

MD/PhD Student Handbook

University of Rochester School of Medicine and Dentistry

Third Edition: Spring 2009



Students and Faculty attending 8th Annual MD/PhD Retreat at Casa Larga Winery,
Fairport, New York, August 8, 2008

Preface

This handbook presents information germane to MD/PhD students at the University of Rochester. It is intended as a guide for curriculum, a resource for transition periods, and a listing of committees, students and advisors who actively participate in the program. New to this third edition are revised guidelines for the MD/PhD Student Council, changes in aspects of the student advising, new programs for student travel and support, and updated curricular guidelines. We fully anticipate as the program grows and new issues arise that some of these contents will be modified and new materials incorporated. Please help us in this process by providing us with feedback about the contents. Thanks in advance for your contributions to this ongoing process.

M. Kerry O'Banion, M.D., Ph.D.
Director, Medical Scientist Training Program

Catherine Senecal-Rice
Administrator, Medical Scientist Training Program

Brigid Waterhouse
Administrative Assistant, Medical Scientist Training Program

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Mission Statement

The MD/PhD program at the University of Rochester trains a diverse community of students dedicated to the advancement of biomedical sciences and practice of compassionate medicine. The unique combination of the Double Helix curriculum, rigorous training in scientific research, and acquisition of clinical skills prepares students to be independent, visionary physician-scientists who promote human health through the integration of basic and clinical sciences.

Program Graduates

MD/PhD students comprise a diverse group of individuals and backgrounds with a common interest in benefiting human health through research and innovation. Graduates of our program typically engage in residency and subspecialty training and go on to assume academic positions at major medical institutions. For example, of 53 MD/PhD students graduating from the University of Rochester between 1990 and 2007, all but 2 pursued residency training. Of these graduates, 48 remain in the academic track with 28 currently holding faculty appointments at the Assistant Professor or higher level and 17 still in fellowship or residency training. Of the 36 graduates out of training, 33 are in academic or industry positions, with 2/3 being principal investigators on one or more grants and over 50% devoting greater than 75% of their time to research. Ultimately many rise into academic leadership positions, fulfilling important missions in educating future generations of physicians and physician-scientists. For example, Randy Rosier (class of 1978) is Professor and former Chair of Orthopedics and Bradford Berk (1981) is Senior Vice President for Health Science and CEO at the University of Rochester Medical School; John Dipersio (1980) is Director of the Alvin J. Siteman Cancer Center at Washington University; Robert Arceci (1981) is Director of Pediatric Oncology at Johns Hopkins; Ed Maytin (1985) is Section Head of Molecular Dermatology at The Cleveland Clinic; Richard Gallo (1986) is Chief of Dermatology at the University of California, San Diego; Alison Bertuch (1993) is Co-Director of the Interdepartmental Program in Cell and Molecular Biology at the Baylor College of Medicine; and Paul Love (1987) is Section Head of Cellular and Developmental Biology at the National Institute of Child Health and Human Development.

MSTP STUDENTS 2009



Robert Ambrosini
Grad 5 - BME



Brandon Bader
Med 1



Abdallah Bitar
Grad 4 - Chemistry



Adrienne Chesser
Med 1



Qi Cui
Grad 4 - NBA



Debbie Dao
Grad 3 - Pathology



Laura DiChiacchio
Med 2



Cindy Duke
Med 4



Adam Dziorny
Grad 4 - BME



Katherine Eisenberg
Med 3



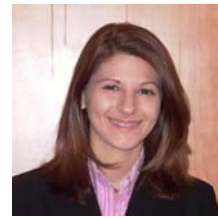
Yasser Elshatory
Med 3



Youssef Farhat
Med 1



Vincent Fong
Grad 3 - IMV



Laura Fornarola
Grad 1 - Pharm/Phys



Richard Gaines
Med 2



Candace Gildner
Grad 4 - BME



Natasha Golub
Med 2



James Hart
Med 3



Michael Jacob
Grad 2 - NBA



Conan Kinsey
Grad 5 - Genetics



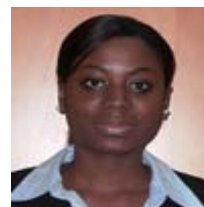
Sarita Kishore
Grad 4 - NBA



Anat Kohn
Grad 1 - Genetics



Jonathan Langdon
Med 1



Rialnat Lawal
Med 1



Susan Lee
Grad 3 - IGPN

MSTP Students 2009 (continued)



Kevin Makino
Grad 4 -HSR



Daniel Marker
Grad 1 -IGPN



Rebekka Matheson
Grad 1 - NBA



Marlene Mathews
Med 3



Kofi Mensah
Grad 3 - IMV



David Meoli
Grad 4 - Pharm/Phys



Michael Moravan
Grad 5 - NBA



Amish Naik
Med 4



Tristan Nicholson
Med 1



**Nancy Ann Oberheim-
Bush**
Med 3



Keith Olsen
Grad 2 - IMV



Alexander Pearson
Med 3



Scott Peslak
Grad 1 - Pathology



Andrew Pistner
Med 2



Rebecca Porter
Grad 2 - Pathology



Salvatore Priore
Grad 1 - Chemistry



Imran Punekar
Grad 1 - NBA



Phillip Rappold
Med 2



Babak Razavi
Med 4



Chris Richardson
Grad 4 - IMV



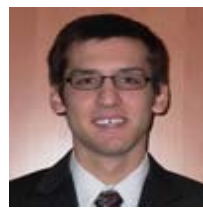
Laurie Robak
Med 3



Danny Rogers
Grad 2 - NBA



Shuolun Ruan
Grad 3 - HSR



Drew Scoles
Med 1



Solomon Shaftel
Med 4

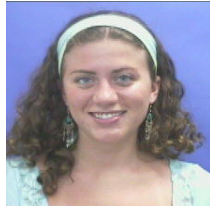
MSTP Students 2009 (continued)



Jharon Silva
Med 1



Adam Simning
Grad 2 - Epidemiology



Mercedes Szpunar
Grad 2 - Pathology



Ana Tablante
Grad 3 - Pharm/Phys



Joanna Touger
Grad 2 - IMV



Edward Vuong
Grad 2 - Genetics



Jonas Wilson-Leedy
Med 2



Michael Wu
Grad 2 - NBA

Committees and Program Structure

The organization of the MD/PhD program has been revised to better serve the needs of our trainees as well as integrate the larger role that the MD/PhD Student Council plays in the program. Dr. O'Banion, Cathy Senecal-Rice, and Brigid Waterhouse work with three different committees to assure the smooth operation of the program. These include an Executive Committee that provides program oversight, an Admissions Committee that assists in the important job of student selection, and the MD/PhD Student Council, which provides a critical venue for student input and a mechanism for implementation of many student-centered activities. Membership for each of these committees is provided in the following tables, accompanied by information about meeting schedules and specific roles.

MD/PhD Program Executive Committee

Name	Title
Regis O'Keefe, MD, PhD <i>(Co-Chair)</i>	Professor & Chair, Orthopaedics
Mark Taubman, MD, PhD <i>(Co-Chair)</i>	Professor & Chair, Medicine; Director, Cardiovascular Research Institute
Susan Fisher, PhD	Professor & Chair, Community & Preventive Medicine; Director, Doctoral Program in Epidemiology
Vincent Fong <i>(alternate student representative)</i>	3 rd yr. graduate student in MSTP
David Guzick, MD, PhD	Dean, School of Medicine & Dentistry; Professor, Obstetrics & Gynecology
Robert Gross, MD, PhD	Professor, Neurology; Director, Academic Research Track
Stephen Dewhurst, PhD	Senior Associate Dean for Basic Research; Dean's Professor, Microbiology & Immunology
Barbara Iglewski, PhD	Professor & Chair, Microbiology & Immunology
Edith Lord, PhD	Professor of Oncology in Microbiology & Immunology; Sr. Associate Dean of Graduate Education
David Lambert, MD	Associate Professor, Medicine; Associate Dean of Undergraduate Medical Education
Hartmut Land, PhD	Professor of Biochemistry & Biophysics; Director, Biomedical Genetics
Susan Lee <i>(student representative)</i>	3 rd yr. graduate student in MSTP; President of MD/PhD Program Student Council
Lynne Maquat, PhD	Professor of Biochemistry & Biophysics
M. Kerry O'Banion, MD, PhD	Director, MD/PhD Program; Associate Professor of Neurobiology & Anatomy and of Neurology
Gary Paige, MD, PhD	Professor & Chair, Neurobiology & Anatomy
Thomas Pearson, MD, MPH, PhD	Albert D. Kaiser Professor, Epidemiology, Community & Preventative Medicine; Assoc. Dean for Clinical Research
Alice Pentland, MD	Professor & Chair, Dermatology
Nina Schor, MD, PhD	Professor & Chair, Pediatrics
Douglas Turner, PhD	Professor of Chemistry; Associate-Director, MD/PhD Program

- Provides oversight of program, program committees and program directors
- Meets 4-6 times per year
- Brigid Waterhouse (MSTP) serves as secretary for the Committee

MD/PhD Program Admission Committee

Admission Committee Member	Academic Position
Burns Blaxall, PhD	Assistant Professor of Medicine in the Center for Cellular and Molecular Cardiology and of Pharmacology and Physiology
Mark Dumont, PhD	Associate Professor of Biochemistry & Biophysics
Katia Noyes, MPH, PhD	Interim Division Chief Health Services Research; Associate Professor Health Services Research & Community & Preventative Medicine
Chin-To Fong, MD	Associate Professor, Pediatrics (Chief, Genetics Division)
Deborah Fowell, PhD	Assistant Professor of Microbiology & Immunology in the Center for Vaccine Biology & Immunology
Robert Freeman, PhD	Associate Professor of Pharmacology & Physiology, Neurology and Oncology; Director, Interdepartmental Graduate Program in Neuroscience
Frank Gigliotti, MD	Professor of Pediatrics (Infectious Diseases Unit)
John Hansen, PhD (<i>ex officio</i>)	Professor of Neurobiology & Anatomy; Associate Dean for Medical Admissions
Edward Brown, PhD	Assistant Professor, Biomedical Engineering
Edith Lord, PhD	Professor of Oncology in Microbiology & Immunology; Sr. Associate Dean of Graduate Education
Margot Mayer-Proschel, PhD	Associate Professor, Biomedical Genetics
Kofi Mensah (<i>student representative</i>)	3rd year graduate student in MSTP
M. Kerry O'Banion, MD, PhD (<i>Chair</i>)	Director, MD/PhD Program; Associate Professor of Neurobiology & Anatomy and of Neurology
Elaine Sia, PhD	Associate Professor of Biology
Joanna Touger (<i>student representative</i>)	2nd year graduate student in MSTP
Douglas Turner, PhD	Professor of Chemistry; Co-Director, MD/PhD Program

- All interviewed students meet with at least one committee member
- Committee meets several times during recruiting season to evaluate and rank interviewed students
- Dr. O'Banion works with the Medical School Admissions Committee, which provides a separate evaluation for MD/PhD applicants
- Student representatives provide evaluations of each applicant based on the student interviewer notes

MD/PhD Student Council

Position	Council Member	Role
President	Susan Lee	Schedules and runs meetings Follows up with other Council members
Events	Laura Fornarola	Arranges chalk talk and seminar schedules Arranges Fall and other retreats (e.g. Upstate New York student retreat)
Admissions	<i>Co-Chairs:</i> Kofi Mensah Joanna Touger Richard Gaines Edward Vuong Tristan Nicholson	Representatives to Admissions Committee Dinner Organizer Contact for Applicant Hosting Applicant Greeting Coordinator
Curriculum	Jonathan Langdon Andrew Pistner Adam Simning Rebecca Porter Keith Olsen	Medical School Curriculum Committee Honor Board
Social	Anat Kohn	Organize social events (e.g. graduate picnic, dinners, etc.)
Public Relations	Rebekka Matheson	Maintains and distributes minutes from Student Council meetings & assists in Newsletter preparation
Outreach	Michael Jacob	Works closely with the Program Director to promote awareness among undergraduate and high school students about biomedical/translational sciences and opportunities afforded by MD/PhD training.

- Student Council meets once a month during academic year
- Disseminates information to all MD/PhD students
- Provides an important forum for discussion of student concerns and representation on other committees

MD/PhD Student Council Guidelines: 2008-2009

1. Overview

The MD/PhD Student Council represents the voice of MSTP students and acts as a liaison between the MST Program and its students. In addition, the Student Council provides support for social and scholastic activities while fostering a community among students. To these effects, the Council is composed of several officers, and the MD/PhD student body as a whole. Regular meetings, events, and the annual retreat provide opportunities for the Council to help make this program meaningful and enjoyable for all involved.

2. Events

2.1 Council Meetings

In order to keep the MD/PhD student body informed of Council activities and to elicit feedback for the Council or the program, regular Student Council meetings are held. These meetings are organized and run by the Council President and are open to all members of the program. A major goal of these meetings is to bring forth and discuss issues that are important to the students. These discussions serve to guide the president in properly representing student concerns at MSTP Executive Committee meetings. Minutes are recorded and distributed to the student body following the meeting to all students by the Council public relations chair.

If more sensitive issues require discussion, the president may call special officer or MD/PhD Executive Council meetings, as appropriate. These include issues relating to the MST Program, the Council, or recommendations to the MD/PhD Executive Committee not endorsed by the entire student body. The minutes of these meetings may be distributed at the discretion of the officers present.

2.2 Seminars and Lectures

As part of the scholastic enrichment of the students in the program, and to further encourage student interaction, the Council sponsors various seminars and lectures throughout the year. These seminars and lectures will include speakers from the University, invited guest lecturers, or speakers from within the program.

As per the MD/PhD Executive Committee, all students in the program will be required to attend 2 out of the 3 seminars scheduled each semester. If one of the seminars includes a speaker from outside the University, attendance at this seminar will be required of all students.

2.3 Social Events

In keeping with the theme of bringing together students from throughout the program, the Council regularly sponsors social events. These events, including such activities as wine tours, berry picking, bowling, movie nights, special holiday gatherings & graduation parties, are organized and supported by Council funding. The Social Chair is charged with planning and organizing such events.

2.4 Applicant Events

There are several events associated with the applicants. These involve the dinners during each interview session, applicant greeting as appropriate, and the revisit weekend for accepted students. All of these events fall under the auspices of the Admissions Committee, which is headed by the Admissions Chair; individual members are assigned specific tasks to plan.

The Admissions Chair is charged with organizing the social events during the MSTP revisit weekend. These events, typically held on the second evening of the revisit, are an opportunity for current and accepted students to interact in a more informal environment and become acquainted.

2.5 Annual Retreat

Once a year, the MST Program holds a retreat to bring together current students and faculty while welcoming new MD/PhD students. A keynote speaker is invited to speak about his/her research and clinician-scientist career. The retreat also includes research presentations from senior students and discussion of Council issues. Council elections are held at the retreat. The planning of the retreat is tasked to the Events Chair, with the help of the program administration. ****Attendance is mandatory for this event and students must receive permission from the MSTP Director if they have a valid reason to miss the retreat**

3. Council Officers

Council officers are chosen each year at the retreat, and will guide the direction of the Council throughout the year. The officer positions are divided into the Executive Board positions, the admissions committee positions, and the other positions. Procedures for choosing the officers are outlined below (see Section 5).

3.1 Student Council Executive Board

3.1.1 President

The main duty of the president is to coordinate the activities of the Student Council with the MD/PhD program, including the MSTP Executive Committee. In addition to serving on the Executive Committee, the president is in charge of calling, planning, and running the monthly Student Council meetings. He/she will coordinate with the MD/PhD office on budget expenditures and will oversee the other duties to ensure responsibilities are fulfilled. The president will work with the other chairs to plan events, such as speakers, social events, and applicant events. He/she will also act as an advocate for any MD/PhD student issues or complaints to the MST Program regarding any aspects of medical or graduate education.

The term of the president is two years, and an individual shall be limited to serving only one term. Additionally, the outgoing president will serve in an advising capacity and sit on the Executive Committee for the following term. These rules serve to maintain continuity in the Student Council and provide guidance for the incoming president.

