

Microbiology and Immunology Graduate Program Columbia University 2015-2016 Guide for New Students

FROM: **David A. Fidock, Ph.D., Director of Graduate Admissions**

Welcome to the Department of Microbiology and Immunology. We are delighted to have you join us!

The following description of our Graduate Program will give you some idea of how the next several years of your Graduate Education and Research will proceed. **Please keep this description in your files for future reference.** The information contained in this document can also be found at the Departmental website, <http://www.microbiology.columbia.edu/>, which is updated regularly.

Our Department works hard to administer a vibrant Graduate Program, and with the continuing advances in biology it is a particularly exciting time to be pursuing scientific research. We are looking forward to your development as inspired, creative, and productive scientists.

Your contacts here will primarily be the graduate admissions and training grant program director David Fidock, the graduate studies director and program co-director Lorraine Symington, your faculty mentor and student advisors and our head administrator James Lapin. Contact details are provided below. You are welcome to contact us whenever you have questions. We are here to ensure you have a successful, productive and fulfilling graduate research education.

You will need to schedule a meeting with Lorraine Symington, the Co-Director, at least one time per each semester during the first year to assist you with choosing a lab for your rotation and to discuss your progress. Lorraine also assumes the responsibility for the remainder of your graduate education here. You are also welcome to contact me at any time.

MICROBIOLOGY AND IMMUNOLOGY GRADUATE COMMITTEE

The Microbiology and Immunology Graduate Committee is responsible for reviewing applicants to the Ph.D. program, and establishing and reviewing curriculum, including courses, rotations, and qualifying exam; and monitoring student progress. Members of the Graduate Committee for 2013-14 are listed below:

David Fidock, Director of Graduate Admissions and Director of the Training Grant (TG) in Microbiology, Immunology and Infection
Room 1502A HHSC, ext. 305-0816
df2260@cumc.columbia.edu

Lorraine Symington, Director of Graduate Studies and Co-Director of the TG
Room 1222 HHSC, ext. 305-4793
lss5@cumc.columbia.edu

Saul Silverstein, Head of Qualifying Exam Committee
Room 1310A HHSC, ext. 305-8149
sr2978@cumc.columbia.edu

The Committee receives administrative support from:

James Lapin, Departmental Administrator
Room 1208 HHSC, ext. 305-4046
js1023@columbia.edu

Oliver Jovanovic, Curriculum
Room 1412 HHSC, ext. 305-3647
oj2@columbia.edu

Carol Duigou, Department Finances
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CURRICULUM FOR STUDENTS ENTERING 2015

Note: Information about these courses can be obtained through the Columbia University Directory of Classes at: <http://www.columbia.edu/cu/bulletin/uwb>. Every fall and spring the department will send you a list of upcoming courses and details on how and when to register online. A copy of the Fall 2015 Registration is appended to the end of this guide. Once you are enrolled, you can access the course information through our Courseworks system: <https://courseworks.columbia.edu/>

Our first year courses are designed to provide the student with a strong foundation in both classical and modern molecular biology and genetics. The first year courses are generally lecture-style with time taken for discussion of published papers. A listing of the courses is provided at the end of this document.

In addition to courses in biochemistry and molecular genetics, our department now teaches two courses – advanced topics in microbiology and immunology and graduate immunology. Electives are not required, although you are welcome to review these electives and discuss with your mentor and with Dr. Symington the suitability of an elective course for your particular research. A listing of potential electives can be found below, and other options can be found through Courseworks.

Please note also that the Seminars in Microbiology and Immunology program is a seminar series from 12-1 PM on Wednesdays and research in progress talks from 3:30-4:30 PM on Fridays. These are held in the Hammer Health Sciences Center (HHSC) Room 301. Attendance is mandatory. Please see below for more detail.

