semester, and the final oral Dissertation Defense. All PhD candidates are strongly encouraged to participate in the NIH trainee Journal Club, in which the students take turns presenting discussion of recent research publications. Additionally, PhD candidates are strongly
urged to attend national and international conferences and present their research accomplishments. (Support is typically available to the student for conference travel.)

9. Are there any non-credit courses/seminars that students are required to attend? If so, please give details.

Yes. BE 790. (See details in Item 1 above.)

10. Are there any differences between these requirements and those for students enrolled as purely PhD candidates?

There are differences in the course requirements as described under item 1.

MD/PhD Questionnaire

Department/Program: Biophysics (Department of Physiology & Biophysics)

1. What courses are required (and how many credits for each) for MD/PhD students starting their PhDs after one year, and two years of Medical School?

   1 year or 2 years:
   - GMS MS735 Cell Biology, 4 cr
   - GMS BY 771 Macromolecular Assemblies, 4 cr
   - GMS BY 760 Foundations of Biophysics and Structural Biology, 4 cr
   - 2 semesters of GMS BY 871 Biophysics Seminar

2. How many elective courses/credits are required (not including research credits?)

   A minimum of 12 course credits beyond those accrued in medical school are required.

3. What are the research requirements (number of semesters, etc.)? Is there a publication requirement?

   Students generally do research and course work for 2-3 years in the Department. While there is no strict requirement for publication to graduate, students are expected to have performed and documented in their thesis scientific research of publishable quality.

4. What is required for the qualifying examination? When is the qualifying exam taken?

   The qualifying exam is usually taken in the spring at the end of the second semester that the MD/PhD student is in the Department. The qualifying exam consists of two parts: 1) A written Qualifying Examination with four thought questions that span topics in Biophysics, Physiology, Biochemistry and Cell Biology. Each student chooses and answers four of the eight questions in four hours. 2) An oral examination where the student is assigned 3 current research papers to read and is subsequently tested on their understanding of the material in front of an examining committee. This committee is comprised of 5 Program Faculty members. Papers are chosen by the committee and given to the students 2 weeks in advance of the oral examination. Thesis Advisors will not participate in the oral defense of students who are pursuing an MD/Ph.D. in their laboratory. Both the written and oral portion of the qualifying exam must be passed in order
for a student to continue in the MD/PhD program. Students who fail either the oral or the written portion of the exam (or both) can retake that portion of the exam once in order to achieve a passing score.

5. What are the requirements for advising meetings with Graduate Studies Director of Program, Advisor, and Dissertation Committee?

Students form a thesis advisory committee shortly after passing the qualifying exam. The committee meets annually.

6. In addition to the 8-10 week rotation required by the MD/PhD Program (usually taken in the summer after BUSM I), how many laboratory rotations (and how long for each) are required outside of the thesis laboratory?

None are required, but student usually do at least one additional rotation

7. What, if any, teaching requirements do you have?

None

8. How does the training program develop oral research presentation skills? Is this a requirement of your program?

MD/PhD students are required to take two semesters of the Biophysics Seminar course where students read papers and present them to their peers with one faculty advisor as well as attend the weekly Physiology & Biophysics seminar series. After completion of the PhD qualifying exam, students are required to present a short research talk to the Department annually, and to present posters the annual Physiology & Biophysics retreat and at the Henry I Russek Student Achievement Day.

9. Are there any non-credit courses/seminars that students are required to attend? If so, please give details.

No

10. Are there any differences between these requirements and those for students enrolled as purely PhD candidates?

No

MD/PhD Questionnaire
Department/Program: Cell and Molecular Biology

1. What courses are required (and how many credits for each) for MD/PhD students starting their PhDs after one year, one and a half, and two years of Medical School?

Critical Thinking – 2 credits
Molecular Biology – 4
Cell Biology – 4 credits
Biochemistry – 4 credits
Mini Course – 2 credits

2. How many elective courses/credits are required (not including research credits?)

Departments track

3. What are the research requirements (number of semesters, etc.)? Is there a publication requirement?

Depends on department. Aim for two publications.