3.1.2 Public Relations Chair

The Public Relations (PR) Chair provides communication to the MD/PhD student body regularly, updating them on events and activities. He/she records minutes at Council meetings and promptly relays them to the student body after each meeting. The Public Relations Chair will assist the program administrator in writing the MSTP newsletter as requested. The PR Chair serves as the URSMD MSTP Institutional Representative (IR) to the American Physician Scientist Association (APSA). Because UR MSTP Council elections are held in

August of each year while APSA IR terms begin in July, the PR chair will serve as IR beginning in July of the following year.

The term of the PR Chair is one year with an additional year as APSA IR. There are no term limits.

3.1.3 Events Chair

The events chair is charged with planning and organizing scholastic events for the MD/PhD students. These events typically include seminars run by faculty members, as well as the yearly retreat. If his/her term falls in a year in which the Upstate NY MD/PhD conference is held at UR, he/she will also be in charge of planning this event. The scheduling of these events, securing faculty presenters, advertising, planning location & food (if necessary), and ensuring a smooth execution all fall under the auspices of the events chair. If desired, the chair can form and work with an events committee for these activities.

The term of the Events Chair is one year. There are no term limits.

3.1.4 Admissions Chairs

The Admissions Chairs are the MD/PhD student representatives to the MD/PhD Admissions Committee. The Admissions Committee meets after interviews begin to determine which students will be offered a position in the following year's MD/PhD class. The Admissions Chair will perform student interviews, and act as the Student Council representative on the committee. Additionally, the Admissions Chairs appoint a Student Council admissions committee (described below) and work with the program administrator in organizing revisit weekend.

Two Admissions Chairs are elected each year. The Admissions Chair term is one year. There are no term limits.

3.1.5 Social Chair

The Social Chair is in charge of planning and organizing social events for the MD/PhD students. The scheduling, planning, securing of funding, and execution of these events all fall under the auspices of the social chair. If desired the chair can form and work with a social committee for these activities.

The Social Chair term is one year. There are no term limits.

3.2 Student Admissions Committee

The Admissions Committee is chaired by the Admissions Chairs, but generally functions as a separate entity. It includes the following positions:

3.2.1 Applicant Dinner Coordinator

The Dinner Coordinator is charged with planning and organizing the applicant dinners. This includes signing up MSTP students to attend, sending out schedules and reminder emails, scouting and reserving the restaurant, and securing payment if necessary. Typically 9 - 10 dinners are held per year on the first night of each interviewing session.

3.2.2 Hosting Coordinator(s)

The Hosting Coordinator(s) are tasked with organizing the hosting for applicants who request a student host. This involves signing up MSTP students before interview season starts and

being listed as the student host contact for MSTP applicants. When an applicant contacts the coordinator, the coordinator will find an appropriate student host for this applicant.

3.2.3 Greeting Coordinators

On the morning of the first day of each interview session, the Greeting Coordinators are responsible for ensuring that current MD/PhD students are available in the admissions lobby to talk with MD/PhD interviewees. The coordinators provide an opportunity to provide a good first impression and "sell" Rochester to the applicants.

3.3 Other Positions

These positions do not fall under the direction of any committee or chair, but are still vital representatives of the Council.

3.3.1 Curriculum Committee Representatives

The MD/PhD program sends three representatives to the School of Medicine Curriculum Committee meetings: one from the first year medical school class, one from the second year medical school class, and one representing the third and fourth year medical school classes. Two new representatives will be selected each year: one from the first year medical school class for a 2-year term on the M1-M2 committee, and one from either the graduate training phase or the upper medical school classes for a 1-year term on the M3-M4 committee.

These individuals are charged with representing the interests of the MD/PhD students at these bi-monthly committee meetings with students from the medical school classes and faculty. Students filling these positions will attend and report on any relevant issues to the MD/PhD students.

3.3.2 Honor Board Representative

The Honor Board Representative attends Honor Board Meetings and provides the MSTP student voice at these meetings.

The Honor Board Representative and an alternate are elected from the student body in graduate training. These individuals serve for the duration of their graduate school training. The alternate replaces the representative when the representative is unable to perform his/her duties due to personal, professional, and/or time conflicts. When the representative re-enters medical school training, the alternate will take his/her place and a new alternate will be elected. In a case in which both the representative and alternate will re-enter medical school, both positions will be elected. In cases in which the alternate re-enters medical school before the representative, a new alternate will be elected.

Trainee Advising

Advising for MD/PhD students has evolved to best serve students during each phase of their training and takes advantage of the open and accessible advisors, administrators and faculty of our school. This provides a flexible approach tailored to each individual student. Key components are described below.

Trainees meet individually with **Dr. O'Banion** at least once per year (generally in the spring) for formal review of progress. The review is documented in a written note produced by the student and Dr. O'Banion. Specific topics to be covered are stage dependent and include:

- Med 1 and 2: Transition to graduate training, including selection of graduate program, rotations, and thesis mentors
- Grad Years 1 and 2: Progress in identifying thesis topic, graduate coursework requirements, progress in research, timing of qualifying examinations, exploration of meeting and funding opportunities, and longitudinal clerkship selection
- Grad Years 3 (and 4): Research progress, productivity (abstracts, meetings attended and manuscripts), timing of thesis defense, transition into clinical phase
- Med 3 and 4: Timing of clerkships, choice of residency area, meeting opportunities

Trainees meet with **Dr. David Lambert**, Advisory Dean for MD/PhD students, as a group during regularly scheduled Advisory Dean Lunches in Med Years 1 and 2, and individually to discuss academic progress and return to the clinical phase, including planning of clerkship timing. Drs. O'Banion and Lambert work closely together to assure that student issues are addressed and that the transition to clinical work is smooth and efficient (see next section). For students who entered the program prior to 2006, clerkship planning and residency selection is carried out in consultation with their assigned Advisory Dean (Drs. Richeson, Naumberg or Guttmacher).

The **thesis mentor** plays a critical role in guiding trainees in the selection of their thesis topic and in assessing research progress. A **thesis committee**, the composition of which depends on school and program guidelines, augments the thesis mentor's role. Timing of committee meetings is program dependent, but is at least once per year. MD/PhD trainees are encouraged to schedule more frequent meetings (e.g. every 6 months) and make full use of committee members in order to efficiently move through graduate training.

As trainees move through the various phases of the program, they are encouraged to engage other faculty and program directors to fulfill specific advising and mentorship roles. These individuals include:

- Graduate training program directors and basic science chairs for selection of rotations, thesis laboratories and graduate curricular issues
- Longitudinal clerkship mentors for exploration of clinical training opportunities
- Clinical residency directors, faculty and chairs for residency information

Finally, specific meetings are scheduled with groups of students who are entering particular phases of trainings. These include:

- Entering students meet with Dr. O'Banion, senior MD/PhD trainees, and MSTP Administration during student orientation week to review training milestones, resources, and program expectations
- First and second year medical students meet with Dr. O'Banion, senior MD/PhD trainees and other faculty to consider selection of thesis mentors and research projects as well as outline funding opportunities
- Third and fourth year graduate students who are completing their thesis work meet with Dr. O'Banion and Dr. Lambert to go over opportunities for transition to clinical work.

The MD/PhD Curriculum at the University of Rochester

Overview

The MD/PhD curriculum provides students with a longitudinal integration of basic and clinical sciences, punctuated by a period of rigorous graduate research training. The diagram on the following page provides an outline for the major curricular components of the program. For most students it is anticipated that this program can be readily completed in 8 years, and that a significant proportion of students will complete the program in 7 years. Opportunities for conducting research rotations in the first years of the program, a shortened second medical school year, targeted clinical activities during graduate training, and significant flexibility in returning to medical school at the conclusion of graduate training all contribute to timely completion. Details for each phase of the curriculum as well as transitions between phases are summarized in the following sections.

MD/PhD Curriculum

Yellow Shaded areas are basic science periods.

Blue Shaded areas are clinical periods.

Green Shaded areas indicate months devoted essentially full time to the PhD program.

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June		
Year 1	Optional Rotation	MMI	Human Structure and Function			Molecules to Cells			Host Defense			←		
		Scientific Reasoning in Medicine (SRM) Two Sessions/Month												
		Introduction to Clinical Medicine				SCOPE				Ambulatory Clerkship Experience (ACE) 1				
Year 2	Lab Rotation	Mind Brain Behavior I	P	Disease Processes and Therapeutics Modules 1 and 2					C A	USMLE Prep and Exam		←		
		SRM Two Sessions/Month												
		ACE 2 (modified)												
Year 3	Lab Rotation	Graduate Courses/Initiate Thesis Work												
		Longitudinal Clerkship 1/2 d/wk					Longitudinal Clerkship 1/2 d/wk							
Year 4		Thesis Work												
		Longitudinal Clerkship 1/2 d/wk					Longitudinal Clerkship 1/2 d/wk							
<i>FOR SOME STUDENTS AN ADDITIONAL YEAR OF GRADUATE WORK OCCURS HERE</i>														
Year 5/6	Thesis Work											*		
Year 6/7	Thesis Defense	← Clinical				Core				Clerkships →			C A	
Year 7/8	EM, Subinternship, and Electives						POD	Lab Return or Elective		SI				

MMI – Mastering Medical Information

P – Pharmacology

CA – Comprehensive Examination

SI – Successful Interning (1 wk) and Commencement

- – Orientation to Year 3 (1 wk)

Year One (Medical School)

MD/PhD students at the University of Rochester have the option of starting a **laboratory rotation** in the summer preceding the beginning of medical school. Students taking this option will receive a stipend during the summer. It is critical that such students identify themselves soon after acceptance in order to make the necessary arrangements. Dr. O'Banion will work closely with such students to select a rotation mentor.

A day-long **retreat** is scheduled for all MD/PhD students and a subset of faculty involved in the program at an off campus site early in the academic year, typically the Friday prior to the day medical school starts. **Attendance is mandatory for this event and students must receive permission from the MSTP Director if they have a valid reason to miss the retreat.** Planned by the MD/PhD Medical Student Council, this event welcomes new students to the program and consists of a balance of research presentations (students and an invited scientist) and social activities. The event provides an opportunity to discuss programmatic issues that affect all students. The membership of the student council is also established. Previous venues have been at a Finger Lakes winery, an Inn in Letchworth State Park, and an Inn on Canandaigua Lake. The food and company are always outstanding.

MD/PhD students participate in the full first-year medical school Double Helix Curriculum, including all lectures, laboratories, PBL sessions, ICM (Introduction to Clinical Medicine), SCOPE (Skills and Complete Patient Evaluation), and the Primary Care Clerkship (PCC). For some classes (e.g. Molecules to Cells), MD/PhD students share the same PBL group. This creates an opportunity to delve into basic science issues together.

All MD/PhD students participate in an additional class, **Scientific Reasoning in Medicine (SRM)**, that meets for 8 sessions each semester. Based on student feedback, the format for these sessions consists of a faculty presentation at noon on Friday followed by a student-run journal club the following Monday at noon. Faculty are chosen from all disciplines within the medical center and are asked to present on research issues with clear clinical relevance. The journal club provides a forum for critical evaluation of primary scientific literature related to the research topic. Dr. O'Banion organizes this course and is assisted by David Rempe, MD-PhD, who serves as Co-Director of SRM. Dr. O'Banion or Dr. Rempe will be available to attend nearly all sessions. Lunch is served during the Friday session. SRM is also required of students in the second year of the program. Thus students are introduced to the science of more than 30 faculty in their first two years.

Other opportunities for learning about faculty research interests include regular departmental seminars, MD/PhD organized seminars (see under "MD/PhD Program Events"), interactions with faculty who teach in the medical curriculum, and student-initiated meetings with graduate program advisors and individual faculty. These last mechanisms are particularly important for determining summer rotation options and ultimately, graduate department affiliation and thesis advisor. Dr. O'Banion also meets on an individual basis with trainees to gauge the progress of these important decisions as well as provide additional opportunities for advice about research options.

Although students may take on additional class-work during the first two years in medical school, this option is unlikely given the number of hours devoted to the Double Helix Curriculum. Students interested in additional class work generally take courses as "non-credit" and should speak to Dr. O'Banion and Dr. Lambert to initiate the process.

During the summer following the first year of Medical School, MD/PhD students typically engage in a **laboratory rotation** of 8 to 10 weeks duration. Laboratory rotations provide outstanding

opportunities for learning new systems and techniques, familiarizing oneself with specific laboratory and departmental environments, and establishing ties with potential thesis research mentors. Thus students are encouraged to participate in two or three rotations prior to settling into a thesis laboratory, and most do so. However, the MD/PhD program has no set requirement for number of laboratory rotations and students with very clear ideas about research direction may engage in fewer rotation experiences.¹ It is important to note that some graduate programs (e.g. Chemistry) do not have a formal rotation mechanism while those programs grouped under “Health and Population Sciences” (Epidemiology, Health Services Research, and Biostatistics & Computational Biology) offer other summer experiences.

Rotation choices are to be discussed with Dr. O’Banion prior to initiation. Forms for rotation initiation and evaluation are provided in the Appendix.

¹This should be cleared with specific graduate departments, since some may require a minimum number of rotations (see detailed graduate curricula in the Appendix).

Year Two (Medical School)

MD/PhD students enter the second year with their medical school colleagues and participate in a modified Double Helix Curriculum as detailed below. The major benefit is completion of most curricular requirements by the end of March, allowing students to take their Step 1 Board Exams early and progress into the graduate training phase.

- Students participate in all aspects of Mind Brain Behavior I (MBB I) (here they are again placed together in a PBL group lead by an MD/PhD Neurologist) and Disease Processes and Therapeutics (DPT), Modules 1 and 2.
- Students must take the two Medical Humanities Electives. One of these electives is a special session of the course IND501 “Ethics and Professional Integrity” which must be completed by all MD/PhD students and fulfills requirements for training in the Responsible Conduct of Science.
- Students take the Comprehensive Assessment in May
- Students are exempt from Stress, Adaptation and Transitions (SAT)
- Students participate in PCC Year 2 with the following modifications:
 - Exempt from Integration Conferences late-March to May
 - Exempt from Specialty Rotations after late-March. Schedules will be arranged so MD/PhD students complete all Specialty Rotations with the exception of Pediatrics being limited to 6 instead of 12 weeks.
 - Exempt from Journal Club and Master-Clinician Rounds (note that this is “replaced” by participation in SRM for the full year). Students may elect to participate in Master-Clinician Rounds if they wish, in which case they must notify the PCC Office by early December.
 - The Home Visit is *required* and the write-up must be handed in as part of PCC.
 - Students *must continue* with the longitudinal preceptorial/primary care experience through the end of second year (1/2 day per week).

Note that the PCC grade will be weighted according to the components engaged in by the MD/PhD student. An evaluation for small group activities will be derived from student

participation in SRM during the second year and included in determination of the PCC grade. The evaluation form is found in the Appendix.

Year Three (Graduate School)

The transition from medical school to graduate school is aided by familiarity with graduate training and graduate faculty gained during the first two years of the program and by rotation experience(s). The late spring and summer following the second year provides an outstanding opportunity for students to finalize their choices for graduate degree program and thesis mentor. The extra time afforded by shortening the second year and the relatively late start of the graduate school calendar (September) allows students the option of completing two rotations, if desired. Alternatively, students who establish their mentor early can initiate studies leading to their thesis. Advising efforts are directed at helping students make program and mentor choices in order to efficiently take advantage of graduate courses starting in the fall. Indeed, MD/PhD students are expected to declare an area by the beginning of the Fall Semester, and a thesis advisor by January of that year (students can elect to do an additional rotation during the Fall Semester to help in this decision), although many declare earlier. Early planning, seeking advice, and multiple meetings with graduate program directors and potential thesis advisors are critical to this process. A list of graduate program directors and administrators is included in the "Contacts" section of this handbook.

