This guide describes the organization of the Weill Cornell/Rockefeller/Sloan-Kettering Tri-Institutional MD-PhD Program. The guide is intended to help students become familiar with the Program and conduct their studies in a productive fashion. The guide thus amounts to the current “rules” governing the program. These rules may evolve, and this guide may be amended from time to time. Under the terms of the Tri-Institutional Agreement governing the administration of the program, the program director has the ultimate authority to interpret or change existing rules. The program director will be available for discussion and clarification regarding any aspect of the program.

It is the policy of Weill Cornell Medical College, The Rockefeller University, and the Sloan-Kettering Institute to support the equality of educational opportunities.

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Contact Information:

TRI-INSTITUTIONAL MD-PH.D PROGRAM OFFICE
1300 York Avenue, C-103
New York NY 10065-4896
Tel:  (212) 746-6023 & (888) U2-MD-PHD
Fax:  (212) 746-8678
mdphd@med.cornell.edu
www.weill.cornell.edu/mdphd

Olaf S. Andersen, M.D.
Program Director
(212) 746-6023
sparre@med.cornell.edu

Ruth Gotian, B.S., M.S.
Administrative Director
(212) 746-6023
rgotian@med.cornell.edu

Craig T. Basson, M.D., Ph.D.
Associate Director
(212) 746-6023
ctbasson@med.cornell.edu

Jochen Buck, M.D., Ph.D.
Associate Director
(212) 746-6023
jobuck@med.cornell.edu

RESEARCH ADVISORY COMMITTEE

Jan Breslow, M.D.
The Rockefeller University
breslow@mail.rockefeller.edu

Michael S. Glickman, M.D.
Sloan-Kettering Institute
glickmam@mskcc.org

Hugh C. Hemmings, M.D., Ph.D.
Weill Cornell Medical College
hchemmi@med.cornell.edu

OFFICE OF ACADEMIC AFFAIRS AT WEILL CORNELL MEDICAL COLLEGE
Weill Cornell Medical College, C-118
Tel:  (212) 746-1050
Fax:  (212) 746-8935
ach2003@med.cornell.edu
www.weill.cornell.edu/education/

WEILL CORNELL GRADUATE SCHOOL OF MEDICAL SCIENCES
Weill Cornell Medical College, A-131
Tel:  (212) 746-6565
Fax:  (212) 746-8906
gsms@med.cornell.edu
www.weill.cornell.edu/gradschool/

DAVID ROCKEFELLER GRADUATE PROGRAM
The Rockefeller University, Founders Hall 105
Tel:  (212) 327-8086
Fax:  (212) 327-8505
phd@mail.rockefeller.edu
www.rockefeller.edu/education.htm

GERSTNER SLOAN-KETTERING GRADUATE SCHOOL OF BIOMEDICAL SCIENCES
Memorial Sloan-Kettering Cancer Center, Zuckerman 1106
Tel:  (646) 888-6639
Fax:  (646) 422-2351
gradstudies@sloankettering.edu
http://www.sloankettering.edu/gerstner/
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The mission of the Tri-Institutional MD-PhD Program is to educate and train physician-scientists, to bridge the gap between laboratory research and clinical medicine and thereby contribute toward improving health and enhancing the quality of life by reducing disability and death from disease.

INTRODUCTION

The Weill Cornell/Rockefeller/Sloan-Kettering Tri-Institutional MD-PhD Program comprises Weill Cornell Medical College (WCMC), The Rockefeller University (RU), and the Sloan-Kettering Institute (SKI)—a group of three biomedical research and educational institutions that are in close geographic proximity.

The three institutions recognize the national need for training biomedical investigators who possess two complementary skills. On the one hand, they should have an advanced understanding of biomedical science and a mastery of contemporary research skills, which will allow them to undertake fundamental studies to elucidate basic biological processes pertaining to human disease. On the other hand, they should be well grounded in human biology, pathobiology and clinical medicine, and thus equipped to transfer advances in basic research to the understanding, prevention, and treatment of human disease.

This combination of skills is necessary if society is to exploit fully the explosive advances in the basic biological sciences to improve the public health. Moreover, major research advances will continue to come from scientists who are motivated by the intellectual challenges of disease-oriented research in their search for new biological discoveries. The three institutions have found that a successful approach to developing such physician-scientists is to operate a dedicated MD-PhD training program that is charged with identifying and attracting outstanding students, who have a strong desire to become physicians and yet manifest an informed commitment to research careers. In addition, the MD-PhD program should guide these exceptional students through a rigorous course of study that offers individual flexibility and unrestricted access to experienced mentors in leading laboratories. Graduates of such a program should be equally well prepared to work in the laboratory or at the bedside—and therefore able to bridge the (widening) gap between clinical medicine and laboratory research, which is brought about by technological developments and specialization in both fields.

Clinical medicine and laboratory research have many rewards—and potential frustrations. The Tri-Institutional MD-PhD Program recognizes that a scientific career is a challenging undertaking. In addition to the challenges that are common among all professional careers, there are particular challenges associated with dual-degree careers: the training is long; and it is difficult to manage the conflicting demands of clinical, laboratory and family responsibilities. During your training, we provide guidance for how to plan your studies, and how to deal with the challenges that you will encounter throughout your stay in the program—and in your future career—while preserving the flexibility for which the program is renowned.

The Tri-Institutional MD-PhD Program comprises one medical college, WCMC, and three graduate schools: RU; Weill Cornell Graduate School of Medical Sciences (WCGS), which is a joint undertaking of SKI and WCMC; and the Gerstner Sloan-Kettering Graduate School of Biomedical Sciences (GSK). The unique structure of the program provides you with extraordinary resources and opportunities. It also is a source of uncertainties, which we hope to minimize with this Guide. Please note, however, this is only a guide—not a substitute for the policies that govern your education and training in WCMC or the graduate schools. These policies are updated regularly, and it is your responsibility to abide by the policies of the training component in which you are matriculated.
TRI-INSTITUTIONAL MD-PH D PROGRAM

OVERVIEW OF THE TRAINING PROGRAM

The goal of the Tri-Institutional MD-PhD Program is to train the next generation of leaders in biomedical research—and to do so in a manner that promotes an effective intellectual dialogue between the research and the clinical settings. Graduates of the program will have excellent research credentials and be well qualified for the practice of medicine.

To achieve these goals, the students are guided by the Research Advisory Committee and the Career Counseling Committee. The Research Advisory Committee guides students in their choices of rotation and thesis laboratories. The committee is composed of the program Director (who chairs the committee) and a representative of the graduate faculty at each of the institutions. The three institutional representatives also are available to discuss specific issues pertaining to their institution. The Career Counseling Committee guides the students during their research years especially during the transition from the research years to the final clinical clerkships. The Committee also provides advice about long-term career planning (post-graduate clinical training, etc.). The Committee is chaired by Craig T. Basson, M.D., Ph.D. and Debra G. Leonard, M.D., Ph.D., and composed of members of the Research Advisory Committee, the Course Director of Introduction to Medicine for Clinical Investigators, and additional members from the WCMC faculty.

THESIS ADVISOR

Any member of the combined faculties of the three institutions at the equivalent of the Assistant Professor level or above can serve as research advisor for MD-PhD students in laboratory rotations and thesis research. For the purposes of the Tri-Institutional MD-PhD Program, the responsibility for a student’s research guidance and progress rests with the head of the laboratory in which the student is working. At WCMC the advisor must have a WCGS faculty appointment; at RU the advisor must be a Head of Laboratory; and at SKI, the advisor must have a WCGS or a GSK faculty appointment. For program purposes, only these individuals are eligible research advisors.

Students in the Tri-Institutional MD-PhD Program are expected to do their thesis research in a laboratory (or in laboratories) in one (or more) of the participating institutions. MD-PhD students can, as part of a collaboration, spend brief periods in an off-campus laboratory; but they cannot do the major part of their thesis research off-campus. MD-PhD students, however, can move with their thesis advisor, and remain Tri-Institutional MD-PhD students, if they have spent more than one year working in the advisor’s laboratory when the advisor moves from the Tri-Institutional campus to another degree-granting institution. The advisor would be responsible for the student’s stipend and health insurance while the student is off-campus; the MD-PhD program would resume responsibility when the student has defended and submitted his/her thesis to the appropriate graduate school office and returned to the final clinical training.

DURATION OF TRAINING

The goal for completing the MD-PhD training is seven years, with a possible additional year. We recognize that each student’s training program will be unique, and that it is difficult to predict the rate of progress. Students therefore are encouraged to consult with the program Director regarding any difficulties that may affect their progress through the program. If a student’s progress is such that he/she needs more than eight years to complete the program, the student and his/her advisor must petition the program Director for an extension of no more than one year (for a total of nine years of study).
ELEMENTS OF THE TRAINING PROGRAM
(For a more detailed description see Pp. 5 – 9)

1. **Medical College Pre-Clinical Education** (two years) In addition to the WCMC curricular requirements, MD-PhD students complete two required graduate level courses (*Frontiers in Biomedical Science I & II*) and three research rotations (in three different laboratories, in at least two different research institutions). The students also take the Tri-Institutional Course on the *Responsible Conduct of Research, Introduction to Clinical and Translational Research* (both in the fall of year 1), and complete a four-week clinical rotation *Introduction to Medicine for Clinical Investigators* (toward the end of Year 2).

   Students should have selected their thesis laboratory advisor, and matriculated in their chosen graduate school, by September 1 of their third year in the program.

2. **Graduate School Education and Thesis Research** (three and a half years to four and half years) MD-PhD students take four course units (four quarter-long graduate courses), chosen in consultation with their thesis advisor, and write and defend a thesis research proposal. These requirements generally must be satisfied no later than December 31 of Year 4. The formal requirements differ slightly among the graduate schools; but MD-PhD students can elect to fulfill their formal, non-course-work requirements according to the standards of any of the graduate schools—irrespective of the graduate school in which they are matriculated.

   During their thesis research, MD-PhD students are encouraged to sample different medical disciplines—to allow them to make more informed decisions about their selection of residency programs. These explorations will be brief electives, guided by *Career Counseling Committee*.

3. **Medical College Clinical Education and Training** (15-21 months) MD-PhD students take the third year medical college clerkships that satisfy the requirements for graduation and licensing. If time permits they explore additional clinical career options.

   In addition to the required clerkships, the summer before MD-PhD students plan to return to the clerkships they need to complete two preparatory courses and be certified in Basic Cardiac Life Support (BCLS).

**PUBLICATIONS**

It is the expectation that MD-PhD students will have at least one first-author research article published or in press in a peer-reviewed journal by the time they graduate from the program.
TIMETABLE OF MD-PhD TRAINING

The overall “timeline” (including critical dates) of the training program is summarized below (for a seven-year program of study). A more detailed description of the training program is provided on the following pages. The academic year is defined to begin September 1.