4. What is required for the qualifying examination? When is the qualifying exam taken?

Depends on department.

5. What are the requirements for advising meetings with Graduate Studies Director of Program, Advisor, and Dissertation Committee?

Must have 3 for CMB Program and depends on departmental requirements.

6. In addition to the 8-10 week rotation required by the MD/PhD Program (usually taken in the summer after BUSM I), how many laboratory rotations (and how long for each) are required outside of the thesis laboratory?

Depends on department. I tell the students to do 2 in total.

7. What, if any, teaching requirements do you have?

Depends on department

8. How does the training program develop oral research presentation skills? Is this a requirement of your program?

CMB rotations require oral presentation. Critical Thinking course requires oral presentation skills.

9. Are there any non-credit courses/seminars that students are required to attend? If so, please give details.

First-year students are required to attend student lab rotation presentations. Students are requested to attend advanced graduate student talks (3 per year).

10. Are there any differences between these requirements and those for students enrolled as purely PhD candidates?

No, the PhD and MD/PhD tracks are very similar for students.
MD/PhD Questionnaire
Department/Program: Medical Nutrition Sciences

1. What courses are required (and how many credits for each) for MD/PhD students starting their PhDs after one year, one and a half, and two years of Medical School?

First year students have typically done a summer research internship on a topic of their choice with a faculty mentor.

After second year, students matriculate in the full program. We require 32 credits, 26 required (GMS NU 600 [Medical Nutrition Sciences (MNS) 4 cr.], 610 [Research Methods in MNS 4 cr.] , 620 [Clinical and Public Policy Applications in MNS 4 cr.] , 700 [Nutrition and Preventive Medicine Seminar 4 cr. Total, four semesters required], 710 [Advanced Research Methods in MNS 4 cr.] and 902/902 [Dissertation 4 cr.] and GMS MS 700 or equivalent [Statistics 2 cr.].

2. How many elective courses/credits are required (not including research credits?)

6 credits maximum electives are allowed.

3. What are the research requirements (number of semesters, etc.)? Is there a publication requirement?

No explicit research semester requirement. It is expected that students can complete the program in three years of full-time study and, of this, that the research would take about 18-24 months or longer depending upon when it commences.

4. What is required for the qualifying examination? When is the qualifying exam taken?

The written qualifying examination is a comprehensive held over two days. The oral qualifying examination covers the dissertation proposal and area of proposed research.

5. What are the requirements for advising meetings with Graduate Studies Director of Program, Advisor, and Dissertation Committee?

Student status is updated every 6 months by the faculty. Otherwise, it is expected that the students are meeting with their faculty advisor regularly (monthly) and that, once the research commences, that they are working directly with their mentor on a weekly if not daily basis. Dissertation committees meet at a minimum of every three to six months but may meet more often depending on the stage of the research.

6. In addition to the 8-10 week rotation required by the MD/PhD Program (usually taken in the summer after BUSM I), how many laboratory rotations (and how long for each) are required outside of the thesis laboratory?

Our program does not require a lab rotation outside of formal class activities since our dissertations may be basic sciences in nature but also clinical, epidemiological, or applied research of some other nature.
7. What, if any, teaching requirements do you have?

Require TA for at least two semesters.

8. How does the training program develop oral research presentation skills? Is this a requirement of your program?

Our required seminar in nutrition and preventive medicine (GMS NU 700), which doctoral students participate in at least four semesters, develops critical inquiry as well as written and oral communications skills.

9. Are there any non-credit courses/seminars that students are required to attend? If so, please give details.

No

10. Are there any differences between these requirements and those for students enrolled as purely PhD candidates?

No, except for the summer research internship after the first year of medical school.

MD/PhD Questionnaire
Department/Program: Genetics and Genomics

1. What courses are required (and how many credits for each) for MD/PhD students starting their PhDs after one year, and two years of Medical School?