The third year is typified by graduate program coursework and initiation of thesis research. Specific course requirements and other guidelines established for each degree program are provided in the Appendix. Program declaration and graduate course registration are handled through the office of Graduate Education and individual graduate program administrators (see contact information on pages 31 and 32). Note that these offices differ for students in River Campus programs (Chemistry, Biology, and Brain & Cognitive Science). Components common to all guidelines include granting MSTP students 30 hours of credit toward coursework accomplished in the Double Helix Curriculum, core and advanced graduate courses specific to each program, and required participation in graduate student seminar series, journal clubs, and departmental/program seminar series. If students did not take IND 501, "Ethics and Professional Integrity" as part of their second year medical humanities elective, they must complete it by fall of the third year in the program. Teaching requirements within most graduate programs are waived for MD/PhD students, though students may elect to participate, and outstanding opportunities for teaching exist in most programs.

Participation in all graduate student activities and required steps for obtaining the PhD degree, including qualifying examinations, ensures that MD/PhD students have regular opportunities for presentation of their work and evaluation of their progress. In addition to graduate student seminars and presentations at national scientific meetings, our students present their work at MD/PhD specific events, including poster or oral presentations at our Annual Retreat, Revisit Day, the Central New York MD/PhD Student Conference, the National MD/PhD Student Conference in Colorado, and the American Physician Scientists Association Annual meeting in Chicago.

The Longitudinal Clinical Experience

During graduate training, all MD/PhD students spend one-half day per week for four semesters engaged in clinical activities. Typically started in the fall of their third year, the goal of the longitudinal clerkship is to maintain clinical skills, to explore unique areas of interest and mentorship, and experience research and clinical roles at the same time. Our students view this unique opportunity as a highlight of the program and feel that it complements their research experience. Students receive two weeks of elective clinical credit per semester, reducing overall requirements in the clinical phase. Full credit for each semester requires a minimum of twenty 3 to 4 hour sessions. Each semester is typically spent with a different preceptor, chosen

on the basis of the student's research and career interests. Students can elect to spend two semesters with one preceptor.

Selecting a Preceptor: The clinical experiences will generally be completed with URSMD faculty. However, if the MD/PhD Program authorizes a student to complete the research project at another institution, in consultation with the Advisory Dean, an appropriate away clinical experience should be identified for the student to complete the longitudinal experience. The URSMD clerkship director from the same department as the host preceptor **must** approve the request for the away experience.

- Students are encouraged to seek out and arrange their own preceptorships with specialists that best fit their needs. A list of potential preceptors who have previous experience with MSTP students or have been nominated by their departmental chair can be found on the MSTP website.
- Students must complete a drop/add form and return the completed form (with the required signatures) to the SMD Registrar's Office to schedule a clinical assignment. No retroactive credit will be awarded for Longitudinal Clinical Experiences completed outside of the stated registration and approval process.
- Trainees arranging primary care experiences should inform Debra Graham, the Administrator for the Ambulatory Clerkship Office.

Evaluation Requirements: The preceptor will receive from, complete, and submit to the Registrar's Office, the URSMD MD/PhD Longitudinal Clinical Experience evaluation form (see Appendix). The evaluations will become a part of the students' official academic record. Upon satisfactory evaluation of the student by the preceptor at the completion of each longitudinal experience, the student will be awarded 2 weeks of 4th year elective credit. The Advisory Deans and the MSPRB will review concerns regarding performance, professionalism or clinical competence.

Other Clinical Experiences: Students may elect to arrange additional clinical experiences during the summers after the first and second year of medical school or during graduate school (e.g after completion of the Longitudinal Experience). It is expected that students will not spend over 1/2 day per week in any clinical endeavor, since the focus during this time is on graduate research. Credit is not given for these "extracurricular" experiences. Importantly, **all such experiences must be approved prior to initiation** as described in the Appendix. These steps are absolutely necessary to ensure proper liability coverage for students engaged in clinical activities.

Years 4, 5, (and 6) (Graduate School)

For most programs these years are filled with ongoing research towards the student's thesis and engagement in laboratory and departmental activities. Attending and presenting results at scientific conferences is another important part of training. For students in Health and Population Sciences there may be additional coursework during this time. Because of the nature of the research, students earning a degree in Epidemiology may complete the 3rd and 4th year of medical school while their data "matures", returning in the last year to write up results. Details are found in the Graduate Curricular Guidelines section.

MD/PhD students continue to participate in MD/PhD seminars, social events, MD/PhD Student Council service, and program retreats. Indeed, interaction between students at all phases in the program is a critical aspect of the training process. Students are also called upon to help with admissions and recruiting efforts, including conducting applicant interviews for the program.

As thesis research nears completion, students are encouraged to work closely with their thesis committee to ensure that the goals of graduate training have been reached. Submission and publication of manuscripts in peer-reviewed journals, presentation of work at national meetings, and completion of the thesis document represent important milestones in this process. Students should consult with the graduate office regarding proper thesis formatting and the timing of thesis submission and scheduling the final thesis defense. This should be done well in advance since there are University imposed blackout dates for conducting the thesis examination.

Transition to Clinical Years

There is significant flexibility in entering the third and fourth year medical school clinical phases of training. Coordination for reentry is accomplished in consultation with Drs. O'Banion and Lambert, Medical School Advisory Deans, thesis committees, and the Medical School Registrar. Individual plans are established for each student based on their needs and status with regard to thesis completion. For students completing their thesis in the summer or early Fall, Core Clerkships (see below) can be initiated at several time points starting in July or October. In cases where students have turned in a thesis, provision may be made for clerkships to be started, with the stipulation that the thesis be defended during an early elective period. The Thesis Advisor, the Thesis Committee, and Drs. O'Banion and Lambert must approve all such arrangements. Although it is possible to start Core Clerkships as late as January and still complete all requirements for graduation, this should only be attempted by students with very clear ideas about residency choices, so that proper sequencing of clerkships can be accomplished. Students who plan to enter residencies with early match may be at a particular disadvantage if they start after October.

Dr. Lambert, representing the Medical School Advisory Deans, and Dr. O'Banion meet with all students in years 5 and 6 as a group in early spring to discuss possible strategies, coordinate efforts, and offer individualized opportunities for these students to sharpen their skills for hospital-based medicine prior to entering the Core Third Year Clerkships. A variety of opportunities exist to facilitate the transition to the clinically intensive portion of the curriculum.

Years 6 and 7 or 7 and 8 (Medical School)

Core Clinical Clerkships occur over a one-year period and include integrated clerkships in Women and Children's Health (5 weeks each Ob/Gyn and Pediatrics); Mind/Brain/Behavior II (4 weeks each of Neurology and Psychiatry); and Adult Inpatient Care (8 weeks of Medicine and 6 weeks of Surgery). Each integrated clerkship has an associated two weeks devoted to Advanced Basic Science topics (3 total). These topics are explored in lecture/discussion and small group laboratory, journal-club, and PBL sessions, and cover cutting edge examples of translational research and the application of basic science to clinical medicine. Advanced Basic Science sessions offer additional opportunities for MD/PhD students to explore topics of special interest and meet scientists and clinicians actively engaged in translational research.

There is also a total of 10 weeks of elective time in the third year. This elective time provides flexibility for MD/PhD students needing to complete their thesis defense as well as providing an opportunity to pursue specialized areas of clinical medicine that may be important in career choice decisions. A complete list of required experiences in the final two years is provided on the next page. MD/PhD students can possibly meet all clinical requirements in a 1.5 year period and may receive up to 6 weeks elective credit for research conducted during their thesis preparation with prior approval. Thus there is ample opportunity for conducting residency interviews. In addition, students can elect to return to the laboratory in their last year to pursue additional research.

Requirements for Completion of Medical School (MD/PhD Curriculum)¹

Course/Clerkship	Credit or Equivalent (weeks)
Core Clinical Clerkships, including Advance Basic Science Sessions (Adult Inpatient/Women & Children's Health/Mind, Brain, Behavior)	38
Electives ² (Up to 8 credits can come from the Longitudinal Clinical Experience)	27
Emergency Medicine Clerkship	4
Surgical Subspecialty Elective	2
Subinternship	4
Process of Discovery (4 th year)	4
Successful Interning (4 th year)	1
Total	80

Note: MD/PhD trainees are exempt from the 4th year Community Health Improvement Clerkship. If they choose to complete it, they receive 4 weeks of elective credit.

¹Above requirements begin with the Class of 2011. Because the Surgery Clerkship for the Class of 2010 was 5 weeks, the total elective weeks required is 28.

²Up to 6 weeks of "Research Elective" may be granted for MD/PhD students and applied to this elective time requirement.

MD/PhD Program Events: Opportunities for Student and Faculty Interaction

- **Yearly Retreat** in August (discussed on page 19)
- **MD/PhD Dinner Seminars**—held three times each semester, these meetings alternate between an informal faculty presentation, a presentation by residents or fellows, and a visiting faculty lecture. Members of the Student Council are responsible for scheduling speakers and selecting food. These sessions represent outstanding opportunities for students to interact in a scientific, collegial forum. Students are expected to attend at least 2 sessions each semester as detailed in the Student Council Guidelines (page 10). Some sessions are devoted to career choices. A popular forum from past years is a round table discussion with faculty and fellows at different career stages discussing their integration of research and clinical training.
- **Student Hosts and Revisit Weekend**—our MD/PhD students play a very active role in recruiting potential matriculants through their extensive involvement with hosting applicants, and planning/participating in Revisit Weekend activities. Specific Revisit Weekend activities include a combined luncheon and poster session by current MD/PhD students that is attended by a large number of faculty, program directors and administrators.
- **Local and National Meetings**—in addition to attending meetings in their specific fields, our students take advantage of opportunities to interact with MD/PhD students from other programs. Locally, Dr. O'Banion and MD/PhD students attend the Annual Upstate New York MD/PhD Research Conference, held jointly with MD/PhD students from Syracuse and Buffalo. We also send 6 to 8 students to the National MD/PhD Student's Conference in Colorado each summer. These represent outstanding opportunities to learn about other programs, current research, and career options. Details about student travel support are provided in the next section.
- **Social Events**—throughout the year, MSTP students organize events about every other month. These include outdoor activities such as white-water rafting or downhill skiing, an annual maple sugar pancake excursion, holiday parties, and dinner or brunch for students graduating from the program in May. These are always well attended and enjoyed by spouses, significant others, program directors and our administrator.

Support for MD/PhD Students at the University of Rochester

Funds supporting MD/PhD students come from a variety of sources. Our MSTP grant provides tuition and stipend support for a set number of students (currently 11) as well as some additional funds for programmatic and student expenses. Some students also receive support as Clinical Translational Science Award Fellows. Medical School Dean's funds cover a larger portion of support, including funds from the Graduate Program for the 21 months of graduate training. Following this period, stipend support for students in the graduate phases is derived from departmentally based training grants, individual investigator (RO1) or program project (PO1) grants, or individual predoctoral fellowships obtained by the student. All MD/PhD students are encouraged to apply for these prestigious awards and should talk to departmental, thesis and program advisors early on to learn about these opportunities.

Students are fully funded for their entire tenure in the MD/PhD Program. Specific items that are covered include:

- Tuition (for academic year 2010-11 it is \$41,400 for medical students; \$39,488 for graduate students)
- Stipend throughout both medical and graduate school. The stipend level for academic year 2010-11 is \$25,500. The University is committed to maintaining a competitive stipend for its students, so this amount will likely increase in future years.
- Health Fees and Disability Insurance. Note that current policies allow us to cover health fees for singles and families with children.
- Microscope Rental in all years of Medical School

Importantly, Student Activity and Service Fees (approximately \$300 in medical school and \$200 in graduate school; subject to modest change) are NOT covered by the Program. In addition, a one-time fee of approximately \$550, collected prior to the start of medical school, covers purchase of equipment required to conduct physical exams.

Student Travel, Training and Research Funds

The principal source of funding for travel and research related expenses of graduate students lies with their research laboratory. Recognizing the special situation of dual degree training, additional funds are provided by the MSTP in support of its students. These funds are meant to provide MSTP students with more flexibility, early on when they have not yet chosen a laboratory and later for travel, research or training related expenses that are not directly provided for by the thesis advisor's grant. Each student will receive a budget of \$2400 - \$1200 for each four years that they are matriculated in the MSTP. Unspent funds can be carried over from one 4-year period to the next. However no single expenditure can exceed \$1000 and the total aggregate amount of funds available will not exceed \$2400 per student. All spending is limited to expenses related to a student's travel, training, or research and is subject to the approval of the Program Director.

For current students, these funds will be prorated based on the stage of training in Academic Year 2007-08. For students in the first two years of training, the full amount will be available; students in their third and fourth years will have an aggregate total of \$1800, continuing as \$1200 for students in the fifth and sixth years and \$600 for students in their seventh year and beyond.

Participation in national conferences is a critical component of career development. Use of funds for the purpose of attending scientific conferences is therefore strongly encouraged. Travel related expenses include but are not limited to registration fees, airline tickets, car rental, food and lodging. Students wishing travel to participate in a conference, course or instructional program directly related to their thesis research may do so with prior approval from the thesis advisor. Students are strongly encouraged to use the MSTP funds to supplement or leverage travel funds from other sources (see below).

Research funds may also be used for purchase of research related equipment and services, software, scientific books or scientific periodicals (not available in the laboratory or University library). A student wishing to purchase a computer may apply research funds towards 1/2 the cost but may use no more than \$1000; however students may only use research funds towards the purchase of one computer (either a desktop, or a laptop, but not both) during their tenure, and if ISD support is desired, the computer must be purchased through the University Computer Store. There are no restrictions on the type of computer. Photocopying, or printing services that reasonably are needed for study, research and preparation of the thesis (e.g. poster printing, article requests, etc.) may also be covered.

Program Specific Travel

National MD/PhD Student Conference in Colorado

Organized by the University of Colorado MSTP, this conference provides an opportunity for MD/PhD students to present their research to and interact with other MD/PhD students and prominent scientific investigators from across the nation. During one's tenure, every student will receive an invitation from the Program Director to represent the University of Rochester School of Medicine and Dentistry at the National MD/PhD Student Conference in Colorado. Expenses related to travel and attendance at the National MD/PhD Students' Meeting are completely covered by the MSTP, and are not counted toward the invited student's \$2400 budget. Additional attendance at the meeting is encouraged but will count toward the student's budget.

American Physician Scientist Association (APSA) Annual Meeting

The annual meeting held in conjunction with the American Society for Clinical Investigation, the Central Society for Clinical Research, and the Midwestern Section of the American Federation for Medical Research, provides an extraordinary opportunity for MD/PhD students to present their research, address career development and gain invaluable perspectives on possible career paths. Because of this focus, preference will be given to more senior students who are nearing completion of their graduate work as well as to students who participate as institutional APSA representatives. Students wishing to attend this meeting should speak to the Program Director. Expenses related to travel and attendance at the American Physician Scientist Association (APSA) Annual Meeting are 50% covered by the MSTP; the remaining 50% can be covered by a portion of the student's \$2400 budget. Expenses incurred by our institutional representatives to APSA are completely covered and are not counted toward the invited student's \$2400 budget.

Upstate New York Regional MD/PhD Conference

All students, regardless of year in training, are encouraged to attend the annual Upstate New York Regional MD/PhD Conference which is hosted on a rotating basis by the MD/PhD Programs at Syracuse, Buffalo, and Rochester. The program will cover all reasonable expenses for travel to this meeting.

ABRCMS, SACNAS, and other Recruitment Conferences

The MSTP routinely participates in recruiting opportunities at national meetings and will invite current students to serve as program representatives. Travel costs are fully covered by the program.