<table>
<thead>
<tr>
<th>Date</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer before Year 1</td>
<td>Research Rotation #1; Careers in Biomedicine Summer Series; Introduction to Clinical and Translational Research</td>
</tr>
<tr>
<td>Year 1</td>
<td>First Year Medical College Curriculum Frontiers in Biomedical Science I Tri-Institutional Ethics Course</td>
</tr>
<tr>
<td>Summer of Year 1</td>
<td>Research Rotation #2; Careers in Biomedicine Summer Series</td>
</tr>
<tr>
<td>Year 2</td>
<td>Second Year Medical College Curriculum Frontiers in Biomedical Science II</td>
</tr>
<tr>
<td>May of Year 2</td>
<td>USMLE Step 1</td>
</tr>
<tr>
<td>June of Year 2</td>
<td>Introduction to Medicine for Clinical Investigators</td>
</tr>
<tr>
<td>Summer of Year 2</td>
<td>Research Rotation #3</td>
</tr>
<tr>
<td>Start of Year 3 (September 1)</td>
<td>Choose Thesis Laboratory  Register at WCGS, RU or GSK</td>
</tr>
<tr>
<td>Year 3</td>
<td>Thesis Research Complete graduate course requirements Select Faculty Advisory or Special Committee</td>
</tr>
<tr>
<td>Year 4</td>
<td>Thesis Research Submit and defend Thesis Research Proposal (by September 30 and December 31, respectively)</td>
</tr>
<tr>
<td>Year 5</td>
<td>Thesis Research Annual Committee meeting Inform MD-PhD Office and WCMC Office of Academic Affairs of return date to clerkship training (January 31) Clerkship lottery (March/April) Introductory clinical courses (June) BCLS certification</td>
</tr>
<tr>
<td>Year 6</td>
<td>Defend and submit thesis return to Medical College for the clerkship training (no later than early January)</td>
</tr>
<tr>
<td>Year 7</td>
<td>Internship application (November 1) USMLE Step 2 Graduation (late May/early June)</td>
</tr>
</tbody>
</table>
DETAILED DESCRIPTION OF THE TRAINING PROGRAM

First Summer (First Rotation)  The Tri-Institutional MD-PhD Program requires as a condition of matriculation that new students arrive at the tri-institutional campus the first week in July (usually the first Monday after July 4). The students must return the Health Forms to the WCMC Student Health Services before their matriculation. At the time of matriculation, the program office must have received final, official transcripts from the undergraduate institution in which the student was enrolled, confirming that the anticipated course of study was completed and the appropriate degree was received.

All students begin their first research rotation at arrival. They are expected to have chosen their rotation laboratory before arriving. Accepted applicants visit laboratories they are considering for their first research rotation during the Revisit Day (in April). After the Revisit Day, the incoming students are encouraged to consult with the program Director (and other faculty members) before they finalize their choice of rotation laboratory. Once the laboratory has been chosen, the program office should be informed of the choice (by June 1).

In addition to their laboratory research, the students participate in a series of lunch discussions with clinician-scientists from the three institutions entitled Careers in Biomedicine, a joint course for First- and Second-Year students.

First Academic Year  In late August, the students begin their medical college education. MD-PhD students take all medical college courses plus three additional courses: Introduction to Clinical and Translational Research, a graduate-level course designed for MD-PhD students; Frontiers in Biomedical Science I, which is a research-article-based course that exposes the students to modern developments in biomedical research.

The medical college curriculum is an amalgam of problem-based learning sessions, lectures, small-group conferences, wet and computer labs, and journal clubs. The following science courses are given sequentially: Molecules, Genes and Cells (general biochemistry, cell physiology, molecular biology, general pharmacology and human genetics); Human Structure and Function (gross anatomy, histology, development, embryology and system physiology); and Host Defenses (general pathology, immunology, general microbiology, pharmacology). In addition, a year long course, Medicine, Patients and Society I, introduces the students to the problems of clinical medicine, public health, epidemiology, and biostatistics.

In early August, all students convene for the annual program retreat. The retreat is organized by MD-PhD students in Year 3 and held outside New York City. The retreat serves as a general scientific and social information exchange, and introduces the First-Year students to their older peers and their research projects.

During the year, MD-PhD students should visit laboratories and decide where they will do their second research rotation (during the summer of Year 1). Students should choose a laboratory in a different institution from where they were working during the first summer. The program Director meets with the students, as a group, to discuss strategies for choosing a rotation laboratory. Then the students meet individually with the Research Advisory Committee to discuss their search for a rotation laboratory. The students are encouraged to consult with the program Director before finalizing their decision.

First-Year MD-PhD students also complete a required course on Responsible Conduct of Research, the Tri-Institutional Ethics Course, on four consecutive Tuesday afternoons in January.
Summer of Year 1 (Second Rotation)  The students devote this period to their second research rotation. They also participate in the Careers in Biomedicine lunch seminars.

Second Academic Year  The medical college curriculum resumes in late August. Again, the MD-PhD students’ curriculum is similar to that for all WCMC students, with the addition of two MD-PhD courses: Frontiers in Biomedical Science II; and Introduction to Medicine for Clinical Investigators.

The medical college science courses are: Brain and Mind (neuroscience, neurology, and psychopathology); Basis of Disease (microbiology, pathology, pathophysiology, pharmacology, radiology). Medicine, Patients and Society II, which focuses on public health and advanced physical diagnosis, and is taught concurrently with these two courses.

During the year, MD-PhD students again visit laboratories to decide where to do their third research rotation (during the summer of Year 2). The students also should begin to search for a thesis laboratory. The program Director meets with the students, as a group, to discuss strategies for choosing a thesis laboratory. Then the students meet individually with the Research Advisory Committee to discuss their search for their rotation and their thesis laboratory. The students are encouraged to consult with the program Director before finalizing their decisions.

MD-PhD students take the United States Medical Licensure Examination (USMLE) Step 1 examination in May of Year 2, before they begin their clinical rotation Introduction to Medicine for Clinical Investigators. They must have passed USMLE step 1 before they begin their thesis research. If a student has not passed Step 1 by the August 31 of Year 3 (for students who do one research rotation during the summer after Year 2) or September 30 of Year 3 (for students who do two research rotations during the summer after Year 2), the student will no longer be in good academic standing.

The students take Introduction to Medicine for Clinical Investigators (IMCI) between in June – after they have taken USMLE Step 1. This four-week clinical rotation is during Module L of the 3rd clerkship schedule. For 2009-10, the dates for IMCI will be June 1 to June 25, 2010. For 2010-11, the likely dates for IMCI will be May 31 to June 24, 2011. In addition to the four-week IMCI session, the students will get training into the use of the hospital computer system and venipuncture in late April.

Summer of Year 2 (Third Rotation)  The students devote this period to their third research rotation. They should choose their thesis research laboratory by September 1. Students who would like to explore two laboratories before choosing their thesis laboratory can, with the approval of the program Director, do two six-week rotations before choosing their thesis laboratory by September 30.

The Research Years  MD-PhD students should have selected their thesis laboratory by September 1 of Year 3. The primary institutional appointment of their thesis advisor determines the graduate school (WCGS, RU or GSK) in which the student enrolls. MD-PhD students must matriculate in one of the three graduate schools by September 1. It is important that the students complete the administrative requirements for matriculation by that time, so that they become aware of the current policies of their chosen graduate school. Also, a student’s research account cannot be activated until the student has matriculated in a graduate school. The program office must be notified of the choice of thesis laboratory and graduate school.

Some students choose to do their thesis research under the guidance of two advisors. Any
student who contemplates to do such a “joint thesis” should consult with the program Director before going forward. If the two advisors are members of the same graduate school faculty, the student will formally have two advisors. If the advisors are members of different graduate school faculties, one of the advisors will need to be the primary advisor and the student should matriculate in that faculty member’s graduate school.

With prior approval by the program director, MD-PhD students can change their thesis laboratory throughout Year 3. If the change in laboratory involves a change in graduate school, the student must change his/her matriculation the moment he/she begins in the new laboratory. In Year 4 and beyond a change in thesis laboratory similarly requires the approval of the program Director, who will consult with members of the program’s executive committee before approving (or disapproving) the change. A major change in research focus, which will delay graduation, likewise requires the approval of the program Director.

Students who matriculate in WCGS will need to enroll into the graduate program in which their thesis advisor is a member (there are no graduate programs at RU or GSK). If the thesis advisor is a member of more than one graduate program, the student can select the program they wish to enroll in; but they must enroll in a graduate program at the time of matriculation into the graduate school. The graduate programs at WCGS are: Biochemistry & Structural Biology; Cell Biology and Genetics; Immunology; Molecular Biology; Neuroscience; Pharmacology; Physiology, Biophysics & Molecular Medicine. Students should consult the WCGS web page for more detailed information about the programs and the course offerings, and should meet with the graduate program director for their program. Irrespective of the graduate program, the specific for requirements for MD-PhD students will be those that pertain to all MD-PhD students, see P. 8.

MD-PhD students should select their faculty advisory committee (FAC) or special committee (SC) no later than January 31 of Year 3. These committees are an important complement, and counterbalance, to your advisor. Their function is to guide the students and evaluate their progress. The FAC, at RU, is composed of three to four members; the SC, at WCGS, is composed of three members. In addition to faculty from the graduate school in which the student is matriculated, MD-PhD students should have a faculty member from another of the graduate schools on their committee; this member may be one of the statutory members or in addition to the regular members of the committee. The committee members should be chosen for their scientific expertise, in consultation with your thesis advisor; and the relevant graduate school office must approve the selection. The committee should meet at least once in every twelve-month period, usually during the month of December.

MD-PhD students are on an accelerated track when they enter their research years, and it is advised that the FAC or SC be convened as soon as possible after the committee members have been selected. This way, the student, his/her advisor and the Committee members can discuss the plans for the thesis research and any other issues that might be relevant. (This initial meeting does not substitute for the student’s annual Committee meeting, which will be toward the end of Year 3.)

Students are responsible for scheduling their committee meetings. It is the policy of the MD-PhD program that students in Years 4+, who fail to convene their annual committee meeting by March 31st of the academic year, will be considered to be in poor academic standing—unless they have received explicit permission to have the meeting at a later date. Consequently, the student will not receive a stipend check until their committee meeting has been held and the committee reports have been submitted to the respective graduate school office. The program office receives copies of the committee reports. If the reports have not been received in the program office by April 1st, the stipend check will be withheld unless there is a compelling reason why the committee meeting could not be held in a timely manner. All students therefore
are strongly encouraged to make sure that their committee meetings occur in a timely manner, and that the reports are submitted to meet this deadline. Given the difficulties associated with coordinating the calendars of busy people, students are advised to begin scheduling the committee meetings several months in advance—and to send out reminders!

Research proceeds at an unpredictable pace, which often is slower than the students’ optimistic expectations. The committee meetings therefore are important, as they provide for periodic assessments of the progress by people outside the laboratory. The meeting in the middle of Year 5, after two years of laboratory research, is particularly important in this respect because the overall scope of the thesis research should begin to materialize by this time. If the student, or his/her committee, is concerned about the rate of progress, it is advised that committee meetings be scheduled twice a year, so that the rate of progress can be monitored more closely. The decision whether the student can defend his/her thesis in Year 6 usually is made in the meeting in the middle of Year 5 (sometimes at a later meeting at the end of Year 5/beginning of Year 6). If a student is concerned about his/her progress, the program director should be invited to that meeting. In any case, if it is decided to wait a year, the program office must be informed and the committee meetings scheduled twice a year so as to closely monitor the student’s progress.

Students may propose changes in the committee composition as their research interests evolve. Any such changes must be approved by the relevant graduate school office.