   Year One, Fall Semester
   1. Principles of Genetics and Genomics, GMS GE 701, 4 cr
   2. Cell Biology, GMS MS 753, 4 cr

   Year One, Spring Semester
   1. Advanced Topics in Genetics and Genomics, GMS GE 702, 4 cr
   2. Molecular Biology, GMS BI 782, 4 cr
   3. Critical Thinking in Genetics and Genomics, GMS GE 705, 2 cr

   Year Two, Fall Semester
   Genetics and Genomics Colloquium I, GE 703, 2 cr

   Year Two, Spring Semester
   Genetics and Genomics Colloquium II, GE 704, 2 cr
   Ethico-Legal Issues in Bioscience, MS 610, 4 cr

2. How many elective courses/credits are required (not including research credits?)

   Elective courses: no additional electives required.
3. What are the research requirements (number of semesters, etc.)? Is there a publication requirement?

An complete body of work that is of publication quality

4. What is required for the qualifying examination? When is the qualifying exam taken?

After the second year of PhD study, a qualifying exam is taken composed of a written dissertation proposal, a written paper critique, and oral defense of these documents.

5. What are the requirements for advising meetings with Graduate Studies Director of Program, Advisor, and Dissertation Committee?

Annual dissertation committee meetings; other meetings are determined on a case-by-case basis.

6. In addition to the 8-10 week rotation required by the MD/PhD Program (usually taken in the summer after BUSM I), how many laboratory rotations (and how long for each) are required outside of the thesis laboratory?

Two to three rotations total, one of which is in the dissertation laboratory.

7. What, if any, teaching requirements do you have?

Teaching assistant for a single course, either a PhD or MD program course.

8. How does the training program develop oral research presentation skills? Is this a requirement of your program?

We do this formally with our two-semester colloquium courses and informally in a trainee seminar series.

9. Are there any non-credit courses/seminars that students are required to attend? If so, please give details.

Genome Science Institute seminars: guest speakers, internal speakers, and trainees Responsible Conduct of Research seminars

10. Are there any differences between these requirements and those for students enrolled as purely PhD candidates?

The rotation requirement and elective requirements are reduced for MD-PhD candidates, but the rest of the requirements are the same.

MD/PhD Questionnaire
Department/Program: Microbiology, Microbiology/Immunology

1. What courses are required (and how many credits for each) for MD/PhD students starting their PhDs after one year, and two years of Medical School?
The requirements vary depending on whether the student is entering into the Host-Pathogen Interactions track or the Immunology Track.

HPI students must take Concepts in Microbiology (MI700, 4 cr); Immunological Basis of Disease (MI715, 2 cr), Infection and Immunity (MM705, 2 cr).

ITP students must take Comprehensive Immunology (MI713, 4 cr); Immunological Basis of Disease (MI715, 4 cr)

Note: MI715 is a variable credit course. The 2 cr version is given over 6 weeks. The 4 cr version includes 6 weeks of MI715 and 6 weeks of MM705.

2. How many elective courses/credits are required (not including research credits?)

8 cr

3. What are the research requirements (number of semesters, etc.)? Is there a publication requirement?

Students are required to complete a sufficient body of research, as determined by their dissertation advisory committee, that will allow them to write a PhD dissertation.

There are no publication requirements but publication in peer-reviewed journals is strongly encouraged.

4. What is required for the qualifying examination? When is the qualifying exam taken?

The qualifying exam requires the student, based on their reading of the literature, to identify a significant scientific question that is unrelated to their proposed dissertation research. They are expected to develop a scientific hypothesis and write a 10 page, NIH-style proposal designed to test this hypothesis. The proposal will be evaluated by the exam committee and constitutes the written component of the exam. The student will then defend the proposal in the oral component of the exam.

The exam is typically taken at the end of the first year of PhD studies.

5. What are the requirements for advising meetings with Graduate Studies Director of Program, Advisor, and Dissertation Committee?

Students are required to meet with the Graduate Studies Director at least once per semester but are encouraged to meet with the Director at other times if necessary. Students typically meet with their dissertation advisors daily and with their dissertation advisory committees 2 times per year.