FIRST YEAR

Fall semester:

Biochemistry and Molecular Biology I [G6300](#)

Molecular Genetics [G4150](#)

Research in Microbiology and Immunology I [G9501](#)

Seminars in Microbiology and Immunology I [G9301](#)

Spring semester:

Biochemistry and Molecular Biology II [G6301](#)

Graduate Immunology [G4020](#)

Research in Microbiology and Immunology II [G9502](#)

Seminars in Microbiology and Immunology II [G9302](#)

Summer semester:

Research in Microbiology and Immunology III

SECOND YEAR

Fall semester:

Advanced Topics in Microbiology and Immunology I [G6055](#)

Intro to Computational & Quantitative Biology [G4120](#)

Advanced Elective (optional; see Electives below)

Research in Microbiology and Immunology I [G9501](#)

Seminars in Microbiology and Immunology I [G9301](#)

Spring semester:

Advanced Topics in Microbiology and Immunology II [G6056](#)

Responsible Conduct of Research and Related Policy Issues [G4010](#)

Dissertation Research in Microbiology and Immunology II [G9502](#)

Seminars in Microbiology and Immunology II [G9302](#)

Ph.D. Qualifying Exam (typically first or second week of March of second year)

Summer semester:

Dissertation Research in Microbiology and Immunology III

SUBSEQUENT YEARS

Dissertation Research [G9501/G9502](#)

Seminars in Microbiology and Immunology I and II [G9301/G9302](#)

Ph.D. Thesis Defense!

ELECTIVES

Second year students may wish to take one graduate level elective course, preferably in the Fall of their second year, which is relevant to their research interests. Examples of courses currently offered at the College of Physicians and Surgeons follow. Please note that not all courses are offered each year. Check with the individual Department websites (these can be accessed through the Graduate School of Arts and Sciences (GSAS) link to PhD Programs in Basic Cell and Molecular Biology listed [here](#) and the GSAS PhD Selection overview site listed [here](#)) or the Registrar's [Directory of Classes](#). Also, please note that some students may wish to take a course in another Columbia school (e.g. the Mailman School of Public Health) as an elective. Many excellent courses exist and we are happy to consider such an option. In that case, students are required to obtain prior approval from their Mentor and the Program

Director.

Fall semester electives:

Mechanisms in Human Disease [G6003](#)

Genetic Approaches to Biol. Problems [G6210](#)

Cancer Biology I [G4500](#)

Spring semester electives (will be updated in memo for Spring registration):

Virology [W4310](#)

Statistics for Basic Sciences [G8012](#)

Quantitative and Computational Aspects of Infectious Disease [G4016](#)

ACADEMIC STANDARDS

The department has strict guidelines for academic progress. Students are required to maintain a 3.0 GPA. Any student who receives a C or lower without a reasonable explanation can be placed on academic probation. Possible outcomes of probation include remedial instruction on the topic, re-taking the course or in instances of serious deficiencies possible dismissal from the program.

RESEARCH ROTATIONS

Our program immediately emphasizes your participation in research. At the departmental retreat September 4-5, you will attend a series of informal presentations by each faculty member to become acquainted with the research in the Department. You will then select a laboratory for the first research rotation, which begins no later than Monday, September 14th.

The three research rotations are vital components of the training program. This is a valuable experience, even if you feel you have already decided on a field for your thesis research. Rotations are scheduled for three months each to allow you to obtain a realistic sampling of the nature of the research and the strategies and methodologies employed by a given laboratory. The duration is long enough for you to have a productive research experience. In several cases, the work accomplished during laboratory rotations has resulted in or been included in published papers. You are expected to participate at laboratory meetings and to make a final presentation of your work to the lab and mentor.

Rotations will follow this schedule:

- *Rotation 1:* **9/14-12/18**
- *Rotation 2:* **1/4-3/26**
- *Rotation 3:* **3/29-6/24**

A summer rotation is permissible if the student has not found a host lab in which to conduct their doctoral research. We will assist you in choosing these rotations. Note however that the Faculty members are not obliged to offer PhD studies to a rotation student. It is important for you as students to make an excellent impression and to convince your Faculty Mentor to accept you into their lab.

Please note that your first rotation needs to be with a member of the department and that two of the three rotations need to be with a departmental faculty member.

PARKER AWARD

The Richard C Parker award is awarded to the best senior student, usually one that has recently graduated or is about to graduate. It consists of recognition at the annual Richard C. Parker Memorial Lecture, and a \$500 award. This annual Lecture offers graduate students the opportunity to invite and host a speaker of their own choice.

SEMINAR PROGRAMS

Microbiology and Immunology Seminar Program for Invited Speakers. The Wednesday seminar series is an opportunity for our department to host outstanding scientists and we strive to create a very high level scientific forum here. <http://www.microbiology.columbia.edu/seminars/seminarseries.html> provides the speakers list, which is also shown towards the end of this guide. These seminars are generally held on Wednesdays, 12:00 Noon, Room 301 HHSC. A schedule is appended at the end of this document. Please watch the bulletin boards for updated announcements. **Attendance is required for all students of the Microbiology and Immunology Department and the program has 2 credits.** This is an activity of major importance for students, postdocs, and faculty. The first lecture this year starts Wednesday October 14 and will be presented by Dr. Blossom Damania, the Boshamer Distinguished Professor of Microbiology and Immunology, University of North Carolina at Chapel Hill.

Friday Work in Progress Seminars. Held every Friday, 3:30 PM, Room 301 HHSC. The Friday seminars provide an opportunity for students and postdocs to speak about their research. Once students begin their thesis work, they are asked to give a talk in the Department's Friday seminar series once a year. This is a valuable experience that brings together all members of the Department including faculty. These seminars present ongoing and unfinished work and generate considerable discussion. The first speaker will present on **Friday September 18.** As with the Wednesday seminar series, the Friday Research in Progress Seminars are mandatory for students to attend! The Work in Progress seminar is a graded with P or F and failure in maintaining attendance will lead to an F grade.

Happy Hour. This follows the Research in Progress on Fridays from 4:30-5:30 PM, in the Lobby on the 12th floor or occasionally in the CCTI conference room on the 15th floor of the Black building. This is a great occasion for students, postdocs and faculty to socialize in a more causal environment and we encourage all to attend:-)

JOURNAL/DATA CLUBS

Starting in September of the second year, the student are encouraged to participate in one of several departmental journal/data clubs, preferably one related to the student's area of research. We encourage each student to attend at least one regularly and make at least one presentation each year. These clubs include:

Microbial Pathogenesis - Jonathan Dworkin (check with Dr. Dworkin for the time of the first meeting)

1st Tues of every month from 12:00 – 1:00 PM. Location alternates between HHSC 1212 and the Biology department on the Morningside campus

DNA Dynamics – Shan Zha (attended by Basu, Gottesman and Symington labs from Micro and Immuno). 2nd Mon of every month 1:30 PM ICRC auditorium.

QUALIFYING EXAMINATION

The qualification exam is administered to all second year PhD students to ascertain whether the student is prepared for PhD level research. A passing grade is required to advance within the program to dissertation-only status. The exam is conducted in early March of the second year. It consists of a written report of research conducted to date in the dissertation laboratory written according to NIH F31 guidelines. Thus the report will include a brief Introduction of the problem area, Specific Aims with defined hypotheses, Experimental Results (acquired during the first year rotation in the laboratory and those continued upon joining the lab) and Planned Experiments. The report is not to exceed 6 pages not including references. In addition, a 20 - 30minute research presentation and an oral defense will be conducted the week following submission of the report.

Timeline –

March 1 – Deadline for submission of the report (single line spacing Arial font 11 pt with 1” margins all around) that utilizes the research conducted to date in the host laboratory to formulate a research proposal along the lines of an F31 application (see section below on Written Proposal Guidelines).

March 8-15 – Research presentation. Students are encouraged to use Powerpoint presentations, and to bring paper copies of their presentation for each committee member (see recommendations below).

Qualifying Exam Committee

The committee will consist of 2 microbiology-genetics and 2 immunology faculty members. It will meet as a group to review the written reports, listen to the oral presentations and ask questions. All faculty members within the department will serve on the committee on a rotating schedule, with a balance of junior and senior faculty. A thesis advisor may not examine his/her own student. In the event a committee member has a student that will be examined then an alternate committee member will be selected. Of note, for each student the thesis advisor will be called in to attend, but will not be allowed to participate.

Written Proposal Guidelines

The structure will be a brief report, in the form of an NIH Predoctoral Proposal, of no longer than **6** pages: For explicit examples of Grant Applications please see (the actual application is toward the back of the pdf):

<https://www.nigms.nih.gov/training/indivpredoc/pages/predoctoral-f31-sample-applications.aspx>

Introduction: A 1 page section that summarizes the topic.

Specific Aims: No longer than 1 page, each aim must address experimentally testable hypotheses. State concisely the goals of the proposed research and summarize the expected outcome(s), including the impact that the results of the proposed research will exert on the research field(s) involved.

List succinctly the specific objectives of the research proposed, e.g., to test a stated hypothesis, create a novel design, solve a specific problem, challenge an existing paradigm or clinical practice, address a critical barrier to progress in the field, or develop new technology.

Results and Discussion: This section should present your own experimental results discussed in the context of existing literature and how the data advance our understanding of the biological system being investigated. Future research should be integrated into each Section.

Organize the Research Strategy in the specified order using the instructions provided below. Start each section with the appropriate section headings - Significance and

Approach. Cite published experimental details in the Research Strategy section and provide the full reference in the References Cited section using EndNote to create your Bibliography.

a. Significance

Explain the importance of the problem or critical barrier to progress in the field that the proposed project addresses.

Explain how the proposed project will improve scientific knowledge, technical capability, and/or clinical practice in one or more broad fields.

Describe how the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field will be changed if the proposed aims are achieved.

b. Approach

Describe the overall strategy, methodology, and analyses to be used to accomplish the specific aims of the project. Include how the data will be collected, analyzed, and interpreted as well as any resource sharing plans as appropriate.

Discuss potential problems, alternative strategies, and benchmarks for success anticipated to achieve the aims.

If the project is in the early stages of development, describe any strategy to establish feasibility, and address the management of any high risk aspects of the proposed work.

Point out any procedures, situations, or materials that may be hazardous to personnel and precautions to be exercised. A full discussion on the use of select agents should be described.

If you have multiple Specific Aims, then you may address Significance, and Approach for each Specific Aim individually, or may address Significance and Approach for all of the Specific Aims collectively.

References: This section does not count towards the page total. References should be listed in the order in which they were cited in the main text (where they should be listed as a number between brackets). References should include all of the authors and the manuscript titles. It is anticipated that the student will list > 20 manuscripts that they have read about their topic, as well as references for the proposed experimental approaches.

Example Reference: Doe, J (2010). Really cool stuff about your favorite pathogen. **Nature** 1: 200-12.

You are allowed to include additional Figures or Tables in an Appendix that illustrate data or a model if essential for understanding the experimental rationale. These will not add to the page length. However, incorporation of Figures and Tables into the body of the Proposal makes it easier to read.

Writing Tips

Dr. Farber has agreed to present a one hour lecture on how to write a Grant on January 11, 2016. You will be advised of the date and should definitely attend.

All students are strongly encouraged to use EndNote for the preparation of references. It is available for download at:

<http://www.columbia.edu/acis/software/endnote/>

Role of the Thesis Advisor

Students are encouraged to discuss their project with their mentor and to show the mentor their written proposal and slide presentation with sufficient lead-time for the mentor to provide feedback on the documents. The thesis mentor should not be involved in any primary writing or extensive editing. The thesis mentor is also not permitted to give the student past or present grant or fellowship applications.

Committee Members

Saul Silverstein (Chair), Steve Reiner, Donna Farber, Jonathan Dworkin
Alternate: Uttiya Basu

Student Evaluations

At the end of the examination, the committee chair will provide students with an evaluation of their written material, slide presentation and their oral defense.

Oral Exam Guidelines

Exams will be scheduled for 90 minutes. At the beginning of the exam, the student's file will be provided to the committee by the training program, including all grades and rotation evaluations. The committee will initially meet and discuss the student's overall record to date. They should identify possible weaknesses in order to focus the oral questioning. They will also discuss the written report and slides, and identify any deficiencies.

The student should prepare a 20 to 30-minute Powerpoint presentation. Students will be able to proceed with their presentation uninterrupted, with questioning at the conclusion. Questioning will proceed in a rotating fashion through the committee. The student is welcome to use the white board to assist with responses.

Questions will explore the depth of the student's knowledge on the subject of the research report. Questions pertaining to experimental design and the ability of the student to interpret results should be emphasized. Questions may extend to a broader line of inquiry about the student's fund of knowledge in areas covered by graduate courses (primarily in microbiology and immunology). When the committee feels that the student has been examined sufficiently, the student will be asked to leave the room.

Each student will be evaluated based on:

- Quality of the written report
- Quality of oral presentation
- Strength of oral defense
- General background knowledge

Committee members will be asked to evaluate the student on a numerical scale from 1-5 (1 indicates outstanding, 5 unacceptable) in each area. They will also be asked for additional comments. The forms must be signed, and submitted by the end of the day of the exam. They will be included in the student's permanent file. At the conclusion of their exam, all students will receive their grades.

Possible Outcomes

Pass, recommended for PhD studies -The outcome for most students is a Pass. This indicates they have a solid grounding in both knowledge and experimental design. Students with a Pass will progress to thesis research and be expected to form a thesis committee to monitor their progress.

Conditional Pass - A student that does well, but exhibits a major weakness in a specific area, may receive a Conditional Pass. The student will be asked to defend a proposal again in September. The format will be decided by the Qualifying Exam Committee Chair. This will require a revised and updated proposal. The student may also be asked to take additional coursework to fill gaps in their knowledge.

Pass, NOT recommended for PhD studies – Although the student will not be allowed to remain in the PhD program, he/she will be provided with the opportunity to receive an M.A. degree.

Fail - This is the outcome for a student with multiple, significant weaknesses. This can constitute grounds for immediate dismissal from the program. No degree will be awarded. At the committee's discretion, the student may be given the opportunity to receive an M.A. degree prior to withdrawal. Although this is possible, it is extremely rare.

DEPARTMENTAL TRAINING GRANT

The Department of Microbiology and Immunology was recently awarded a NIH Training Grant to support our mission of scientific graduate education in the area of microbiology, immunology and infection. Drs. Fidock and Symington are co-Directors of this training grant. All students who are US citizens or hold a green card are eligible once they have passed their qualifying exam and we encourage all eligible students to apply. Support is available for one to two years. The deadline for applications in 2016 is June 2; details will be coming later in the academic year.

DISSERTATION RESEARCH

After passing your qualifying exam, it is your responsibility to form an advisory committee. A Thesis Advisory Committee (TRAC) consists of at least three faculty members, not including the advisor. One of the faculty members, who is a primary member of the department, should be designated a Chair; other faculty members may be from the department or from outside departments. The TRAC is assembled to follow the progress of your research until its completion for the dissertation. The purpose of the TRAC is to monitor the student's progress throughout the period of dissertation research. To accomplish this goal, the student must meet at least once a year with the committee, unless the committee recommends a more frequent schedule. After 5 years, the committee must meet twice a year. This is a departmental requisite to continue with good standing in the program. The students must hold a TRAC meeting within a year of successful completion of the qualifying examination, and preferably within 6-8 months. The student presents a complete description of the proposed research project at the first meeting, and any data gathered. For subsequent meetings, the student must prepare a written summary of progress and of future objectives, and distribute it to the committee prior to the meeting.

