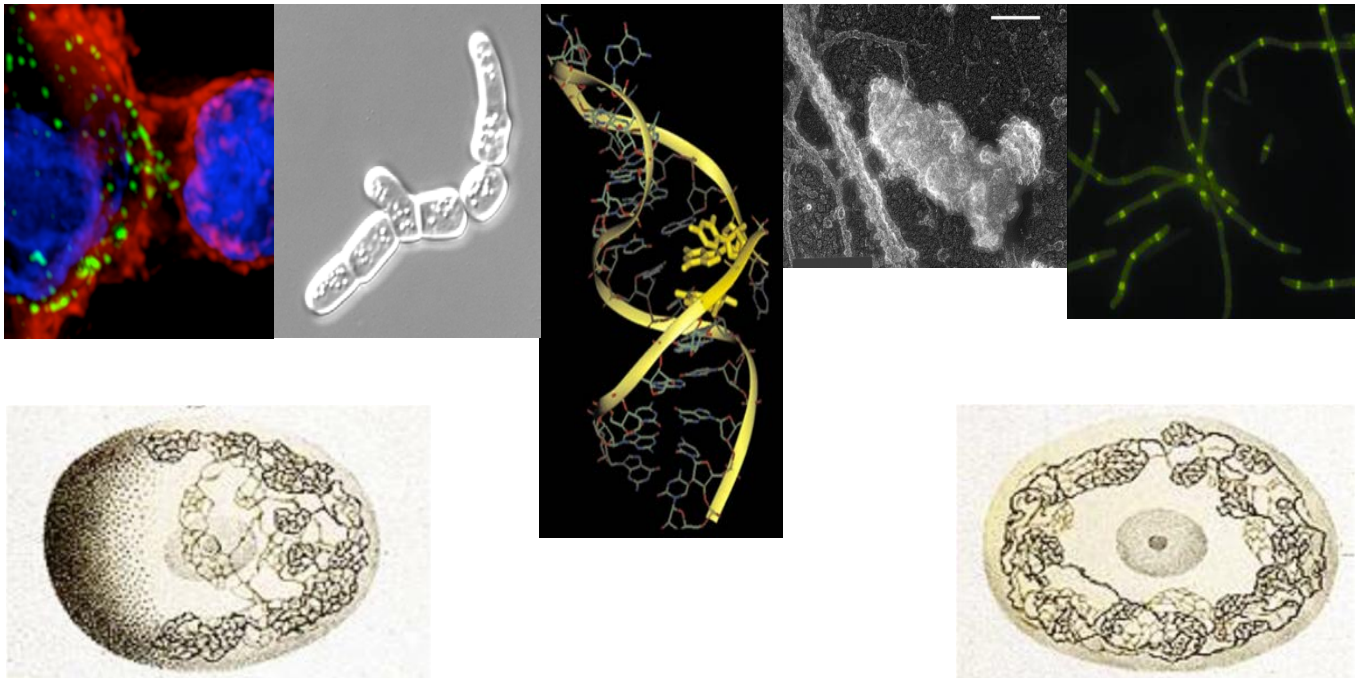


Ph.D. Program in Molecular Biology and Microbiology

Ph.D. Program in Molecular Virology

Ph.D. Program in Cell Biology

# Graduate Student Handbook



Department of Molecular Biology and Microbiology

## Table of Contents

<b>Section One: Program Administration</b> .....	<b>3</b>
<b>Section Two: Introduction to the Ph.D. Programs</b> .....	<b>4</b>
<b>On Being a Graduate Student</b> .....	<b>4</b>
<b>Getting to Know Our Department and Its Programs</b> .....	<b>4</b>
<b>Opportunities for Travel Support</b> .....	<b>4</b>
<b>Journal Clubs and Seminars</b> .....	<b>5</b>
<b>Section Three: Program of Study</b> .....	<b>6</b>
<b>Overview of the Program</b> .....	<b>6</b>
<b>Coursework</b> .....	<b>6</b>
<b>Satisfactory Progress</b> .....	<b>8</b>
<b>Full-Time Status</b> .....	<b>8</b>
<b>Year One</b> .....	<b>9</b>
<b>Academic Integrity</b> .....	<b>10</b>
<b>Choosing a Thesis Advisor</b> .....	<b>10</b>
<b>Beginning Thesis Research</b> .....	<b>12</b>
<b>Year Two</b> .....	<b>12</b>
<b>Year Three</b> .....	<b>16</b>
<b>Years Four and Five</b> .....	<b>16</b>
<b>Section Four: Practical Matters, Graduate Stipend and Other Benefits</b> .....	<b>19</b>
<b>Tuition and Stipend Support</b> .....	<b>19</b>
<b>Recordkeeping</b> .....	<b>19</b>
<b>Health Insurance</b> .....	<b>20</b>
<b>Getting a Computer</b> .....	<b>20</b>
<b>Student Web Pages</b> .....	<b>20</b>
<b>Graduate Student Holiday, Vacation, Parental Leave and Sick Leave</b> .....	<b>20</b>
<b>Individual Predoctoral Grant Support</b> .....	<b>20</b>
<b>Tax Liability</b> .....	<b>21</b>
<b>Membership in the American Society for Cell Biology</b> .....	<b>21</b>
<b>Helpful Resources and Information</b> .....	<b>21</b>
<b>When Students Need Help</b> .....	<b>22</b>
<b>Section Five: Master of Science Degree</b> .....	<b>23</b>
<b>Plan A, With Thesis</b> .....	<b>23</b>
<b>Plan B, No Thesis</b> .....	<b>23</b>
<b>Section Six: Medical Scientist Training Program (MSTP)</b> .....	<b>24</b>
<b>Section Seven: Appendix</b> .....	<b>25</b>
<b>Required Forms</b> .....	<b>25</b>

## Section One: Program Administration

### PH.D. PROGRAMS IN MOLECULAR BIOLOGY & MICROBIOLOGY (MBIO), MOLECULAR VIROLOGY (MVIR) AND CELL BIOLOGY (CLBY)

Faculty	Location	Phone, Email
Jonathan Karn, Ph.D.; Program Director	W200	368-3915 jonathan.karn@case.edu
David McDonald, Ph.D.; Graduate Studies Director	W208b	368-3715 djm41@case.edu
Arne Rietsch, Ph.D.; MBIO Co-Director	W222d	368-2249 axr160@case.edu
Alan Tartakoff, Ph.D.; CBLY Co-Director	Wolstein 5313	368-5544 amt10@case.edu

### GRADUATE SEMINAR COURSE MBIO/MVIR/CLBY 435

Faculty	Location	Phone, Email
Piet de Boer, Ph.D.; Course Director	W213b	368-1697 pad5@case.edu

### DEPARTMENT OF MOLECULAR BIOLOGY & MICROBIOLOGY ADMINISTRATION

Contact	Location	Phone, Email
Jonathan Karn, Ph.D.; Reinberger Professor & Chair	W200	368-3915 jonathan.karn@case.edu
Brinn Omabegho; Department Manager		368-3915 brinn@case.edu
Dorothy Canepari; Finance Manager		368-3947 djc29@case.edu
Brad Fairfield; IT Coordinator		368-0650 brad.fairfield@case.edu

Department Shipping Address	Department Address	Mailing Address	Department Phone, Fax
Case School of Medicine 2109 Adelbert Road 2nd Floor Wood Bldg., Rm W200 Cleveland, OH 44106	Department of Molecular Biology and Microbiology 10900 Euclid Avenue, LC 4960 Cleveland, OH 44106-4960		Phone 216-368-3420; Toll-free: 800-368-6246 Fax 216-368-3055 Department Website <a href="http://www.cwru.edu/med/microbio/index.htm">http://www.cwru.edu/med/microbio/index.htm</a>

## **Section Two: Introduction to the Ph.D. Programs**

The Ph.D. Programs in Molecular Biology and Microbiology (MBIO), Molecular Virology (MVIR), and Cell Biology (CLBY) offer comprehensive graduate training leading to the Ph.D. degree. We strive to provide predoctoral students with the necessary conceptual and technical foundations to address important problems in modern biology as independent investigators. Because being a professional scientist today requires many tools to succeed in a competitive environment, we have designed a challenging course of study that provides training in: (1) problem-solving, critical analysis of data and modern technical approaches leading to scientific excellence; (2) communication skills, both oral and written; (3) scientific integrity and ethics, and (4) productivity via publication in the most respected scientific journals.

We believe that both faculty and students prosper when students are treated as promising junior colleagues. The centerpiece of both programs is the completion and publication of a substantial body of original research, additional components including didactic coursework, seminars and journal clubs to keep students abreast of the latest developments in their field, and opportunities to present research findings to the department as well as at national or international meetings.

### **On Being a Graduate Student**

Pursuing a Ph.D. degree is a very different experience than working for an undergraduate degree. As a Ph.D. student most of your work will consist of your own reading, interaction with the faculty, and working on your research. Coursework and other formal activities in the program are designed to give students the background and skills needed to pursue their own studies. Because of the high degree of independence given to graduate students you are in effect your own boss. The students who get the most out of the experience take a dedicated and disciplined approach to their studies. From the first year onward, you should plan to work in the laboratory and attend seminars even when classes are not in session. Pursuing a Ph.D. is a chance to pursue your own interests, and most students find the work to be a great deal of fun!