Additional Resources for Students

Students are strongly encouraged to utilize all resources available for travel to conferences and participation in special courses. These include, but are not limited to the following:

- Application for travel awards from associations sponsoring the meeting or course. Our students have been particularly successful in competing for such awards.
- Travel supplements offered by the medical school
- Travel funds available as part of an individual (e.g. F30) or institutional training grant (e.g. CTSA)
- Departmental travel supplements

Contact Information: MD/PhD Program

M. Kerry O'Banion, MD, PhD	Director, MSTP Principal Investigator	x5-5185
Doug Turner, PhD	Associate-Director	x5-3207
Regis O'Keefe, MD, PhD	Executive Committee Co-Chair	x3-1261
Mark Taubman, MD	Executive Committee Co-Chair	x5-7500
Catherine Senecal-Rice	Administrator	x5-8721
Brigid Waterhouse	Administrative Assistant	x5-9777

Program Office Address: Box 657

Program Office FAX: 585 756-5479 (Include a Cover Sheet to Cathy Senecal-Rice)

Contact Information: Medical School

David Lambert, MD	Associate Dean for Undergraduate Medical Education	x5-4537
Laurence Guttmacher, MD	Advisory Dean	x5-5469
Cheryl Kodjo, MD	Advisory Dean	x5-2189
Elizabeth Naumburg, MD	Advisory Dean	x5-4537
Brenda Lee, PhD	Assistant Dean, Medical Education & Student Affairs	x5-4537
John Hansen, PhD	Associate Dean for Admissions	x5-4539
Kathryn Markakis, MD	Director of PCC	x5-7202
Robin Carter-McFadden	Director, Educational, Curricular and Diversity Affairs	x5-2928
Adrienne Morgan, MS	Director, Student Enrichment Programs	x5-7203
Carol Veltre	Medical School Registrar	x5-4541
Monique Williams	Assistant Registrar	x5-4541
Peg Ehmann	Bursar	x5-4672

Departments, Centers & Programs	Personnel	Extension
BCG-Biochemistry & Biophysics Fax 275-6007 Box 712 <i>BMCB-Biochemistry, Molecular & Cell Biology</i> <i>BSB-Biophysics & Structural Biology</i>	Robert Bambara, Chair Rose Burgholzer, Program Administrator Katie Weir, Secretary Carolyn Johnson, Secretary Jeff Hayes, <i>BMCB</i> Director Mark Dumont, <i>BSB</i> Director	x5-3843 x5-3417 x5-3723 x5-1446 x3-4887 x5-2466
BCS-Brain & Cognitive Sciences Fax 442-9216 RC Box 270268	Elissa L. Newport, Chair Kathy Corser, Administrative Assistant	x5-8689 x5-1844
BIO-Biology Fax 275-2070 RC Box 270211 <i>Cellular Biology, Developmental Biology, Molecular Biology and Ecology and Evolutionary Biology.</i>	Thomas Eickbush, Department Chair Richard E. Glor, Co-Chair, Biology Graduate Affairs/Admissions Committee Vera Gorbunova, Co-Chair, Biology Graduate Affairs/Admissions Committee Cynthia Landry, Department Administrator	x5-7247 x6-3346 x5-7740 x5-7991
BME-Biomedical Engineering Georgen Hall Box 270168	Rick Waugh, Chair Anne Luebke, Director Gayle Hurlbutt, Department Administrator Donna Porcelli, AA (graduate contact)	x5-3768 x3-1635 x5-0453 x5-3891
CHM-Chemistry Fax 275-4231 RC Box 270216 <i>Organic, Inorganic, Physical, Biological, Theoretical</i>	Robert K. Boeckman, Chair Robin Cooley, Graduate Studies Coordinator	x5-4229 x5-0635
GGD-Biomedical Genetics KMRB 2-9633 Box 633 <i>Genetics, Genomic, & Development</i>	Hartmut Land, Chair Katie Scoville, Graduate Coordinator/Admin. Dirk Bohmann, <i>GGD</i> Director Jill Van Atta, Secretary Jiyong Zhao, CGS Rep	x3-1442 x3-1441 x3-1446 x3-1447 x3-1453
BST-Biostatistics & Computational Biology MED 3-8814 Box 630 Fax 273-1031	David Oakes, Interim Chair Michael McDermott, CGS Rep. Brian Griebner, Administrator Sheryl Hennekey, Secretary Cheryl Bliss-Clark, Graduate Coordinator	x5-6688 x5-6685 x5-2407 x5-6696 x5-6684
Ctr for Oral Biology KMRB G-9640 Box 611 Fax 473-2679	Robert Quivey, Center Director, <i>Dental Sciences</i> Nicole Beaumont, Administrative Manager Barbara Sperduto, Secretary	x5-3444 x3-3287 x5-3441
Community and Preventive Medicine Helen Wood Hall 4W156 Fax 461-4532 Box 644 <i>HSR Health Services Research & Policy</i> <i>EPI Epidemiology</i> <i>PH Public Health</i>	Susan Fisher, Chair, <i>EPI</i> Director Pam Allen, Administrator Bruce Friedman, <i>HSR</i> Director Donna Vink, Administrative Assistant to Susan F. Nancy Chin, <i>MS/MPH</i> Director Pattie Kolomic, Program Administrator Sheila M. McCart, Administrative Secretary	x3-2849 x5-1845 x3-2618 x5-8784 x5-9780 x5-7882 x3-2590
CTSI - Clinical & Translational Science Inst <i>TBS Translational Biomedical Science</i> <i>CTR Clinical Translational Research</i> <i>CTI Clinical Research</i> <i>PH Public Health</i>	Nina Schor, Director (Box 777) Shanti Sharma, Administrator (Box 645) MS - CTR Nancy Chin, Director MS - CLI, MPH	x5-4673 x5-7704 x5-9780

Environmental Medicine MED 4-5702 Box EHSC Fax 256-2591 <i>TOX-Toxicology</i>	Tom Gasiewicz, Chair Mike Terry, Administrator Lisa Opanashuk, CGS Rep TOX Christine Gramza, Graduate Coordinator Ned Ballatori, <i>TOX</i> Director	x5-7723 x5-4203 x3-2954 x5-6702 x5-0262
Microbiology and Immunology MED 2-5418 Box 672 Fax 473-9573 <i>IMV-Immuno, Micro, & Virology</i>	Barbara Iglewski, Chair Wendy Keck, Administrator Edith Lord, Director Constantine (Gus) Haidaris, CGS Rep Brenda Knorr, Graduate Coordinator Corrine Aleese, Secretary	x5-3402 x5-2536 x5-5855 x5-0678 x5-3402 x5-1359
Neurobiology and Anatomy Box 603 ANA	Gary Paige, Chair John Olschowka, NBA Director & CGS Rep. Ania Dworzanski, Graduate Coordinator	x5-2591 x5-8238 x5-5788
NEU Neuroscience <i>IGPN</i> Box 603 ~ MED 5-7425	Robert Freeman, IGPN Director & CGS Rep. Ed Freedman, Cluster Director Ania Dworzanski, Graduate Coordinator	x3-4893 x3-1892 x5-5788
Pathology MED 1-7424 Box 626 <i>PWD-Pathways of Human Disease</i> Fax 273-1027	Daniel Ryan, Chairman Cheryl Breitenbuecher, Administrator Robert Mooney, <i>PWD/PhD</i> Director & CGS Rep. Taimi Marple, Graduate Coordinator	x5-3184 x5-1863 x5-7811 x5-1866
Pharmacology and Physiology MED 4-6441 Box 711 CMPP Fax 273-2652 <i>Cellular and Molecular Pharmacology and Physiology</i>	A. William Tank, Chair Debra Andreacchi-Roth, Senior Administrator Joann Barberi, Senior Accountant Denise Hocking, CGS Rep. David Yule, CMPP Director Linda Fullington, Graduate Coordinator	x5-1681 x5-3142 x5-1680 x3-1770 x3-2154 x5-0447
Psychiatry MED 1-9068 Box PSYCH M&F Fax 271-7706 <i>MFT</i> <i>Marriage and Family Therapy</i>	Eric Caine, Chair Paul McArthur, Administrator Pieter Le Roux, Director & CGS Rep. Pat Atkins, MFT Administrator Deb Contestabile, Administrative Assistant Diana Julian, Graduate Coordinator	x5-3574 x5-6732 x5-9179 x5-6792 x5-0577 x5-2532
OGE-Offices for Graduate Education <i>MED G-9556</i> <i>Box 316</i> <i>Fax 461-4927</i> <i>Box 316A (Admissions)</i>	Edith M. Lord, Ph.D., Senior Associate Dean Linda Lipani, Registrar/Director of Student Services Administrator/Dir., Admissions/Recruitment (TBD) Josephine Hitzfield, Admissions Secretary Administrative Assistant Recruitment/Admissions Marcia Perotto, Assistant Registrar Administrative Assistant to Registrar	x5-4522 x5-7288 x5-9017 x3-4650 x5-2933 x3-1620 X3-1619

MD/PhD Program in Biochemistry

MD/PhD program students usually enter the PhD portion of their combined degree work after the basic science years of the MD curriculum. During the second year of the MD program students should discuss the PhD Program with prospective faculty advisors and the Biochemistry Program Director. It is optimal for the student to complete two research rotations before choosing a permanent advisor.

CURRICULUM

1) All of the following courses are required:

- | | | | |
|---|------------------|--|-----------------|
| • | BCH 412 (5) | Adv. Topics in Biological Macromolecules | Spring |
| • | IND 410 (4) | Molecular Biology and Genetics | Spring |
| • | IND 501 (0) | Ethics in Research | Fall |
| • | BCH 501, 502 (1) | Biochemistry Seminar* | (each semester) |
| • | BCH 595 | PhD Research | (each semester) |

*includes yearly presentation

2) Additional requirement

IND 409 (4)	Cell Biology	Fall
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Or

An (advisor and program director) approved alternative elective

NOTE: MD/PhD students are granted 30 credits toward the 90 credit hour requirement for the PhD on the basis of their basic sciences curriculum.

OTHER REQUIREMENTS

- No Teaching Assistantship is required.
- The Qualifying Examination is required at the end of the second year of PhD studies.
- Thesis preparation and defense.

Reviewed: March 2008

MD/PhD Program in Biology

The Department of Biology at the University of Rochester offers PhD degrees in the areas of Molecular, Cellular and Developmental Biology and Evolutionary Biology. The Department is united by a common interest in genetic processes which has created a continuum of research interests among the different laboratories. For example, our evolutionary biologists use molecular biological approaches, and some of our cell biologists publish in the areas of development and evolution. The Biology Department is housed in Hutchison Hall, together with Earth and Environmental Sciences and the Chemistry Departments. The Department is only a five minute walk from the Medical Center which is home to the Departments of Biochemistry and Biophysics, Microbiology and Immunology, Neurobiology and Anatomy, Physiology, the Cancer Center, and related medical service departments. The physical closeness of these groups facilitates intellectual exchange and collaboration among the graduate programs of the basic and biomedical disciplines. Interdepartmental programs such as the Graduate Education in the Biomedical Sciences (GEBS), the MD/PhD Program and the Genetics Program serve to increase communication and training opportunities for our students.

I. COURSE WORK

A. Credit Hours

90 credit hours are required for completion of the PhD degree. Credit hours include both coursework and research. Once a research advisor has been selected, students must register each semester for a sufficient number of credit hours in Biology 595 (PhD Research in Biology) to bring the total to 12 credits. After a total of 90 credits has been achieved, the student should register for Biology 999 (Doctoral Dissertation). Students do not formally register for credit during the summer, but are required to do full-time research during this period.

B. Course Requirements

Students whose interests are in cell, developmental or molecular biology must take a minimum of six courses during their graduate career, selected according to background and research interests. Each course must be > three credits. Students whose interests are in ecology and evolutionary biology are required to take five lecture or reading courses (each > three credits). Courses will be selected, in consultation with a faculty advisor, to assure appropriate depth and breadth of preparation. A list of courses available in the Department is provided at the end of this document.

Students who have taken graduate courses prior to entering the PhD program may petition the GAC for a reduction in the number of required courses. MD/PhD students typically take fewer courses because of their work in the first two years of medical school.

C. Laboratory Rotations

Rotations are not required. Students may rotate through research laboratories in order to become acquainted with faculty and to aid in selection of a research advisor.

D. Seminar Requirements

All students are required to participate in a minimum of four seminar courses in which they make oral presentations. EEB students will meet this requirement in BIO 584 and CMD students will meet this requirement by taking three BIO 516 seminars and presenting in BIO 517 every Spring semester. First year students and advanced students who will defend their dissertation within six months are not required to present in BIO 517. Both EEB and CMD students may petition the GAC to have one oral presentation at a national or international meeting count towards the seminar requirement. Students must complete the seminar requirement by the end of their fourth year in order to avoid tuition charges.

II. TEACHING

MD/PhD candidates who are supported by fellowships are exempt from teaching.

III. QUALIFYING EXAMINATION

The PhD Qualifying Examination consists of a written thesis proposal and an oral examination. The oral exam is intended to determine whether a student is prepared to pursue a professional career in science, as demonstrated by successful defense of the proposal. The exam also will test general knowledge of biology and, in greater depth, knowledge within the students' field of interest.

Preparation of the thesis proposal for the Qualifying Examination should be a realistic training experience that involves developing a feasible research project and presenting it in concise and cogent prose. The suggested format for the thesis proposal is that used for a research grant. It should include an introduction providing a brief background to the research, a list of specific aims, a description of experimental procedures, and presentation of preliminary data that have been obtained by the student to demonstrate the feasibility of the approach. The advisor must sign the thesis proposal, indicating that (s)he is willing to allow the research to be carried out in her/his laboratory. The advisor should also indicate his/her level of input into the proposal. This might include, for example: provision of a recently submitted proposal or one in preparation; suggestions to expand and/or clarify specific parts of the proposal; discussions on the preliminary data to be included, and its interpretation; identification of missing background information; and text editing for grammar, syntax or clarity.

A copy of the thesis proposal must be distributed to the examining committee and filed with the secretary of the GAC at least one week prior to the oral exam. The proposal should be less than or equal to 10 pages, single spaced, excluding figures and references.

The examining committee is selected by the GAC and approved by the Associate Dean of Graduate Studies of the College. It will consist of four members one of whom may be from outside the Department., The student's advisor will not be present. The committee will be chaired by the most appropriate faculty member.

After the questioning is concluded, the candidate will be asked to leave the room and each committee member in turn will discuss the strengths and weaknesses of responses to his/her questions. The committee will also list major strengths and weaknesses of the research proposal. When discussion has been completed to everyone's satisfaction, an anonymous written, pass-fail vote will be taken.

IV. RESEARCH

The most important part of the work leading to the PhD degree is the independent research that leads to the preparation of a thesis. The following sections outline the formal mechanisms for guiding thesis research and monitoring its progress

A. Selection of a Research Sponsor

Students become familiar with the research of faculty through lab rotations, seminars, reading published work, and conversations with individuals. By the announced deadline (usually the end of April), first year students submit their first and second choices for a research sponsor to the secretary of the GAC. Students who enter the PhD program with at least two years of prior graduate training in biology may petition the GAC to select a research advisor prior to the April deadline. Faculty are not allowed to make commitments to students before the April deadline. The involved faculty will then be notified, and the students informed promptly as to whether or not they can be accepted into the lab of their first choice. Students will be matched with their highest possible choice. The research sponsor becomes the student's academic advisor, and recommends courses that should be taken or audited.

B. Thesis Advisory Committee and Progress Reports

Following completion of the Qualifying Exam, the student will meet with his or her Thesis Advisory Committee (TAC), which need not include the same members as the Qualifying Examination Committee. The first meeting should be held by the end of the fifth semester. Subsequently, the Thesis Advisory Committee must meet at least once a year to review the candidate's progress. More frequent meetings may be held at the request of the student or any member of the Thesis Advisory Committee.

The Thesis Advisory Committee is normally selected by the student and the research advisor to include faculty members especially knowledgeable in the research area. The committee is formally appointed by the Associate Dean of Graduate Studies. It must include at least three faculty members from the Department (one of whom is the research advisor) and a faculty member from outside the Department. The outside member is usually from another department at the University of Rochester but may be from another institution, if sufficient expertise is not available at the University.

At least one week before each meeting, the candidate will provide TAC members with a written report of work completed since the previous meeting. This report should be no more than five pages long (double-spaced, typed). A copy of the report should be filed with the secretary of the GAC for retention in the student's record. Written assessments of the candidate's progress will be submitted to the GAC by members of the Thesis Advisory Committee after every meeting. These reports will form the basis for the Department's recommendation regarding continuation in the PhD Program. If more than two semesters and one summer elapse without a progress meeting, the student will not be allowed to register for the next semester.

TAC meetings are intended to be a constructive mechanism to assist the student in his/her progress toward an outstanding thesis. They should be used as opportunities to review results and focus research plans. However, they are not the only mechanism. Students are encouraged to consult with their sponsor, with members of the TAC, and with any faculty member or student whose expertise is of use.

C. Preparation and Defense of the Thesis

Once a student has completed the work agreed upon by the advisor and TAC, he/she writes a thesis. Students are strongly encouraged to begin writing sections of their theses dealing with completed work, even while final research projects are being carried out. The style of the thesis (e.g., chapters based on papers, or a continuous results narrative) should be agreed upon by the student and the TAC at least six months prior to the intended submission date.

The final version of the thesis (as approved by the research advisor), must be registered with the Associate Dean for Graduate Studies of the College of Arts and Science at least twenty full working days prior to the date of the final oral examination. The Dissertation Examining Committee will normally consist of the members of the student's Thesis Advisory Committee and a chairman to be appointed by the University Dean of Graduate Studies. If the Thesis Advisory Committee did not include an outside member of the Department, the student and advisor must select a faculty member from outside the Department to sit on the Dissertation Advisory Committee.

The final oral examination will consist of a one-hour public seminar, followed by an open question and answer period. The candidate and the examining committee, will then meet in private for additional discussion and the formal defense.

Courses Offered by the Department of Biology

- 402. Molecular Biology
- 405. Evolution: Fundamentals of Evolution and Population Biology
- 406. Eukaryotic Genomes
- 407. Advanced Genetics
- 419. Advanced Cell Biology: Nuclear Structure and Function
- 420. Advanced Cell Biology: Cytoplasmic Structures and Functions
- 426. Developmental Biology
- 428. Laboratory in Cell and Developmental Biology
- 432. Genetic Diversity and Human Diseases
- 434. Phylogenetics
- 436. Developmental Genetics
- 437. Advanced Developmental Biology
- 443. Eukaryotic Genome Organization and Expression
- 451. Advanced Molecular Biology
- 460. Animal Behavior
- 463. Ecology
- 468. Laboratory in Molecular Genetics
- 472/473/474. Topics in Ecology and Evolution

Reviewed: 2006

MD/PhD Program in Biomedical Engineering

Students earning a PhD in Biomedical Engineering through the MD/PhD program will begin PhD training in the third year of graduate school after two years of medical school training. Unless explicitly stated below all requirements and definitions for the PhD in Biomedical Engineering (Section I) apply to students in the MD/PhD program.

A. Curricular requirements

Because the medical school training emphasizes biology and physiology, the BME PhD requirement for 12 credits of Approved Biology are waived. Additionally, only 4 credits of BME Intensives are required, and the preliminary exam is waived. A teaching assistantship is encouraged but not required. The BME faculty believe that experience and training in teaching is a valuable part of doctoral education for biomedical engineers, however the program does not require TA service in order to be consistent with MD/PhD requirements in other departments. The following summarizes the full non-research requirements for BME PhDs in the MD/PhD program:

- 12 credits of approved engineering
- BME502: Analytic Foundations in BME* (4 credits; fall term)
- 4 credits of BME Intensives
- The proposals writing course (2 credits; spring term)
- Research ethics (1 credit; fall term)
- Three formal presentations in a public forum

A student should complete the curricular requirements in one academic year, and it is expected that 2-3 additional years will be required to complete the PhD thesis. Students must select a research advisor by the beginning of the spring term, and research should be underway by the spring term so that the proposal writing class is most effective. The qualifying exam should be taken in the fall of the second year of PhD study.

B. Clerkships

During the years of doctoral training, students will continue with clerkship activities for one afternoon each week to remain active in medical training. The clerkship time accumulates as medical school credit, and enables the student to have a free block in the last year of medical training to pursue either additional elective or further research activities.

Reviewed: March 2008

MD/PhD program in Biophysics and Structural Biology

Students in the MD/PhD program who are considering a PhD in Biophysics are encouraged to meet with the Biophysics Program Director and potential thesis mentors as early as is convenient but no later than the middle of the second year of the MD program.

Curriculum:

All MD/PhD students in the Biophysics program must complete the following courses:

- | | | | |
|---|-------------|-------------------------------|--------------------------------|
| • | BPH 411 | Methods in Structural Biology | 5 credits |
| • | IND 509 | Molecular Biophysics | 5 credits |
| • | IND 501 | Ethics in Research | 0 |
| • | BPH 571,572 | Biophysics Seminar | 1 credit each semester |
| • | BPH 595 | PhD research | up to 15 credits each semester |

Elective course:

At least one elective course must be taken. The choice must be approved by the PhD advisor and Program director. Recommended courses are listed below.

- | | | | |
|---|---------|--|-----------|
| • | IND 408 | Biochemistry | 5 credits |
| • | IND 409 | Cell Biology | 4 credits |
| • | IND 412 | Advanced Topics in Biological Macromolecules | 5 credits |

Other requirements:

- Two research rotations should be conducted prior to joining a laboratory for dissertation research. Students are encouraged to complete these rotations during the first two years of the MD program.
- The qualifying examination must be completed by the end of the second year of PhD studies.
- At least one meeting per year with the thesis advisory committee (normally held after the student's Biophysics Seminar presentation).
- A satisfactory thesis must be written and successfully defended.
- Details of these requirements are given in the Biophysics and Structural Biology Graduate Student Handbook.

Reviewed: 2006

MD/PhD Program in Biostatistics and Computational Biology

The activities of the Department of Biostatistics and Computational Biology include biostatistical research, collaborative research, and teaching. The department conducts a program of teaching and research in statistical methodology oriented toward the health sciences and in statistical theory and stochastic modeling growing out of research in the health sciences. The department has recently expanded to include a unit devoted to methodological and collaborative research in the rapidly emerging area of computational biology, as well as a unit devoted to biocomputing and modeling for clinical studies. Department faculty have wide-ranging research interests, including survival analysis, sequential analysis, clinical trial design, longitudinal data analysis, missing data methods, causal inference, analysis of categorical data, measurement error models, multiple testing, analysis of gene expression data, network inference, statistical genetics, nonparametric smoothing and curve estimation, model selection techniques, robust inference, mathematical and stochastic modeling of complex biological systems, order restricted inference, ROC curve analysis, nonparametric inference, Bayesian inference, functional response models, and small-sample asymptotics. The department has expertise in virtually all fields of modern theoretical and applied statistics. Members of the faculty have served as Editors and Associate Editors of journals such as *Journal of the American Statistical Association*, *Biometrika*, *Annals of Statistics*, *Lifetime Data Analysis*, *Journal of Modern Applied Statistical Methods*, and *Neurology*. Many faculty members also serve on study sections or special emphasis panels for the National Institutes of Health or organizations such as the Muscular Dystrophy Association. Senior faculty have received recognition as Fellows of the Institute of Mathematical Statistics, the American Statistical Association, and other professional organizations.

Faculty of the department have played major roles in important breakthroughs in medical research at Rochester. Examples include the better understanding of the role of calcium channel blockers in treating patients who have had a heart attack, demonstration of both the clinical effectiveness and the cost effectiveness of implantable defibrillators in reducing mortality among certain heart disease patients, demonstration of the effectiveness of deprenyl in slowing onset of disability in early Parkinson's disease, and of surfactant therapy for respiratory distress syndrome in premature infants, and an ongoing epidemiologic study of the assessment of the effects of low levels of dietary mercury intake on childhood development. Faculty are currently involved in wide-ranging collaborative activity with the Environmental Health Sciences Center, the Cancer Center, the Center on Aging and Developmental Biology, the Center for Oral Biology, the General Clinical Research Center, the Heart Research Follow-Up Program, the School of Nursing, and the Departments of Medicine, Neurology, Community and Preventive Medicine, Pediatrics, Psychiatry, Emergency Medicine, Obstetrics and Gynecology, Ophthalmology, Dentistry, and Biomedical Genetics. The department houses the Biostatistics Centers for national and international research groups such as the Parkinson's Study Group, Huntington's Study Group, Muscle Study Group, and Tourette's Syndrome Study Group and is responsible for the statistical analysis of many recent and ongoing multicenter clinical trials of new treatments for those diseases. This environment is ideally suited for collaborative research and consulting.

Program for the Degree of Doctor of Philosophy in Statistics

The department administers the doctoral program in statistics, which is taught jointly by biostatistics faculty and faculty of the Program in Statistics in the College. The department interprets the term "statistics" very broadly. The program permits specialization in probability, statistical theory and analysis, biostatistics, and interdisciplinary areas of application. Students have opportunities for supervised teaching and supervised consulting experience, requiring approximately 12 to 15 hours of effort per week for one academic year.

A candidate for admission to the PhD program should have a background in college mathematics, including a year of advanced calculus or mathematical analysis (similar to MTH 265, 266), a course in linear and/or matrix algebra, and a year of probability and statistics (similar to STT 201, 203); a course in statistical methods is also recommended. However, promising students may make up deficiencies after matriculation.

Doctoral students are expected to attain some competence in each of the following (overlapping) areas: I. statistical inference; II. statistical analysis (theory and methods); III. probability and stochastic processes. In addition, each student is expected to qualify at a more advanced level in two areas, designated major and minor. Minor areas, in addition to those three above, include IV. mathematics; V. epidemiology; VI. biostatistics; and VII. a specific field of application, such as econometrics, psychometrics, computer science, genetics, engineering, etc. Students are required to acquire some proficiency in statistical computation, using at least one high-level language and several statistical packages.

Students are required to take a minimum of 16 formal courses, including:

1. *Basic courses*: at least two courses in each of the areas I, II, and III and at least three in areas IV–VII combined.
2. *Major area*: at least three additional courses (12 credits), ordinarily at the 500 level, in one of the areas I–III (or IV–VII with permission).
3. *Minor area*: at least two additional courses in another one of the seven areas.

Beginning students should expect to spend all of their first year, most of their second year, and some of their third year taking formal courses. This includes a minimum of six semesters of BST 497, a one-credit seminar course designed to give students extensive practice in searching the statistical literature and preparing and delivering presentations. The balance of time is spent on reading and research. Students entering with advanced training in statistics may transfer credits at the discretion of their advisors. Typical programs for an entering student without previous advanced training are as follows:

<i>Year 1: Fall</i>	<i>Year 1: Spring</i>	<i>Year 1: Summer</i>
BST 401 (4 credits)	BST 426 (4 credits)	BST 477 (0 credits)
BST 411 (4 credits)	BST 466 (4 credits)	BST 478 (0 credits)
BST 464 (4 credits)	BST 520 (4 credits)	
BST 497 (1 credit)	BST 497 (1 credit)	
BST 590 (2 credits)	BST 590 (3 credits)	
 <i>Year 2: Fall</i>	 <i>Year 2: Spring</i>	
BST 402 (4 credits)	BST 412 (4 credits)	
BST 479 (4 credits)	BST 512 (4 credits)	
BST 531 (4 credits)	BST 513 (4 credits)	
BST 497 (1 credit)	BST 497 (1 credit)	
BST 590 (3 credits)	BST 591 (3 credits)	

Year 3+

Mostly reading and research, with some 400-level (e.g., BST 452 or 465) and 500-level courses.

Notes

1. BST 497, Seminar in Statistical Literature (1 credit), is offered every semester. Topics covered vary. PhD students are required to register for at least six semesters.
2. Training in the use of statistical software (BST 477/ 478) is offered during the first six weeks of the summer as a computing rotation (no formal credit).
3. All PhD students are required to have at least four credits of supervised teaching and/or supervised consulting (BST 590, 592).
4. Advanced courses listed as BST 511, 512, 550, or 570, for varying numbers of credits, are offered depending on interests of students and instructors. Recent and current examples include: Monte Carlo Methods and Modeling of Biomedical Dynamic Systems; Semiparametric Inference; High-Dimensional Data Analysis; Statistical Methods in Epidemiology; Smoothing Methods; Statistical Inference Under Order Restrictions; The Bootstrap, the Jackknife, and Resampling Methods; Permutation Tests; Causal Inference; Introduction to ROC Methodology.

These requirements are to be interpreted as guidelines, rather than as regulations. A balanced program is worked out with the student's advisor and the graduate advisor.

The *examination* requirement consists of:

1. *Written examination* in two parts. The basic part covers basic material in areas I–III, based on undergraduate preparation and some of the first-year graduate courses. It is taken after one year of study. The advanced part covers advanced material from two to three core courses in each of areas I–III taken during the first two years of graduate study. This part is usually taken after two years of study.
2. *Qualifying examination* (oral) on the general area of proposed research and other topics as necessary.
3. *Final examination* on the completed dissertation.

The *dissertation* will consist of substantial scholarly contribution, worthy of publication, in one of the areas I–III or in any other area approved by the faculty committee.

Considerations for Students in the MD/PhD Program

Students admitted to the MS/PhD program follow essentially the same course of study as students in the PhD program, except that their coursework in statistics begins during the fall of the third year in the program. During the first year, students spend three months (June–August) with a mentor to begin the process of orientation toward research in statistical methodology. This may be implemented either as a formal reading course (BST 491) or as involvement in an applied project that may motivate a methodologic research problem. This is repeated during the second year of the program (March–August) just prior to the start of coursework. The main goals of these interactions during the first two years are to provide the student some insight regarding the process of research in statistical methodology and to facilitate the process of choosing a research advisor.

Reviewed: March 2008

MD/PhD Program in Brain and Cognitive Sciences

The Department of Brain and Cognitive Sciences (BCS) offers a PhD degree that can be combined with the MD. After two years of the MD curriculum, students complete two years of coursework in BCS and at least a 3rd year of dissertation research before returning to complete the MD.

The full complement of required courses in BCS has been reduced slightly to accommodate the additional coursework and training for the MD. The requirements are listed below.

Core courses

Students must take three of the following six core courses (reduced from the normal requirement of four), with at least one core course from each of the three pairs.

BCS 501: Language
BCS 502: Cognition

BCS 504: Sensory Systems
BCS 505: Perception and Motor Systems

BCS 508: Neural Plasticity in Learning and Development
BCS 541: Integrative and Systems Neuroscience

Experimental Design and Statistics. One course from the following list:

BST 464: Applied Linear Regression
STT 203: Introduction to Mathematical Statistics
STT 422: Design of Experiments and STT 441: Applied Multivariate Analysis (together these 2 courses form one semester)

Methodology. One course from the following list:

BCS 511: Behavioral Methods in Cognitive Science
BCS 512: Computational Methods in Cognitive Science

Teaching Assistantship

A one-semester TA experience in a relevant undergraduate course in BCS or NSC (to be determined based on TA needs and the skills and background of the student), with simultaneous enrollment in BCS 598: Supervised Teaching

Elective Courses and Seminars

In addition to the above course requirements, the student must complete a minimum of 90 credit hours of formal coursework or readings/research courses. Enrollment in the following courses should be used to meet the 90 credit-hour requirement for the PhD.

BCS 591: Readings at the PhD level
BCS 595: Research at the PhD level
BCS 999: Doctoral Dissertation

Research Activities

In contrast to other GEBS programs, BCS does not have a formal lab rotation requirement. Students are encouraged to move as quickly as possible into a lab (after suitable negotiation with the faculty mentor) and engage in research activities for the entire duration of the 3 (or more) years spent in BCS fulfilling course requirements and completing the dissertation.

Students are also required to make a formal presentation about their on-going research to the Department (students, postdocs, and faculty) at the biweekly BCS Lunch no later than their third semester in the program.

Written Qualifying Exam

At the end of the second year, students must take a multi-day, open book, written examination based on their coursework and a custom reading list negotiated with their faculty mentor and two other BCS faculty of their choosing. The qualifying exam for MD/PhD students is 2/3 the length of the normal BCS qualifying exam. A passing grade on this exam enables the student to be formally admitted to candidacy in the University's Graduate School for a PhD in BCS.

Dissertation

Once admitted to candidacy for the PhD, the student forms a dissertation committee consisting of the faculty mentor, two other faculty members in BCS, and one faculty member in a non-BCS department (or program). A formal presentation of the dissertation proposal, both in written form and orally, is made to this dissertation committee well in advance of completion of the dissertation research. Upon completion of the dissertation research, and having met all course and credit hour requirements, the written dissertation is filed with the Graduate Dean who schedules the final oral examination and appoints an outside Chair to monitor the examination. This examination consists of a public lecture to the entire Department, followed by a closed oral exam by the dissertation committee.

Reviewed: March 2008

MD/PhD Program in Chemistry

1. Course Requirements. All students enrolled in the PhD program must demonstrate breadth and depth in their coursework. For graduate students matriculated into the PhD program 20 credits determined by the student's interests and field of study are required. For MD/PhD students, courses taken during the first two years are taken into account and the required number of Chemistry credits required is reduced to 12.

Programs of study can be modified to best address a student's research needs and interests. For their first year in Chemistry, students develop a program of study either in consultation with the Graduate Studies Committee, or in consultation with a research adviser, who is typically chosen in December of the student's first year of Chemistry concentration. Other options are available, such as taking a course offered in another department; these options require the approval of the Chair of the Graduate Studies Committee. Courses within the department include those given below.

- 402. Biophysical Chemistry I (4 credits)
- 404. Biophysical Chemistry II (4 credits)
- 411. Advanced Inorganic Chemistry (4 credits)
- 414. Bioinorganic Chemistry (4 credits)
- 415. Group Theory (2 credits)
- 417. X-ray Crystallography (2 credits)
- 421. Basic Organometallic Chemistry (2 credits)
- 422. NMR Spectroscopy (2 credits)
- 423. Organometallic Chemistry - Survey (2 credits)
- 424. Inorganic Spectroscopic Techniques (2 credits)
- 426. Organic Structure Determination (2 credits)
- 433. Advanced Physical Organic Chemistry I (4 credits)
- 434. Advanced Physical Organic Chemistry II (4 credits)
- 435. Organic Reactions (4 credits)
- 436. Organometallic Chemistry for Organic Synthesis (2 credits)
- 437. Bioorganic Chemistry (4 credits)
- 438. Advanced Synthetic Strategy (2 credits)
- 450. Biochemistry (4 credits)
- 451. Quantum Chemistry I (4 credits)
- 452. Quantum Chemistry II (4 credits)
- 455. Thermodynamics and Statistical Mechanics (4 credits)
- 458. Molecular Spectroscopy and Structure (4 credits)
- 460. Chemical Kinetics (4 credits)
- 461. Advanced Experimental and Computation Laboratory (4 credits)
- 465/466. Nuclear Chemistry I (4 credits)
- 470. Computational Chemistry (4 credits)
- 561. Magnetic Resonance Spectroscopy (4 credits)
- 566. Nuclear Chemistry II (4 credits)

2. Seminar - All students register each semester for graduate seminar (CHM 511 for physical and inorganic students or CHM 513 for organic students). Students receive one credit per semester until a total of four (4) credits have accumulated. After this, students continue to register for and attend seminars, but for zero credits.
3. Chemistry Colloquium - Participation in the chemistry colloquium series is an integral part of the graduate program. All chemistry students register for CHM 583 for zero credits each semester.
4. Teaching - All graduate students in Chemistry participate in the teaching program as teaching assistants in undergraduate and graduate courses. Teaching time for MD/PhD students is decreased to one semester.
5. PhD Research in Chemistry - Students register each semester (including summer) for a sufficient number of credit hours of PhD Research in Chemistry (CHM 595) to bring the total credit hours for the semester to 12 credits, until a total of 90 credits has been achieved.
6. Doctoral Dissertation - After students accumulate 90 total credit hours, they register for Doctoral Dissertation (CHM 999) for zero credits, as well as for the appropriate seminar and colloquium courses.

QUALIFYING EXAMINATIONS

1. Written Qualifying Examinations - These examinations are based on material from undergraduate course work, first-year graduate course work, seminars, colloquia, and the literature. These examinations serve to stimulate review of past and current materials, and are designed to encourage reading of current literature. First-year students entering in September must begin the Written Qualifying Examinations series between October and April of their first year. They then have twelve consecutive months to obtain the necessary points to pass the Written Qualifying Examinations.
2. Oral Qualifying Examination - The Oral Qualifying Examination for admission to PhD candidacy is based on, but not limited to, a written report of the student's research problem outlining research objectives, important background (including key references) and progress to date. The Oral Qualifying Examination must be completed by the end of the student's second year in the program.

SEMINAR PRESENTATION

During the third year of study, students present a departmental seminar on a research topic as is customary within the student's subdiscipline.

Reviewed: March 2008

MD/PhD Program in Epidemiology

INTRODUCTION

The School of Medicine and Dentistry at the University of Rochester Medical Center (URMC) seeks to improve health through *caring, discovery, teaching and learning*. Education has traditionally been the 'centerpiece' of the URMC; our history has been marked by the education of renowned academic leaders including Nobel Laureates and deans of prestigious universities throughout the U.S. The University of Rochester remains committed to integrating excellence in education into the ever increasingly complex environment of health care. Comprehensive educational programs are well established in the laboratory, clinical and public health sciences. The hallmark of these programs is that each is based upon the interdisciplinary biopsychosocial model that approaches health and disease as a multidimensional continuum influenced by biologic, social and psychologic determinants.

Scholarly research has also been a critical component in the history of URMC. Clinical advances emanating from today's science require the knowledge and skills from a broad spectrum of independent, scientific disciplines including some outside of the 'traditional' basic sciences. Such disciplines as epidemiology, biostatistics, health services research and behavioral sciences have a unique theoretical core while also possessing the tools and methodologies for significant applicability to the study of health. Epidemiology has a distinct philosophy and a unique set of scientific concepts and methods, which are utilized to conduct independent community and population research, focusing on the delineation of disease causation and the prevention of morbidity and mortality. It also provides the principles and tools necessary for the practice of preventive medicine and the formulation of public health practice.

Doctoral Program in Epidemiology

A PhD program in Epidemiology was newly established in 2002 within the Division of Epidemiology, Department of Community and Preventive Medicine. The program addresses the complex patterns of disease occurrence in human populations; the etiologic role of biomedical, environmental, and socio-behavioral factors in the incidence and natural history of disease; and effective approaches for disease prevention and health promotion. The curriculum emphasizes the sequential process of reasoning that is inherent to the discipline of Epidemiology. Rigorous methodologic approaches, both observational and experimental, and strong analytic skills are fostered in all initiatives.

The specific objectives of the doctoral program in epidemiology include:

- Educating individuals in the basic science of Epidemiology;
- Teaching the skills required to conduct population research;
- Providing intense mentoring to assure a successful, productive, and satisfying research experience;
- Preparing students to successfully transition into a role of an independent investigator;
- Providing educational role models that encourage students to develop and cultivate their own teaching skills;
- Nurturing a research environment in which accuracy, integrity and ethical practices are highly valued.

The most important aspect of this program is the development of a unique model of epidemiologic training interfacing with multiple disciplines and the provision of opportunities for population research across the biopsychosocial continuum from the individual and the community to national and international populations.

The educational experience within the doctoral program provides a comprehensive blending of a didactic curriculum of theory and methods for epidemiologic research with an intensive mentored research experience. Epidemiology students have access to experiences and opportunities across numerous departments and scientific centers within the University. Quality education is provided through innovative approaches in a supportive, integrated environment.

Research Opportunities

The research component of the doctoral training has been planned as an intense, carefully mentored process. The program faculty represent the majority of clinical departments within URM as well as basic science departments. Also represented are government agencies such as the Health Department and private corporations such as Kodak, Xerox and Blue Cross/Blue Shield, each of which has expressed interest in public health/health care issues. Collaborations with these institutions have been developed and nurtured by the DCPM because of the diversity that they bring to the department activities as well as the rich data sources each holds. The program faculty provides the primary source of research opportunities for students to share in during their training as well as serving as the foundation on which dissertation research investigations may be built. The federally funded research studies led by program faculty provide ample options for doctoral students, however, students are not limited to these programs.

Combined MD/PhD in Epidemiology Program

This MD/ PhD option in epidemiology extends the long commitment of the University and the Department to improve health through research and education, with a particular emphasis on community and population-based research. The interest in epidemiology throughout both the medical education and graduate education programs at the University mirrors the growing need for epidemiologists nationally who can both act as independent investigators and make significant contributions to medical research.

This combined program may be integrated into the established MD/PhD program at the University of Rochester School of Medicine & Dentistry and culminates in the award of both an MD and a PhD in Epidemiology. The overall goal of this program is to prepare individuals for an academic career in medicine, which will focus on the conduct of epidemiology-oriented, population-based research.

The major components of the program design are outlined below:

1. Students seeking admission to the Doctoral program in Epidemiology as part of the combined MD/PhD program are held to the same academic standards for admission and performance as the students in the established PhD Program. Requirements for admission are similar. Student interviews with the Executive Committee of the epidemiology program (responsible for program admissions) are integrated into the admission process as conducted by the MD/PhD program. Faculty provide the MD/PhD Admissions Committee with an evaluation as to the student's eligibility and potential contributions to the program.
2. Given the year 1 and 2 medical school curriculum (and perhaps completed masters degrees), some of the epidemiology course requirements in the standard doctoral program may be 'waived' for the MD/PhD students. A maximum of 30 credits may be waived. Courses which may be waived are specified on the attached MD/PhD program worksheet below.
3. The first 2 years of the medical school curriculum will be completed by the student. During this time, as schedules allow, students will participate in selected Division of Epidemiology activities such as seminars, journal clubs, etc. Emphasis will be placed on integrating the epidemiology student in program and division activities as much as possible in order to maximize the student's exposure to epidemiologic principles/methods and research opportunities.

4. In year 3 of the program the student will transition to the doctoral program in epidemiology. At this time he/she will complete the majority of the required coursework for the PhD program and will complete elected courses from the epidemiology-specific offerings. It is expected that the student will complete 5 courses during each of the two semesters. Due to scheduling an additional course may need to be completed in year 4.

After the student has completed this year of coursework he/she is required to complete both written and oral qualifying examinations. The written examination, which is developed each year by the Executive Committee of the program, is administered within a two-day 'classroom' setting, but may have a 'take home' analysis component. The oral examination is administered by the Executive Committee. Based on both the written and oral examination, a vote of the members to pass the candidate is required; all votes are recorded. In the case of failure, approval may rarely be given to a second qualifying examination after a minimum period of 6 months has elapsed. No further opportunities for examination are provided. Any student not successfully completing the examination is counseled to complete the requirements for a Masters in Public Health

5. During year 4 the student will focus on the development of his dissertation research, perhaps writing a pre-doctoral grant to support these research activities. Students are also expected to serve as a Teaching Assistant for 1 introductory course.

6. In year 5 and 6 the student will complete the 3rd and 4th year of medical school. Blocks of time will be available during these two years in which the student will be able to return intermittently to continue work on their data collection. Since original data collection is required as part of the dissertation research, it is planned that these two years will provide a period for data 'maturation'.

7. In year 7 the student will return full-time to the Division of Epidemiology to close-out his study, analyze the data and complete writing of the dissertation. Although this could take 6 to 12 additional months, it is anticipated that most students (with good planning and hard work) will complete the entire program in 7 years.

The program director and steering committee in epidemiology work closely with the directors of the MD/PhD program to refine the educational process to allow for flexibility and integration of the two program missions. We look forward to full development of this program, which is committed to the development of strong clinical investigators with the research skills to contribute to the translation of scientific knowledge from the bench to the bedside *and* to the community.

MD/PhD Program in Epidemiology: PLANNING WORKSHEET

REQUIRED COURSES

The doctoral program in Epidemiology includes 62 credits of required coursework. According to University policies, MD/PhD students will receive up to 30 credits from the first 2 years of medical school curriculum that will be applied to the doctoral degree requirements. MD/PhD students are therefore required to take a minimum of 32 additional credits of coursework specific to the doctoral degree. Five introductory courses have been specifically waived for these students. The 32 required credits must include the 7 advanced courses required of all doctoral students and 3 additional elective courses (or non-waived required courses) in epidemiology.

Expected time to completion: 4 yr. MD + 3 yr. PhD

<u>Requirement</u>	<u>Course (credit)</u>
<u>Waived</u>	PM 415 Principles of Epidemiology (3)
_____	PM 416 Epidemiological Methods (3)
<u>Waived/Elective</u>	PM 414 History of Epidemiology (3)
<u>Waived</u>	BST 463 Introduction to Biostatistics (4)
_____	BST 464 Statistical Methods (4)
<u>Waived</u>	BST 465 Design of Clinical Trials (4)
_____	STT 221 Sampling Techniques (4)
<u>Possible Waiver</u>	PM 410 Intro to Data Mgt & Data Analysis Using SAS (3)
_____	PM 477 Advanced SAS (3)
_____	PM 469 Multivariate Stats Methods (3)
_____	PM 472 Measurement & Evaluation of Research Instruments (3)
<u>Waived</u>	PM 412 Survey Research (3)
_____	PM 413 Field Epidemiology (3)
<u>Waived</u>	PM 426 Social & Behavioral Medicine (3)
<u>Waived/Elective</u>	PM 442 Nutritional Epidemiology (3)
<u>Waived/Elective</u>	PM 451 Infectious Disease Epidemiology (3)
<u>Possible Waiver</u>	IND 501 Ethics (1)
ELECTIVE COURSES (not a complete listing; minimum of 3 elective courses required)	

Course (credit)

_____	PM 451 Infectious Disease Epidemiology (3)
_____	PM 433 Epidemiology & Public Health of Aging (3)
_____	PM 466 Cancer Epidemiology (3)
_____	PM 442 Nutritional Epidemiology (3)
_____	PM 462 Genetic Epidemiology (3)
_____	PM 468 Epidemiology of Mental Disorders (3)
_____	PM 418 Cardiovascular Disease Epidemiology (3)
_____	PM 417 Molecular Epidemiology (3)
_____	PMXXX Injury Epidemiology (3)

Additional courses within and outside of the department that are judged to significantly contribute to the student's preparation in epidemiology may also be taken as electives with approval from the Epidemiology Program Director.

**Teaching Assistantship – Serving as a teaching assistant in one introductory epidemiology class is required of all MD/PhD students.

Reviewed: March 2008

MD / PhD Program in Genetics

MD/ PhD program students usually enter the PhD portion of their combined degree work after the basic science years of the MD curriculum. During the second year of the MD program, they should discuss the PhD Program with prospective faculty advisors and the Genetics Program Director. It is optimal for the student to complete two research rotations before choosing a permanent advisor.

A total of 90 credit hours are required for the PhD MD/ PhD students are granted 30 credits toward the 90 credit hour requirement for the Ph. D. on the basis of their basic science curriculum. Program course requirements are meant to be sufficiently flexible to accommodate students with diverse backgrounds and career goals.

CURRICULUM**1) All of the following courses are required:**

GEN 507 (4 credits)	Advanced Genetics and Genomics	Fall
IND 410 (4 credits)	Molecular Biology and Genetics	Spring
IND 501 (0 credits)	Ethics in Research	Fall
GEN 503/504 (1 credit)	Genetics Seminar*	(each semester)
GEN 595	PhD Research	(each semester)

*Includes yearly presentation

2) Additional requirement: One of the following electives is required. The elective must be approved by the advisor and the program director.**Fall Semester**

BCH 412 (5 credits)	Advanced Topics in Biological Macromolecules
BIO 402 (4 credits)	Molecular Biology
BIO 426 (4 credits)	Developmental Biology
BPH 509 (5 credits)	Molecular Biophysics
IND 409 (4 credits)	Cell Biology
IND 408 (5 credits)	Biochemistry
MBI 473 (3 credits)	Immunology

Spring Semester

GEN 508 (4 credits)	Genomics and Systems Biology
IND 407 (4 credits)	Structure and Function of Cell Organelles
IND 411 (5 credits)	Methods in Structural Biology
IND 443 (4 credits)	Eukaryotic Gene Organization & Expression
IND 447 (4 credits)	Signal Transduction
MBI 421 (3 credits)	Microbial Genetics
MBI 456 (4 credits)	General Virology (odd numbered years)

OTHER REQUIREMENTS

- The Qualifying Examination is required at the end of the second year of the PhD studies
- Thesis preparation and defense.