6. In addition to the 8-10 week rotation required by the MD/PhD Program (usually taken in the summer after BUSM I), how many laboratory rotations (and how long for each) are required outside of the thesis laboratory?
At least one additional rotation is expected that lasts ~10 weeks.

7. What, if any, teaching requirements do you have?

All students are expected to serve as a teaching assistant at least once in the MS 211 Medical Microbiology Course.

8. How does the training program develop oral research presentation skills? Is this a requirement of your program?

Students are required to present a research paper discussion at least once per year in journal club. They are also required to present an annual research seminar to the Department.

9. Are there any non-credit courses/seminars that students are required to attend? If so, please give details.

Students in the HPI are required to attend the HPI/Infectious Diseases seminar series on Mondays at noon. Students in the ITP are required to attend the ITP seminar series on Wednesdays at noon. Students in Microbiology are strongly encouraged to attend both seminar series.

10. Are there any differences between these requirements and those for students enrolled as purely PhD candidates?

No

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MD/PhD Questionnaire
Department/Program: Molecular Medicine

1. What courses are required (and how many credits for each) for MD/PhD students starting their PhDs after one year, and two years of Medical School? Three of these four:

MM701 Genetics and Disorders (2 credits)
MM703 Cancer Biology and Genetics (2 credits)
MM707 Organ System Diseases (2 credits)
MM705 Emerging Infectious Diseases (2 credits)
AND
MM710 Molecules to Molecular Therapeutics (4 credits)

2. How many elective courses/credits are required (not including research credits?)

MD/PhD students are required to fulfill 10 credits as above plus 4 elective credits.

3. What are the research requirements (number of semesters, etc.)? Is there a publication requirement?

No set requirement.
Publications are strongly encouraged but not required

4. What is required for the qualifying examination? When is the qualifying exam taken?

A mock grant proposal outside of thesis area of research, taken after courses are completed. Typically summer/fall after 1st grad yr for MDPHs.

5. What are the requirements for advising meetings with Graduate Studies Director of Program, Advisor, and Dissertation Committee?

Typically every semester/twice a year for all of the above.

6. In addition to the 8-10 week rotation required by the MD/PhD Program (usually taken in the summer after BUSM I), how many laboratory rotations (and how long for each) are required outside of the thesis laboratory?

Three rotations are required, but may be reduced with previous research experience for MDPHs.

7. What, if any, teaching requirements do you have?

There are no teaching requirements for GPMM

8. How does the training program develop oral research presentation skills? Is this a requirement of your program?

Journal club presentations, annual presentations on research for advanced students, poster presentations at Evans and Russek Days are all required.

9. Are there any non-credit courses/seminars that students are required to attend? If so, please give details.

Journal Club is held every Friday at 3PM in X715. GPMM students are required to attend this and Responsible Conduct of Research training.

10. Are there any differences between these requirements and those for students enrolled as purely PhD candidates?

No

MD/PhD Questionnaire
Department/Program: Pathology

1. What courses are required (and how many credits for each) for MD/PhD students starting their PhDs after one year, and two years of Medical School?

Please see below:
2. How many elective courses/credits are required (not including research credits?)

This depends on whether students enroll in Pathology, Path-ITP, Path-CMB, or Path-Neuro track (24, 30, 36, and 30 total course / elective credits respectively). Please see table above.

3. What are the research requirements (number of semesters, etc.)? Is there a publication requirement?

The number of research credits required depends on whether students are enrolled in Pathology, Path-ITP, Path-CMB, or Path-Neuro track. Lab research (or course) credits cannot exceed 10 per semester.
Typically students will require 3 years to procure the required number of research credits.
A minimum of two first author manuscripts is expected for a student to defend.

4. What is required for the qualifying examination? When is the qualifying exam taken?

BUSM Department of Pathology and Laboratory Medicine
Qualifying Examination for PhD Candidates.