**Graduate School Requirements**  
The graduate school requirements are comparable for MD-PhD students, irrespective of the graduate school they are matriculated in (or graduate program their thesis advisor is associated with). Students in any graduate school must complete satisfactorily four graduate school course units (a course unit is, approximately, a quarter-long course)—in addition to the Frontiers courses. MD-PhD students usually take advanced level courses, chosen in consultation with the thesis advisor. All graduate courses at WCGS, RU and GSK are open for MD-PhD students without regard to the graduate school in which they matriculate. It is expected that the students complete their course requirements by the June 30 of Year 4. (It is recognized that some courses may be offered only in alternate years.)

No later than September 30 of Year 4, the students must submit a research/thesis proposal, which should be defended in front of their Faculty Advisory Committee (at RU) or Special Committee (at WCGS) no later than December 31 of Year 4— at which point they are free to concentrate fully on their thesis research. The format for the research or thesis proposal differs slightly between the three graduate schools. MD-PhD Students can choose to follow the format used by any of the graduate schools. A suggested format is given in Appendix B.

It is expected that students have completed all their course requirements before they defend their research/thesis proposal. Exceptions will be made if a student wishes to take a regularly scheduled course that was not offered during the student’s first research year. If they so wish, students in Year 4 and beyond are free to take additional courses. Students who do so usually audit any such courses.

If a student and his/her advisor find that the student’s progress in his/her thesis research depends on the student taking graduate courses outside WCGS, RU or GSK, the student should discuss the situation with the relevant graduate school dean.

**Clinical Electives**  
In addition to their thesis research, students in Year 4 and beyond are encouraged to participate in part-time Clinical Electives, where they for a brief period follow a WCMC faculty member on a clinical service at Hospital for Special Surgery, Memorial Hospital, or NewYork Presbyterian Hospital. This will help students gain familiarity with clinical specialties they may be considering for post-graduate clinical residency training. Please note,
Student Guide to the Tri-Institutional MD-PhD Program

however, that MD-PhD students are covered for malpractice insurance only if they work under the direct supervision of a WCMC member.

**Defense of Thesis**  In order to graduate from the program in seven years, students should complete their thesis research, write, defend and submit their thesis no later than February of Year 6. The program strongly recommends that students defend in the Fall of Year 6, in order to have sufficient time to explore clinical career options.

The relevant graduate school offices should be consulted for the format for the preparation, submission and defense of the research thesis. All students must submit the final, approved version of their thesis to the appropriate graduate school before returning to the clinical training. Thesis corrections and revisions are not possible after the return to the clinic.

It is expected that MD-PhD students have submitted original research articles, of which they are first authors, by the time they defend their thesis. It is advised that all research articles relating to the thesis research be submitted (but not necessarily accepted for publication) before the students begin their clinical training.

**Final Clinical Training**  The year before MD-PhD students intend to defend their thesis and return to the medical college for their final clinical training, they must complete a three week long Introductory Clerkship and one week long Introduction to Anesthesiology taught in the month of June and be certified in Basic Cardiac Life Support.

MD-PhD students also must complete 56 weeks of clinical clerkships. The required clerkships are: Medicine (12 weeks); Medicine, Patients and Society III (2 weeks); Neurology (4 weeks), please note that Medicine is a prerequisite for Neurology; Obstetrics and Gynecology (6 weeks); Pediatrics and Adolescent Medicine (6 weeks); Public Health (2 weeks); Primary Care (6 weeks); Psychiatry (6 weeks); Surgery and surgical subspecialties (12 weeks). Depending on the date of return to the clinical training, MD-PhD students can take a subinternship and other clinical electives. Though a subinternship is not required for graduation, the Program recommends that all students who contemplate a career in internal medicine take a subinternship.

The clerkships are organized in six or twelve week long blocks. The return dates are (in order): early July, mid August, late September; mid-November; early January; and mid-February. Most students return in November, and the program encourages all MD-PhD students to return by that time, as it provides for some flexibility during the clerkships (as well as time for electives). If a student wishes to begin his/her clerkship in mid-February, he/she must have approval from the program Director before contacting the Office of Academic Affairs at WCMC.

Students who are contemplating “non-traditional” clinical specialties (specialties that historically have few MD-PhDs in their ranks), are encouraged to return no later than in late September, so that they have sufficient time to explore their interests. Students who are contemplating residencies in Ophthalmology and Urology need to return in September because they will participate in the San Francisco Matching Program, the Early Match.

Students who return in July or August are expected to do a 12 or a 6 week long elective in clinical or translational research, which may involved a study abroad.

The order of the clerkships is determined by lottery, which usually is conducted during the month of March in the preceding Academic Year. MD-PhD students participate in only this one lottery, which is important for two reasons: first, MD-PhD students have considerable control over their clerkship schedule, particular in their final year of training; second, all students know their complete clerkship schedule before they begin their clinical training!
With permission, and at least 30 days’ advance notice, students may be able to change the order of their clerkships. The relevant clerkship director(s) and the WCMC Office of Academic Affairs grant the permission.

MD-PhD students will receive information about the clerkships before the lottery (in the student-organized Discussion Group on Clinical Clerkships and Residency Programs, see P. 12, and in meetings organized by the WCMC Office of Academic Affairs). All MD-PhD students who plan to defend their thesis in the upcoming academic year should inform the MD-PhD Program Office and the Office of Academic Affairs at WCMC no later than January 31.

Planning for the Return to the Clerkships  When MD-PhD students plan their final year in the laboratory – and schedule their thesis defense and return date – they need to be aware of several important issues:

1. Due to the organization of the clinical training, MD-PhD students have not completed their clerkships when they apply, and interview, for post-graduate clinical training positions. Be sure to schedule your clerkships such that you have completed the expected clerkships (Medicine and Surgery plus clerkships or electives in your chosen specialty) before you apply for training positions.

2. It can take several weeks (even a month) for grades to be issued after a clerkship is completed. If you plan to participate in the National Resident Matching Program, the Main Match, any clerkship that you want to be considered in your application (and listed in your transcript) must be completed by September. This cutoff is even earlier for the Early Match residencies (see above), where the application usually is due in August.

3. It is becoming increasingly difficult to take time off from a clerkship – to interview and revisit the training programs you have applied to.

4. Taken together, points 1 - 3 mean that if you go back late you may (will): be ineligible for the Early Match; limit the clerkship experience you may need to make informed career decisions; sacrifice your ability to do exploratory electives and “audition” at first choice programs; limit the time you will have to interview and revisit programs; and limit your vacation time.

Finally, please note that the formal requirements for graduation for MD-PhD students differ from those for MD students. MD-PhD students are not required to do a subinternship, but we recommend that MD-PhD students do a four-week subinternship—if they return to their clinical training in time to do so. Also, based on their having completed satisfactorily their thesis research, MD-PhD students get credit for 16 weeks of elective courses, four weeks of Advanced Basic Science Experience, and the Advanced Basic Science Course (four-weeks).
SPECIAL COURSES OF INSTRUCTION AND TEACHING OPPORTUNITIES

The information below is for the MD-PhD student-specific courses mentioned above.

The WCMC course descriptions can be found at: http://www.med.cornell.edu/education/curriculum/

The WCGS course descriptions can be found at: http://www.med.cornell.edu/gradschool/course/offerings.html/

The RU course descriptions can be found at: http://www.rockefeller.edu/graduate/ru/

**Careers in Biomedicine** (Summer before Year 1, Summer of Year 1)  Twice-a-week lunch discussions that introduce incoming MD-PhD students and First-Year students to clinician-scientists at the three institutions. Most faculty presenters are young investigators, who combine research and clinical responsibilities at some level and thus serve as role models. The speakers rotate over a three-to-four year cycle. Course Director: J. Buck, M.D., Ph.D.

**Responsible Conduct of Research** (Fall Semester, Year 1)  A Tri-Institutional Ethics course, consisting of four lecture sessions and four small-group discussions. The course is conducted on four Tuesday afternoons during September and October (the schedule varies from year to year and students should consult http://weill.cornell.edu/research/rea_com/tri_ins_pro.html for the most recent schedule). The aims of the course are: to heighten the awareness of ethical considerations relevant to the conduct of research; to inform about applicable federal, state, and institutional policies; and to provide an opportunity to discuss the implications of these policies with senior faculty. Course Coordinator: Adam Schechter.

**Frontiers in Biomedical Science I: Critical Reading of Scientific Literature** (Year 1)  The aim of this course is to present modern biomedical research at an advanced level. The course is taught at WCMC and is organized by a Tri-Institutional faculty group. The organizing faculty members are appointed by the program Director with input from the institutions. Course Director: J. Buck, M.D., Ph.D.

With permission of the program Director, the course is open to a limited number of MD students, with preference given to students who are considering applying for transfer to the MD-PhD program.

The course covers the following topics: quantitative biology (including biophysics, structural and systems biology); cell biology; signal transduction; and genes and development. The course is a structured journal club, which is described in more detail in Appendix C.

Students must pass the course (Pass/Fail grading) in order to advance to Year 2. Any student who participates in less than 80% of the sessions will receive a Fail. As a make-up, the student must write a five-to-ten page review paper on a topic that was covered in a session the student did not attend.

To address the diverse expertise among the incoming students, the course is preceded by a brief series of overviews of methods used in modern biomedical research. These sessions are given by MD-PhD students in their research years.

**Introduction to Clinical and Translational Research**  The aim of this course, which is required of First Year MD-PhD students but open to all students in the program, is to introduce students
to the excitement of clinical and translational research. The course covers concepts related to clinical trials, IRB, data safety monitoring, IND, NDA, federal regulations as well as intellectual property issues. In addition, six faculty members (two from each institution) describe their own work with special consideration of the unique aspects of international, pediatric and HIV clinical trials. Course Director, J. Buck, M.D., Ph.D.

**Frontiers in Biomedical Science II: Introduction to Molecular Medicine** (Year 2)  This course is also taught at WCMC. It covers the following topics: pharmacology; neuroscience; cancer; endocrinology; immunology/microbiology. The course is organized, structured and graded in the same manner as Frontiers in Biomedical Science I. Students must pass the course in order to advance to the research years. Course Director: J. Buck, M.D., Ph.D.

**Introduction to Medicine for Clinical Investigators**  (June of Year 2)  This is a four-week rotation, which provides some clinical perspective and experience for MD-PhD students between the preclinical years and their thesis work. Students are paired in groups of two or three with medical teams consisting of first- and second-year residents under the supervision of a medical ward-attending physician. The students are expected to participate in all the activities of the service, to give them hands on experience in clinical medicine. The students also select “their own” patients to follow, to give them first-hand insight into the natural progression of disease and the response to treatment. In addition to the clinical (ward) experience, the students also explore specialized, interventional procedures. Under the guidance of clinical research preceptors the students arrange to have tutorial sessions with clinician-scientists in the three Institutions. Course Director: J. W. Weinsaft, M.D.

**Clinical Electives**  Individualized, short-term exposures to clinical medicine in the student’s area of interest. Clinical tutors are identified by the student, with assistance by the Career Counseling Committee. The students accompany the tutor on rounds, in the clinic, or in some other appropriate clinical activity. “Shadowing” an attendant on the consult service in the student’s field of interest is a particularly effective way to learn about that specialty. The aim is to provide career guidance with minimal impact on the students’ time management. There is no fixed number of electives, and MD-PhD students should not explore clinical career options until their thesis research is well underway (in Year 4 and beyond).