NOTE: The teaching assistant requirement is waived for MD/ PhD students.

Reviewed: March 2008

MD/PhD in Health Services Research & Policy Program–Curriculum Outline

Graduate students may focus on one of two tracks: Clinical Decision and Evaluation Sciences or Health Systems Research, each with a unique, but related curriculum.

	<u>Clinical Decision & Evaluation Sciences</u>	<u>Health Systems Research</u>
Year 1	<ul style="list-style-type: none"> • MD Curriculum • If Feasible – PM 428 - Research Workshop/Departmental Seminar Series 	<ul style="list-style-type: none"> • MD Curriculum • If Feasible – PM 428 - Research Workshop/Departmental Seminar Series
Year 2	<ul style="list-style-type: none"> • MD Curriculum • If Feasible – PM 428 - Research Workshop/Departmental Seminar Series 	<ul style="list-style-type: none"> • MD Curriculum • If Feasible – PM 428 - Research Workshop/Departmental Seminar Series
Year 2, Summer	<ul style="list-style-type: none"> • Math Refresher course (2 weeks) 	<ul style="list-style-type: none"> • Math Refresher Course (2 weeks)
Year 3, Fall	<ul style="list-style-type: none"> • PM 421- Introduction to the U.S. Health Care System • PM 463 - Statistics I: Introduction to Mathematical Statistics * ECO 207 - Microeconomics (ECO 471 could be substituted at student's request) • PM 415 - Introduction to Epidemiology • Alternating years 1 & 2: PM 420 - Politics & Policy or IND 501: Ethics • PM 428 - Research Workshop/ Departmental Seminar Series 	<ul style="list-style-type: none"> • PM 421 - Introduction to the US Health Care System * PM 463 - Statistics I: Introduction to Mathematical Statistics * ECO 207 - Microeconomics (ECO 471 could be substituted at student's request) * PM 415 - Introduction to Epidemiology * Alternating years 1 & 2: PM 420 - Politics & Policy or IND 501: Ethics * PM 428 - Research Workshop/ Departmental Seminar Series
Year 3, Spring	<ul style="list-style-type: none"> • BST 465 - Design of Clinical Trials • PM 464 - Statistics II: Introduction to Regression Analysis • Alternating years 1 & 2: PM 483 Advanced Health Economics – Part I or PM 456 - Advanced Health Econ. II: The Industrial Organization of Health Care Markets • PM 412 - Survey Research • Elective • PM 428 - Research Workshop/ Departmental Seminar Series 	<ul style="list-style-type: none"> • BST 465 - Design of Clinical Trials • PM 464 - Statistics II: Introduction to Regression Analysis • Alternating years 1 & 2: PM 483 - Advanced Health Economics - Part I or PM 456 - Advanced Health Econ. II: The Industrial Organization of Health Care Markets • PM 412 - Survey Research • PM 448 - Policy Analysis • PM 428 - Research Workshop/ Departmental Seminar Series
Year 3, Summer	<ul style="list-style-type: none"> • Research with Faculty 	<ul style="list-style-type: none"> • Research with Faculty

Year 4, Fall	<ul style="list-style-type: none"> • PM 422 - Quality of Care & Risk Adjustment • PM 465 - Statistics III: Applied Multivariate Analysis • Alternating years 1 & 2: PM 420 - Politics & Policy or IND 501 - Ethics • PM 494 - Principles of Scientific Inquiry, Measurement, and Research • Elective • PM 428 - Research Workshop/ Departmental Seminar Series 	<ul style="list-style-type: none"> • PM 422 - Quality of Care & Risk Adjustment • PM 465 - Statistics III: Applied Multivariate Analysis • Alternating years 1 & 2: PM 420 - Politics & Policy or IND 501 - Ethics • PM 494 - Principles of Scientific Inquiry, Measurement, and Research • Elective * PM 428 - Research Workshop/ Departmental Seminar Series
Year 4, Spring	<ul style="list-style-type: none"> • PM 484 - Cost Effectiveness Research • PM 416 - Advanced Epidemiology • Alternating years 1 & 2: PM 483 - Advanced Health Economics - Part I or PM 456 - Advanced Health Econ. II: The Industrial Organization of Health Care Markets • PM 438 - Practical Skills in Grant Writing • PM 478 - Workshop in Scientific Communication • PM 428 - Research Workshop/ Departmental Seminar Series 	<ul style="list-style-type: none"> • PM 484 - Cost Effectiveness Research • PM 416 - Advanced Epidemiology • Alternating years 1 & 2: PM 483 - Advanced Health Economics - Part I or PM 456 - Advanced Health Econ. II: The Industrial Organization of Health Care Markets • PM 438 - Practical Skills in Grant Writing • PM 478 - Workshop in Scientific Communication • PM 428 - Research Workshop/ Departmental Seminar Series
Year 4, Summer	<ul style="list-style-type: none"> • Comprehensive Exam • Human Subject Protection Program • Project Leading to Dissertation Research 	<ul style="list-style-type: none"> • Comprehensive Exam • Human Subject Protection Program • Project Leading to Dissertation Research
Year 5	<ul style="list-style-type: none"> • Dissertation research • Optional Teaching Assistantship * PM 428 - Research Workshop/ Departmental Seminar Series 	<ul style="list-style-type: none"> • Dissertation research • Optional Teaching Assistantship * PM 428 - Research Workshop/ Departmental Seminar Series
Year 6, Fall	<ul style="list-style-type: none"> • Dissertation research * PM 428 - Research Workshop/ Departmental Seminar Series 	<ul style="list-style-type: none"> • Dissertation research * PM 428 - Research Workshop/ Departmental Seminar Series
Year 6, Spring	<ul style="list-style-type: none"> • MD Curriculum • If Feasible – PM 428 - Research Workshop/Departmental Seminar Series 	<ul style="list-style-type: none"> • MD Curriculum • If Feasible – PM 428 - Research Workshop/Departmental Seminar Series
Year 7	<ul style="list-style-type: none"> • MD Curriculum • If Feasible – PM 428 - Research Workshop/Departmental Seminar Series 	<ul style="list-style-type: none"> • MD Curriculum • If Feasible – PM 428 - Research Workshop/Departmental Seminar Series

List of Possible Electives

Fall courses: PM 410; PM 413; PM 426; PM 433; PM436; PM440; PM 443; PM 447; PM 454; PM 459

Spring courses: PM 411; PM 417; PM 441; PM 442; PM450; PM453; PM 458; PM471; PM 480

For course descriptions go to www.urmc.rochester.edu/smd/cpm/courses

Reviewed: 2006

MD/PhD Program in Microbiology & Immunology:

Typical MD/PhD students enter the PhD portion of their combined degree program after the basic science years of the MD curriculum. During their first and/or second year of the MD program, they should discuss the PhD program in Microbiology and Immunology with the departmental faculty including the director of graduate studies in this department. During this period, they should also be considering possible dissertation research mentors. Research rotations in two (or more) of the prospective labs are conducted, typically in the summers before their entry into the Ph.D. program.

Based on their basic science courses in the medical curriculum, MD/PhD students are granted 30 credits toward the 90-credit requirement for the PhD. This means that the Core Courses for all PhD candidates (i.e., IND 408 - Biochemistry, IND 409 - Cell Biology, IND 410 -Molecular Biology and Genetics) are waived by MD-PhD students. Of course, any portions of these or other courses may be audited as needed.

Depending on their research focus, MD/PhD candidates, like all doctoral candidates in the Department of Microbiology & Immunology, enter either the Immunology Track, the Microbiology Track, or the Virology Track; required and elective course offerings in each track are described below. In addition, each student is required to take the Microbiology & Immunology Student Research Seminar (MBI 501) given every semester, and Biomedical Ethics (IND 501).

PhD research training focuses on the following major topics of cluster faculty members' interest such as: microbial pathogenesis; molecular genetics; microbial physiology; oral microbiology; parasitology; molecular virology; neurovirology; viral immunology; vaccine biology; autoimmunity, tumor immunology; lymphocyte biology; developmental immunology; cytokines and immune regulation; psychoneuroimmunology; immunogenetics; and phylogeny of immunity. MD/PhD students typically begin their dissertation research upon entry into the PhD program. Their research focus intensifies in subsequent years during which time there is also an emphasis on presentation of research results locally, at national and international scientific meetings, and in journal articles. Didactic course work is usually completed before the end of the second year. Additional required courses are typically small group seminars and journal clubs (1-2 credits) where students learn how to critically evaluate and orally present recent literature in their chosen field of study.

PhD students take an oral qualifying examination on their proposed thesis research by the end of their second year of study (i.e., there is no cumulative test of all course work, but rather an assessment of a student's ability to generate a scientific hypothesis and to test it experimentally). The doctoral program typically takes four years for combined degree students to complete.

Core Requirements Common To All Three Tracks in IMV

IND 501 (1 cr)	Ethics in Research
IND 408 (4 cr)	Biochemistry (waived for MD/PhD students)
MBI 501 (1 cr)	Microbiology & Immunology Student Seminar
MBI 507 (8 cr)	Laboratory Rotations (fulfilled by MD/PhD students in their first two years of medical school)
MBI 595	PhD Research

Immunology Track

Track requirements

MBI 473/573 (5 cr)	Immunology (473 waived for MD/PhD students) + Co-Seminar (Required)
IND 410 (4 cr)	Molecular Biology & Genetics (waived for MD/PhD students)
IND 409 (4 cr)	Cell Biology (waived for MD/PhD students)
MBI 580 (1 cr)	Journal Club & Immunology Research-in-Progress Seminar
MBI 540 (2 cr)	Advanced Topics in Immunology - taken in 2nd semester of 1st year plus 2 seminars during the rest of the PhD program

Electives

Chosen after consultation with the research advisor and PhD committee, to best serve the needs of the student's program, background, and interests. Electives taken by students have included:

IND 447 (4 hr)	Signal Transduction: Cellular & Molecular Mechanisms
MBI 483 (2 cr)	Seminar in Neural Immune Interactions
MBI 456 (4 cr)	General Virology
BST 463 (4 cr)	Introduction to Biostatistics
MBI 414/514 (4 cr)	Mechanisms of Microbial Pathogenesis + Co-Seminar
MBI 591 (4 cr)	Advanced Immunology. It is anticipated that MD/PhD students in the Immunology Track will take this course in lieu of MBI 473, the basic course in immunology,

Virology Track

Track requirements

IND 409 (4 cr)	Cell Biology
IND 410 (4 cr)	Molecular Biology & Genetics
MBI 456 (4 cr)	General Virology
MBI 588 (1 cr)	Virology Research Seminar Series - each year starting second year
MBI 589 (1 cr)	Advanced Topics in Virology - each year starting second year

Electives

Chosen after consultation with the research advisor and PhD committee, to best serve the needs of the student's program, background, and interests. Electives taken by students have included:

IND 425 (4 cr)	Cells and Membranes
IND 447 (4 cr)	Signal Transduction: Cellular & Molecular Mechanisms
MBI 421 (4 cr)	Microbial Genetics + Co-Seminar
MBI 473/573 (5 cr)	Immunology + Co-Seminar
MBI 414/514 (4 cr)	Mechanisms of Microbial Pathogenesis + Co-Seminar

Microbiology Track

Track requirements

Four 400-level courses chosen from the following offerings:

MBI 456 (4 cr)	General Virology
MBI 445 (3 cr)	Industrial Microbiology
MBI 414/514 (4 cr)	Mechanisms of Microbial Pathogenesis + Co-Seminar
MBI 421/521 (4 cr)	Microbial Genetics + Co-Seminar
MBI 431/531 (4 cr)	Microbial Physiology + Co-Seminar
MBI 473 (4 cr)	Immunology

Electives

Chosen after consultation with the research advisor and PhD committee, to best serve the needs of the student's program, background, and interests. Electives taken by students have included:

IND 409 (4 cr)	Cell Biology (waived for MD/PhD students)
IND 410 (4 cr)	Molecular Biology & Genetics (waived for MD/PhD students)
MBI 581 (2 cr)	Oral Microbiology

Reviewed: March 2008

MD/PhD Program in Neurobiology and Anatomy

The graduate program in Neurobiology and Anatomy is ideally suited for MD/PhD students. Students satisfy several NBA requirements, including HSF and MBB I, and 2 lab rotations during the first two years of their medical school curriculum. The program is specifically directed toward preparation for academic careers within a medical school setting, where teaching in medical and graduate school curricula comprises a strong component of faculty mission, and where research interests include systems, integrative, and translational/clinical attributes of neural science. The department consists of over 20 faculty with diverse research interests including:

- sensory, motor and integrative systems
- cognition and perception
- cell signaling and transmission
- development and aging
- neurobiology of disease
- learning and plasticity
- neuro-engineering, and computational neurobiology

Year One

Fall

- **ANA 521.** Neurobiology & Anatomy Journal Club (1 credit)
- **ANA 522.** Neurobiology & Anatomy Student Seminar (1 credit)
- **IND 501.** Ethics In Research (1 credit)
- Electives (0-4 credits)¹
- **ANA 595.** PhD research (variable credits)

Spring

- **ANA 521.** Neurobiology & Anatomy Journal Club (1 credit)
- **ANA 522.** Neurobiology & Anatomy Student Seminar (1 credit)
- Biostatistics elective (3-4 credits)²
- Electives (0-4 credits)¹
- **ANA 595.** PhD research (variable credits)

Lab Rotations. Two lab rotations are typically completed during the first two years of medical school; an additional rotation may be completed during the first fall of graduate studies.

¹**Electives.** Students are required to complete at least 6 credits of elective in the first year of graduate school.

²**Statistics Requirement.** All students must demonstrate a proficiency in statistics. This may be met by STT 463, Introduction to Biostatistics, BCS 510 Data Analysis or equivalent. This is best completed in years 1 or 2, depending upon scheduling. In cases where students have completed statistics coursework previously, they may petition the NBA Graduate Education Committee for a waiver.

Thesis Advisor. Students are expected to select a Thesis Advisor and laboratory for their PhD dissertation project by the end of spring semester of year 1. The Thesis Advisor must be an appointee in NBA (primary or secondary). Collaborative efforts with faculty outside NBA are encouraged, and co-advisorships are possible with approval by the NBA Graduate Committee.

Year 2 & Beyond

Fall

- A Teaching Assistantship (3 credits) in one of the courses listed below (typically linked to HSF or MBB) is encouraged but not required:
 - **ANA 581.** Teaching Tutorial in Human Structure and Function
 - **ANA 583.** Teaching Tutorial in Neurobiology

Advanced students in NBA are expected to attend

- **ANA 522.** Graduate Seminars (including a presentation of their work each year)
- **ANA 521** Journal Club of choice³
- NBA Seminar series during the year

³Journal Club (ANA 521) options in the NBA Graduate Program:

- Multisensory
- Motor control
- Neural precursors
- Signal transduction
- Neuroinflammation
- Cortical Circuitry
- (development of others is encouraged)

Other Requirements & Related Details

Qualifying Exam (Part I). The Part 1 exam determines whether a student is qualified to pursue further studies toward completion of a PhD dissertation. Each student with the help of their advisor will select a committee of 3 faculty with expertise in the area of their research. Together, they will select at least 50 relevant papers to be read by the student during a ~2 month period. The student will formulate and submit exam questions to the Examination Committee based upon these readings. The Committee will select a subset of these questions, and supplement them with several of its own. For the exam, the student will compose written answers to these questions over a period of several days. (*Must be completed no later than August 1st following the 4th semester of graduate studies*)

Qualifying Exam (Part II): Thesis Proposal. Written (NIH pre-doc application format) as well as oral presentations, and a defense with the Thesis Committee. (*Must be completed by the end of the 5th semester of graduate studies*).

PhD Dissertation and Defense. After the successful completion of the Part II Qualifying Exam and completion of the thesis research project, students submit a written dissertation of their work for review by the Thesis Committee. Students present their project in a lecture to the community, followed by a closed defense of their research with the Thesis Committee.