Pathology PhD graduate students are eligible to take this compulsory examination after successfully completing the required course work. This will typically take place at the end of 2nd year for the PhD students and at the end of third year for the MD-PhD students.
There are two exam periods each year: January-February and May-June
The qualifying examination has two parts:

1. **Written (computer typed) examination. Length 6-8 hours.**
   Morning and afternoon sessions consisting of essay type questions based on pathology course work, directed readings, critique of selected publications, experimental design and evaluation of pathology seminars. These study instructions are provided by the individual members of the examination committee no more than two months prior to the examination. The students are responsible for contacting the committee members. At least one sample question will be provided by each committee member to the student. Within 48 hours of the written exam, all committee members will review the written answers and provide an evaluation to the qualifying committee chair. After reviewing the individual evaluations, the committee chair will make an overall recommendation (pass/fail/conditional pass) which will be communicated to the student. Examiners are also encouraged to provide students with specific feedback regarding the written exam.
   Upon passing the written exam, students will proceed to the oral examination which will take place 7-10 days after the written part.

2. **Oral examination. Length 1 ½ - 2 hours.**
   Students will present a 10 to 15 minute summary of their thesis/grant proposal and be prepared to describe and discuss: (i) Background and Significance (ii) Rationale (iii) Hypotheses to be Tested (iv) Research Design (v) Anticipated Results and Future Directions. Typically, the Research Design will comprise three Specific Aims which are complimentary but not inter-dependent.
   At least one week prior to the oral exam candidates should provide all committee members with a brief (2-3 pages) written proposal which specifically addresses (i)-(v) above.
   The choice of presenting either a grant or thesis proposal will be guided by the major advisor and may include preliminary results.
   The candidates are expected to demonstrate their understanding of the scientific concepts in the proposed research area and critically analyze any preliminary results obtained. Familiarity with the relevant literature is expected.

Exam evaluation: **pass/fail/conditional pass.** In the event of a conditional pass, the examining committee will define the appropriate corrective steps and a time frame for completing these steps.
After passing the qualifying examination the graduate student will proceed with selection of his/her thesis committee.

5. **What are the requirements for advising meetings with Graduate Studies Director of Program, Advisor, and Dissertation Committee?**

Director of Graduate Studies monitors progress of all students. DGS meets periodically with all students to offers advice with choice of courses (for electives), selection of lab rotations and final selection of thesis lab.
6. In addition to the 8-10 week rotation required by the MD/PhD Program (usually taken in the summer after BUSM I), how many laboratory rotations (and how long for each) are required outside of the thesis laboratory?

Typically at least 3 rotations are recommended.

7. What, if any, teaching requirements do you have?

No formal requirement.

8. How does the training program develop oral research presentation skills? Is this a requirement of your program?

Attending and giving Departmental seminars is mandatory. Additionally, most laboratories gain experience in public speaking by presenting their research regularly in lab meetings.

9. Are there any non-credit courses/seminars that students are required to attend? If so, please give details.

Responsible conduct in research is mandatory.

10. Are there any differences between these requirements and those for students enrolled as purely PhD candidates?

No.

MD/PhD Questionnaire
Department/Program: Pharmacology

1. What courses are required (and how many credits for each) for MD/PhD students starting their PhDs after one year, and two years of Medical School?

For students starting after one year of the M.D. program the requirements are Molecular Neurobiology and Pharmacology (4 cr), Advanced General Pharmacology (2 cr) and Current Topics (2 cr). For students starting after two years of the M.D. program the requirements are Molecular Neurobiology and Pharmacology (4 cr) and Current Topics (2 cr).

2. How many elective courses/credits are required (not including research credits?)

Four credits of advanced (800 level) electives in pharmacology or electives in other biomedical sciences.

3. What are the research requirements (number of semesters, etc.)? Is there a publication requirement?

There is no requirement as to number of semesters, although usually a minimum training period is three years. Generally, students are expected to publish at least one first-authored paper in a peer-reviewed journal.
4. What is required for the qualifying examination? When is the qualifying exam taken?

The qualifying examination for Ph.D. candidates consists of a written and oral examination. MD/PhD students are expected to take the qualifying exam no later than the end of the first PhD year.

5. What are the requirements for advising meetings with Graduate Studies Director of Program, Advisor, and Dissertation Committee?

MD/PhD students choose a Boston University faculty member as advisor for the dissertation research project, preferably after two rotations and before matriculating into the PhD program. The student is expected to meet regularly with the advisor and once each semester with the Program Director. The student and advisor designate a Dissertation Advisory Committee with the approval of the department chairman, after the qualifying exam has been passed. The student then must meet each semester with the committee to update progress on the dissertation research.

6. In addition to the 8-10 week rotation required by the MD/PhD Program (usually taken in the summer after BUSM I), how many laboratory rotations (and how long for each) are required outside of the thesis laboratory?

Students are strongly encouraged to complete two laboratory rotations in total prior to selecting a dissertation advisor.

7. What, if any, teaching requirements do you have?

There are no requirements, but MD/PhD students are strongly encouraged to participate as tutors in the BUSM II Disease and Therapy course and help in the pharmacology-related discussion sessions in that course.

8. How does the training program develop oral research presentation skills? Is this a requirement of your program?

Yes, these skills are developed through presentations in the Molecular Neurobiology and Pharmacology and Current Topics courses, in laboratory meetings and through the required departmental Progress Report Seminar and Dissertation Defense Seminar. In addition, students practice research presentations through the student-run Graduate Student Forum.

9. Are there any non-credit courses/seminars that students are required to attend? If so, please give details.

Students are required to attend the Biomolecular Pharmacology Program Seminars, held each Wednesday throughout the fall and spring semesters.

10. Are there any differences between these requirements and those for students enrolled as purely PhD candidates?

No
MD/PhD Questionnaire

Department/Program: Physiology (Department of Physiology & Biophysics)

1. What courses are required (and how many credits for each) for MD/PhD students starting their PhDs after one year, and two years of Medical School?

1 year or 2 years:
GMS MS735 Cell Biology, 4 cr
2 semesters of GMS BY 871 Biophysics Seminar

2. How many elective courses/credits are required (not including research credits?)

A minimum of 12 course credits beyond those accrued in medical school are required.

3. What are the research requirements (number of semesters, etc.)? Is there a publication requirement?

Students generally do research and course work for 2-3 years in the Department. While there is no strict requirement for publication to graduate, students are expected to have performed and documented in their thesis scientific research of publishable quality.

4. What is required for the qualifying examination? When is the qualifying exam taken?

The qualifying exam is usually taken in the spring at the end of the second semester that the MD/PhD student is in the Department. The qualifying exam consists of two parts: 1) A written Qualifying Examination with four thought questions that span topics in Biophysics, Physiology, Biochemistry and Cell Biology. Each student chooses and answers four of the eight questions in four hours. 2) An oral examination where the student is assigned 3 current research papers to read and is subsequently tested on their understanding of the material in front of an examining committee. This committee is comprised of 5 Program Faculty members. Papers are chosen by the committee and given to the students 2 weeks in advance of the oral examination. Thesis Advisors will not participate in the oral defense of students who are pursuing an MD/Ph.D. in their laboratory. Both the written and oral portion of the qualifying exam must be passed in order for a student to continue in the MD/PhD program. Students who fail either the oral or the written portion of the exam (or both) can retake that portion of the exam once in order to achieve a passing score.

5. What are the requirements for advising meetings with Graduate Studies Director of Program, Advisor, and Dissertation Committee?

Students form a thesis advisory committee shortly after passing the qualifying exam. The committee meets annually.
6. In addition to the 8-10 week rotation required by the MD/PhD Program (usually taken in the summer after BUSM I), how many laboratory rotations (and how long for each) are required outside of the thesis laboratory?

None are required, but student usually do at least one additional rotation.

7. What, if any, teaching requirements do you have?

None

8. How does the training program develop oral research presentation skills? Is this a requirement of your program?

MD/PhD students are required to take two semesters of the Biophysics Seminar course where students read papers and present them to their peers with one faculty advisor as well as attend the weekly Physiology & Biophysics seminar series. After completion of the PhD qualifying exam, students are required to present a short research talk to the Department annually, and to present posters the annual Physiology & Biophysics retreat and at the Henry I Russek Student Achievement Day.

9. Are there any non-credit courses/seminars that students are required to attend? If so, please give details.

No

10. Are there any differences between these requirements and those for students enrolled as purely PhD candidates?

No
APPENDIX B
NIH PREDOCTORAL FUNDING OPPORTUNITIES

M.D./Ph.D. Pre-Doctoral Fellowship (F30):


- Ruth L. Kirschstein National Research Service Award (NRSA)
- **Purpose**
  - Ensure highly trained physician/scientists being available in adequate numbers and in the appropriate research areas and fields to meet the Nation's mental health, drug abuse and addiction, alcohol abuse and alcoholism and environmental health sciences research needs.
  - Train clinical investigators who wish to focus their research endeavors on patient-oriented studies
- **Overview**
  - Applicants (by the time of award) must be citizens or noncitizen nationals of the United States, or have been lawfully admitted to the United States for permanent residence ("green card").
  - Provides combined medical school and pre-doctoral Ph.D. support for a maximum of **6 years** of NRSA support
- **Other Helpful Links**
  - PHS 416-1 Application: http://grants1.nih.gov/grants/forms.htm
  - NRSA Extramural Training Page: http://grants.nih.gov/training/extramural.htm

Pre-Doctoral Opportunities

NOTE: To be eligible for any of these programs, the applicant/trainee (by the time of award) must be either a U.S. citizen, non-citizen national of the U.S., or have been lawfully admitted to the U.S. for permanent residence ("green card").

**Pre-Doctoral Fellowships**

- Supports preparation of dissertation.
- **By the activation date of the award, must:**
  - have a baccalaureate degree
  - be enrolled in a program leading to a research doctorate such as the Ph.D. or D.Sc., or a combined clinical and research degree such as M.D./Ph.D.
- May receive up to **5 years** of aggregate NRSA support at the aggregate pre-doctoral level, including any combination of support from institutional training grants and individual fellowship

(expires January 8, 2010)

Supported by NIH's:

- National Institute on Aging (NIA)
- National Institute on Alcohol Abuse and Alcoholism (NIAAA)
- National Institute of Biomedical Imaging and Bioengineering (NIBIB)
- National Institute on Deafness and Other Communication Disorders (NIDCD)
- National Institute on Drug Abuse (NIDA)
- National Institute of Mental Health (NIMH)
- National Institute of Neurological Disorders and Stroke (NINDS)
- Office of Dietary Supplements (ODS)


**T32 (NRSA Institutional Training Grant)**


• Funded T32s: [http://grants.nih.gov/training/outcomes.htm](http://grants.nih.gov/training/outcomes.htm)

**Supplements**


**Other Helpful Links**

• NRSA Extramural Training Page: [http://grants.nih.gov/training/extramural.htm](http://grants.nih.gov/training/extramural.htm)

• Forms: [http://grants.nih.gov/grants/forms.htm](http://grants.nih.gov/grants/forms.htm)

• Award Data (including success rates): [http://grants.nih.gov/training/outcomes.htm](http://grants.nih.gov/training/outcomes.htm)

**Definition of Underrepresented Minority**

Individuals from racial and ethnic groups that have been shown by the **National Science Foundation** to be underrepresented in health-related sciences on a national basis (see [http://www.nsf.gov/statistics/showpub.cfm?TopID=2&SubID=27](http://www.nsf.gov/statistics/showpub.cfm?TopID=2&SubID=27)). In addition, it is recognized that underrepresentation can vary from setting to setting and individuals from racial or ethnic groups that can be convincingly demonstrated to be underrepresented by the **grantee institution** are eligible for support under this program.