It is the responsibility of each student to become familiar not only with the specific rules that apply to their program of study within this document, but also with the general rules and regulations of the University. Specific regulations for the Ph.D. degree may be found in the School of Graduate Studies Section of the General Bulletin of Case Western Reserve University (<http://www.cwru.edu/provost/gradstudies/>). The Graduate Studies Office, located at Nord Hall, 6th Floor, will be especially helpful as the time to prepare and defend your dissertation draws near.

### **Getting to Know Our Department and Its Programs**

The Ph.D. Program in Molecular Biology and Microbiology (MBIO), the Ph.D. Program in Molecular Virology (MVIR), and the Ph.D. Program in Cell Biology (CLBY) are administered by the Department of Molecular Biology and Microbiology. The first exposure to the Department for most students will take place during the BSTP or MSTP research rotations. Students seeking a Ph.D. in Molecular Biology and Microbiology or Molecular Virology will formally enter these programs at the end of their first semester of graduate study. We hope you are interested in learning more about the Department, and encourage you to contact Dr. Arne Rietsch (MBIO Graduate Studies Director), Dr. David McDonald (MVIR Graduate Studies Director), Alan Tartakoff and Laura Nagy (CLBY Co-Directors) or individual faculty members whose research is of interest. Additional information for MSTP students is provided in Section Six (page 21). To learn more about the faculty in each of the programs, please visit our website (<http://www.cwru.edu/med/microbio/>).

### **Opportunities for Travel Support**

We encourage our students to seek opportunities to present their work at national or international meetings, in addition to local or regional meetings. Some of our students enjoy presenting and attending very large meetings (such as the American Society

for Microbiology), while others find small meetings such as Gordon Conferences more rewarding.

#### *CFAR STUDENT TRAVEL AWARD:*

The Developmental Core of the Center for AIDS Research (CFAR) is offering travel stipends to MBIO and MVIR graduate or medical students who have submitted AIDS-related abstracts to national or international scientific meetings. Priority will be given to students whose abstracts have been accepted for presentation. Awards will generally be up to \$500 to defray travel and registration costs for students presenting posters and up to \$1000 for students giving oral presentations. It is expected that the work to be presented has been performed in a Case CFAR member laboratory. For more information please visit: <http://casemed.case.edu/cfar/education-training/travel/>

Travel support may also be available from training grants. Please visit the following website to obtain reimbursement forms, and to learn more about Case travel procedures such as using your own vehicle, traveling with a companion, available discounts, etc.: <http://www.case.edu/bizpolicies/travel/travel.pdf>

## Journal Clubs and Seminars

The Department of Molecular Biology and Microbiology offers MBIO, MVIR and CLBY Program students a wide variety of opportunities to meet and collaborate with faculty, students, researchers, and guest speakers.

- ✓ ***Student/Fellow Seminar Series*** — Weekly seminars in which MBIO, MVIR and CLBY trainees have an opportunity to present their latest research results to their peers.
- ✓ ***Pathogen of the Month Club*** — Monthly journal club run by the MBIO students and does not involve faculty participation, graduate students enjoy munchies and stimulating discussion of the literature of their choice.
- ✓ ***Other Journal Clubs*** in the SOM in which students present talks on articles from the literature focusing on Immunology, HIV/AIDS, Neurobiology and many others. Additional seminar series sponsored by other departments and programs include Biochemistry, Developmental Biology, Genetics, Neurosciences, Pharmacology and the Center for RNA Molecular Biology. Everyone can find a journal club in their area of interest. CLBY students working in laboratories outside the Department of Molecular Biology and Microbiology must attend the seminar series specified by the chair of their professor.
- ✓ ***Krampitz Speaker Program*** — This endowed lecture series brings premier microbiologists to the Department.
- ✓ ***CFAR Leaders in AIDS Speaker Program*** — Provides our students exposure to cutting-edge AIDS research via seminars and lunches with the speakers.
- ✓ ***Cell and Molecular Biology Training Program*** — Monthly student/faculty presentations, annual mini-symposia.
- ✓ ***Biomedical Graduate Student Symposium (BGSS)*** - Student-organized event held each May that includes poster and oral presentations and a keynote speaker selected by the BGSS committee. Students in the MBIO program have a strong tradition of not only participating, but winning awards for exceptional presentations. The current faculty advisor for the BGSS is Dr. David McDonald (djm41@case.edu). Participation on the organizing committee provides a unique opportunity to observe all aspects of putting together a scientific symposium.

## Section Three: Program of Study

### Overview of the Program

Completing a Ph.D. typically takes 5 years. However, some students are able to complete their studies in 4 years while others might remain an extra year to complete their thesis research. A typical program of study is shown in Table 1.

### Coursework

While the major emphasis of the MBIO, MVIR and CLBY Programs is to provide a stimulating atmosphere conducive to carrying out high quality, independent research, a certain amount of formal instruction is necessary and desirable for Ph.D. students. It is expected that the student, in consultation with her/his thesis mentor and advisory committee, will design a program compatible with her/his research goals.

Ph.D. students are required by the University to take 36 semester hours of graduate coursework; this total includes required courses, advanced electives and MBIO/MVIR/CLBY 601 (pre-thesis research). **At least 24 hours must be graded coursework (not research).** The required Core Curriculum in Cell and Molecular Biology (C3MB), taken during fall semester of the first year, is 8 credit hours. Students will therefore need to take an additional 16 hours of advanced graded coursework. **Students in all programs are expected to attend the joint student seminars (MBIO/MVIR/CLBY 435) for at least 3 semesters (3 graded credit hours). Continued participation in the seminars after completion of this requirement is highly encouraged.** Up to 4 credit hours can be allocated to the seminar course (one credit per semester). Students who elect to take an advanced course graded Pass/No Pass (P/NP) can report these hours in place of comparable MBIO/MVIR/CLBY 601 hours for satisfying the University requirement, if they so desire, but will still need to accumulate 24 credit hours of traditionally-graded advanced coursework prior to graduation.

During the fall semester of Year One, most students will be participating in the Core Curriculum in Cell and Molecular Biology (C3MB), an integrated course which provides formal instruction in modern cell and molecular biology. This course covers the biology of eukaryotic organisms including basic genetics, macromolecular biosynthesis, regulation of gene expression, cell structure/function, growth and signaling. Some exceptional students with strong backgrounds, such as a previous Master's Degree, may be eligible to be exempted from part of the Core Curriculum, and could instead enroll in one or more advanced courses during the fall semester. *For students entering with an approved master's degree, completion of 18 total credit hours of new coursework is required (12 credits hours must be graded courses, 6 credits may be research (MBIO/CLBY/MVIR 601)); and 18 credit hours of MBIO/CLBY/MVIR 701.*

For Ph.D. students, credit can be counted towards the degree only for advanced courses at the 400 level or higher. Any combination of courses from within or outside the department can be used to fulfill the requirement as long as the planned program of study has the approval of the student's advisor and committee. Prior to advancement to candidacy, students must register for at least 9 credits per semester, commonly MBIO/MVIR/CLBY 601 credits are used to "top-up" the credit hours.

Cells and Pathogens (MBIO/MVIR/CLBY 450) is the core course for all three programs. It is a discussion based course taught by all primary faculty in the department as well as some additional faculty trainers, who lead discussions of the literature in their areas of expertise. MVIR students additionally take the core Virology course (MVIR 445). Table 2 lists additional courses that students might particularly want to consider taking. Many of these are cross-listed in several departments.