**Teaching Opportunities**  MD-PhD students may be involved, on an elective basis, in several teaching initiatives. The aim is to provide students with teaching experience with minimal disruption of their other activities; the students’ time commitment is limited. The following opportunities are available:

1. Students in their research years can be journal club facilitators for the journal clubs that are part of the First- and Second-Year medical college curriculum.
2. Students late in their research years give the introductory methods lectures in Frontiers in Biomedical Science I.
3. Students in all years organize and tutor the journal clubs for the MD-PhD program’s Gateways to the Laboratory Program for underrepresented minority students, as well as other initiatives, such as the Basic Laboratory Skills Workshop and Clinical Skills Workshop.
STUDENT-INITIATED ACTIVITIES

Work-In-Progress Sessions and Journal Clubs  Over the years, MD-PhD students have organized Tri-Institutional work-in-progress sessions, where students in their research years present their work, and a number of focus-group journal clubs have been organized, such as in Immunology and Cell Biology. The program office supports these activities by providing funds for light refreshments.

Annual Barbecue  The First-Year students are welcomed to the program at a barbecue early in July. The barbecue is organized by the Second-Year students. Students from all years, program faculty, and administration attend the Barbecue.

Annual Retreat  The retreat is in mid August, before the medical college’s orientation for the incoming students. It is organized by the Third-Year students with logistic support from the program office. The purpose of the retreat is general information exchange, where students from all years give brief presentations of their rotation or thesis research and discuss common concerns. The retreat also introduces the First-Year students to their older peers. Recent graduates of the program are invited to come and talk about their post-graduate experiences. The retreat therefore is an important element of the training program and attendance is mandatory. Students in their final clinical training should request that they are not on call the weekend of the retreat. If a student cannot participate, he/she must notify the program office and request approval for an exemption.

Discussion Group on Clinical Clerkships and Residency Programs  MD-PhD students in their final year organize sessions for all interested MD-PhD students in early January and in late March/early April, where graduating students share their experiences on how to schedule clerkships and how to choose and to apply for residency programs. The program office provides refreshments and logistic support.

Du Vigneaud Symposium  Organized by PhD students at WCGS, who for many years have convened a day-long symposium in early May, where they present their research in oral and poster presentations. All MD-PhD students, including those doing their thesis research at RU, and their faculty advisors are invited to participate.

Rockefeller Graduate Students’ Retreat  Organized by PhD students at RU. Takes place in late October (or early November).

Admissions and Recruitment  MD-PhD students participate in the recruitment of new students into the program during the Interview Days (in October and November) and the Revisit Day for accepted applicants, where students in Years 1 and 2 organize “get acquainted with NYC” activities.

Class Dinners  The program office provides support ($15/student) for two dinners per year for each MD-PhD class (one per semester, at least four months apart). Upon request (and approval) these funds can be used for other class-wide activities.
GUIDANCE AND COUNSELING OF MD-PHd STUDENTS

The MD-PhD program devotes considerable effort to advise and guide students in the selection of laboratories for their rotations and thesis research. To ensure that the students have a reliable, consistent source of academic advice, two MD-PhD program committees, the Research Advisory Committee and the Career Counseling Committee provide the MD-PhD program-specific academic and career advisory functions. The two committees have overlapping membership, but different functions, as described below. Three key faculty members, who serve on both committees and who have accepted responsibility for tracking and advising MD-PhD students, are (contact information on P. ii): Hugh C. Hemmings, M.D., Ph.D., at WCMC; Robert Benezra, Ph.D., at SKI; and Jan Breslow, M.D. at RU.

The program office, which is managed by Ruth Gotian and staffed by Renee Horton, Irma Torres and Elaine Velez, generally should be the starting point for all information gathering by MD-PhD students – in particular for students in their early years in the program.

The program’s Administrative Director has extensive experience in dealing with day-to-day issues and acts as an effective liaison between the medical college and the three graduate schools. The Administrative Director will be able to advise students about the proper contact people, who are experienced with program issues and the policies and traditions in each of the three institutions. Questions relating to academic guidance usually are referred to the program Director or one of the faculty advisors listed above. Also after the students have matriculated in one of the graduate schools, they should remain in close contact with the program office, as this will facilitate a smooth transition back to the clinical training. During the graduate school years, MD-PhD students have an added responsibility because they must abide by the policies of their respective graduate school, keep in touch with their graduate program director or dean’s office, while keeping the MD-PhD program office in the information loop.

In addition to these formal mechanisms, MD-PhD students are encouraged to consult with their laboratory research advisors and student advisors; but these individuals may be less familiar with the intricacies of the program than those identified above.

Finally, the program Director has weekly office hours (Thursdays 5 to 7 pm), where he is available to discuss student concerns, academic or otherwise. Problems usually can be addressed most effectively if the program is informed early, and MD-PhD students should feel free to come directly to the program Director if a serious problem of any nature arises. (It is recommended, however, that students reserve a time slot (with Renee Horton, Irma Torres or Elaine Velez at 746-6023), as there usually are several students who wish to meet with the program Director.)

Guidance on the Selection of Rotation and Thesis Laboratories. The Research Advisory Committee provides advice and guidance during the first two years of medical college training. The Committee meets with the incoming students in July to welcome them to the campus and to introduce the academic and research opportunities available. The Committee meets with each student again in late January/early February to help the student in his/her search for their next rotation laboratory. Before these meetings, the students have a group meeting with the program Director, to discuss general issues pertaining to choosing a rotation or thesis laboratory and to encourage the students to bring a list of tentative laboratory choices to their meeting with the Research Advisory Committee. The Committee will help the student narrow down the list and, for students who have not yet chosen a laboratory, identify suitable laboratories in each of the three institutions based on the students’ research interests and preferred type of laboratory environment.

All students should inform the program office when they have chosen a rotation laboratory.
student who has not done so by mid-April will be asked to meet with the program Director. Students who have not decided on a thesis laboratory by late July of Year 2 should meet with the program Director to discuss their options.

In late August of year 2, when the students have chosen their thesis laboratories, the MD-PhD program office informs the three graduate schools about the students’ choice of thesis advisors. For students who matriculate in WCGS, the graduate school office will inform the appropriate graduate program director that an MD-PhD student has enrolled into their program.

**Things to remember when you search for a rotation or thesis laboratory:**
1. Your experience will be different from that of the student who came before you – and the student who will come after you.
2. Explore the laboratory in person, by participating in lab meetings, before committing.
3. Do not expect to accomplish much in your rotation research; therefore, select a laboratory in which you will work on something the laboratory is known for – so that you learn the methods (but be an active participant in the exchange of new ideas).
4. When searching for a thesis lab, you really are searching for a thesis project. Your eventual decision should be based on the quality of the research project you will work on and the mentoring you will receive.
5. If you have an idea for a great research project that does not fit well within any single laboratory; you should consider whether it possible to work on this project by combining the expertise of two laboratories with complementary skills. Students before you have done so; but it is a challenge, and you should discuss the issues involved with the program Directory before finalizing your plans!

**Guidance in the Conduct of Graduate Studies and Career Counseling** The Dean of the graduate school in which the student is matriculated is responsible for monitoring the student’s performance during the research years. If an MD-PhD student is perceived to be in (academic) difficulties, the Dean will consult with the program Director.

To address the special needs of MD-PhD students, the Career Counseling Committee follows the students’ progress through their research years. The Committee meets with the student in the beginning of Year 4 to monitor their progress and discuss their clinical interests. The Committee will help the students identify clinical faculty members who can serve as tutors (role models/advisors) in clinical electives. The next meeting is December/January of year 5, where post-graduate training is the major focus. The Committee members provide information about training programs and application strategies. Students are encouraged to search out alumni of the program for additional information (about the alumni’s own training experience and their knowledge of other institutions).
PROFESSIONAL CONDUCT

As MD-PhD students you are entering a profession, and you will from your first day in the program be regarded as junior members of that profession. You should behave accordingly. The term Professional Conduct has many implications, and all students should familiarize themselves with the Code of Professional Conduct in the institution in which they matriculated.

The aim of the Code is to foster an atmosphere of academic and professional integrity, in which each individual accepts responsibility for his/her behavior. The Code establishes norms that will guide you as you struggle with the, at times difficult, moral and ethical questions that will arise in your career as a biomedical investigator. The nature of the questions that arise will change over time, as will your own appreciation of the issues involved; but the basic principles will remain invariant.

Some norms are self-evident, such as the absolute prohibition against plagiarism and other scientific misconduct. Other norms are more subtle, such as those pertaining to your interactions with your colleagues, advisors and other faculty, and eventually your patients. This involves three related issues: how you behave; how you communicate; and how you treat the information you receive.

You are in training to become a physician-scientist, which means that you will have clinical responsibilities—at least while you are completing your clinical training in the medical college. You will be responsible for your patients’ lives and well being, which means that you must have the competencies needed to practice your chosen profession. You also have special responsibilities in terms of how you behave toward your patients—you show compassion and respect. Your interactions with colleagues and faculty should be at the same high level.

Science progresses because scientists exchange information, and it is important that you communicate accurately, effectively and with appropriate consideration for the people you communicate with. This requirement goes beyond the mere exchange of scientific information; it applies to all your professional interactions—including those pertaining to your medical education and clinical activities—from your first day in the program.

You will be the beneficiary of confidential information: fellow students will discuss their newest results and you will exchange information about different laboratories; at lab meetings you learn about your colleagues’ exciting results; you read their grant applications and manuscripts; and you will be given manuscripts to review for journals. Later, your patients will trust their secrets to you. Some of the information that comes your way can be disseminated freely; but much of the information is privileged, meaning that it can be disseminated only with the explicit approval of the individuals who gave you the information. If you are in doubt whether some information is privileged, you should assume it to be so until you have permission to discuss it with others. Breaches of confidentiality are serious violations of professional conduct. You need to use your judgment—at all times!

This combination of competency, honesty and confidentiality is the hallmark of professional integrity.

Finally, as MD-PhD student you have many privileges. These privileges are not entitlements; you have to earn them—by performing at a consistently high level. Noblesse oblige!
EVALUATIONS

FACULTY EVALUATION OF STUDENT PERFORMANCE

Committee on Promotion and Graduation During the medical college years (Years 1, 2, and final), MD-PhD students are subject to the policies pertaining to MD students regarding academic and professional conduct. The responsibility for evaluating student performance rests with the Senior Associate Dean for Education at WCMC. The grades and descriptive précis submitted by each Course or Clerkship Director after the completion of each course or clerkship are reviewed by the Committee on Promotion and Graduation, which is chaired by the Senior Associate Dean for Education. The MD-PhD program Director is ex officio member of the Committee. The Committee’s certification that all courses have been passed is needed before a student can advance to the next academic year or to graduation.

Laboratory Research Rotation Advisors The research advisors submit written reports on the students’ performance during each of the three research rotations. The reports are forwarded to the MD-PhD program office, which will send a copy of all evaluations to the graduate school in which the student matriculates. The evaluation form is reproduced in Appendix D1.

Research Advisory Committee and Career Counseling Committee A brief synopsis of student performances is prepared after each meeting.

Special or Faculty Advisory Committees Each student’s Special Committee (WCGS) or Faculty Advisory Committee (RU) meets at least annually to evaluate the student’s academic progress. Written reports are forwarded to the Dean of the respective graduate school. In case difficulties are perceived, the Dean will confer with the MD-PhD program Director.

Defense of Research Proposal (WCGS) or Thesis Proposal (RU) No later than December 31 of Year 4, the SC or FAC evaluate whether the student has mastered his/her research area and is ready to proceed officially to the thesis research. (The student’s written Thesis Research Proposal should be submitted to the Committee no later than September 30 of Year 4.) The Committee’s evaluation is forwarded to the graduate school Office (and the MD-PhD Office).