**NOTE:** Women are not considered an underrepresented minority.

**National Center on Minority Health and Health Disparities (NCMHD)**: [http://ncmhd.nih.gov](http://ncmhd.nih.gov)

National Institutes of Health
6707 Democracy Boulevard, Suite 800
Bethesda, MD 20892-5465

Telephone: 301-402-1366

Email: NCMHDinfo@od.nih.gov

**Internship/Fellowship Information Requests:** NCMHDinternships@od.nih.gov
Funding Opportunities for Minorities: [http://www.nigms.nih.gov/minority/programs.html](http://www.nigms.nih.gov/minority/programs.html)

(Partial List)


  - Provides support for research experiences at grantee institutions for minorities throughout the continuum from high school to the faculty level
  - May be submitted by the principal investigator at any time.

- **Bridges to the Future**
  - Partnership/consortium of two or more institutions
  - Provide course work, faculty development, mentoring and advising, and research opportunities to facilitate the transition of minority students into biomedical research careers.
  - Transition Points
    - 2-year junior or community colleges to a Baccalaureate-granting program
    - Terminal Masters programs to Ph.D. programs
  - Announcements for this program are released by NIGMS annually.
PURPOSE

- The purpose of this Funding Opportunity Announcement (FOA) is to invite applications for support of drug abuse doctoral dissertation research in epidemiology, prevention, treatment, services, and women and sex/gender differences. 
- Grants to support dissertation research will provide no more than $50,000 in direct costs per year, and are awarded for up to two years, with the possibility of extension without additional funds for up to 12 months. 
- Because the nature and scope of the proposed research will vary from application to application, it is anticipated that the size and duration of each award will also vary. The total amount awarded and the number of awards will depend upon the mechanism numbers, quality, duration, and costs of the applications received. 
- This FOA provides funding support of dissertation research through the NIH Dissertation Award (R36) mechanism. 
- Eligible Organizations: Any domestic public or private university or college is eligible to apply, given that it has the staff and facilities available to provide a suitable environment for the candidate to perform high-quality research. 
- Eligible Project Directors/Principal Investigators (PD/PIs): The applicant for a dissertation research grant must be enrolled in an accredited doctoral degree program in the behavioral, biomedical, or social sciences and must propose to conduct research in one of the areas specified in this FOA. (These awards do not support study leading to the M.D., D.O., or D.D.S., or similar professional degrees unless they are part of a combined degree program.) The doctoral student must be a citizen or a non-citizen national of the United States or an individual who has been lawfully admitted for permanent residence (i.e., in possession of an Alien Registration Receipt Card) at the time of application. Individuals from underrepresented racial and ethnic groups as well as individuals with disabilities are always encouraged to apply for NIH support. 
- Only one application may be submitted per doctoral candidate in response to this announcement. Two resubmissions will be allowed in response to this FOA. 

See Section IV.1 for application materials. The SF424 (R&R) Application Guide for this FOA is located at these Web sites:


For general information on SF424 (R&R) Application and Electronic Submission, see these Web sites:

APPENDIX C
USEFUL WEB SITES FOR STUDENTS

OPPORTUNITIES FOR STUDENTS

Graduate Record Exam (GRE)
www.gre.org

Individual Predoctoral Awards For M.D./PH.D. Fellowships (F30)

Institutional Training Grants-Predoctoral (T32)
http://search.nigms.nih.gov/funding/funding.asp

List of NIH Investigators
e-mail: ra50h@nig.gov
Anthony A. Rene, Ph.D.
Assistant Director, NIGMS, NIH
(301) 594-3833 ra50h@nih.gov

NIGMS Funding Opportunities & Results
http://www.nigms.nih.gov/

Medical College Admissions Test (MCAT)
www.aamc.org

NIH Loan Repayment Program
www.lrp.nih.gov/

NIH Postbaccalaureate Program
http://www.training.nih.gov/

Funding Opportunities for Minorities
http://www.nigms.nih.gov/minority/programs.html

Predoctoral Fellowship Awards for Students with Disabilities (F31)
http://www.nhlbi.nih.gov/funding/training/redbook/gradf31.htm

Summer Internships at NIH
http://clinicalcenter.nih.gov/training/students/summer_internships.html