TABLE 1: TYPICAL PROGRAM OF STUDY			CREDITS		
Year	Term	Course/Activity	Graded (24)	Research (28)	ALL (54)
Year 1	Fall	Cell & Molecular Biology Core Course (C3MB; CBIO 453 / 455) MSTP students <i>may substitute the medical school core academic program (IBIS 401-402-403) for the C3MB core</i> Research Credit/Rotation (BSTP 400) ✓ <b>Select a laboratory</b>	8	1	9
	Spring	Two advanced graduate courses (MBIO/MVIR/CLBY 450, MVIR 445 and/or electives) MBIO Seminar (MBIO/MVIR/CLBY 435) Research (MBIO/MVIR/CLBY 601) Bioethics (IBMS 500) <i>a one credit pass/fail course</i> ✓ <b>Formulate thesis project</b>	6 1 1	1	9
	Summer	Research (RSCH 750) <i>a 'zero credit' course</i> ✓ <b>Assemble thesis committee and hold first meeting</b> ✓ Complete forms: Committee Approval, 1 <sup>st</sup> Committee Meeting Report, Planned Program of Study			
Year 2	Fall	One or Two advanced graduate courses MBIO Seminar (MBIO/MVIR/CLBY 435) Research (MBIO/MVIR/CLBY 601) ✓ <b>Submit pre-thesis proposal and hold second meeting</b> ✓ Complete form: 2 <sup>nd</sup> Committee Meeting Report	(3-6) 1	(2-5)	9
	Spring	One advanced graduate course MBIO Seminar (MBIO/MVIR/CLBY 435) Research (MBIO/MVIR/CLBY 601) ✓ <b>Give first seminar, hold third meeting</b> ✓ Complete form: 3 <sup>rd</sup> Committee Meeting Report	3 1	5	9
	Summer	Research (RSCH 750) <i>a 'zero credit' course</i> ✓ <b>Hold Qualifying Exam</b> ✓ Complete forms: Predoctoral Standing (if applicable), Qualifying Exam Report, Advancement to Candidacy, Planned Program of Study			
*Year 3	Fall	Research (MBIO/MVIR/CLBY 701; a total of <b>18 credits are required to graduate</b> ) MBIO Seminar (MBIO/MVIR/CLBY 435) (Optional) ✓ <b>From this semester onward, continue to attend MBIO Seminars</b>	(1)	3	3
	Spring	Research (MBIO/MVIR/CLBY 701) ✓ <b>Give second seminar (All students must have committee meetings with reports at least every six months)</b>		3	3
	Summer	Research (RSCH 750) <i>a 'zero credit' course</i>			
*Year 4	Fall	Research (MBIO/MVIR/CLBY 701)		3	3
	Spring	Research (MBIO/MVIR/CLBY 701) ✓ <b>Give third seminar</b>		3	3
	Summer	Research (RSCH 750) <i>a 'zero credit' course</i>			
*Year 5	Fall	Research (MBIO/MVIR/CLBY 701)		3	3
	Spring	Research (MBIO/MVIR/CLBY 701) ✓ <b>Write and defend thesis</b> Complete forms packet from Grad Studies website including: Notification for Scheduling the Final Oral Exam, Application for Graduation at least 12 weeks in advance of the Thesis Defense date. ✓ <b>You are ready to defend your thesis if you have:</b> <input type="checkbox"/> Earned at least 24 letter-graded credit hrs + 18 hrs of MBIO 701/MVIR 701/CLBY 701 <input type="checkbox"/> Committee meeting reports which reflect readiness to defend ( <b>All students must have committee meetings with reports at least every six months</b> ) <input type="checkbox"/> At least one <b>first author</b> paper published/accepted for publication		1*	1

Note: Students must take 24 hours of advanced graded coursework. Students may take 4 advanced graduate courses instead of 5, and take MBIO/MVIR/CLBY 435 four times in order to meet the "24 letter graded credit hours" requirement of Grad Studies. MSTP students may substitute the medical school core academic program (IBIS 401-402-403) for the C3MB core course.



**TABLE 2: COURSE CONTENT**

<p><b>MOLECULAR BIOLOGY AND MICROBIOLOGY</b></p> <ul style="list-style-type: none"><li>• Yeast Genetics and Cell Biology</li><li>• Macromolecular Structure and Function</li><li>• Structure and Function of RNA</li><li>• Prokaryotic Genetics and Pathogenesis</li><li>• Principles of Microbiology</li><li>• Signaling via Cell Adhesion</li><li>• Trends in Prokaryotic Cell, Developmental Biology</li><li>• Microscopy Principles and Applications</li><li>• Protein Phosphorylation and Cell Regulation</li></ul> <p><b>MOLECULAR VIROLOGY</b></p> <ul style="list-style-type: none"><li>• Molecular Biology and Pathogenesis of RNA and DNA Viruses</li><li>• Molecular Genetics of Cancer</li><li>• Mechanisms of Drug Resistance</li><li>• Immunology of Infectious Disease</li></ul> <p><b>CELL BIOLOGY</b></p> <ul style="list-style-type: none"><li>• Yeast Genetics and Cell Biology</li><li>• Cell Biology and Human Disease</li><li>• Topics in Cell Biology</li></ul>	<p><b>Biochemistry</b></p> <ul style="list-style-type: none"><li>• Macromolecular Structure and Function</li><li>• Mechanism and Regulation of Protein Biosynthesis</li><li>• RNA and DNA Biosynthesis</li><li>• Advanced Methods in Structural Biology</li><li>• Protein Structure, Folding and Design</li><li>• Transcriptional Mechanisms</li></ul> <p><b>Genetics</b></p> <ul style="list-style-type: none"><li>• Advanced Eukaryotic Genetics</li><li>• Developmental Genetics</li><li>• Chromosome Structure &amp; Function</li><li>• Advanced Human Genetics</li><li>• Structural Analysis of Complex Genomes</li><li>• Mammalian Cytogenetics</li></ul> <p><b>Neurosciences</b></p> <ul style="list-style-type: none"><li>• Principles of Neural Development</li><li>• Cellular &amp; Molecular Neurobiology</li><li>• Developmental Neurobiology</li></ul> <p><b>Pathology</b></p> <ul style="list-style-type: none"><li>• Cell Biology of the Nucleus</li><li>• Cellular and Molecular Biology of Cancer</li><li>• Advanced Molecular Immunology</li><li>• Structure and Function of Cytokines</li><li>• Mechanisms of Mammalian Cell Growth Control</li></ul> <p><b>Pharmacology</b></p> <ul style="list-style-type: none"><li>• Molecular Pharmacology</li><li>• Developmental Pharmacology</li><li>• Membrane Transport Processes</li><li>• Mechanisms of Drug Action</li></ul> <p><b>Physiology and Biophysics</b></p> <ul style="list-style-type: none"><li>• Cell Signaling</li><li>• Molecular Endocrinology</li><li>• Fluorescence Microscopic Imaging</li><li>• Epithelial Cell Biology</li></ul>
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## Satisfactory Progress

To remain in good standing, a student must maintain a Grade Point Average (GPA) of 3.0 or higher at the end of the first 12 semester hours that receive quality point grades (A= 4.0; B = 3.0; C = 2.0). A student who receives two grades lower than B will be evaluated by the Graduate Studies Director (see Section One) to determine whether s/he should continue in the program. Courses in which a student earns a C do count towards the fulfillment of degree requirements.

## Full-Time Status

### PRE-QUALIFYING

To maintain full-time status **before passing the qualifying examination**, a student must be registered for a minimum of 9 credit hours.

### POST-QUALIFYING

To maintain full-time status **after advancing to candidacy**, a student may be registered for as little as 1 or as many as 6 credit hours, depending on individual needs (see also page 16, "Advancement to Candidacy"):

- ✓ Student Loans: Students with loans may need 6 or more credit hours to maintain full-time status during the post-qualifying years, and are urged to verify this with the Student Financial Aid office, and discuss financial implications with Brinn prior to registration.



## Year One

Students do not officially enter the Department of Molecular Biology and Microbiology until after the first semester. The first semester academic program consists of research rotations and coursework under the BSTP. After the first semester, students should discuss course selection and other academic issues with their thesis advisors.

### BIOMEDICAL SCIENCES TRAINING PROGRAM (BSTP)

Incoming graduate students are strongly encouraged to arrive by July 1, as this will give them an opportunity to become familiar with CASE and complete a research rotation before classes begin in the fall. All students must be on campus for the beginning of the fall semester in late August. Upon arrival, students should check in with the BSTP Office, where they will receive information about such practical matters as obtaining an ID card, activating their e-mail account (see <http://www.cwru.edu/med/BSTP/index.html>), initiating health insurance coverage, tuition and stipend support, etc. The BSTP office will also provide instructions about how to sign up for safety training through the Department of Occupational and Environmental Safety (a prerequisite to working in research labs). The BSTP also holds an orientation program just before classes begin in August.

As soon as possible after arriving on campus, each student should meet with the Graduate Student Advisor assigned by the BSTP (the BSTP assigns advisors based on research interests indicated on the student's application). These first-year graduate student advisors oversee the first semester of graduate study, including providing advice about coursework, research rotations, and selection of a thesis advisor. The BSTP advisor also signs registration and other relevant forms, periodically discusses with each student his or her progress in the program, and can serve as a student advocate should difficulties arise.

During the summer when classes are not in session, students are expected to work in the lab at least 40 hours per week. Once classes begin, the time spent in activities associated with the rotation may be reduced to 20-25 hours per week. In addition to laboratory work, students should participate in other research-related activities such as lab meetings, journal clubs, and departmental seminars to get a better idea of what it would be like to be a member of the rotation lab. A tentative schedule for the rotations should be determined during the first meeting between a new student and the BSTP advisor, but this may be revised as the student's interests evolve.

### RESEARCH ROTATIONS

One of the most important decisions a student must make during the first year of graduate study is to choose a faculty advisor to supervise his or her dissertation research. In addition to serving as the primary basis for making this decision, rotations provide exposure to a variety of research problems and laboratory techniques. **Students enrolled in the BSTP must complete a minimum of three rotations of 4-6 weeks duration by December 15 of their first year. The only way for a BSTP student to be accepted into either the Graduate Program in Molecular Biology and Microbiology or the Graduate Program in Molecular Virology is to complete successful rotations with our faculty and be accepted into their laboratories.**

Students interested in the Molecular Biology and Microbiology Program, the Molecular Virology Program, or the Cell Biology Program may elect to rotate with any affiliated faculty member who is interested in taking a student (for a complete list, see <http://www.cwru.edu/med/microbio/program.htm>). A list of faculty members with open slots is available from the BSTP advisor.