Thesis Committee The SC (at WCGS), augmented with two additional members, or the FAC (at RU), augmented with one external reviewer, reads the thesis, attends a public presentation by the degree candidate, and administers an oral examination on the subject matter presented. The Committee’s recommendation to the Dean is necessary for the acceptance of the thesis in partial fulfillment of the requirements for the PhD degree.

MD-PhD students who tutor Journal Clubs The tutors’ performance is evaluated by the same mechanism that First- and Second-Year MD students evaluate all their courses and course components. The MD-PhD student tutors receive a copy of the evaluation, and they are encouraged to discuss any questions they may have regarding their evaluations with the Associate Dean for Curricular Affairs at WCMC.

STUDENT EVALUATIONS OF FACULTY PERFORMANCE

Frontiers of Biomedical Science (Year 1 and Year 2) Each MD-PhD student fills out questionnaires prepared by the MD-PhD program office (see Appendix D2). The questionnaires and analyses are reviewed by the program’s Executive Committee, and shared with the Course Design Groups. Where appropriate, the Courses are adjusted in format, subject matter, and choice of instructors in response to the students’ comments.
Medical College Curriculum (Year 1 and 2)  In the same manner, each MD-PhD student fills out a questionnaire about other courses. The questionnaires and the analyses are reviewed by the Medical college’s Office of Curriculum and Educational Development. The evaluation form for the journal clubs is reproduced in Appendix D3.

Rotation Laboratory  Each MD-PhD student fills out questionnaires prepared with input from the student representatives of the program’s Advisory Committee (see Appendix D4). The questionnaires are reviewed by the program Director, the Associate Directors and the Administrative Director and filed in the program office. Given that the identity of the students who submit the forms will be known to anybody who reads them, these forms are confidential information. ANY breach of this confidentiality will be considered a breach of the Code of Professional Conduct.
TRANSITIONS

MATRICULATION INTO THE MD-PH.D PROGRAM

Are MD-PhD students MD or PhD students? Well, you are both – at all times. You will work in the laboratory; you also will be in the classroom during the first two years of medical college training. You will be co-mingled with a large class of MD students; become a full-fledged member of that class – if for no other reason than that your classmates will be residents on the house staff teams when you complete your clerkship training. Also, do not forget that you are the beneficiary of many privileges, which means that you will be held to a high(er) standard. Always remember that though the laboratory is exciting, and may be your eventual calling, while in the medical college you are training to become a physician – to take care of patients. Act accordingly! That said, you will (or should) approach the material with a more questioning attitude than many MD students would; but you should not go overboard doing so. As a physician-scientist you are expected to be skeptical of authority – and yet to function well within the medical profession, which as other professions has a well-developed hierarchy (and you are at the bottom of the totem pole). Finally, as MD-PhD student your training involves a series of transitions that set you apart from both MD and PhD students. Your fellow, MD or PhD, students will not always understand the stresses these transitions create; but the program leadership will.

FROM MEDICAL COLLEGE TO GRADUATE SCHOOL

The transition from the medical college to the graduate school may be very stressful. First, you must decide on a thesis laboratory. Second, medical college is predictable and your life is structured by the curricular demands. Laboratory research, in contrast, is not predictable and is inherently less structured. You need to identify a suitable thesis project, which despite the best planning may turn out to be a dead end – or cause unexpected difficulties. You also will worry about how you will “fit” into the laboratory: will you get along with your advisor; will your thesis project continue to excite you? These concerns are common for all MD-PhD students. Relax, even though the concerns are real, they are manageable—and your predecessors in the program have managed them successfully!

FROM GRADUATE SCHOOL BACK TO MEDICAL COLLEGE

The transition from Graduate School back to the medical college may cause similar stress. You leave the relative freedom of the laboratory for the structure of the clerkship, where you are part of a team and where your activities to a large extent will be dictated by your responsibilities for your patients. It is difficult to make the transition from being a recognized expert in your field of research to a (somewhat unprepared) MD student. You have been away from the medical college for 3½ years, or more, and now you will be responsible for human life! Yes, in the first few weeks you will not know as much as the third-year MD students in your clerkship group – and, to make matters worse, you will not even know your fellow students as you usually will be the sole MD-PhD student. But you will catch up fast! Do not underestimate the impact of what you have learned during your thesis research. You have gotten a thorough training in basic biological mechanisms. You also are trained to digest large amounts of material, to formulate working hypotheses, and to plan and execute the experiments that will allow you to test your hypotheses. These same skills are invaluable in the clinical setting – and you will find that you remember more of the medical college curriculum than you thought you did.

The clerkship lottery is sufficiently flexible that you, subject to the time available, will be able to explore your major clinical interests. It is a good idea to start out with a clerkship in an area that is peripheral to your future career plans; but you should do your chosen clerkship (or clerkships)
early, so that you are informed about the field that you intend to enter. This also will enable you to participate in off-site electives – assuming that you return in January, or earlier.

In the clinic, including during IMCI, remember the following six rules:
1. Live on the wards (as you lived in the lab)
2. Be a full-fledged member of your house-staff team
3. Be interested (or try to be) in everything that you are doing
4. Take notes; details are important and you need to be organized
5. Take good care of your patients; you are responsible for them
6. Read—constantly

FROM MEDICAL COLLEGE TO POSTGRADUATE CLINICAL TRAINING

The search for internship and residency programs is another period of stress. You will apply when you have been through only a fraction of your clerkships, and you are likely to be uncertain about your goals. The decisions you make are important; but relax (a little)—medicine and biomedical research are changing rapidly, and nobody can plan for more than three years, or so, into the future. So, the only thing that really matters is to avoid bad decisions – and to maintain as much flexibility as possible. You cannot do the “control experiments”—don’t look back!

Remember that postgraduate clinical training programs are looking for clinicians, people who take good care of patients. That you are trained in research is a plus; but no amount of research training (or publications) will make up for a poor record in your medical college training! Grades matter, and it is important to “make a good impression”—as a future physician.

The Dean’s Letter, which is being sent to all postgraduate training programs that you apply to, is important because it summarizes your standing as a MD student. The letter is mailed at November 1 of your final year in the program. You should review your Dean’s Letter when you are notified that it is ready, and you should feel free to identify omissions/inaccuracies before it is mailed out. The WCMC Office of Academic Affairs may not be aware of all you have done as an MD-PhD student. The MD-PhD program office provides a summary of your contributions to the Office of Academic Affairs; but it is your responsibility to make sure the relevant information is being provided in the Dean’s Letter. An equally important letter is the Chairman’s Letter from the WCMC Academic Department in your field of clinical interest.

You will apply and be interviewing while you are doing your clerkships. Write your applications early, during your one-week vacations in April and June after you begin your clerkships (you can revise them in October, when you career plans have become better defined). Do not schedule too strenuous clerkships during the interview period. Also, choose clerkships where the Clerkship Director, with advance warning, will let you go. Make sure the Clerkship Director knows when you will be away for interviews.

During your clerkships you will receive detailed information about your options for postgraduate clinical training. The MD-PhD program also keeps a binder describing research residencies that we have information about. The binder content is updated as new information comes in.

You also need to consider that the requirements for Board certification vary among clinical specialties, and that these requirements regularly are revised. You need to explore in detail the current requirements for the specialties that you are considering. You will find much useful information in: K. V. Iserson. Iserson’s Getting into a Residency: A Guide for Medical Students, 7th Ed. Galen Press, Ltd., 2006; and Graduate Medical Education Directory, updated annually by the AMA: http://www.ama-assn.org/ama/pub/category/3991.html. You also should consult FREIDA On-line http://www.ama-assn.org/ama/pub/education-careers/graduate-
medical-education/freida-online.shtml.
LIFE AFTER THE MD-PHD, MEDICAL LICENSURE, CAREER PATHS

The mission of the MD-PhD program is to educate and train physician-scientists, who can bridge the (widening) gap between clinical medicine and laboratory research, which is brought about by technological developments and specialization in both fields.

The mission of the physician-scientist is to promote better health and enhance the quality of life by reducing morbidity and mortality from disease through the advancement of basic and clinical science and education.

The MD-PhD training, however, does not make you a scientist or a physician; it gives you the skills and credentials to pursue a career in biomedicine, broadly defined. Just as any other PhD, you may need to do post-doctoral research training in order to become a scientist who can compete successfully for grant support. Similarly, like any other MD, you need to complete your post-graduate clinical training before you can be a (licensed, Board-certified) clinician.

MEDICAL LICENSURE, USMLE

It is a requirement for medical licensure that you complete the three steps of the United States Medical Licensing Examination (USMLE). Step 1 is taken toward the end or Year 2, before you begin your thesis research. You take Step 1 in May of Year 2, before you begin your clinical rotation Introduction to Medicine for Clinical Investigators. You must have passed USMLE step 1 before you begin your thesis research. If you have not passed Step 1 by the August 31 of Year 2 (for students who do one research rotation) or September 30 of Year 2 (for students who do two research rotations), you will no longer be in good academic standing! Step 2 is taken during your clerkships, usually in the spring of the year you graduate. Step 3 is taken during your post-graduate clinical training. Medical licensure is administered by each State’s Medical Board; the requirements for licensure therefore vary from state to state. The requirements are summarized at http://www.usmle.org/home.htm Step 3 “Eligibility Requirements.” Overall USMLE policies are set by the USMLE Composite Committee, which is composed of representatives from the Federation of State Medical Boards (FSMB), the National Board of Medical Examiners (NBME), and the Educational Commission for Foreign Medical Graduates (ECFMG). You should be aware that the Composite Committee recommends a general time limit of seven years for the completion of the three USMLE steps. Some states implement this Seven-Year Rule rigorously, other states are more lenient, see http://www.fsmb.org/usmle_eliniinitial.html. The USMLE Composite Committee has recommended that the Seven-Year Rule be relaxed for MD-PhDs, http://www.usmle.org/General_Information/bulletin/2009/eligibility.html, but it is a recommendation only. You need to be aware of the different states’ requirements when you apply to postgraduate training programs—and the USMLE Seven-Year Rule is a very good incentive for aiming to graduate in seven years.

CAREER PATHS OF MD-PhDS

Apart from the USMLE requirements, the world is your sandbox. The figure below summarizes the main MD-PhD career paths. You can combine the various options in different ways; but it is difficult to excel in more than two activities – at any one time.

Also, the transition from your post-doctoral clinical/fellowship training to your first independent faculty position, and the next few years, will be a particularly stressful period. Be sure that you have the fellowship training that will be needed to establish an independent clinical research program. Nobody can stay in training forever, and you will be burning to get a “real” job; but the methods you mastered in during your thesis research are likely to have become obsolete, so you cannot skimp on your fellowship training—which is another, good reason for graduating from the program in seven years.
FINALLY:

As an MD-PhD you can become (almost) anything you want to be; 
*but someday you have to make a decision!*

Biomedical research is changing at a rapid pace; 
*you have got to adapt – and be ready to make new decisions!* 

In life you cannot do the control experiment; 
*there are many right decisions; you need to avoid the wrong ones!* 

NOBODY remembers what your thesis research was about; 
*it is the training and mentoring that is important!*
ADMINISTRATIVE ISSUES

FINANCIAL SUPPORT

It is the policy of the Tri-Institutional MD-PhD Program that all students in the program should be fully funded, meaning that they receive a fellowship consisting of a stipend, full tuition scholarship and health insurance. Please note, however, that the fellowship is contingent on students’ being in good academic standing—meaning that they satisfy the medical college and graduate school requirements in a timely manner and generally adhere to the standards of conduct and academic performance expected of future physician-scientists.