The template for the TRAC meeting report is available from Lorraine Symington, and is to be used by the advisory committee members and the student to document student

progress. These forms must be completed and signed at the end of the meeting and the original given to Dr. Symington. Please note that students are welcome at any point to request a meeting with the Program Director or their designated TRAC Chair (see above) to discuss any concerns that may arise along the way.

THESIS AND THESIS DEFENSE

The Department of Microbiology and Immunology expects that all graduate students should complete their thesis research within 5–5.5 years of entrance into the training program. We require a dissertation that represents a definitive contribution to scientific knowledge and that demonstrates the student’s ability to perform independent research. The dissertation should contain experimental information that answers a stated question and should display a logical progression of scientific thought. Graduates should have as their goal accomplishing work that results in two or more lead-author research publications in peer-reviewed scientific journals.

At a minimum, one lead-author peer-reviewed research publication should be in press prior to the granting of permission to write and defend the thesis. In exceptional cases, a senior student who has produced an outstanding body of work that is being revised for a high-profile publication may be allowed to write and defend their thesis. This decision will be entirely at the discretion of the thesis committee and program directors, and will require evidence of a pending publication. The thesis committee has the final authority to grant permission to write and defend the thesis. However, in cases where these standards are not met, the thesis committee chair or research advisor must consult with the Program Director prior to granting permission to write the thesis. University laws specify the composition of the Thesis Defense Committee and the format of the thesis defense. Members of the Thesis Advisory Committee are usually part of the Thesis Defense Committee.

The advisor, department chair, and Director of Graduate studies nominate the Dissertation Defense Committee, and students are not permitted to be involved in asking faculty members to sit their committee. The committee must consist of two members from inside the department, including the advisor, and two members from outside the department. At least three of the five members must hold a seat on the GSAS Faculty.

Students must distribute copies of their dissertation to defense committee members at least two weeks prior to the defense date to ensure the committee members have time to read the dissertation thoroughly before the defense. Formatting guidelines can be found at <http://gsas.columbia.edu/content/formatting-guidelines>. Instructions for distributing, defending and depositing your thesis can be found [here](#).

The thesis defense consists of a one-hour public lecture followed by a closed-door thesis exam with members of your thesis committee. The public lecture is a research seminar. Please remember this when preparing your slides as we now mandate one and only one acknowledgements slide. We strongly discourage students presenting multiple slides with a long list of acknowledgements that become often emotional. This is about your thesis research. The thesis exam typically takes about 2 hours, during which time the committee will probe your fund of knowledge about your research and its broader context. You are expected to have read the articles that you cite. You are also required to give due credit to other researchers that have contributed to any data included in your thesis. It is imperative that the committee be able to readily distinguish between your original research and that from others that collaborated with you on this project. At the completion of the exam, the committee will vote for a pass with minor revisions, a conditional pass that requires major revisions, or a fail. A conditional pass may require another examination, although that is rare. Thesis committee members are expected to bring their thesis copy with annotated notes, which they will leave for the student.

At the completion of the exam, the student is expected to generate a document that lists the revisions that were requested. The student then will make the changes and needs to present these changes along with a completed summary of revisions to both the research advisor and the graduate director.

Once you have passed your defense, you must submit the Approval deposit the final thesis copy (with any pertinent revisions) to the Dissertation Office at 107 Low Library (Monday-Friday 9AM-4:45 PM). Details of the deposit can be found at <http://www.columbia.edu/cu/gsas/sub/dissertation/main/tensteps/index.html>.

We are here to help you at all times throughout your graduate program and encourage you to work hard and take full opportunity of the scientific resources available in our department and across the campus. We are confident you will all succeed brilliantly and look forward to these coming years leading to your PhD degree.