In addition to learning about the work of the laboratory and undertaking their research project, during the rotations students will be expected to present their results at laboratory group meetings (see Table 3).

### TABLE 3: GUIDELINES FOR ROTATION REPORTS

Typically, the report should be 2-3 pages double-spaced (not including literature citations), but it may be longer if the student has data figures to present. It should include:

- ✓ Rationale. Outline the problem under investigation, describe what new information is being sought by the research performed during the rotation, and indicate how this information will be useful.
- ✓ Description. Indicate the experimental approach, outline the procedures, present data and figures (if any were acquired during the rotation), and describe clearly how the data were analyzed.
- ✓ Discussion. Relate the results to the rationale for the research, existing literature and other pertinent information. Outline any further experiments that may be required to complete the rotation project. Indicate what knowledge was gained from the rotation beyond simply the techniques that were mastered.
- ✓ Literature citations. Provide documentation of literature pertinent to the project. Typically five to ten papers are cited.

Students are responsible for providing the faculty member with the Rotation Evaluation Form (available from the BSTP Office, TG-1). It should be given to the rotation mentor along with the report within one week after completion of laboratory work. Within one week of turning in the report, the student should schedule an "exit interview" with the rotation supervisor to discuss the rotation as a whole and go over the evaluation and report. This interview is intended to be constructive and to give useful feedback to the student. It is expected that the research advisor will be honest and indicate the degree to which s/he is interested in having the student pursue dissertation research in her/his lab. The student may also want to indicate degree of interest to the PI during the exit interview. After both the student and the mentor have signed the form, it should be returned, together with a copy of the rotation report, to the BSTP Office for inclusion in the student's file.

**Important!!** In order to receive credit for the research rotations and register for spring semester classes, students must complete at least three rotations and hand in the reports and evaluation forms by the end of the fall semester.

Research rotations are graded Pass/No Pass. If a student receives a rating of "Poor" from the supervisors of all three research rotations, this will result in a grade of NP and may also lead to separation from the program.

Students normally choose their thesis advisors in December. If there are circumstances that prevent placement by this date, a student may be allowed to do additional rotations with the approval of the SOM director of Graduate Education.

## Academic Integrity

The importance of academic integrity cannot be over-emphasized. Throughout the course of their scientific careers, scientists must be very careful to properly allocate credit for data or written material generated by others. The BSTP has prepared a detailed document about Case's academic integrity policy. It is the responsibility of each incoming student to read this document, available at this URL: [http://casemed.case.edu/gradprog/BSTP\\_academic\\_integrity.htm](http://casemed.case.edu/gradprog/BSTP_academic_integrity.htm).

University policy states, in part, "All forms of academic dishonesty including cheating, plagiarism, misrepresentation, and obstruction are violations of academic integrity standards." Anything you write, whether it is for a course, rotation report, or other document, must be entirely in your own words. Students who copy the words of others are engaging in plagiarism, which is a form of academic dishonesty which can lead to loss of credit or even dismissal from the program. Ask for advice from the faculty if you have any questions about academic integrity.

## Choosing a Thesis Advisor

Perhaps the most important decision a student will make during their graduate career is the choice of their thesis advisor. Table 4 outlines the formal process. The choice of a thesis advisor is a highly personal decision for both the student and their mentor. It's important for students to consider what type of research they would like to pursue, whether they feel comfortable interacting with their advisor, and finally and perhaps most importantly, the track record and productivity of the laboratory they are planning to join. The student should feel free to discuss their choice of advisors with a wide range of faculty members and their program advisor and Graduate Studies Director.

#### TABLE 4: SELECTING AN ADVISOR FOR THESIS RESEARCH

This process begins on or around December 15, when students meet with their BSTP advisor, and turn in their completed selection form. During this meeting the student should share the reasoning behind the preferences and the strength of each preference with the BSTP advisor. Once all of the student preferences have been assembled and the appropriate faculty members have been consulted, the BSTP advisor will make final assignments in consultation with the BSTP Director (currently Dr. Martin Snider). By early January the process will be complete. Once a student has been assigned a thesis laboratory, the research advisor replaces the BSTP advisor as the primary source of advice not only on matters pertaining to research, but also about course selection and any other academic decisions that the student must make. While every effort is made to assign students to their preferred advisors, sometimes a lower-ranked choice may be assigned if two or more students list the same advisor as first preference and the faculty member can accommodate only one student. All assignments are made with the consent of the student and no student will be assigned to a lab against her/his wishes. Program policy regarding multiple placements is the following:

- ✓ One student per lab per year is preferred.
- ✓ Two students can be placed in one lab in one year, if the faculty member has sufficient resources, is willing to take both students, and agrees not to take a student the following year.

In rare cases, a student may exhaust his or her options without being assigned to a lab. If necessary, the student may be allowed more time to consider additional rotations, however, the student must be accepted into a laboratory by March 15.

#### TABLE 5: GUIDELINES FOR THESIS RESEARCH

##### Goals for Graduate Students

Students must develop with their advisor a research project that yields a coherent, feasible and original body of work. By completion of the PhD, we expect graduates of Case biomedical graduate doctoral programs at the School of Medicine to have one or more first-authored primary research publications in peer-reviewed scientific journals. **As a minimum, at least one such paper must be published or accepted for publication before completion of the PhD. The thesis defense cannot be scheduled until this milestone has been achieved and supporting documentation has been provided to the Departmental Office. In exceptional circumstances a defense can be scheduled prior to the publication of a paper if there is written consent of the Chair of the Thesis Committee and the approval of the Department Chairman.** Students and programs are expected to strive for higher levels of accomplishment, and indeed, many PhD graduates are publishing at higher levels.

Students should seek opportunities to present data generated in the course of their graduate research at one or more national or international meetings.

##### Goals for Training Faculty

The thesis advisor will provide the student with intensive training in the scientific method, including the ability to formulate clear research questions, develop feasible experimental approaches to answering them, critically evaluate data from his or her own research and that of others, and discuss the significance of the work in the context of the field as a whole.

The thesis advisor, in conjunction with the thesis advisory committee, is responsible for developing and implementing a training plan with the student, including the elaboration of an independent research project.

The thesis advisor is responsible for providing the physical, financial, and intellectual resources necessary for completing the research plan.

The thesis advisor should work regularly with the student to develop strong communication skills, both oral and written.

The thesis advisor should encourage the student to think broadly about the research project and not necessarily be limited to approaches/techniques currently used in the advisor's laboratory.

## Beginning Thesis Research

Thesis research should be the primary focus of students once they have chosen a laboratory in which to pursue their dissertation. The spring semester should be used to formulate a thesis project and obtain preliminary data. Although the actual writing of the dissertation may be some years off, students should bear in mind the guidelines outlined in Table 5 during the formative stages of their project. Table 6 describes the courses that students are required to register for during the spring semester.

Advanced Graduate Courses	Two advanced graduate courses in the biomedical sciences (4-6 credit hours) in consultation with their Ph.D. mentor. Typically these are chosen based on research interests and to obtain a broad background in cell and molecular biology. <i>For MVIR one course must be MVIR 445.</i>
Molecular Biology Graduate Seminar	Participation in the seminar course MBIO/MVIR/CLBY435 is credited at the rate of 1 credit hour per semester. Registration for credit may begin in the second semester of the first year. The course will be graded based on attendance in both the graduate student research seminar series (Thursdays at 1:00 PM) and outside speaker series (Thursdays at 1:00 PM) and on participation in the graduate student seminar series. While this course must be taken at least once, even after students take three semesters of MBIO/MVIR/CLBY435 for credit, they are still expected to attend the departmental seminar series although they will not receive further course credits for their participation.
Bioethics Course	All MBIO, MVIR and CLBY students are required to take the bioethics course "On Being a Professional Scientist" (IBMS 500). IBMS 500 is offered in the spring semester. Information about the course can be found at: <a href="http://casemed.case.edu/gradprog/research.cfm">http://casemed.case.edu/gradprog/research.cfm</a>

## Year Two

### SUMMER RESEARCH

The summer following the first year of graduate study will provide students with their first opportunity to devote their full energies to research in the Ph.D. thesis lab. This time should be spent continuing to develop the thesis project, not only through bench work, but also critical reading of the literature and discussions with their mentor and other members of the research group. Students should take RSCH 750 (a 0 credit course) during the summer, which will allow them to maintain full-time student status with full benefits and stipend support.

### SELECTION OF A THESIS COMMITTEE

The selection of a thesis advisory committee is a key decision that must be made by students prior to the fall semester of the second year (see Table 7 for details).