The two main sources of support are: the Medical Scientist Training Program (MSTP) grant that we receive from the National Institute of General Medical Sciences at NIH; and funds provided by the three institutions. In addition, there are a limited number of named fellowships that are administered by the program office. Finally, some students in their research years (Year 5 and beyond) receive stipend support from their thesis advisor’s research grant(s). Whatever the initial source(s) of funding, after 4.5 years of research training all MD-PhD students receive their stipend support from their advisor’s research budget.

We expect all MD-PhD students to apply for independent fellowship support in Year 3 (the first research year); but funding does not depend on their receiving such support. Some fellowships programs restrict the number of applications from any training entity. It therefore is important that students inform the program office what fellowships they intend to apply for before they begin writing the proposal. Students who are awarded an independent fellowship that provides for more than 50% of their stipend will receive a stipend supplement of $5,000 each year they are supported by the fellowship.

Students in the Tri-Institutional MD-PhD Program are expected to engage full-time in advanced studies and research. The program does not permit students to accept extramural activities for compensation. In exceptional circumstances, such activities may be approved after prior discussion with the program Director.

All MD-PhD students, including students in the graduate school years, receive their stipends and benefits through WCMC. The program office arranges for the distribution of stipends and the travel and book funds during the first two years of medical college training. The graduate research accounts (see below) are administered through the respective graduate school Offices.

ACKNOWLEDGMENT OF MD-PhD FELLOWSHIP SUPPORT IN PUBLICATIONS

ALL students who have been supported by the MSTP grant at some time during their studies must acknowledge the support in all publications (except abstracts) as follows:
“X.Y.Z. was supported by NIH MSTP grant GM07739” or “This work was supported by .. (list of other support) and by NIH MSTP grant GM07739 (X.Y.Z.)”

It does not matter whether the student is supported by the MSTP grant at the time the work is done or the manuscript is submitted. The important point is that the MSTP grant made it possible for the student to be here and do the work: “once an MSTP [student], always an MSTP!”

Students who are/have been supported by any other fellowship, should acknowledge the support using the format used for acknowledging MSTP support.
PUBLICATIONS

Students should provide the MD-PhD program office with two copies of any publication (except abstracts and their thesis) on which they are an author or co-author. The program office will collect the publications from each year in bound volumes, so please provide reprints or the URL for your article to the program office as soon as possible after publication.

HOUSING

All MD-PhD students are guaranteed housing; they have the option to live off-campus.

MD-PhD students will be housed by WCMC during Years 1 through 4 – together with the medical college class with which they enrolled. During Year 5, MD-PhD students (irrespective of which graduate school they are matriculated in) will be housed by WCGS (and live in WCMC or SKI housing). In Years 6+ the students will be housed by RU. When MD-PhD students move to RU, they will participate in the RU housing lottery, where they will receive four seniority points.

MD-PhD students are subject to the housing policies of the institution that provides their housing. These policies evolve, and it is the students’ responsibility to acquaint themselves with the relevant, current policies.

INSURANCE

All MD-PhD students, whether matriculated in WCMC, WCGS or RU, are covered by the WCMC health and disability insurance plans.

MD-PhD students who are matriculated in WCMC – in Years 01 and 02 and their final clinical training (including the Introductory Clerkship the summer before they defend their thesis) – are covered by the WCMC malpractice/liability insurance plan for MD students. MD-PhD students who participate in short-term Clinical Electives during their research training also are covered, whether they are matriculated at RU or WCGS, provided the students are under the direct supervision of a WCMC faculty member.

EXTENSION OF THE LENGTH OF TRAINING BEYOND EIGHT YEARS

If a student and his/her advisor find that the student cannot (or is unlikely to) complete the thesis research in time to graduate from the program in eight years (4½ years of thesis research), they can petition the program Director in writing for an extension of one year. The request should be received no later than September 30 of Year 7 (at the beginning of the fifth research year). The program Director will forward the request to the relevant graduate school Dean for consultation. If an extension is granted, the advisor will be financially responsible for the student’s stipend and health benefits, but not the tuition, from January 1 of Year 7 through December 31 of the year the student begins his/her clinical clerkships.

VACATIONS, PARENTAL LEAVE AND LEAVE-OF-ABSENCE

Vacation Students may take an annual vacation of up to two weeks, in addition to official institutional closings (Scheduled Breaks, Christmas and National Holidays) and major religious observances.

Students in their first two years of medical school education and their final clinical training cannot take vacation during any time the students are supposed to participate in structured
educational activities. For students in their research training, the timing of their vacations should be agreed upon between the student and the thesis advisor. Grievances can be brought to the program Director.

**Sick Leave and Other Leave**  Students may continue to receive stipends for up to 15 days of sick leave per year. Sick leave may be used for medical conditions related to pregnancy and childbirth.

**Parental Leave**  Students may receive stipends for up to 30 days of parental leave per year for the adoption or the birth of a child. The use of parental leave must be requested at least 30 days in advance of the anticipated beginning date, and must be approved by the program Director and, when appropriate, the thesis advisor.

**Unpaid Leave**  Students requiring extended periods of time away from their training experience, which could include more than 15 days of sick leave and/or more than 30 days of parental leave, must seek approval from the program Director for an unpaid leave of absence. Such leave shall be subject to approval from the National Institutes of Health for students on training grant support. Whenever possible, approval for a leave of absence must be requested in advance of the leave.

Students who request a leave-of-absence from the medical college will be charged a re-matriculation fee when they re-enroll into the program.

**WITHDRAWAL FROM THE PROGRAM**

Students who contemplate withdrawal from the MD-PhD program should recognize that withdrawal has serious repercussions, as they will lose all MD-PhD “privileges” including stipend and tuition support. Assuming they otherwise are in good academic standing, and with the permission of the program Director, students who withdraw from the program can matriculate in the medical college or either of the graduate schools, where they will be subject to the policies and graduation requirements that apply to single-degree MD or PhD students. Of particular importance, students who withdraw from the program will have to complete the full two years of clinical training.

**PROTECTION OF INTELLECTUAL PROPERTY RIGHTS**

A student may not enter into any legal agreement involving his/her research without consulting his/her advisor and the Dean’s Office – as well as the MD-PhD program Director. Many organizations and investigators that supply research materials, which could be in the form of access to proprietary databases, insist that a Materials Transfer Agreement, or a similar document, be signed by the recipient. These are legal documents, and their wording may place (severe) restrictions on the use, and outcome of any use, of the supplied materials. If a student uses such supplied materials to make a patentable discovery, the student may discover that it is the supplier of the materials and not the student who owns the invention. Therefore, do not view such documents lightly, and do not sign any agreement that has the potential to limit your rights to any discovery without seeking advice. As a general rule, students should avoid signing any such documents and refer the matter to their advisor.

**RESEARCH ACCOUNTS, BOOK AND TRAVEL FUNDS**

The research activities of MD-PhD students are supported primarily by funds available to the laboratories in which they work. In addition, MD-PhD students receive a small research budget ($1,000 in Years 1 and 2, and $3,000 in Years 3 through 7), which provides the students with
some fiscal independence. Within a lab, the research funds enable the students to explore areas of interest that are not connected to aims of their advisor’s grants by providing funds for supplies or equipment. The research funds can also be used to attend scientific meetings and courses (e.g. at the Cold Spring Harbor Laboratory and the Marine Biological Laboratory). Except for Years 1 and 2, the unspent allocations are carried forward to the next fiscal year. Overdrafts will be deducted from the next fiscal year’s budget. If any overdraft remains when the student returns to his/her clinical training, they will be charged to the thesis advisor’s account. (Please note, whereas the program’s academic year is from September 1st to August 31st, the fiscal year is from July 1st to June 30th.)

The research funds for Year 3 are not released until the student has matriculated in a graduate school.

In principle, the students and advisor should agree on the expenditures that are needed for the student’s research. Should a student change laboratory, any funds that are carried from previous years will be forfeited. Any remaining unspent amount in the yearly budget will remain in the student’s research account; but the account will be closed when the student returns to his/her clinical training or at the end of Year 7, whichever comes first.

The research accounts are managed by the student; but purchases exceeding $500 require prior approval by the Financial Administrator (at RU) or the Registrar (at WCGS) and must be briefly justified in writing (by the student) with approval by the advisor.

The use of the research funds is limited to supplies and expenses associated with the student’s research. Stationery items, photocopying expenses, and specialized computer services that reasonably are needed for study, research and preparation of the thesis may be charged to the research budget. The funds also may be used to reimburse students for the purchase of scientific books and one periodical (if it is unavailable in the lab) – exceptions will be made for Nature, New England Journal of Medicine, and Science – up to a limit of $200/year in the first two medical college years and $500/year in the thesis research years. The research funds also may be used to pay for high-speed internet connections through the Rockefeller or Weill Cornell Academic Computing services. Reimbursements must be requested from, and approved by, the Financial Administrator (at RU) or the Registrar (at WCGS).

The research funds may not be used for a student’s personal use (e.g. accommodation and hobbies), or to pay for other personal expenses (including photocopying and computer time). Any equipment item(s) purchased with student research funds (with the exception of personal computers) cannot be moved into the student's room. All equipment purchased with such funds must remain in the laboratory – and will stay there when the student graduates.

**Computer Purchases** MD-PhD students may use the research budget to purchase up to two computers during their tenure in the program. The two computer purchases must be a minimum of three years apart, and the purchase of a second computer must be justified in writing (e-mail is acceptable), and pre-approved by the relevant graduate school. For each computer, a student may spend up to $2,500 of research funds to purchase the computer—with no restrictions as to the kind of computer, and the computer must be purchased through the relevant Purchasing Department. Direct purchases from outside vendors will not be reimbursed.

**PDAs** A student may not use the research budget to purchase PDAs or smartphones.

The computers are the students’ personal property, and they will be responsible for service and maintenance (including backup). Also, students are reminded that most software is subject to strict copyright and licensing restrictions. These restrictions must be adhered to.
Meetings and Courses  Students in Years 1 and 2 may use up to $800/year (July 1st to June 30th) and students in the research years may use up to $1,500/year from the research budget to attend meetings and courses. For students in Years 1 and 2, participation in a meeting may conflict with their medical college course schedules. If that is the case, the student must receive prior approval from the relevant Course Director before registering for the meeting and planning the travel. The MD-PhD program office must receive a copy of the letter giving permission; travel expenses will not be reimbursed unless a copy of the permission letter is on file in the program office. For students in their research years, the student’s research advisor must send a letter, recommending attendance at the meeting/course, to the relevant graduate school Office prior to the activity. (A student, who wishes to participate in a course directly related to their thesis research, can request an exemption from the $1,500 limit. The request should be in writing, with approval from the thesis advisor.)

Students in the final clinical training do not have a research budget. They can, however, request travel support from the MD-PhD program to present their thesis research at a scientific conference. Such travel support will be awarded subject to available funds. Students who wish to apply for travel support should contact Ruth Gotian.

MD-PhD students who participate actively (i.e. give an oral or poster presentation) at the National MD-PhD Students’ Meeting in Keystone, CO, will get their registration and some travel expenses reimbursed by the MD-PhD program. These funds do not count toward the $800/$1,500 limit.