Thesis Committee. The student and their Thesis Advisor will assemble the Committee by the fall of year 2 of graduate study. In addition to the Thesis Advisor, three tenure-track faculty must be included, of which two must be NBA faculty and one outside the Department. The committee will meet at least once per year and provide a written evaluation of the student's progress. An additional member from outside the University is encouraged to join the Committee for the thesis defense (requires special approval by the Associate Dean of Graduate Studies).

Reviewed: March 2008

MD/PhD Program in Neuroscience

The Interdepartmental Graduate Program in Neuroscience at the University of Rochester is designed to provide the interdisciplinary training needed to study the nervous system at many levels of analysis. The program includes over 60 faculty members in ten different departments from both the School of Medicine and Dentistry and The College. The program offers the opportunity to study a wide range of modern neuroscience disciplines organized as specific programmatic themes:

- *Development & Aging*—The study of neural development and aging, including neurogenesis, differentiation, cell death, synaptic specification, and changes in neural organization and function that accompany senescence.
- *Neurobiology of Disease*—The study of fundamental pathologic processes and genetic predispositions that afflict the nervous system, including the neurodegenerative and neuromuscular disorders, neuroviral infection, epilepsy, multiple sclerosis, neuropsychiatric conditions, and neuroinflammation.
- *Learning, Memory, & Adaptive Plasticity*—The study of processes and mechanisms underlying how early and adult experience modifies neural function and behavior.
- *Cell Signaling & Communication*—The study of the processes and mechanisms underlying intracellular messaging, excitable membranes, and synaptic and non-synaptic transmission of neural information.
- *Sensory, Motor & Integrative Systems*—The study of sensory transduction across modalities, central processing and integration of sensory input, and the neural control of motor output and behavior.

Curriculum

The first year provides a rigorous core curriculum in cellular and systems neuroscience that builds a solid foundation for more advanced, specialized coursework. Beyond the required core courses, the program insures that students have the flexibility to develop a curriculum that will both augment their research effort and broaden their view of neuroscience.

First Year—Fall Semester

- NSC 512 Cellular Neuroscience
- NSC 592 Neuroscience Journal Club
- IND 501 Ethics in Research
- Biochemistry, Cell Biology, or other elective*

First Year—Spring Semester

- NSC 531 Integrative Systems Neuroscience
- NSC 592 Neuroscience Journal Club
- BST 463. Introduction to Biostatistics (or other biostatistics course)
- Elective*

*Over 20 elective courses are available to students; MD/PhD students fulfill this requirement (minimum of 10 hours elective credit) with coursework completed in the first two years of medical school, though they are encouraged to take additional advanced coursework in line with their interests.

Laboratory Rotations

Rotations are intended to both familiarize students with a range of research topics and techniques, and facilitate the student's choice of a dissertation laboratory. The sequence of rotations is planned in consultation with a faculty advisory group. During each rotation, students conduct a research project under the guidance of a faculty member of their choice, and at the

conclusion of the rotation students present the work to faculty and peers. For MD/PhD students the rotations are typically completed by the fall of their third year in the program. A minimum of two rotations is required.

Journal Club

A regular journal club attended by all first and second year students focuses on new findings in the neuroscience literature and provides additional experience in critical thinking and experimental design.

Qualifying Exam

The Qualifying Exam is designed to evaluate a student's knowledge base, critical reasoning, written and oral presentation skills, and ability to integrate information across disciplines in neuroscience. Students are expected to take the Qualifying Exam at the end of their second year of classes, but no later than the end of the Fall term in their third year. All program and research track courses in the student's Plan of Study and laboratory rotations must be completed before an examination can be scheduled. Currently the examination consists of two parts: Part I tests the ability of students to develop research questions on a topic not directly related to their thesis; Part II is the actual thesis qualifying examination. At the current time the format of the Qualifying Examination is under evaluation.

Student Seminar Program

Each year the students give a seminar describing their recent research activities.

Teaching

MD/PhD students are exempted from program teaching requirements.

Reviewed: 2006

MD/PhD Program in Pathology

The Department of Pathology offers a program leading to a PhD in Pathology to students enrolled in the MD/PhD program. Degree requirements are somewhat modified to take into account the basic science curriculum completed by students during their first two years of medical school.

1. Laboratory rotations: MD/PhD students are expected to have completed 2-3 lab rotations during their first two years of medical school.

2. Course Requirements for MD/PhD Students: The following courses are required for a PhD degree in Pathology:

<u>Group A</u>	(Select 1 Pathology elective course in consultation with program director)		
PTH 507	Cancer Biology		spring
PTH 571	Molecular Basis of Disease		fall
PTH 593	Nuclear Hormone Receptors		fall, even years

<u>Group B</u>	(Select 1 non-Pathology elective 4-credit course in consultation with program director. <i>Most often selected, though not exclusive electives.</i>)		
BST 463	Introduction to Biostatistics	IND 408	Adv Biochemistry
CVS 401	Cardiovascular Biology & Disease	IND 409	Cell Biology
MBI 473	Immunology	IND 410	Molec Biol & Genetics
IND 447	Signal Transduction		

<u>Group C</u>	(all are required)		
PTH 504	Current Topics in Experimental Pathology – Student Seminar		
IND 501	Ethics and Professional Integrity		

Note: Additional courses may be considered depending on the background and future directions of the student.

3. Departmental and Student Seminar Series: Attendance at the Student Seminar Series (PTH 504) is mandatory for all Pathology graduate students. Students writing their thesis are exempt from PTH 504 during their final semester.

4. Oral qualifying exam: Students are expected to defend their thesis proposal before an oral exam committee by the end of their second year of graduate training. By this time, the student will have completed all course requirements and will have generated sufficient preliminary data in their chosen thesis laboratory to propose and defend before the committee the thesis question that they wish to pursue for the PhD.

5. Monitoring progress: Students who have passed their qualifying exam must meet with their thesis advisory committee at least yearly. The purpose of the committee is to monitor the student's progress and to provide advice and additional guidance to the student.

Reviewed: June 2011

MD/PhD Program in Pharmacology and Physiology:

During their second year, MD/PhD students should discuss entry into the PhD program with the Director of Graduate Studies of the Department of Pharmacology and Physiology. The PhD portion of their combined degree program will begin after successful completion of the first two years of the Double-Helix Curriculum

MD/PhD students should expect to successfully complete 2-3 laboratory research rotations, at least one with a primary faculty member in the Department of Pharmacology and Physiology, during the first two years of the Double-Helix Curriculum

The Ph. D. portion of the MD/PhD program will build on previous background acquired in the Medical School curriculum. Because of this, certain course requirements of the traditional Ph. D. track will be waived and advanced courses may be substituted to provide depth in an area of specialization.

MD/PhD students are granted 30 credits toward the 90 credit requirement for the PhD on the basis of their basic science courses in the medical curriculum.

Students who consider that their background may permit exemption from other core curriculum courses in Pharmacology and Physiology should request such an exemption.

Each MD/PhD student must complete at least one of the following three Core Courses:

- IND408 Biochemistry (5 credits)
- IND409 Cell Biology (4 credits)
- IND410 Molecular Biology (4 credits)

MD/PhD students must complete each of the following additional courses:

- IND447 Signal Transduction (4 credits)
- PHP502 Seminar (4 semesters) (1 credit)
- IND501 Ethics and Professional Integrity (0 credits)

MD/PhD students must also complete a total of at least 4 credits of upper-level A/E credit selected from the following list of recommended courses:

- NSC 531 Integrative and Systems Neuroscience (6 credits)
- PHP 440 Topics in Vascular Biology (4 credits)
- TOX 521 Biochemical Toxicology (4 credits)
- PTH 593 Molecular Mechanisms of Human Disease (4 credits)
- STT 463 Introduction to Biostatistics (4 credits)
- PHP 550 Ion Channels and Disease (2 credits)

MD/PhD students must complete the Departmental Qualifying Examination by 12/1 of their 4th year of study in the MD/PhD program.

After successful completion of the Qualifying Examination, MD/PhD students must meet with their Dissertation Advisory Committee at least once yearly. During these meetings, the committee will discuss the student's progress, clarify research problems, and outline priorities of future research directions.

Thesis Preparation and Defense (see DPP Graduate Student Handbook).

Reviewed: 2006

MD/PhD Program in Toxicology

(<http://www2.envmed.rochester.edu/envmed/TOX/welcome.html>)

The PhD Program in Toxicology takes advantage of the great diversity of specialties and resources available at our comprehensive academic medical center. Over 50 faculty members participate in this PhD Program, and their research areas span the entire spectrum of toxicology, from molecular mechanisms to cellular processes to whole animals and human populations.

Areas of strength include:

- Neurotoxicology
- Pulmonary Toxicology
- Osteotoxicology
- Molecular Modifiers of Toxicity
- Carcinogenesis
- Immunotoxicology
- Reproductive and Developmental Toxicology

The program is housed in the Department of Environmental Medicine, which also hosts the Environmental Health Sciences Center, one of 22 such Centers of Excellence sponsored by the National Institute of Environmental Health Sciences. It also houses the Division of Occupational Medicine, whose clinical specialists play an active role in graduate education. The Department also houses the Particulate Matter Center, one of five such Centers sponsored by the Environmental Protection Agency. Faculty within the Particulate Matter Center carry out cutting-edge research on the relationship between air pollution and lung disease.

Curriculum

Typical MD/PhD students enter the PhD portion of their combined degree program after the basic science years of the MD curriculum. During their first and/or second year of the MD program, they should discuss the PhD program in Toxicology with departmental faculty and the Director of the Toxicology Graduate program. During this period, they should also evaluate possible dissertation research mentors. Research rotations in two or three prospective labs are conducted, typically in the summers before their entry into the PhD program.

Based on their basic science courses in the medical curriculum, MD/PhD students are granted 30 credits toward the 120-credit requirement for the PhD. Thus, many of the required courses for Toxicology PhD candidates (i.e., IND 408 – Biochemistry; IND 409 - Cell Biology; IND 410 - Molecular Biology and Genetics; PHP 403 and PHP 404 – Pharmacology and Physiology; PTH 505 - Pathology) are waived for most MD/PhD students.

The required courses are: TOX 521 – Biochemical Toxicology; TOX 522 – Organ Systems Toxicology; and SST 463 – Biostatistics, unless an equivalent Biostatistics course has already been taken. In addition, each student is required to take the Toxicology Student Research Seminar (TOX 558 – 1 credit hour) given every spring semester, and Biomedical Ethics (IND 501). Additional courses are typically small group seminars and journal clubs (1-2 credits) where students learn how to critically evaluate and orally present recent literature.

PhD students take an oral qualifying examination on their proposed thesis research by the end of their second year of study (i.e., there is no cumulative test of all course work, but rather an assessment of a student's ability to generate a scientific hypothesis and to experimentally test it). Typically, the combined degree students complete the Ph.D. portion in 3-4 years.

Reviewed: March 2008

**University of Rochester
School of Medicine and Dentistry
MD/PhD Laboratory Rotation Proposal Form**

Date: _____

Student Name (Please Print): _____

Faculty Member Name (Please Print): _____

Department/Center: _____

Proposed Starting Date Rotation: _____ **Completion Date:** _____

Brief Description of Proposed Research Including Hypothesis to be Tested and Expected Experiments:

University of Rochester
School of Medicine and Dentistry
Graduate Student Laboratory Rotation Evaluation Form

Student Name (Please Print): _____ **Date:** _____

Faculty Member Name (Please Print): _____

Cluster or Program:

- BMCB
- BSB
- CMM
- GGD
- IMV
- NS
- PWD
- TOX
- BME
- Other _____

Lab Rotation Period:

- July 1 – August 31
- October 1 – December 31
- January 1 – March 31
- April 1 - June 30
- Other: _____

Grade:

- Satisfactory
- Unsatisfactory
- Other: _____

Project Topic/Description: _____

Student's lab attendance was:

- Excellent
- Average
- Poor

Student's attitude and intellectual involvement:

- Excellent
- Average
- Poor

Student's grasp of new concepts/techniques and self-sufficiency:

- One-trial learner/ Independent worker
- Above average/ Sometimes needs guidance
- Average/ Sometimes needs guidance
- Needs constant repetition & supervision

Extent of your personal involvement in training:

- 100%
- About 75%
- About 50%
- Less than 25%

Overall Rating:

- Excellent
- Average
- Poor

Student's accomplishments:

- Excellent (all experiments completed)
- Average (most experiments completed)
- Below Average (few experiments completed)
- No progress made towards defined goals

Leadership/Presentation Evaluation Form

Student Name: _____ Evaluator: _____ Date: _____

Topic: _____

Please assess the student in the following domains. **Narrative comments are essential and specific examples are extremely helpful.**

I. Preparation

1	1.5	2	2.5	3.0
<i>Poor/Marginal</i>	<i>Satisfactory</i>	<i>Good</i>	<i>Excellent</i>	<i>Outstanding</i>

Comments:

II. Organization

1	1.5	2	2.5	3.0
<i>Poor/Marginal</i>	<i>Satisfactory</i>	<i>Good</i>	<i>Excellent</i>	<i>Outstanding</i>

Comments:

III. Accuracy of appraisal and depth of critique

1	1.5	2	2.5	3.0
<i>Poor/Marginal</i>	<i>Satisfactory</i>	<i>Good</i>	<i>Excellent</i>	<i>Outstanding</i>

Comments:

IV. Leadership of discussion and answers to questions that arose

1	1.5	2	2.5	3.0
<i>Poor/Marginal</i>	<i>Satisfactory</i>	<i>Good</i>	<i>Excellent</i>	<i>Outstanding</i>

Comments:

V. Summary and Clarification (i.e. important “take home points”)

1	1.5	2	2.5	3.0
<i>Poor/Marginal</i>	<i>Satisfactory</i>	<i>Good</i>	<i>Excellent</i>	<i>Outstanding</i>

Comments:

**University of Rochester School of Medicine and Dentistry
Evaluation Form for MD/PhD Longitudinal Clinical Experience**

Student: _____
Preceptor: _____

Please Return to:
Registrar's Office
Box 601
URMC – 601 Elmwood Ave
Rochester, NY 14642
FAX (585-273-1016)

Student (please complete the following):

Check one: I completed the:
full-year (40-52 weeks) _____ clinical assignment
half-year (20-26 weeks) _____ clinical assignment

In the space below, **first** comment on your LCE, and then give the form to your preceptor.

Faculty: Please complete the following:

Grade (circle one): Pass Fail

1. Please comment briefly on the student's professionalism and enthusiasm for learning.

2. Did the student complete the number of sessions listed above at your office (actual attendance for the minimum of 20 (half-year) or 40 (full-year) sessions)?

_____ Yes _____ No

3. Please comment on the student's participation and potential as a future clinician in the space below and on the back of this page if necessary.

Procedure for Arranging Independent Clinical Experiences

All clinical experiences that are not part of the normal MD/PhD Curriculum must be approved by a special process, as outlined below, to ensure liability coverage for the student. This process must be completed before starting any such experience, including arrangements made for clinical exposure in the summers after first and second year medical school and experiences outside of the longitudinal clinical experience in graduate school. The policy is in place for all medical student contemplating such activities (normally summer activities for non-MD/PhD students).

Medical Student Liability Coverage for (Summer) Activities

University of Rochester medical students (with an eligible student status) can be given consideration for Medical Student Liability Coverage for Summer Activities. Described below is the approval process for all students engaging in **non-credit bearing electives** during the summer.

1. Students will be required to complete a special elective form for any summer clinical experience. This elective form must include a description of the activity.
2. Once the special elective form is completed, students will be required to have approval from a UR faculty member (in an appropriate clinical department) AND their Advisory Dean AND a representative from the Registrar's Office prior to the start of the elective. (**NO RETROACTIVE** approval will be accepted).
3. Students must have an evaluation form completed by the on-site mentor. This evaluation form will become part of the student's academic record. The special elective experience will be reflected on the student's transcript as a non-credit bearing elective.
4. For students, who will be engaging in a community service activity as part of the longitudinal track of the Community Health Improvement Clerkship*, the faculty course director, Professor Sally Trafton, will need to sign off on the special elective form (prior to initiation of the work) in addition to the Advisory Dean and Registrar sign offs.

*The Community Health Improvement Clerkship is NOT required for MD/PhD trainees.