### FIRST THESIS COMMITTEE MEETING

**This first committee meeting should take place during the summer between years 1 and 2.** It will begin with a brief description, in the student's absence, of his/her performance to date in the program by the student's advisor. The student will then be asked to join the meeting. The bulk of the first committee meeting will be devoted to discussing the research completed to date by the student and the experiments planned for the next year and beyond. For this meeting the student should prepare a 5 page report which focuses on the background and research aims. This report should be sent to committee members 2 weeks ahead of the scheduled meeting. As this meeting sets the tone for student/committee relations, a frank conversation about the strengths and weaknesses of the proposed work should be encouraged. At the end of the meeting the chair will prepare a report about the meeting (see Section Seven) and convey any concerns the committee might have about the student's progress. **The report must be submitted to the departmental office by September 1st.**

## TABLE 7: SELECTION OF THE THESIS ADVISORY COMMITTEE

This committee will consist of a minimum of four faculty including the advisor. The committee shall select its chair, who must not be the mentor and must be a Case tenured or tenure-track faculty in the student's program. For students in the MBIO program, the committee chair must hold either a primary or secondary appointment in the Department of Molecular Biology and Microbiology. In the case of MVIR and CLBY students, the committee chair must be among the MVIR/CLBY training faculty. For the MBIO, MVIR and CLBY programs at least one member must have a primary or secondary appointment in the Department of Molecular Biology and Microbiology. University rules stipulate that at least one member must be a faculty whose primary appointment is outside the student's program or department. For MVIR and CLBY students, at least one member must be from CWRU, and at least one member must have a primary or secondary appointment in the Department. Students who are performing their thesis research at the Lerner Research Institute may wish to include an LRI faculty member in addition to their advisor on the committee. The thesis advisory committee functions as an oversight body to help guide the student's graduate education by providing advice on coursework, periodically reviewing the student's research progress, offering constructive criticism on either completed or planned experiments, and conducting the qualifying and thesis examinations. Thesis committee members should have expertise in areas related to the proposed work and an acknowledged interest in contributing actively to the student's progress towards becoming an independent research scientist. All thesis advisory committees must be approved by the Department Chair and the Program Director who are responsible for student oversight beyond the first year. Using the Committee Approval Form (see Section Seven), each graduate student should submit the names of proposed committee members to the departmental office by the beginning of their second year, no later than September 1<sup>st</sup>.

## COURSEWORK

Students will continue to accumulate credit towards the Ph.D. degree during the second year of graduate study. It is suggested that students enroll in at least two 3 credit graduate-level courses during the fall semester of year 2. *MVIR students must enroll in MVIR 450.* Students will also continue to participate in all departmental seminars, for which they will receive 1 credit hour by registering for MBIO/MVIR/CLBY435. Finally, students will continue to spend the remainder of their time conducting thesis research, for which credit is given as MBIO/MVIR/CLBY 601. Students should register for a variable number of hours of research credit to make up a total of 9 credit hours per semester in combination with their coursework. Late during the fall semester, students should have a second meeting with their committee.

## PREPARATION OF THE PRELIMINARY PROPOSAL

**This document must be delivered to all members of the thesis advisory committee at least one week in advance of the student's first scheduled departmental seminar.** The student's third thesis advisory committee meeting must be held within two weeks of the seminar, but preferably immediately afterwards.

Both the preliminary proposal and the qualifying examination proposal (submitted late in year 2) should be patterned after a grant application in NIH format and should describe the student's thesis project in sufficient detail to allow the advisory committee to critically evaluate the proposed research. The preliminary proposal should be approximately 10 double-spaced type-written pages, whereas the qualifying examination proposal will be a more detailed document of approximately 20 pages. It is recognized that students will have only limited preliminary data at the time of the preliminary proposal, so the bulk of this proposal should focus on their future plans. For the qualifying examination proposal additional preliminary data and more refined research plans are expected. Table 8 provides detailed requirements for both the preliminary proposal and the qualifying examination proposal.

## FIRST SEMINAR

Beginning in the spring semester of the second year in graduate school, students will be required to make an annual formal presentation in the Thursday MBIO seminar series. The first seminar is expected to last approximately 30 minutes. In general, the student should begin the talk by stating the goal of their proposed thesis project or the question to be addressed, followed by a discussion of relevant background literature and significance of the proposed research. Although most students will not have accumulated a great deal of preliminary data at this point, they should describe the approaches employed and results of the experiments they have conducted to date. The final section of the seminar should be devoted to setting forth future goals, including a description of the experimental approaches to be taken and the rationale for why they were chosen. In preparing for this seminar, it is critical that students not only prepare clear and informative slides, but also practice the talk in advance in order to benefit from constructive criticism provided by their advisor and/or other members of the research group.

### THIRD COMMITTEE MEETING

The third committee meeting will focus on a discussion of the student's preliminary proposal. Committee members will provide feedback on the content and aims of the document and provide feedback about the student's progress. By the end of the meeting, a consensus plan for the next year should be developed.

Following the pre-thesis committee meeting, the student and chair must complete the Third Committee Meeting Report (see Section Seven). The written committee report is important, as it provides a reference point for future committee meetings. To ensure accuracy, the chair's report should be written and distributed within one week of the committee meeting. The departmental form "Committee Meeting Report" is provided for additional committee meetings.

### RESEARCH QUALIFYING EXAMINATION

This examination is designed to assess students' preparation to advance to candidacy for the Ph.D. degree. The examination has both a written and an oral component, as described below. **To continue in the program students are required to pass the qualifying exam no later than December 1<sup>st</sup> of their third year in the program, and preferably by the end of the previous summer. Because advancement to candidacy is based on intellectual preparation as well as preliminary results, there is no penalty for scheduling the research qualifying examination early.** *Students who are taking their qualifying mid semester should complete the form, "Predoctoral Standing" in order to register for MBIO/MVIR/CLBY 701 before advancing to candidacy. Please check with your Graduate Studies Director before registering, as the qualifying exam must be passed in the same semester that this form is approved.*

The qualifying exam proposal is an original description of the student's research project that provides a blueprint for the remainder of their thesis research. It should be scholarly, rigorous, and contain sufficient detail to be judged as a stand-alone document. The quality of the written proposal is a major factor in determining the outcome of the exam, and the student is expected to organize and write the proposal without extensive editorial input from the advisor or other faculty members.

The completed written proposal must be delivered to committee members two weeks prior to the date set for the oral exam. Upon receiving this document, committee members will evaluate whether it is of sufficient clarity to serve as the basis for the oral examination. Within one week of receiving the written proposal, committee members will convey to the committee chair via e-mail their decision about whether to proceed with the oral exam as scheduled. If the written proposal is deemed inadequate, the qualifying exam will be postponed and the student will be provided by the committee chair with a detailed description of the deficiencies to be addressed in a revised proposal. Once a satisfactory written document has been received, the next phase can proceed.

To begin the oral exam, the student will be asked to present a short (10-15 minute) overview of the project. This should include visual aids that focus on the student's future plans and do not reiterate material covered in their last seminar. The presentation is followed by a question and answer session aimed at evaluating the student's intellectual preparation to carry out and rigorously interpret the proposed research. Questioning is conducted by the student's committee with the exception of the student's advisor. The advisor is present primarily as an observer, but s/he may be invited to clarify either misconception or matters of fact relating to the student's project. In the oral examination, the student is expected to defend the proposed research in terms of feasibility of experimental design and/or possible problems that may be encountered in interpreting results. It should be stressed that this applies to results of experiments already performed as well as potential results of proposed experiments. It is also expected that the student will be conversant with the literature in all areas that impinge on her/his specific project and will know, in detail, the scientific content of any literature cited in the written proposal.

Following completion of the question period, the student will be asked to leave the room while the committee reaches a consensus about their performance. Based upon both the written and oral presentations and the oral exam, and following a detailed discussion, the committee will recommend one of three outcomes: 1) Pass; 2) Provisional Pass; or 3) Fail. If the student passes unconditionally, s/he will be advanced to Ph.D. candidacy.



## TABLE 8: PRELIMINARY AND QUALIFYING EXAM WRITTEN PROPOSAL FORMAT

A. Specific Aims: List the broad, long-term objectives and provide a concise, realistic statement of what the proposed research is intended to accomplish, e.g. to test a stated hypothesis, solve a specific problem or answer a fundamental question. This section should include a brief description of the approaches to be employed but should not be simply a list of experiments. (*Suggested page length: Preliminary-1 page/Qualifying-1 page*)

B. Background and Significance: Briefly sketch the background relevant to the proposed project, critically evaluating existing knowledge and specifically identifying gaps that the research is intended to fill. State concisely the importance of the proposed research in relation to previously published data and discuss how it may contribute to answering larger biological questions. (*Suggested page length: Preliminary-2 pages/Qualifying-3 pages*)

C. Preliminary Studies: Summarize results obtained to date and discuss how they relate to experiments proposed for the future. This section should describe all pertinent experiments carried out, not necessarily only those that gave the expected/desired outcome. Figures depicting experimental data (positive or negative), including graphs, autoradiograms, etc., with appropriate legends, should be included either within the text or as an appendix. (*Suggested page length: Preliminary-3 pages/Qualifying-6 pages*)

D. Experimental Design and Methods: Describe the experimental strategies and the procedures to be used to accomplish the specific aims of the project; cite published work in which similar strategies were employed or include other information that bears on the feasibility of the proposed research. A key component of this section is a discussion of how the data will be analyzed and interpreted, as well as any new methodology and its advantage(s) over existing methodologies; it should also point out potential difficulties and limitations of the proposed procedures and discuss alternative approaches to achieve the aims. Finally, a tentative sequence or timetable for the investigation should be provided. (*Suggested page length: Preliminary-4 pages/Qualifying-10 pages*)

E. Literature Cited. Provide complete citations, including titles, for all relevant published research papers and reviews. Typically 25-30 references will be necessary to document the background and feasibility of the proposed research.