The graduate schools have established a student travel per diem of $140/day for reimbursing room and board expenses for approved meetings. Room charges must be documented with receipts; the food allowance is $50/day (receipts not necessary).

In the case of air travel, travel costs are limited to the lowest reasonable commercial airfares (i.e. coach). In the case of foreign travel, U.S.-flag air carriers must be used to the maximum extent possible.

Car rentals will not be reimbursed unless there is prior approval from the graduate school Office. Approval is contingent on acceptable justification by the student and advisor.
APPENDIX A

PROGRAM STRUCTURE

Steering Committee  Overall responsibility for the Tri-Institutional MD-PhD Program resides with the Steering Committee, which is composed of the Provost for Medical Affairs and Dean of WCMC, the President of RU and the Director of SKI. The program Director participates on a non-voting basis, and a representative from the program leadership at each of the three institutions is invited to the meetings. The Steering Committee makes the major financial and policy decisions – usually upon recommendation from the program’s Advisory Committee (see below).

MD-PhD Program Advisory Committee  This Committee provides a forum for discussions of the concerns of both faculty and students, and the Committee sets specific policies for the program within the guidelines set down by the Steering Committee. The members are: the program Director; the Associate Director; the Dean at RU; the Director of Graduate Studies at SKI; the Dean at WCGS; the Senior Associate Dean for Education at WCMC; a faculty member from each of the three graduate divisions; the course director of Introduction to Medicine for Clinical Investigators; the chair of the Career Counseling Committee (see below); three MD-PhD students in their research years, one from each institution; and one MD-PhD student in medical college training. Additional, ex officio members represent the three participating institutions (the Associate Dean for Educational Affairs at RU; the Associate Dean at WCGS; the Director of Research and Training Programs Administration at SKI) and the medical college (the Associate Dean for Admissions; and the Associate Dean for Student Affairs and Equal Opportunity Programs).

Executive Subcommittee  This committee assists the program director in the daily management of the program. The committee meets monthly to discuss current and upcoming issues that affect the program. The committee also prepares policy positions for deliberation of the program’s advisory committee. The committee is chaired by the program director and consists of the dean at WCGS; the dean at RU; the dean at GSK; the senior associate dean for education at WCMC—or their designees.

Research Advisory Committee  This committee provides advice to the students during their first two years in the Program. The committee consists of the Program Director, who chairs the Committee, and a faculty member from each of the three institutions. The current members are: Robert Benezra, Ph.D. (SKI); Jan Breslow, M.D. (RU); and Hugh C. Hemmings, M.D., Ph.D. (WCMC).

Career Counseling Committee  This committee is charged with following the students’ progress through their research years and final clinical training. The committee is co-chaired by Craig T. Basson, M.D., Ph.D. and Debra G. Leonard, M.D., Ph.D. Its membership includes faculty members from clinical departments at WCMC, including the course director for Introduction to Medicine for Clinical Investigators, plus the members of the Research Advisory Committee.
APPENDIX B

THE QUALIFYING EXAMINATION FOR MD-PhD STUDENTS

Before MD-PhD students can concentrate fully on their thesis the students must present successfully a Thesis Research Proposal (TP) at GSK, a Thesis Research Proposal (TRP) at RU or pass the Admission to Candidacy Examination (ACE) at WCGS. This qualifying examination consists of a written research proposal, and an oral presentation/examination based on the proposal. Because MD-PhD students enter their graduate training after two years of medical school education, they usually write and defend a TP/TRP—irrespective of which graduate school they are enrolled in.

In order to present and defend the TP/TRP, MD-PhD students must have passed all required graduate courses (an exception will be made for courses given only every other year).

Students usually begin writing the TP/TRP toward the end of their first research year (Year 3 of training). As the proposal is being written, the student should select an Advisory Committee (AC), at GSK, a Faculty Advisory Committee (FAC), at RU, or Special Committee (SC), at WCGS. The committee members are chosen for their expertise in areas relating the thesis research. MD-PhD students in RU or WCGS should have a faculty member from another graduate school (WCGS in the case of RU students, RU in the case of WCGS students) on their committee. The usual committee composition is three members from the graduate school in which they are matriculated plus one additional member (for students matriculated in RU or WCGS).

The TRP should be submitted to the MD-PhD program office, the relevant graduate school office and the student’s committee no later than September 30 of Year 4, and the TRP should be presented and defended no later than December 31 of Year 4.

At GSK, the proposal is presented to a Thesis Proposal Examining Committee (TPEC), which is composed by the student’s AC minus the thesis advisor, plus two additional faculty members. At RU the proposal is presented at the first annual meeting of the FAC, which is both the student’s advisory and examining committee; At WCGS, the proposal is presented to an examining committee (EC) composed of the SC plus a chairperson.

It is the student’s responsibility to:
1. Contact all members of the TPEC, FAC or SC to ask whether he/she is willing to serve on the committee, and (for students at WCGS) to inform the committee members of the scope of the proposal—that it is a thesis research proposal. The final composition of the committees is subject to approval by the relevant graduate school—and the graduate school may appoint one or more members. (As noted above, MD-PhD students in RU or WCGS should have a faculty member from another graduate school (WCGS in the case of RU students, RU in the case of WCGS students) on their committee.)
2. Schedule the meeting of the FAC or EC and the oral presentation of the proposal.
3. Make sure all GSK, RU or WCGS general requirements for scheduling and presenting TRP are met, and that all relevant information and documents/forms are submitted the graduate school office in a timely manner (you need to read up on the relevant graduate school’s policies, which are revised regularly).

Timely scheduling is important; exams have been cancelled (and re-scheduled) because a student did not provide the necessary information in a timely manner.
Structure of the Thesis Research Proposal

The proposal usually consists of five parts:

1. **Specific Aims**
   - Statement of the problem to be addressed, and the specific aims of the proposed research. Why is this problem important?

2. **Background and Significance**
   - Review of the pertinent literature – relating to why this is an important/unresolved question

3. **Preliminary/Previous Studies** – done by you or by other investigators
   - How will your studies build on previous work? Here you get into the details.

4. **Experimental Plan**
   - How do you plan to do and interpret the experiments; control experiments; how will you adapt if early experiments do not show the expected results?
   - Technical hurdles to be overcome should be mentioned, and alternative approaches should be given for experiments that may not be feasible.

5. **Bibliography**
   - Should be comprehensive and cited in full at the end of the entire proposal.

Many students use their TRP as basis for preparing an application for a F30 pre-doctoral National Research Service Award (NRSA) to the NIH. If you plan to do so, you also should consult [http://grants.nih.gov/grants/guide/pa-files/PA-09-207.html](http://grants.nih.gov/grants/guide/pa-files/PA-09-207.html), as well as the guidelines to the reviewers of pre-doctoral fellowship applications: [http://grants.nih.gov/grants/peer/f_奖项/f30_指导_for_reviewers.pdf](http://grants.nih.gov/grants/peer/f_奖项/f30_指导_for_reviewers.pdf).

You are in training to become a physician-scientist (broadly defined), and it would be appropriate if the proposal (in Background and Significance) discusses the problem in question at different levels of organization, specifically at the:

1. molecular level
2. cellular or organ level
3. organism level (preferably disease-related)

The research proposal should be no more than 20 double-space typed pages, not counting figures and references. The proposal should be written by the student. The thesis advisor may provide guidance, but may not write any part of the proposal or provide the student with a previously written grant proposal on the same subject. It is acceptable, however, to look at your advisor's NIH research proposals (on different topics), so that you get an idea of what is expected.

The proposal is distributed to the members of the student’s committee. Students are encouraged to contact the Committee members about one week after distributing the proposal, to find out if the Committee member has identified any problems or weaknesses. The proposal may/should be revised after these discussions.

At the oral presentation the student will present the proposal. The student should prepare a 30 to 45 min formal presentation (and you expect to be in the room for 90 to 120 min). The EC or FAC members will ask questions during and/or after the presentation. Remember, anything you write or say will be questioned in detail. The evaluation will be according to the guidelines in the graduate school in which the student is matriculated.

If a student wishes to convert the TRP into an application for external fellowship support (e.g., a pre-doctoral F30 NRSA application, see above), the application should be prepared according to the guidelines for the funding agency and should incorporate the feedback the student received during the presentation of the TRP.
APPENDIX C

FORMAT FOR FRONTIERS IN BIOMEDICAL SCIENCE COURSES

(Letter sent to faculty teaching Frontiers I)

To: Faculty teaching Frontiers in Biomedical Science I: Critical Reading of Scientific Literature

From: Olaf S. Andersen
Director, Tri-Institutional MD-PhD Program

Thank you very much for agreeing to participate in the Frontiers in Biomedical Science course for First Year MD-PhD students, which is directed by Dr. J. Buck and that has been organized by Drs. S. Blanchard, C. Blobel, J. Buck and E. Lai. The goal of Frontiers is two-fold: to teach MD-PhD students to critically read the scientific literature – and thereby provide an introduction to critical thinking in an experimental context; and to convey the “joy of science” that is missing in the medical school curriculum. To achieve these goals you should structure your session in a manner that maximizes student participation.

These goals can be achieved in many different ways. Experience has shown that the following general format works well:

1) Briefly introduce yourself, your previous research career and your current research interests.

2) 30 min general introduction to the problem, in which you put the articles to be discussed in context. The students really appreciate if you delineate the historical development of the topic to be discussed. In fact, the hallmark of successful sessions seems to be that the faculty member focuses on a “great story”. This not only helps them get insight into the underlying issues, it also helps them retain the information better. You also should consider listing some key questions on a sheet to be given out with the articles.

2) 60 - 90 min intense discussion of the article(s) that you have given out. Remember, the students are MD-PhD students, with a significant medical school course load. You should hand out no more than two articles. The total length of the articles that you hand out should be no more than 20 pages.

You should not use your own articles, as that dampens the students’ willingness to be actively involved and critical of the material at hand.

If you choose to give out more than one research article, you should provide the students with a brief rationale for why you do so. In any case you should list some key questions on a sheet to be given out with the articles.

It is useful if you can find articles that reach mutually contradictory conclusions – or that examines a biological problem using complementary methods.

Another possibility is to take two brief review articles, one being a classical, defining review the other from the last couple of years, and an intervening experimental article that led to a paradigm shift.
The discussion should emphasize the following questions. Why is the problem important? Why were these particular experiments done? How were they done (experimental design)? Was the experimental approach useful – in light of the underlying problem? Were the conclusions justified?

3) Toward the end of the session you should focus on the Discussion section of the article(s). A common student complaint is that there is not sufficient emphasis on the “big picture,” which often comes up during the analysis of the Discussion. Finally, you should outline where you see the field moving – conceptually and methodologically.

There is flexibility in the above format, and different topics may require different approaches. The main point is that you structure your presentation such as to maximize student participation.

Whereas students do not like to discuss articles written by faculty presenters, they want information about ongoing research in the Tri-Institutional Program; please bring selected reprints, as this is your chance to meet and make an impression on the students.

We have established a forum, the Pre-Sessions, where the students will discuss the articles before the session with you. It therefore is important that the articles are available in the MD-PhD program office no later than two weeks before your session on ________. Attached is a sample-reading list from one of the Frontiers sessions. If you assign more than one article, please indicate clearly the article(s) being assigned for background information and the article(s) that will be gone over in detail.