When preparing both the preliminary proposal and qualifying examination proposal, students are encouraged to seek input from their thesis advisor and other senior members of their own or other laboratories. However, the student is expected to organize and write the proposal without extensive editorial input from the advisor or other faculty members. Students often find it useful to look at previous successful proposals for both the preliminary proposal and the qualifying exam proposal. Examples of both are available from the departmental office.

In evaluating these documents, the committee will provide the student with feedback on his or her writing and organizational skills as well as scientific content.

*Reminder: The preliminary proposal should be approximately 10 double-spaced type-written pages, and the qualifying examination proposal will be a more detailed document of approximately 20 pages.*

The determination of the committee will be communicated to the student by the chair immediately following post-exam deliberations and in writing through the Qualifying Exam Report (see Section Seven). This special form is required, and will include numerical evaluations from all committee members, accompanied by a memo written by the chair. Again, the report will be distributed to the student and all committee members, and a copy placed in the student's file in the Departmental Office. The content of the committee chair's report is particularly critical if the student receives a "Provisional Pass" or "Fail." The narrative must clearly identify any and all specific weaknesses in the student's performance which necessitate repetition of either or both parts of the qualifying exam or other remedial action. For example, even if the written document was deemed adequate to proceed with the oral exam, the committee may still ask the student to re-write part or all of the document. Other deficiencies may warrant a suggestion from the committee to take a course in a particular area. Finally, weaknesses in the oral exam may necessitate repeating this part of the exam. If a student fails the exam, he or she will ordinarily be given a second opportunity to remedy whatever deficiencies were found. A student whose performance on the exam is deemed to be below acceptable standards will be given a grade of "Fail" and will not be allowed to continue in the Ph.D. program.

## ADVANCEMENT TO CANDIDACY

Students will formally advance to Ph.D. candidacy upon successful completion of the research qualifying examination. After advancement to candidacy, students will register for MBO/MVIR/CLBY 701 (dissertation research) rather than 601. **Students must complete 18 total credit hours of MBO/MVIR/CLBY 701 in order to obtain a Ph.D.** (as outlined in Table 1). This course is graded on a Satisfactory/Unsatisfactory basis, and students should be aware that two grades of "Unsatisfactory" in dissertation research will result in automatic separation from the program (University rule; see the General Bulletin). Thus, should problems arise with their advisor, students are urged to seek intervention (see below) well before the point of receiving a second "U" grade.

The required forms that must be filed with the Office of Graduate Studies in order for the student to advance to candidacy and to register for MBO/MVIR/CLBY 701 are listed in the Appendix, and are available to download at: <http://www.case.edu/gradstudies/current-students/forms/>.

**After completing 18 hours of MBO/MVIR/CLBY 701, it is necessary for students to register for only one credit hour per semester**, which significantly reduces tuition costs; the student is still considered a full time graduate student with the reduced number of credit hours.

## Year Three

During the summer preceding their third year in the program students will be intensively engaged in research and related activities such as critical reading of the literature in preparation for taking the research qualifying examination. Students should take RSCH 750 (a 0 credit course) during the summer.

In the fall of their third year many students will have completed their graded coursework by this point, but some may need to register for one last class; e.g., they may have waited for a course that is offered only every other year. Again, the remainder of a student's 9 credit hours should be allocated to MBO/MVIR/CLBY 601. If they have passed their qualifying exam, students should sign up for 1 credit hour of MBO/MVIR/CLBY 701 to maintain full-time status. Please note that students on loans/grants may need to maintain full-time status with 1 credit hour during the post-qualifying years, and are urged to verify this with the Student Financial Aid office prior to registration.

## Years Four and Five

### GRADUATE RESEARCH SEMINAR/THESIS ADVISORY COMMITTEE MEETINGS

Advanced students are required to present one seminar per year on their research. This seminar should be coupled with a meeting of the thesis advisory committee, which must meet at least twice per year to review student progress. Students must prepare a written document for the committee describing current research and immediate and long-term goals. This must be submitted to the committee at least one week in advance of the seminar and meeting. It is the student's responsibility to arrange for regular meetings of her/his thesis advisory committee. These meetings must take place at least once every 6 months, but it is often advantageous to assemble the committee more frequently depending on the individual needs of the student. The departmental form "Committee Meeting Report" is provided for additional committee meetings.

### RESEARCH SEMINAR/THESIS

Each year, the date of the student's seminar will move forward somewhat, as students give their seminars in descending order of the year in which they entered the program. The final seminar, which is part of the thesis defense (see below), will be scheduled when the student has completed her or his written dissertation and had it approved by the advisory committee.

Advanced students also frequently schedule an additional committee meeting to present their plans for completing the dissertation to their committee. Thesis advisory committee meetings are most useful when scheduled immediately after the annual departmental seminar. A meeting of the committee can be called by any participating member including the student, and s/he should also feel free to consult individual members at any time on an informal basis. The presence of three members of the committee constitutes a quorum for the purpose of making decisions.

To aid the thesis advisory committee in evaluating progress and providing the most useful advice, it is crucial that the student deliver an annual written report at least one week in advance of the meeting or seminar, whichever comes first. This report should not only summarize progress to date, but also provide a detailed plan for the coming year and a general plan for completing the project. The report should include any data figures to be shown at the seminar, as well as other illustrations that may help the committee to understand the completed and proposed research. Relevant literature should be cited with complete references. It is the responsibility of committee members to read the report prior to the seminar/committee meeting.

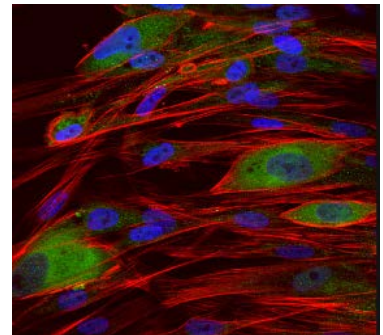
Each committee meeting will generally begin with a brief session in which committee members will discuss any issues of concern in the student's absence. These will be conveyed to the student upon his or her return. The student and committee will then hold a frank discussion of the strengths and weaknesses of the research plan or its implementation.

Again, the Thesis Committee Meeting Report Form and accompanying narrative must be distributed to the student and committee members **and placed on file in the Departmental Office** within one week of the committee meeting. In virtually all cases, the form will indicate that "satisfactory progress" is being made towards the Ph.D. The advisory committee's role when this is deemed not to be the case is discussed below under "Student Advocacy." **Students who have not scheduled a committee meeting in any given six-month period, or who do not have reports of committee meetings on file in the Departmental Office, will be categorized as making unsatisfactory progress towards the degree and will not be allowed to register for the upcoming semester until a committee meeting has been held.**

## OTHER ACTIVITIES

By this time in the student's graduate career, s/he should be functioning as a professional researcher by participating in the following additional activities:

- ✓ Seminars and Journal Clubs sponsored by affiliated programs or other departments: Choices include: Biochemistry, Cell Biology, Developmental Biology, Genetics, Molecular Virology, Neurosciences, RNA Center, Cell Adhesion Molecule.
- ✓ Research Presentations: Attend/present talks or posters at conferences (ideally at least one per year); present at graduate student symposia and departmental/program retreats.
- ✓ Write/coauthor research papers and review articles.



## FINISHING UP

By the fourth and fifth years the focal point of most student's energies should be completing the dissertation and preparing first-author publication(s). At what point a research project is sufficiently complete that the thesis can be written is a matter to be decided between the student, the advisor, and to some extent, the other committee members. The decision must be based on the status of the research rather than on external concerns such as the length of time the student has been enrolled. It is the responsibility of the thesis advisory committee to approve (or not) the shift in a student's priorities from conducting experiments to writing the thesis. While guidance of an individual student's project is the responsibility of the advisor and thesis committee, there is agreement among Program faculty that, after six years of enrollment, the project should be, if not complete, then very nearly so. Therefore, for a student to continue enrollment and receive a stipend beyond the sixth year, the student and advisor must agree upon a well-defined plan for concluding the thesis and have it approved by the Program Director and Department Chair.

FOUR STEPS TO COMPLETING THE PROGRAM	
Step One	Obtain a packet of graduation materials at: <a href="http://www.case.edu/gradstudies/current-students/graduation/">http://www.case.edu/gradstudies/current-students/graduation/</a> Be sure to pay attention to the deadlines set forth by the School of Graduate Studies.
Step Two	Publish a <b>first author</b> paper. Must be either published or accepted for publication. A thesis defense cannot be scheduled until this requirement has been met or without the written consent of the Chair of the thesis committee and the approval of the Department Chairman.
Step Three	Write and defend your written thesis in front of your committee.
Step Four	Public presentation of the thesis.

## THESIS PROPOSAL

At least six months before the student anticipates completion of the Ph.D., a thesis committee meeting should be held to discuss whether the student's research progress is sufficient to bring the project to fruition in the proposed time frame. At this meeting, the student should provide the committee with a detailed proposal for the format (number of chapters, etc.) and content of the thesis. **As noted above under Guidelines for Thesis Research (Table 5), it is generally expected that, by the time of the dissertation defense, the student will have at least one published or in advanced stages for publication experimentally-based manuscript on which s/he is first author. The thesis defense cannot be scheduled until this milestone has been achieved and supporting documentation has been provided to the Departmental Office. In exceptional circumstances, and at the discretion of the thesis committee, a defense can be scheduled prior to the acceptance of a paper if there is written consent of the Chair of the Thesis Committee and the approval of the Department Chairman.** It is also in a student's best interest to submit any manuscripts resulting from the thesis research before leaving the University, because once postdoctoral work has begun, the latter may take precedence.

## DISSERTATION AND DEFENSE

The thesis should describe an original body of research and be written according to University guidelines. The best theses represent the work contained in two or more papers, and a strong publication record will be extremely advantageous to the student in achieving her/his long-term career goals. The thesis describes a substantial body of experimental work arranged in chapters, placed in context with a general Introduction and a Discussion that provides an overview of the work. Often individual chapters in the thesis will correspond to manuscripts authored by the student. The thesis defense consists of two parts: a private oral exam administered by the thesis committee, followed by an oral presentation on the Case campus which is open to all members of the university community. The thesis defense will be in a standard format and primarily involve questions put to you by the committee. It will focus mainly on the written thesis, but it is fair for committee members to also ask for background information in order to test your general knowledge. There is no expectation that you will bring slides or present a talk since the focus will be on the written thesis itself. Formal presentations of the thesis work to the Department are to be held **after the thesis has been successfully defended (including approval of changes to the written thesis as recommended by the committee)**, and are scheduled on **Tuesdays at 1:00 p.m.** Please contact Brinn Omabegho to make arrangements.

Detailed regulations concerning format, quality, time of submission and oral defense are established by the Dean of Graduate Studies and Research, and instructions are available from the Office of Graduate Studies. **A candidate for a degree awarded by the School of Graduate Studies must submit an application for the degree to the School of Graduate Studies by the deadline established for that semester, which is approximately twelve weeks before the commencement date for which the degree is expected to be awarded. Students are encouraged to contact the School of Graduate Studies at the beginning of the semester in which they intend to graduate to obtain a packet of graduation materials, or visit this website: <http://www.case.edu/gradstudies/current-students/graduation/> .** *NOTE: The Graduate Studies form "Final Certification of the PhD" should be completed after the public defense has been held, and the "date successfully passed the final oral examination for the PhD degree" is the date of your public thesis defense.*

**A copy of each Ph.D. dissertation shall be submitted to the Department of Molecular Biology & Microbiology in electronic form (i.e., as PDF file) according to the format specified by the Graduate Committee.** This copy is in addition to any required by University regulations. *The Department also maintains a collection of graduate theses in its library, and all program graduates are encouraged to provide the Department with a print copy of their thesis in addition to the required electronic copy.* The Department will pay any costs associated with making an additional print copy.

## STUDENT ADVOCACY

Although the vast majority of students in the program progress smoothly through each stage previously described, the training faculty recognizes that this is not guaranteed. In the event that difficulties arise during graduate training, a student is advised to initially consult the chair of their thesis committee who will then consult with the Department Chair. One problem that may occur in the late stages of a graduate student's career is disagreement with the thesis advisor on the scope of the dissertation, i.e., when the research project is to be considered complete. In these cases, the thesis advisory committee can often play an important role in brokering an acceptable compromise. Since these or other problems are often unanticipated, it is important for the student, the advisor and the committee to develop early on a relationship characterized by mutual respect.

## Section Four: Practical Matters, Graduate Stipend and Other Benefits

### Tuition and Stipend Support

Students registered full-time in the MBIO and MVIR Programs are eligible for tuition and stipend support. **Tuition, health care and activity fees are generally paid by the department in which the student's faculty advisor holds a primary appointment. Students are responsible for paying any late fees.** Stipend support begins upon matriculation and is guaranteed as long as the student remains in good standing. As of 2016, the stipend level is \$27,500.

The University Academic Calendar provides pertinent information on registration and graduation deadlines, and may be found at: <https://case.edu/registrar/calendar/>

All students are asked to register for courses and submit tuition bills in a timely fashion. The university uses the Student Information System (SIS) to communicate with students about their university expenses. Here, students can view, print and pay tuition bills online with 24/7 account access via the internet. With this system, email reminders are sent to each student when an expense is added to the student's account, such as when a student registers for classes. To access SIS, visit this URL and log in: [www.case.edu/erp/sis](http://www.case.edu/erp/sis). User guides to help you navigate the SIS are available at: [www.case.edu/registrar/sisguides.html](http://www.case.edu/registrar/sisguides.html). Notify the appropriate departmental office when a bill is added to your account. If you are on a training grant your tuition bill should be submitted to that grant's administrator. If your faculty advisor has a primary appointment in the Department of Molecular Biology and Microbiology, then your tuition bill should be submitted to Brinn Omabegho. You should also contact her if you are experiencing a problem with billing (e.g., receiving a bill each month showing a balance due) to avoid incurring a late fee.

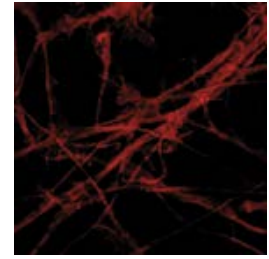
### Recordkeeping

Student records for both the MBIO, MVIR and CLBY Programs are maintained in the Department of Molecular Biology and Microbiology Office. The purpose of record-keeping is to provide documentation of the student's progress in graduate studies, including fulfillment of requirements; to assist the thesis committee in advising the student; to assist the student in preparing a CV; and to assist faculty who may be asked to write letters of recommendation for the student. In addition to the student's original application (which includes his or her academic record prior to enrollment in graduate school at CASE), items routinely included in the file include:

- ✓ Transcripts of CASE graduate coursework
- ✓ Research rotation reports and evaluation forms
- ✓ Copies of the student's annual progress reports and Research Qualifying Exam Proposal
- ✓ The forms and accompanying chair's reports documenting thesis committee meetings at least once every 6 months (which list the names of the advisor and committee members present)
- ✓ The Qualifying Exam Report form and accompanying narrative
- ✓ The Advancement to Candidacy filed with the Office of Graduate Studies
- ✓ Flyers for seminars given by the student including dates and titles



- ✓ Miscellaneous items including records of attendance at scientific meetings or other off-campus scientific activities, participation in teaching, and authorship on publications
- ✓ The Notification for Scheduling the Oral Exam
- ✓ The Application to Graduate



Both the student and the thesis committee chair should make sure that the record is up to date by submitting pertinent information and documents to the departmental office. This can be routinely achieved by reviewing the record at the time of each committee meeting. The student is advised to retain copies of key forms including Rotation Reports, Qualifying Exam Reports, etc. To review a student file, please email Brinn Omabegho to schedule an appointment.

## Health Insurance

Upon matriculation, coverage begins through student health services. For detailed information on the spectrum of services provided by the University Health Service visit: <http://studentaffairs.case.edu/health/> Information on the Case Health Plan program for students, including enrollment and prescription information, may be found at: <http://studentaffairs.case.edu/medicalplan/student/default.html> .

## Getting a Computer

To assist students in preparing their thesis, all MBO, MVIR and CLBY Program students (including MSTP students) who are at least 9 months away from PhD graduation are eligible for one-time grant support towards the purchase of a computer (either a reimbursement of up to \$500 or 50% of the purchase price, whichever is lower). While students may prefer to get one early in their studies, the purchase should be made by the time students begin writing their thesis. **In order to be eligible for discounted Case pricing, the computer must be ordered through the Departmental office and must be paid for when the computer is received at the office.** This process may take anywhere from 1-3 weeks on average, depending on vendor and computer specs. Please contact Brinn Omabegho for further details.

## Student Web Pages

The MBO, MVIR and CLBY Programs maintain active websites for all students. During the first semester, students will be asked to submit a photo along with information about their previous training and current research interests. Students are asked to email updated information throughout their participation in these programs to Brad Fairfield.

## Graduate Student Holiday, Vacation, Parental Leave and Sick Leave

The School of Graduate Studies has established policies regarding student time away. The complete policy may be viewed at their website: <http://www.case.edu/gradstudies/about-the-school/policies-procedures/>

The following is a brief summary:

1. ALL graduate students are entitled to observe University closings for Holidays and other recognized events. The Master Schedule of University Observed Holidays may be found at: <http://www.case.edu/finadmin/humres/policies/employment/holiday.html>
2. ALL graduate students are allowed two weeks (10 days) of vacation per academic year (July 1 – June 30). These can be accrued from ONE year to the next for up to a maximum 20 days to allow for international travel, for example.
3. ALL graduate students are entitled to two weeks (10 days) of sick leave per year (no year-to-year accrual).
4. ALL graduate students are entitled to paid parental leave for the adoption/birth of a child.
5. Graduate students are NOT entitled to compensation for any unused vacation or sick days.

## Individual Predoctoral Grant Support

It is extremely advantageous for students to successfully compete for individual grant support, for example from the National Science Foundation (<https://www.fastlane.nsf.gov/fastlane.jsp> ). Note that funding agencies often require that applications be



submitted early in graduate training.

## Tax Liability

Neither the Department of Molecular Biology and Microbiology nor Case may advise students about their tax liability. Students can obtain information and tax forms and publications at local libraries and post offices. Individuals must take the initiative to identify themselves to their residential community to trigger the Regional Income Tax Authority's awareness of their existence, as applicable. General information regarding taxes may be found at:

<https://students.case.edu/international/information/current/taxinformation.html>

## Membership in the American Society for Cell Biology

CLBY students become student members of the ASCB with expenses covered by the Program. They are encouraged attend the annual meetings of the ASCB.

## Helpful Resources and Information

### REQUIRED FORMS

Both the Department of Molecular Biology and Microbiology and the Graduate Studies Office require a variety of forms, which are listed in the Appendix and may be downloaded at these two URLs:

SCHOOL OF GRADUATE STUDIES: <http://www.case.edu/gradstudies/current-students/forms/>

DEPARTMENT OF MOLECULAR BIOLOGY AND MICROBIOLOGY:

<http://www.case.edu/med/microbio/resources.htm>

### FOREIGN STUDENTS

The University Office of International Student Services ([international@case.edu](mailto:international@case.edu); 368-2517) provides additional resources for foreign students. <https://students.case.edu/international/>

## When Students Need Help

### Emergency: Case Police 368-3333

A student who exhibits current aggression or weapons or appears to be in imminent danger to himself or others requires emergency action.

Graduate study may be a stressful time for students, revealing a need to engage additional resources. Students may exhibit difficulty with attendance, academic or research performance, reflect depression or anxiety, or show lack of progress or interpersonal communication that should not be ignored.

If you become aware of these concerns, ask the student to describe issues that interfere with performance in a private conversation. Ask them to help you understand the issues. Consider campus resources that may assist the student in addressing performance or behavior issues. Keep brief notes of communications with students so you can show that you responded.

#### A. Separate the Academics from the Behavioral Concerns

Consider Tutoring. Identify other students who did well in a course who might spend 2-4 hr/week tutoring the student (to review material, practice, keep on pace). Tutors are hired through student employment at about ~\$12/hr

Consider Learning Differences. Students may need evaluation for learning disabilities. This can be set up through Student Affairs/ Educational Services

Judith Olson-Fallon

368-5230

judith.olson-fallon@case.edu

Consider whether behavioral concerns prevent student from achieving. Call for advice about working with a student, or to refer a student for counseling to improve performance

**University Counseling Service 368-5872**

**or emergency/ after hours 844-8892**

*Can you help me understand what's happening that interferes with your performance?*

*How do you feel about getting help?*

*I'm concerned about your feelings. Can I help you find others to talk with?*

*I cannot promise confidentiality and would like to refer you to places on campus to talk.*

#### B. Manage Performance Goals

Sometimes performance goals (attendance, experimental time, cleaning up, common preparations, deadlines) are not met because of poor communication. Consider creating a behavior contract for the student. Describe what the student has to demonstrate and by when, and describe consequences if goals are not met, and date and sign. Allow the student time to respond. Remember to Be Consistent and Follow up. Apply goals to all students in the same environment.

#### C. Campus Policies and Procedures

Become familiar with the policy and process for Grievances, Misconduct, Authorship, Sexual Harassment etc within the Graduate Student Handbook (Graduate Studies <http://www.case.edu/gradstudies/about-the-school/policies-procedures/>)

## **Section Five: Master of Science Degree**

The Graduate Program in Molecular Biology and Microbiology, the Graduate Program in Molecular Virology and the Cell Biology Program are Doctoral degree-granting programs which do not admit students whose sole goal is to earn a Master's degree, nor does either award M.S. degrees as part of the Doctoral curriculum.

On rare occasion, a graduate student may decide to leave the Ph.D. program after completing a significant body of coursework and/or independent research. Under these conditions, a Master's Degree in either Molecular Biology and Microbiology, Molecular Virology, or Cell Biology may be awarded subject to approval by the student's thesis advisory committee. To qualify, a student must maintain continuity of registration and a B average in graded courses, as for the Ph.D. It is expected that a relevant program of study will be planned for each candidate for the master's degree by the student and the faculty advisor or advisory committee. This planned program of study (PPOS) must be submitted to the School of Graduate Studies by the end of the second semester. Such a program should include appropriate courses, thesis, and/or project hours, and may also include, where relevant, such experiences as field work or practicum. Guides to submitting and updating the PPOS through the student information system are available from the University Registrar. Depending on the point at which the student decides to leave the program, one of the following two options are available:

### **Plan A, With Thesis**

The minimum requirements for the master's degree under Plan A are 18 semester hours of course work plus a thesis equivalent to at least 9 semester hours of registration, or 21 semester hours of course work plus a thesis equivalent to at least 6 semester hours of registration. At least 12 semester hours of course work must be graded. Once registered for thesis credit (Course 651), a student must continue 651 registration each succeeding regular semester until graduation. However, if a student is registered for course work or research toward the doctorate in the semester in which the thesis examination is expected to occur, concurrent registration for 651 is not required. At least 18 semester hours of course work, in addition to thesis hours, must be at the 400-level or higher.

Each student must prepare an individual thesis. Joint theses are not permitted. The written thesis must conform to regulations concerning format, quality, and time of submission as established by the dean of graduate studies. Detailed instructions can be obtained from the School of Graduate Studies website.

For completion of master's degrees under Plan A, an oral examination (defense) of the master's thesis is required. This examination is conducted by a committee of at least three members of the university faculty. The candidate's thesis advisor customarily serves as the chair of the examining committee. The other members of the committee are appointed by the chair of the department or curricular program faculty supervising the candidate's course of study. The examining committee must agree unanimously that the candidate has passed the thesis examination. Because theses are made public immediately upon acceptance, they should not contain proprietary or classified material. When the research relates to proprietary material, the student and advisor are responsible for making preliminary disclosures to the sponsor sufficiently in advance to permit timely release of the thesis, and these plans should be disclosed when the thesis is submitted to the School of Graduate Studies. Upon successfully fulfilling the requirements, these students will earn either a Master of Science Degree in Molecular Biology and Microbiology, a Master of Science Degree in Molecular Virology, or a Master of Science Degree in Cell Biology.

### **Plan B, No Thesis**

The minimum requirements for the master's degree under Plan B are 27 semester hours of course work (with at least 12 semester hours of graded course work), a comprehensive examination, and in some fields, an approved project. At least 18 semester hours of course work must be at the 400 level or higher.

Each candidate for the master's degree under Plan B must pass satisfactorily a comprehensive examination to be administered by the department or curricular program committee. The examination may be written or oral or both. A student must be registered during the semester in which any part of the comprehensive examination is taken. If not registered for other courses, the student will be required to register for one semester hour of EXAM 600 Master's Comprehensive Exam before taking the examination. Upon successfully fulfilling the requirements, these students will earn either a Master of Science Degree in Molecular Biology and Microbiology, a Master of Science Degree in Molecular Virology, or a Master of Science Degree in Cell Biology.

For each of these Master's Degrees, a total of 27 hours of graduate credit is required. A complete list of requirements is available

in the General Bulletin of Case Western Reserve University.

## **Section Six: Medical Scientist Training Program (MSTP)**

MSTP students in our programs are expected to complete the requirements for MSTP students as outlined in the MSTP guidelines. The general guidelines and performance expectations for MSTP students are identical to those for graduate students. MSTP students are required to take 4 elective courses of 3 credit hours each and are encouraged to take graduate courses during the first two years of medical school.

The research qualifying exam for MSTP students follows the same format as for other graduate students, and should be completed in the second summer following identification of a laboratory and mentor. The qualifying exam should be scheduled at the conclusion of required coursework, and must be completed by September of the fourth year following admission into the combined program. In keeping with the policies of the MSTP, each student must have a member of the MSTP steering committee and one MD or MD/Ph.D. on her/his thesis committee and is encouraged to complete the Ph.D. portion of the program within 4 years.

## Section Seven: Appendix

### Required Forms

For your convenience all forms are available for downloading at: <http://www.cwru.edu/med/microbio/resources.htm>

#### DEPARTMENTAL FORMS:

- ✓ Committee Approval Form (also Add New Committee Member Form)
- ✓ First Committee Meeting Report
- ✓ Second Committee Meeting Report
- ✓ Qualifying Exam Report
- ✓ Additional Committee Meeting Report (to be used for additional pre-/post-qualifying committee meetings)

#### SCHOOL OF GRADUATE STUDIES FORMS:

An official Planned Program of Study is required for each graduate student by the end of the second semester.

- ✓ Planned Program of Study / Revisions to Planned Program of Study (complete online at <https://sis.case.edu/psp/P90SCWR/?cmd=login> )

In addition, these and other forms may be found online at <http://www.case.edu/gradstudies/current-students/forms/>

- ✓ Predoctoral Standing
- ✓ Advancement to Candidacy
- ✓ Waiver of Registration
- ✓ Notification for Scheduling the Final Oral Exam for the Ph.D.
- ✓ **If you are preparing to graduate**, be sure to visit the School of Graduate Studies website to download the complete PhD Graduation Packet Forms, at: <http://www.case.edu/gradstudies/current-students/graduation/>