The student performances will be evaluated (pass/fail) based on attendance and participation. Students who do not participate actively will be given a take-home exam at the end of the course.

The students will evaluate the faculty using the enclosed questionnaire (Appendix D2 in this Guide).
An MD-PhD student worked in your laboratory as a rotation student in partial fulfillment of the requirements of the MD-PhD Program. We need your evaluation of this student’s performance.

Please review this evaluation with the student, prior to submitting it to the MD-PhD program office.

The evaluations are filed in the MD-PhD Office and a copy is forwarded to the graduate school upon matriculation.

Student’s Name ___________________________ Year in Program ___________________________

Faculty Rotation Advisor ___________________________ Summer (add year) ____________

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APPENDIX D2

FACULTY EVALUATION QUESTIONNAIRE FOR FRONTIERS IN BIOMEDICAL SCIENCE

FRONTIERS IN BIOMEDICAL SCIENCE

Faculty evaluation form

Date of Session: ________________________  Name of Faculty: ________________________

In the entries below please answer yes/no or quantify on a scale of 1 – 5, 5 being highest. Please circle your response.

If the faculty presented uses a format that differs from the “standard” format, please use the narrative section for your evaluation.

Reading Material

Was the reading material available the week before the session?   Y    N
Did the faculty member use article(s) from his/her own laboratory?   Y    N
Were the article(s) well chosen, useful, and interesting?   Y    N

Presentation

Was the background presentation of appropriate length?  1 2 3 4 5
Did the presentation give a good overview of the field in general?  1 2 3 4 5
Did the presentation help you appreciate better the material in the article?  1 2 3 4 5

Discussion

Was there sufficient time for discussion of the article?  1 2 3 4 5
Did the background presentation, or article discussion, help you understand the pitfalls involved in doing the experiments and interpreting the results?  1 2 3 4 5

General

Was there a summarizing discussion?   Y    N
Did the session increase your interest in the topic?  1 2 3 4 5
Did the session increase your ability to read scientific research papers critically?  1 2 3 4 5

Below please make any other comments you may have about the session:
## Journal Club Tutor Evaluation

Please write in the names of all JC tutors you had in the boxes below and rate your Journal Club tutors using a 1 through 5 scale as defined below:

<table>
<thead>
<tr>
<th>Name of Tutor</th>
<th>Fostered a positive learning climate</th>
<th>Provided focus for scientific concepts</th>
<th>Knowledgeable about the material</th>
<th>Helped me understand the material</th>
<th>Used time efficiently</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not At All = 1</td>
<td>Very Little = 2</td>
<td>Neutral = 3</td>
<td>Very Well = 4</td>
<td>To a Great Extent = 5</td>
</tr>
</tbody>
</table>

A similar evaluation form is used in all the medical college Basic Science courses
Please complete this survey regarding your recently completed summer lab rotation. The
surveys will be filed in the MD-PhD Office. The information you give will NOT be shared
with the Principal Investigator for whom you worked. With your permission it will be shared
with other MD-PhD students interested in rotating in the lab; however, if you wish your name
will be withheld. Thank you for taking the time to complete the survey.

Name __________________________ Year in Program __________________
Faculty Rotation Advisor __________________________ Summer of _____________

General Information:
• How many people worked in the lab at the time of your rotation? ________
• Estimated ratio of post-docs to PhD students: ________________
• Did you have your own bench for the summer? ________________
• Did you have your own desk for the summer? ________________
• Were the aims for the rotation clearly defined?

• How was your project selected?

• Was the PI available to discuss your project? How often?

• Was the PI supportive of your aims?

• Did you work on your own project, or did you work with someone else – if so, with whom (grad student, post-doc)?

• What did you learn (techniques, science, other things)?

• Looking back, was your project focused/reasonable?

• How was the general laboratory environment?

• Did the lab have a Journal Club?

• What were the nature of lab meetings (how often, scope of meeting)?
**Brief description of rotation project**


**Additional Comments about the rotation** (positive or negative)


Please return to the MD-PhD Program mdphd@med.cornell.edu or fax: 746-8678
APPENDIX E

HOW TO WRITE A SCIENTIFIC PAPER

These notes summarize some points that OSA consider to be important when writing a scientific paper or report; they are not meant to be a comprehensive guide for how to prepare scientific manuscripts. The emphasis is on manuscripts relating to experimental studies; the extension to theoretical studies and interim reports should be straightforward.

When you write a scientific paper, you write for an audience; you should aim to fulfill four goals. First, you should explain why the question you have chosen to work on is important—to guide your reader's thinking. Second, you should explain how you did the experiments—to help your reader evaluate whether the methods you used are appropriate for the problem at hand. Third, you should describe the results you obtained and describe the control experiments you did to substantiate your conclusions—and you should do so in a manner that allows the reader to evaluate whether your approach is a good one (or not). Fourth, you should discuss how these results change the way in which we should think about the question at hand—to educate your reader(s).

A good paper provides new insights into a problem. You are not just reporting facts, you are teaching! Therefore, think back to when you were introduced to the question, what difficulties did you have in terms of understanding the material? With the benefit of hindsight, how do you think your advisor should have described the problem and its significance? Write the paper to accomplish that goal!

It is important to recognize who your target audience is, and to write the paper in a style that will help you communicate your ideas and findings clearly and effectively. It usually is NOT helpful to describe the meandering path you took when trying to dig into the problems you met on your way. Rather, you should organize the paper such that the different elements, when combined, constitute a "good" story. Remember that you want to convince your reader that your work is really neat stuff—you are teaching!

It is important to write well; your readers will appreciate your efforts. Define all symbols and abbreviations; avoid lab jargon. ALWAYS spell-check any draft that you give to someone for critical reading and feedback. It is insulting to your readers not to do so. You are imposing on your readers’ time; you should regard it as a precious resource. You also should make full use of grammar checkers, if they are available to you. (But, remember that “here” and “hear” will pass unscathed through a spell-checker and that grammar checkers tend to “retarded”—meaning that they detect only the most egregious errors; there is no substitute for careful reading of your drafts!)

Usually you write a scientific paper to report your successes. Sometimes, however, you may have worked hard in the laboratory, but with little to show for your efforts. That is OK—as long as you do not make a habit of it. In case you are in the situation that you have little to tell, it is often helpful to write a “progress report” in order to identify the problems that kept you back. You look at the problems differently when you put things down on paper. Such “progress reports” also can be used to fulfill various formal requirements, such a report at the end of a research rotation. But never even think of publishing such “progress reports.”
From a practical point of view a paper consists of the following 11 parts:

1. **Title Page.** What question did you study? What did you find? Brief declarative statement(s). In addition: who you are and where you did the work?

2. **Abstract.** A brief summary of the question(s) you studied, the result(s) you obtained and the conclusion(s) you made. Be concise, less than 200 words.

3. **Introduction.** Why is this an important question; what has been done before; how will your experimental approach improve on previous work; what new information/insights did you obtain? This section should be written with full benefit of all that you have learnt.

4. **Materials and Methods.** What materials did you use; what methods did you use; what controls did you do, including any statistical tests for significance.

5. **Results.** A description of those experimental results that you consider to be important for obtaining further insights into the question you set out to study. There is no need to follow the order in which you did the experiments. The presentation should be organized around the figures you plan to show, and the reader should be able to discern the thread from one set of experiments to the next.

6. **Discussion.** Start out by briefly summarizing your main results. Then you discuss the implications of your findings: what can you conclude; what remains uncertain; are there weaknesses in the experimental design, or the methods you used that force you to qualify your conclusions. With the benefit of hindsight, what would you have done different?

7. **Acknowledgments.** Who supported the work. Who helped you: who provided advice; who commented on your early drafts of the paper; who cheered you up?

8. **Bibliography.** The papers (books, book chapters and other resources) that you have read and found useful in your work and that you cite in the paper. Remember, you may be asked to explain the content of any source you list in the bibliography.

9. **Tables and table legends.** Take care to organize any tables to maximize their readability. Once you have put the information into the table you prepare the table legend, which should be a brief definition of symbols, etc.

10. **Figure legends.** These are always positioned before the figures, but written after the figures have been prepared. Figure legends should not duplicate the main text, but explain the main elements in the figure to your reader.

11. **Figures.** Do not clutter. Each figure should have a simple message. In photomicrographs and gels, be sure to highlight the important elements/bands – and explain in the legend what it is you have highlighted. Look at the papers you have read, decide which figures you find to be well prepared and which you dislike, and use the “good” figures as templates when preparing your own figures.
These 11 elements are not independent. In a good, well written paper the different elements “fuse” into a whole. That is, you do not write the paper simply by writing a number of distinct parts. Whenever you change one part of the paper, you should make sure that your change does not impact on other parts of the paper.

Different journals have different styles. Be sure to look at the latest “Instructions to Authors” and “Editorial Policies” for the journal you intend to submit your manuscript to. It would be a pity if your manuscript were sent back because it failed some bureaucratic criterion for suitability. Among such criteria, the most common are limits on the number of printed pages or figures, and the style of the figures. You also should note the style used for the bibliography.

You should look at other papers for examples of how to proceed. That will help you organize your own writing.

The order in which you write the various parts of paper is important. It usually is helpful to begin with the Material and Methods section. Then you should prepare drafts of the Figures and Tables and their legends. Once you have the drafts prepared, you organize them in the order you think they should be presented. Then you can write the Results section—and you usually will find that you need to revise Materials and Methods because you forgot something important. Similarly, you often will find that you need to change the way in which the figures are drawn and organized. Do so while the idea for the change is fresh in your mind. The next step is to write the Discussion. Again, you may need to go back and revise the Results section: the order in which you present the results may need to be changed; you may find that a figure or table is missing, or that you need to emphasize things differently in the text or the legends.

A common error is to wait inserting your references, the papers you have read and wish to cite, until late in the writing. That is a serious mistake, as you will find that you focus your thoughts when you make decisions about what papers to cite – and where.

Once you have written Materials and Methods, Results (plus Figures, Tables and their legends), and Discussion then you sit down and read the whole thing critically. Does it make sense, have you quoted the right articles, are you pleased with the product? Once you have made the necessary revisions, and have a draft that meets your standards, you write the Introduction. This is difficult, as you need to be as clear and concise as possible—in light of what you know now, as opposed to what you knew when you began the study. You will be practicing “revisionist history writing.” Again, be sure to quote the pertinent articles that you found helpful when you planned your experiments. Finally, when you are satisfied with the product, you will prepare the Abstract, Title Page, and Bibliography.

Finally, a comment on plagiarism. Plagiarism is a serious violation of academic standards and scientific integrity. It can be defined as the “use or close imitation of the language and thoughts of another author and the representation of them as one's own original work” (http://en.wikipedia.org/wiki/Plagiarism).

It clearly is wrong to copy and paste without putting the text in question in quotes and citing the original source; it is equally wrong to copy and paste, and then do minor word-smithing, without acknowledging and citing the source. Though you may find that you cannot express a particular issue as well as one of your sources has done, you ALWAYS should strive to rephrase the issue in your own words—and acknowledge the source—even if you consider the issue at hand to be “common knowledge” (see above example). Plagiarism aside, this becomes particularly important in scientific writing because you do not really understand the issue before you are able to express the issue in your own words.
So, always use your own words and cite any source that you used and found to be helpful during
the writing of your manuscript.

BIBLIOGRAPHY:


