

Ph.D./Tech. M.S. Student Handbook

2017 - 2018 Academic Year

**DEPARTMENT OF
PHYSIOLOGY AND BIOPHYSICS**

**CASE WESTERN RESERVE UNIVERSITY
CLEVELAND, OH**

Last revised: December 2017

TABLE OF CONTENTS (ctrl+click to navigate)

KEY PERSONNEL 1
OVERVIEW 2
TRAINING PHILOSOPHY 3
WORK ETHIC 3
UNIVERSITY REGULATIONS FOR GRADUATE STUDENTS 4
PRACTICAL MATTERS..... 4

Tuition and Stipend Support..... 4
Individual Predoctoral Grant Support..... 4
Stipend/Fellowship Payments 5
Tax Liability..... 5
International Students..... 5
Health Insurance..... 5
Dental Care..... 6
University Counseling Services (UCS)..... 6
Legal Services 7
Parking and Shuttle Services..... 8
Student Mail..... 8
Telephones 8
Departmental Library E-504..... 8
Poster Printing..... 9
Building and Department Access, Campus Security..... 9
Student Computers..... 9

GETTING STARTED 10
COURSEWORK..... 10
RESEARCH ROTATIONS..... 16
SELECTING A GRADUATE ADVISOR 18
QUALIFYING EXAM 19
DISSERTATION/THESIS PROPOSAL..... 22
GRADUATE ADVISORY COMMITTEE..... 24
GUIDELINES FOR DISSERTATION/THESIS RESEARCH 25
ACADEMIC INTEGRITY..... 28
SEMINARS AND JOURNAL CLUBS..... 30
PROFESSIONAL DEVELOPMENT 31

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OVERVIEW

The Physiology and Biophysics Graduate Program provides comprehensive training leading to the Ph.D. and Masters degrees for applicants with backgrounds in the biological and/or physical sciences. The Physiology and Biophysics Graduate Program also provides Ph.D. training for M.D., Ph.D. candidates who matriculate via the Medical Scientist Training Program (MSTP) in the School of Medicine. Finally, the Ph.D. program also welcomes applications from M.D.s who are completing their residency requirements at one of the regional hospitals or students working on their M.D. degree.

In addition to the Ph.D. program, the Department offers two Masters degree programs.

- 1 - The Tech Masters program is a Type A program designed for research assistants at Case Western Reserve University and its affiliated hospitals that requires the students to conduct original research and write a Masters thesis.
- 2 - The Masters in Medical Physiology program is a Type B, non-thesis program designed for individuals who are preparing for admission to professional schools (medical, dental, veterinary, physician assistant, pharmacy, etc.), graduate programs in biophysical sciences, or careers in biomedical sciences. Students may take this program as either resident or internet students. This program can also be combined with courses at the CWRU Weathered School of Management for a combined MS/MBA degree. This program has a separate handbook and will not be covered in this document. See the Department of Physiology and Biophysics staff for a copy of the handbook covering the Masters in Medical Physiology program.

The first year of Ph.D. and Tech Masters studies includes required courses, most of which are conducted in a discussion format. A major component of the first semester is a series of graded laboratory rotations that run throughout the year and prepare students to conduct original research and to choose a mentor. Mentors must be chosen from faculty with either primary or secondary appointments in the department. Our advanced courses are often interdepartmental and students can choose from a large number of electives both inside and outside the department. Ph.D. students must demonstrate their capability to conduct original research. One of the required ways to demonstrate this is to satisfy the requirement that all Ph.D. students must publish at least one first authored original research paper in a major peer-reviewed journal and have at least one additional paper submitted to a peer-reviewed journal (after initial review by the Thesis Committee). Our graduates pursue careers in both academia and business. Whatever their career goals, when they enter one of the departmental degree programs, they will embark on a new journey that is exciting and designed to develop and stretch their abilities.

Although designed to help guide students along their way, there may be questions not addressed in this document. The faculty and staff have an open door policy and are committed to providing whatever assistance students may need if answers to specific questions are not found here. The names and their contact information for

individuals that may be most appropriate to answer questions are provided in the preceding section. More detailed information about our department, faculty, students, and educational programs is available on our web site: <http://physiology.case.edu> or <http://biophysics.case.edu> .

TRAINING PHILOSOPHY

The faculty have developed a challenging course of study aimed at providing students with all of the necessary tools to compete effectively for the best academic and non-academic positions in the biomedical sciences. Our goal is to educate future health science professionals in the area of physiological and biophysical sciences and to train skilled biomedical scientists who demonstrate integrity, think critically, and communicate effectively. The training faculty affiliated with the graduate program strongly believe that this is best achieved by partnerships between faculty mentors and individual students that are mutually beneficial. Faculty and students both prosper when students are treated as promising junior colleagues deserving of the best training possible in an environment where freedom of inquiry and expression is valued and encouraged. As such, faculty and students each have important obligations to prepare students to be life-long scholars. Admission to our graduate program is a privilege that will provide lasting opportunities for growth throughout your professional career. A graduate student's success depends on everyone involved. This includes Department and University administrators, as well as training faculty. But most importantly, it depends on you, the student, taking primary responsibility for your educational and research progress.

WORK ETHIC

Science is a profession that requires dedication and drive, and a strong work ethic that does not involve watching a clock. All students are held to a high standard of accountability. From the first semester on, full-time Ph.D. students should plan to work in the laboratory and pursue scholarly activities, such as attending seminars and journal clubs, even when classes are not in session. Unless special permission is granted by the student's thesis advisor and the Director of Graduate Education, vacation time is limited to 2 weeks in addition to official University holidays. Any student who anticipates absence from the program for a period greater than two weeks must inform the Ph.D. Graduate Program Director. Leave of absence, maternity/paternity leave lasting longer than a semester must be registered with the School of Graduate Studies (forms available at <http://www.case.edu/gradstudies/current-students/forms/>). Students who do not comply with Department and University regulations may be placed on academic watch, lose financial privileges, or face dismissal in extreme cases.

UNIVERSITY REGULATIONS FOR GRADUATE STUDENTS

It is the responsibility of each student to become familiar with the specific rules that apply to the program of graduate study in Physiology and Biophysics, as well as the general rules and regulations of the University. Any requirements not specifically addressed in this document conform to the regulations for the Ph.D. or MS degrees specified in the School of Graduate Studies (SGS) section of the General Bulletin of Case Western Reserve University (available online at <http://gradstudies.case.edu>). This website also contains down-loadable forms that must be filed with the SGS as the student advances through their graduate career. All students are encouraged to contact the SGS office directly (Tomlinson Hall 2nd floor, telephone 368-4390) to discuss any concerns or questions they may have. That office is particularly helpful when it comes time to prepare and defend the dissertation and to apply for graduation. It is expected that students will be proactive in seeking information regarding University regulations.

PRACTICAL MATTERS

Tuition and Stipend Support

Ph.D. students registered full-time in the Physiology and Biophysics Program are eligible for tuition and stipend support. This support may derive from a variety of sources, including National Institutes of Health (NIH)-supported training grants (for students who are U.S. citizens or permanent residents), investigator-initiated NIH research grants, other federal and private research grants, and Departmental resources. Stipend support begins upon matriculation and is guaranteed as long as the student remains in good standing and is making progress toward the degree. The base stipend level for 2017-2018 is \$29,000 for 12 months. If students are making plans to leave the program for any reason, they must immediately notify their advisor and the Director of Graduate Education. Should a student accept an offer to join a degree program at another institution, they must immediately withdraw from the Ph.D. program.

Individual Predoctoral Grant Support

Obtaining a fellowship can greatly enhance a student's CV, giving them a distinct competitive advantage in the academic market place. Thus students are encouraged to apply for individual grant support. Common sources of such fellowships are the *National Science Foundation* (<http://fastlane.nsf.gov/grfp>) and the *American Heart Association* (<http://www.americanheart.org>). Note that many funding agencies often require applications to be submitted early in graduate training. Students should discuss the possibility of applying for individual funding with their thesis advisor. The stipend for any student obtaining an independent fellowship will be enhanced by a \$1,000 incentive above the base level.

Stipend/Fellowship Payments

Stipend/Fellowship payments are made on the last working day of each month. Arrangement for direct deposit of these payments to your bank account must be arranged by completing forms that are available from Morley Schwebel.

Tax Liability

Stipend and tuition benefits are reported to federal and Ohio state governments as taxable income. Students may also be required to pay local taxes if they live outside the city of Cleveland. Information can be obtained from each municipality.

International Students

International students often face additional challenges especially if they are first-time visitors to the US. The University has two offices whose primary job it is to help ease the transition to life at an academic institution in the U.S. *International Student Services* (ISS), located Tomlinson Hall, rm. 143, provides information for incoming and current international students. ISS provides assistance to a population of more than 1,000 international students from over 80 countries around the world. Please visit the ISS website (<http://studentaffairs.case.edu/international>) for further description of their services. Another important resource for the foreign student is the office of *Foreign Faculty and Scholars* (FFS), which is the University's liaison with federal agencies that are concerned with visa-related matters. FFS facilitates immigrant/permanent resident status, is responsible for employment eligibility verification (I-9) and W-4 tax status confirmation, and determines whether or not to file tax treaty exemption forms with the Internal Revenue Service. The University's global outreach initiative is supported through FFS by providing technical visa services required in connection with visiting scholars and researchers who come to the University from all parts of the world for various purposes including research, teaching, and training. In addition, FFS provides information and services that international faculty, visitors, and their families may require. The FFS office is located in Tomlinson Hall (8 a.m. to 4:30 p.m.). They may be reached by calling 216-368-4289 or by visiting the *Human Resources* website (<http://www.cwru.edu/finadmin/humres/ffs>).

Health Insurance

For full-time Ph.D. students, insurance coverage through University Health Services (UHS), 2145 Adelbert Road, begins upon matriculation. CWRU contracts with Aetna Student Health to provide the Student/Dependent Medical Plan (<http://students.case.edu/medicalplan/>) and many details of plan coverage can be found online. The plan is accompanied by prescription drug coverage through Rx Options, Inc. UHS is staffed by several qualified professionals with an interest in student health. These include physicians, nurse practitioners, psychologists, psychiatrists, social workers, and registered nurses. A number of the physicians are affiliated with University Hospitals of Cleveland and with the CWRU School of Medicine. More information may be obtained by visiting the UHS website (<http://studentaffairs.case.edu/health>) or by calling one of the numbers listed below.

General Information:	368-2450
After Hours EMERGENCY SERVICES:	368-2450
General/Specialty Clinic Appointments:	368-4539
Women's Health Clinic Appointments:	368-2453
Counseling/Mental Health Clinic Appointments:	368-5872

Students are encouraged to utilize resources through University Health Services before utilizing other in-/out-of-network providers as many preventative and regular well-person examinations can be provided at no cost to you through UHS.

Dental Care

The CWRU School of Dental Medicine manages several in-house dental clinics to provide training for pre-doctoral dental health professionals. Participants in the Student/Dependent Medical plans are eligible to receive free and discounted care through the School of Dental Medicine, including:

- Two free oral exams and evaluations, including one dental and medical history per medical plan year
- Two free oral cleanings per plan year
- Free Periodic Bite Wing X-rays each plan year
- 20% discount on all other dental services offered at the Case Western Reserve University School of Dental Medicine

Treatment is administered by pre-doctoral dental students under the close supervision of experienced dental health professionals. Services through the School of Dental Medicine are often significantly less expensive than going to a private practice dentist. The clinics are open from 8:30 a.m. to 5:00 p.m. Monday through Friday throughout the school year, excluding holidays. Emergency care is available for existing patients by calling 216-368-3200

(<http://dental.case.edu/patients/emergency>). General appointments can be made by phone at 216-368-8730, or in person at the School of Dental Medicine ground floor main clinic reception area. More information regarding health insurance and dental care is available at: <http://students.case.edu/medicalplan/>.

University Counseling Services (UCS)

Graduate School marks a time of tremendous self-exploration and change. At times these changes are intentional and understandable; at other times they are unpredictable, chaotic and upsetting. Each year over 1100 students seek out the staff of the University Counseling Services to help them gain perspective and to lay the groundwork for personal change. For many, the change can become a 'Turning Point' in their lives.

University Counseling Services (UCS) and its divisions of Collegiate Behavioral Health (CBH) and Prevention & Recovery Services (PRS) offers students help with their personal counseling and behavioral health needs, including individual, couples

and group counseling, psychiatric medication management, stress management and recovery support. Its offices are staffed with psychologists, social workers and consulting psychiatrists: <http://students.case.edu/counseling/>

Most services are provided without cost but some specialty services may require a fee.

University Counseling Services

201 Sears Library Building 2nd Floor

Monday – Friday 8:30 – 5:00

Phone: 368-5872 Phone: 368-2510

Fax: 368-1972 Fax: 368-8530

<http://studentaffairs.case.edu/counseling>

Center for Collegiate Behavioral Health

2145 Adelbert Road – Health Services 2nd Floor

Mon., Tues., Wed., & Fri. 8:30 – 4:30

Thursday 9:30 to 4:30

<http://studentaffairs.case.edu/counseling/mindbody>

If instead you are experiencing problems of an academic nature that may affect your performance, we would encourage you also to talk confidentially to your advisor, chair of your thesis committee, program director and/or the director of education.

Legal Services

The *Milton A. Kramer Law Clinic Center* at CASE provides legal services to members of the community unable to afford legal counsel. Third-year law students act as the primary legal counsel in matters related to civil, community development, immigration, and health law.

Housing

Most graduate students elect to rent housing in one of the many nearby neighborhoods. The *Office of Housing, Residence Life & Greek Life* publishes the *Off-Campus Housing Bulletin*. The Bulletin contains apartment and housing listings, roommate wanted advertisements, etc. that are located within a short distance from campus. The bulletin is updated each Friday at noon and can be viewed online by incoming graduate students. In addition, the School of Graduate Studies has housing information available online (<http://students.case.edu/living/housing/graduate>) and includes a listing of off campus housing (<http://gradstudies.case.edu/prospect/area/housing.html>). Many neighborhoods also have housing offices as well as guided tours of available rental properties. Contact local city governments for further information. Another alternative is the Steiner House Cooperative, which is a student-run organization offering housing for graduate students from Case Western Reserve University, the Cleveland Institute of Music, the Cleveland Institute of Art, Cleveland State University, and the Montessori

Institute. Vacancy information as well as applications can be obtained by contacting the Admissions Manager of Steiner House, 11408 Bellflower Rd, Cleveland, OH 44106 or by visiting their website (<http://www.case.edu/affil/steiner>).

Parking and Shuttle Services

The CWRU Office of Access Services manages the University's parking program and is responsible for implementing its policies and procedures. All commuter students are eligible for parking permits upon enrollment. Students who need parking should contact Access Services at 368-2273, online at <http://parking.case.edu> or by e-mail at parking@case.edu for questions related to parking. Most graduate students park in surface lots 42 or 44 or the Veale Garage (S-53) which are the most cost-effective lots nearest the School of Medicine.

University Circle, Inc. (UCI) operates a fleet of buses to provide free transportation service for employees, students, and visitors in the University Circle area. Established bus routes allow riders to travel from designated areas to central drop-off points. Visitors may use UCI's public routes to reach various University Circle institutions. Service is provided approximately 18 hours per day Monday through Friday, with reduced service on weekends and holidays. Bus route schedules and maps are available at various locations or they may be viewed on-line at the *Busing and Shuttles* website (<http://greenie.case.edu>).

Additionally, should you find yourself working on campus late and do not feel safe walking back to your vehicle or nearby apartment and cannot utilize the shuttle services described above, CWRU offers the Safe Ride Program to provide safe transportation around campus and the surrounding CWRU community between 7pm and 3am. You can learn more about this program at its website (<http://police.case.edu/saferide.html>) or request a pickup here: <http://saferide.case.edu> or call at: 216-368-3000.

Student Mail

Shared student mailboxes are located before the 5th floor bridge. Please check your box regularly for mail. Using your Case Mail address for private mail or package delivery is not allowed.

Telephones

Students may make campus and other local calls from telephones in the Department as well as appropriate lab-related long distance calls. There is no specifically designated student telephone.

Departmental Library E-504

A comprehensive collection of biomedical periodicals and books are available in the Allen and Cleveland Health Sciences Libraries. An online catalogue of resources available to CASE and its affiliated institutions can be found on the EuclidPLUS

website (<http://www.cwru.edu/uclibraries.html>). The department maintains a small collection of periodicals and textbooks in E-504.

Poster Printing

The department has a large format printer for printing posters for meetings. Students are allowed to print one poster in their first year, charged to the Department. After this, posters are charged to their faculty advisor. A copy/fax machine is located in the Administration office area.

Building and Department Access, Campus Security

Nearly all University buildings require ID card access. The Department also requires ID card access between 6:00 pm and 8:00 am daily and on the weekends. The Department office personnel will submit information to the University requesting card access once you have your University ID. This usually takes 24 to 48 hrs. If you have forgotten your ID or your ID will not activate the card reader during evening hours, you can call the CWRU Police Department at 368-3333, and an officer will be dispatched to let you in. However, you will still need to present a picture ID.

The University provides a variety of security and safety programs to help ensure a safe educational environment. These programs are directed by *the CWRU Police Department* (<http://police.case.edu>), located at the North Campus Security Office (11320 Juniper Rd). The Security Communications Center is located in the basement level of the Health Services Building, 2145 Adelbert Road (the old Law building). The University's professionally trained security officers patrol the campus facilities and grounds on a 24 hour-a-day basis throughout the year. In addition to basic patrol, security personnel respond to emergencies, fire alarms, and routine security incidents. The Police Department Central Dispatch Center is staffed continuously and can be reached at extension 368-3333 for emergencies and 368-4630 for non-emergencies. The campus is also patrolled by the *University Circle Police Department* (UCPD), a private police agency consisting of fully trained and commissioned police officers. The UCPD also patrols on a 24 hour-a-day, and they respond to all emergencies. They can be reached at 368-2222.

Student Computers

All full-time incoming Ph.D. students will receive a laptop PC computer with wireless internet capability. These computers are an integral part of the student's graduate training before and after entering the laboratory for dissertation research. Each student is expected to take full responsibility for the security of their computer. Each computer comes with a three year extended warranty. The student is financially responsible for all maintenance issues (including replacement batteries) not covered by the warranty. The Department will not replace computers that are lost or stolen. Furthermore, these computers are the property of the Department and must be returned should a student have to leave the program for any reason before graduation. After graduation, the computer becomes the property of the students.

Once formally enrolled at the University, students will be able to activate their network/e-mail account by following the instructions on the Information Technology Service's website (<http://www.case.edu/its/students.html>). Since all official departmental communication is conducted electronically, it is imperative that students check their e-mail at least once a day to stay informed of all required graduate student activities and other events. Please contact Paul Zawolowycz (pxz21@case.edu) for help with any computer related questions.

GETTING STARTED

As soon as possible after arriving on campus, incoming students should contact Bart Jarmusch, the Manager of Graduate Education. The necessary registration materials for the first semester will be emailed to students in their welcome packet. Students should plan to arrive no later than the second Monday in August. Students will register for their first semester and all subsequent semesters using the Student On-Line Academic Registration (**SIS**) system. Late fees, which are the responsibility of the student, are assessed beginning the first Tuesday after classes start.

During the week prior to the beginning of classes, there will be a general orientation sponsored by the School of Graduate Studies. There will be additional orientation sessions specifically for first year graduate students in the Physiology and Biophysics Programs. The School of Medicine also holds a "White Lab Coat" ceremony the Friday before classes begin for all incoming Ph.D. students. Incoming Ph.D. students will also be expected to complete Radiation Safety and Chemical Safety Classes during the first week of classes. Information on the times and locations of these activities can be obtained from Bart Jarmusch or the Environmental Health and Safety web site (<https://www.case.edu/ehs>).

COURSEWORK

Ph.D. and Tech Masters students are required to successfully complete a combination of formal coursework, research rotations, and thesis/dissertation research in order to graduate from the program. The formal coursework consists of a core curriculum and elective courses. For Ph.D. and Tech Master's students, the core curriculum includes CBIO 453 & CBIO 455 (Cell and Molecular Biology), PHOL 401 (Physiology and Biophysics of Molecules and Cells), PHOL 480 (Physiology of Organ Systems). Additionally, Ph.D. students must complete 3 sessions of PHOL 505 (Laboratory Research Rotation). These courses are designed to provide the foundation upon which the graduate training of all Physiology and Biophysics students can be built. In addition to the core curriculum, students will take a customized set of elective courses tailored to their individual needs. Each Ph.D. and Tech Master student's curriculum will be determined in consultation with the student's dissertation advisor and the Director of the Ph.D. Program and approved by the Graduate Education Committee and the department Chair. The School of Graduate Studies form titled "Student's Planned Program of Study" will be used for

this purpose. The School of Graduate Studies requires for graduation that Ph.D. students successfully complete at least 36 hours of course work (24 of which must be graded and not pass/fail) and at least 18 hours of thesis research (PHOL 701). For Ph.D. students, the required course work is typically completed before admission to candidacy and the dissertation research is completed after admission to candidacy. Tech Masters students are required to successfully complete at least 18 hours of course work (12 of which must be graded and not pass/fail) and 9 hours of thesis research (PHOL 651) for a total of 27 credit hours. Students are encouraged to consider courses offered by other departments. The sequence of courses is listed below.

Year One, Fall

Ph.D. and Tech Masters Required Core (Tech Masters complete the first 3 classes typically over a 2-year period. PHOL 505 is recommended but not required).

CBIO 453	Cell and Molecular Biology I (3 cr, gr)
CBIO 455	Cell and Molecular Biology II (3 cr, gr)
IBMS 450	Fundamental Biostatistics to Enhance Research Rigor and Reproducibility (1 cr, gr)
CBIO 456 (sections a-d)	Since you were born: Nobel Prize Biomedical research in the last 21 years. (1 cr, gr)
PHOL 498	Departmental Seminar (1 cr)
PHOL 505	Laboratory Research Rotation (1cr, gr)
PHOL 505	Laboratory Research Rotation (1 cr, gr)
PHOL 505	Laboratory Research Rotation (1 cr, gr)

At the end of year one, fall semester and after the 3 Laboratory Research Rotation courses have been completed, the Ph.D. students should choose a mentor in whose lab they will conduct their dissertation research. Work in that laboratory should begin at the beginning of year one, spring semester.

Year One, Spring

Ph.D. Program

PHOL 401A & 401B Physiology & Biophysics of Molecules and Cells (4 cr, gr)

Elective I (3 cr, gr)

Elective II (3 cr, gr)

PHOL 498 Departmental Seminar (1 cr)

IBMS 500 Ethics and Biomedical Research (1 cr)

PHOL 601 Lab Research – in the mentor’s lab (1 cr)

Tech Master Program

PHOL 401 A & B Physiology & Biophysics of Molecules and Cells (4 cr, gr)

PHOL 498 Departmental Seminar (1 cr)

Year One, Summer

Ph.D. Program

RSCH 750 Summer Research - Ph.D. Level

Tech Masters Program

RSCH 650 Summer Research – Masters Level
(In the lab of their advisor)

Year Two, Fall

Ph.D. Program

PHOL 480 Physiology of Organ Systems (4 cr, gr)

Elective III (3 cr, gr)

PHOL 601 Lab Research – in the mentor’s lab (3 cr)

PHOL 498 Departmental Seminar (1 cr)

Tech Masters Program

PHOL 651 Thesis Research – in the advisor’s lab

Year Two, Spring and all Subsequent Semesters

Ph.D. Program

PHOL 701 Dissertation Research – in the mentor’s lab

Tech Masters Program

PHOL 651 Thesis Research – in the advisor’s lab

Students enrolled in the Tech Masters program for research assistants may take up to three years to complete the curriculum. They are required to take only one major 3 or 4 credit hour course/semester but may take up to 6 credit hours/semester. They will conduct their original research in the laboratory in which they are employed. They are not required to take the laboratory rotation courses but are encouraged to do so. Their major advisor must either be a primary faculty member in the department or be listed as a Trainer for the graduate program.

Once registered, students cannot add or drop courses without the permission of the Graduate Education Committee, since it will impact both tuition and stipend support.

During all years of study, all Ph.D. and Tech Masters students are required to attend at least 75% of the weekly research seminars sponsored by the Department of Physiology and Biophysics to receive credit for PHOL 498 and PHOL 701/PHOL 651. All Ph.D. students are required to actively participate in the departmental journal club in order to receive credit for PHOL 701 (see section on *Seminars and the Journal Club*).

Performance requirements:

The Physiology and Biophysics Program considers only grades of “B” or better to be satisfactory. To remain in good standing and to graduate from the Ph.D. or MS (Tech Masters) programs, a student must achieve a minimum grade point average (GPA) better than 3.0 (A= 4.0; B = 3.0; C = 2.0). This means that each student will need to earn a grade of “A” in at least one class during their course of study. Any student who receives a grade of “C” will be placed on probation until they have a GPA that meets the Department standard of better than 3.0. Any student who receives more than one “C” will be dismissed from the program.

Each Ph.D. student’s GPA will be reviewed at the time of the Qualifying Exam. While it is possible to pass the Qualifying Exam without having obtained an “A” in at least one course, students who pass the Exam, but at this stage have a GPA of 3.0

(or lower) will be advanced to Candidacy under probation. After the completion of two more academic semesters (i.e. at the end of their second year in the program), the Education Committee will review the probationary status and decide whether the student's progress and performance is sufficient to merit further enrollment in the Ph.D. program. Tech Masters students will have their academic performance evaluated at the end of each semester.

No student can graduate until they have met the standard of achieving a GPA better than 3.0.

MSTP Students

Students who are part of the School of Medicine's Medical Scientist Training Program (MSTP) and choose to obtain their Ph.D. in the Department of Physiology and Biophysics are given graduate school credit (equivalent to 18 graded credit hours) for coursework completed as part of the pre-clinical curriculum in the first two years of medical school. MSTP students also complete a minimum of three (3) research rotations during these first two years in the pre-clinical M.D. training phase of the program. As per MSTP policy, these rotations can be performed with mentors in any of the 14 Ph.D. programs affiliated with the MSTP. Successful completion of four additional formal graduate courses for a total of twelve credits is required. These formal graduate courses are typically taken concurrently during the first two years in the M.D. training phase and the first full year of the Ph.D. training phase of the program. The exact choice of graduate courses is tailored to meet the needs of individual MSTP candidates and typically will include both Physiology and Biophysics core courses (PHOL 401 and 480) and relevant elective courses offered by other Ph.D. training programs affiliated with the MSTP. In all other ways, the MSTP students who matriculate in the Physiology and Biophysics graduate program are full-time Ph.D. students in the Department and must satisfy the same requirements as all other Ph.D. students.

BSTP and SBB-TP Students

Students who enter the Ph.D. programs in the department from the Biomedical Sciences Training Program (BSTP) or from the Structural Biology and Biophysics Training Program (see <http://sbb-tp.case.edu>), will be subject to the same requirements as all other Ph.D. students in that program. Since they have already conducted lab rotations as a component of their entry program, they will not be required to take the three graded laboratory rotations (PHOL 505) in the department.

Switching from the Tech Masters Program to the full-time Ph.D. Program

A student who wishes to switch from the Tech Masters program to a full-time Ph.D. program may petition for a change in status. This change in status differs from the Tech Ph.D. status defined below in that the process here converts the student to a full-time Ph.D. student. In this case Tech Masters-Ph.D. transfer student would no longer be a University employee and would fall under all the rules and policies of the full-time designation (no outside employment, stipend support at full-time student levels

etc.) In order to execute transfer to a full-time Ph.D. student status, the student must do the following:

1. Discuss the possibility of transfer with the Director of the Ph.D. program, apply and be admitted to the Ph.D. program by the Admissions Committee.
2. Advise the Office of Graduate Studies of their desire, with an endorsement letter from the student's advisor, the Director of the Ph.D. program, and the Department Chairperson.
3. If the student wishes to convert the credit for PHOL 651 to PHOL 701, they may do so by petitioning the Dean of Graduate Studies. Endorsement by the Department Chairperson is again required.
4. Any additional course work must be completed within the guidelines provided for in the University Bulletin.
5. All other requirements for the Ph.D. degree must be fulfilled - including research rotations, Grade Point Average, timeliness of completion of work, etc.

Switching from the Tech Masters to part-time Ph.D. Program

In rare circumstances, Tech Masters students in good standing and performing their research in the lab of primary or secondary faculty of the department may request their graduate advisory committee for transfer into a part-time Ph.D. track (Tech Ph.D.). This change in status differs from transfer to a full-time Ph.D. student status by allowing the student to remain an official university employee in the host laboratory. Part-time versus full-time status is an important designation and should be carefully considered by the student and discussed with the Ph.D. Graduate Program Director. Such transfer must be endorsed by the graduate advisory committee and referred to the Graduate Education Committee for approval. If transfer is approved, the student must advise the Office of Graduate Studies of their intent and obtain a letter of support from their advisor, the director of the Ph.D. program and the Department Chair. If the student wishes to convert the credit for completed PHOL 651 to PHOL 701, they must petition the Dean of Graduate Studies, accompanied by a letter of support from the Departmental Chair. Following successful petition, the student must present and defend a novel doctoral thesis proposal as part of the qualifying exam/advancement to candidacy required of all Ph.D. students (defined below). Such Tech Ph.D. students are formally considered part-time Ph.D. students in order to maintain employment in their lab but must assemble a Ph.D. graduate advisory committee of appropriate composition (defined below), conduct novel student-driven research, hold regular graduate advisory thesis committee meetings, attend seminars, attend and present posters at retreats and attend and present journal clubs just as regular full-time Ph.D. students (see below). Financial support (tuition + fees, salary, research support) for these students is through the employing laboratory and is not assigned at any time to the department. The departmental and School of Graduate Studies policy governing student-mentor separation does not apply to Tech Ph.D. students, but is rather a matter of standard personnel policy defined by CWRU Human Resources due to their status as

university employees. Requirements for graduation are the same as for full-time Ph.D. students.

RESEARCH ROTATIONS

Before Starting - Selection of Laboratory and Enrollment

Full-time Ph.D. students are required to take three laboratory rotations before the end of the first semester. Each rotation is worth 1 graded credit hour, and each rotation must be completed within the time lines indicated in the table below.

LAB ROTATION DATES

Program	1st Rotation	2nd Rotation	3rd Rotation
Ph.D. Program	3 weeks in August (full time) plus 2 weeks in September	6 weeks (mid September – October)	6 weeks (November – mid December)

Laboratory rotations offer a unique opportunity to learn how to ask scientific questions and design experiments to answer those questions. Lab rotations enable students to become familiar with a variety of techniques, the research activities being carried out by the faculty members of the Department, and to assess the laboratory environment. Laboratory rotations may only be carried out under the supervision and guidance of faculty members having primary or secondary appointments in the Department of Physiology and Biophysics. Exceptions to this limitation may be granted in limited circumstances (e.g. a student has chosen a mentor's lab but wants to gain additional experience in a technique offered outside of that lab). Such exceptions will be made on a case-by-case basis by the Ph.D. Graduate Program Director. Each faculty member may supervise up to 2 rotating students per semester.

Students are expected to spend a minimum of 15 hours per week working in the lab during the 2nd and 3rd rotation and September portion of the 1st rotation. During the summer, students have no other requirements. Accordingly, they are expected to spend a minimum of 40 hours per week working in the lab taking either PHOL 601 or, after admission to candidacy, PHOL 701. Failure to meet these expectations of time spent in the laboratory will result in an automatic grade of "C" in the rotation (PHOL 505) or an unsatisfactory grade in PHOL 601 or 701.

Before a student begins a laboratory rotation, they must complete the following steps:

1. Identify 5 to 6 potential rotation laboratories whose research interests the student. Each lab P.I. must hold either a primary or secondary faculty appointment in the department.

2. Meet with top faculty choices for rotations to determine whether space is available and what type of projects exist. This process should begin at least two weeks in advance of the rotation start date. Students typically meet with at least 3-4 different faculty in advance of their first rotation decision.
3. Meet with the Director of the Ph.D. Program. All rotations must be approved by the Director of the program.
4. Submit a one-page proposal to the Director of the Ph.D. Program and Manager of Graduate Education. This proposal, which must be submitted before the rotation begins, should contain:
 - a. Student's name
 - b. Title of the proposed project
 - c. Dates of the project and name of the faculty supervisor
 - d. Statement of the major problem to which the project relates – This must include a clearly-stated formal hypothesis and a description of the question to be addressed
 - e. Rationale for the project and expected results
 - f. Outline of new methods that will be learned
 - g. Signature of approval by the faculty supervisor to confirm that they are willing to supervise the project
 - h. Signature of student

Finishing The Rotation - Laboratory Reports

Students are required to submit a short report (five to ten pages) at the end of each rotation to the Director of Student Advancement and Manager of Graduate Education. The report must contain the following information:

- a. Student's name
- b. Name of the faculty supervisor under whom the rotation was conducted
- c. Abstract - one paragraph summary of project
- d. Introduction - statement of the goal of the lab rotation, i.e. the scientific problem addressed
- e. Materials and Methods - Describe the methods and materials used and the techniques learned
- f. Results - Report on the actual experiments carried out and present data
- g. Discussion - critical evaluation of data indicating conceptual and technical limitations and what improvements could have been made
- h. References

In preparing the document, the student should discuss the content of the report with their mentor. The student should also provide their mentor with a final draft at least 2-3 days before the end of the rotation. The final version, signed & dated by their mentor, must be submitted electronically to the Manager of Graduate Education no later than 5 days after the end of the rotation. **If this deadline is not met, the**

student's grade in the rotation will be reduced by one letter grade: i.e., if an A were earned, the final grade will be reduced to a B, etc.. Under no circumstances may a student begin their next rotation before completing the report and providing it to their mentor for review.

Grading

Upon completion of the laboratory rotation, the supervising faculty member will submit an evaluation to the Director of Student Advancement and Manager of Graduate Education. The final grade will be determined by the Director of Student Advancement. Grades will be based on the clarity, comprehensiveness and depth of content of the laboratory report, time commitment of the student to the laboratory, as well as the student's performance in relation to other students registered for the course. In case of difficulties or shortcomings that may jeopardize the expeditious and satisfactory progress of the proposal, the course director should be notified immediately.

Students in the Tech Masters program are not required to take the laboratory rotations. However, they are encouraged to do so or substitute other graded courses to fulfill the School of Graduate Studies requirements for successfully completing graded courses.

Recknagel Symposium:

At the beginning of the second year of studies, all Ph.D. students are required to present a 15 minute seminar at the Recknagel Symposium over the research they carried out during one of their three rotations. Faculty will judge these presentations and award the Recknagel Student Awards for the best presentations and for the student with the highest academic record in first year courses. The winners will receive a cash award and have their names added to the award plaques that are displayed in the departmental showcase. All MS and Ph.D. students are required to attend this symposium.

SELECTING A GRADUATE ADVISOR

Criteria

The laboratory in which one's thesis project is conducted provides the setting for a student's most crucial learning experiences. For that reason, it is important to consider this decision carefully. Although choosing a graduate advisor (this advisor must have either a primary or secondary appointment in the Department of Physiology and Biophysics) whose research interests match one's own is an important consideration, it is by no means the only factor that should be taken into account. In addition to evaluating the environment in various labs, students should consider the type and quality of available research projects, the influence of other personnel in the lab, the level of the advisor's involvement in the day-to-day life of

the laboratory, and the kind relationship the advisor has with students. All of these factors, combined with the student's own strengths and weaknesses, will determine the success of the student's graduate education.

Decision-Making Process

It is important for the student to have a candid discussion with any faculty member they are considering as an advisor. However, students should be aware that faculty members are not allowed to recruit a thesis student into their lab until that student has completed all of their research rotations. Furthermore, any student feeling pressure to join a particular lab should report that information to the Director of the Ph.D. Program and/or the Chair of the Department. Students will discuss their choice of an advisor with the Director of the Ph.D. Program prior to making a final decision.

The ultimate responsibility for approving the assignment of students to laboratories falls to the Director of the Ph.D. Program. As indicated above, this process does not begin until after the student has completed their final research rotation. At that time, each student should meet with the Director of the Ph.D. program to discuss the reasons behind the student's preferences. Once all student preferences have been assembled and the appropriate faculty members have been consulted, the Director of the Ph.D. Program will make final faculty assignments by the beginning of Spring Semester of Year 1. The process, in most cases, will result in a student being assigned to his or her preferred advisor. However, students should be aware that typically, faculty members may not serve as the advisor for more than two (2) Physiology and Biophysics Ph.D. students at any one time. Exceptions may be made at the discretion of the Director of the Ph.D. Program on a case-by-case basis. In resolving conflicts over advisor selection, all pertinent information is taken into account, including the strength of the preferences expressed by the students, the preference of the faculty member, and the alternative assignments available to each student.

Typically, Ph.D. students should choose the advisor by the beginning of Spring Semester in Year 1. However, if necessary, the student may be allowed more time to consider additional laboratories and take additional rotations. Tech Masters students will have their faculty employer serve as their advisor.

QUALIFYING EXAM

Ph.D. students are admitted to candidacy after successful completion of a two-part Comprehensive Examination (Tech Masters students are not required to take the Comprehensive Examination).

Part 1. Written Research Proposal. The proposal should be based on one of the three research rotations as chosen by the student (not necessarily the one in the laboratory of future thesis advisor). However the proposal needs to go conceptually

beyond the work performed in the rotation and propose new or follow-up to the original aims of the rotation project. It is due at the date determined by the Director of Student Advancement, typically during the first week of August of Year 2. In the case of the part-time Tech Ph.D. student, who may not be on the same time line as a full-time student, the Qualifying Exam will be held no sooner than 9 months, but no later than 12 months, after transition into the Tech PhD program. Moreover, since Tech PhD students are not required to perform research rotations, the topic of the Tech PhD Qualifying Exam will be determined as follows: the Director of Student Advancement will solicit 3 thematically appropriate topics from the faculty of the Department. The student will be given the option to choose one of the three topics for their written research proposal. The Research Proposal shall be in the form of a research application that includes the following sections: *Specific Aims, Background and Significance, Preliminary Results, Research Plan, Literature Cited*.

All sections are to be in 12 point font, single-spaced with one inch margins (top, bottom and sides), and the pages must be numbered and follow consecutively. The body of the proposal may not exceed seven pages. This does not include the literature cited.

Students will be given a general introduction by one of the faculty members of the Graduate Education Committee on how a research proposal should be written as well as how proposals are reviewed.

Specific Aims (no more than 1 page). This section should include *Introduction, Hypothesis, and Specific Aims*. The *Introduction* must provide a brief overview of the topic, its importance, and set the stage for the central hypothesis and specific aims. The *Hypothesis* must include the overall hypothesis to be tested in the proposal. The *Specific Aims* are the most important part of the proposal. Construction of a focused, mechanism-based set of aims facilitates writing of the subsequent sections of the proposal. Two specific aims are recommended. They must be narrowly focused on specific scientific questions, related to the overall hypothesis, and must be designed to provide new mechanistic insight. They must be related to and complement each other, but they must not be dependent upon one another such that if one fails the other also fails. Each specific aim typically consists of three parts, each stated in one or two sentences. The first part should include a statement of the importance of the problem. The second part should state the specific hypothesis being tested, and the third part should state how the investigator plans to accomplish testing the hypothesis. The hypothesis and specific aims should be based as much as possible on preliminary data generated during the rotation.

Background and Significance (approximately 1 page). This section should present a concise background/history that is pertinent to the project. Furthermore, it should highlight the importance/significance of the topic. The student investigator must state why it is important to complete the proposed experiments, what new knowledge will be gained, and clearly state the novelty of the proposed work.

Preliminary Data (approximately 1 page). This section should present results from the student's work during the rotation relevant to the *Specific Aims* of the proposal. Key figures and/or tables may be included. Text in Tables, Figures, and Figure Legends may be smaller than 12 point but should be easily legible.

Research Plan including Experimental Design and Methods (approximately 4 pages) This section states how the experiments will be performed, and how the results will be interpreted. Each specific aim is treated independently using the following five (5) subheadings. First, the *Specific Aim* is restated. This is followed by the *Rationale* which is a statement of the purpose of the proposed experiments. Next is the *Experimental Approach*, which briefly describes the experimental strategy/design that will be used. Remember, it is critically important that the experiments be designed to include the appropriate controls, time courses, concentrations, etc. - otherwise the experiments cannot be interpreted! The *Methods* section is next and provides a concise description of each method - including enough detail to prove that the student investigator understands the technology. Finally, a section on *Potential Problems* should be included so that the student investigator can describe what may go wrong and what alternative experimental strategies may be considered.

Literature Cited. This section is to provide a complete list of all literature that is cited in the text of the research proposal. It should consist of no more than 40 references. Each reference should include the names of all authors, as well as the full title of the article, in addition to the title of the journal/book, volume, page numbers, and year of publication. Follow the format used in a leading journal in the field.

Part 2. Oral Exam/Defense of the Research Proposal. This exam will be administered at the time determined by the Director of Student Advancement, typically during the third week of August. Students will be required to make a concise (approximately 15 min) presentation of the Research Proposal. This will be followed by the question period during which they will be asked questions related to all aspects of the Research Proposal as well as first year course work broadly relevant to the topic of the Proposal. The examining committee, chaired by the Director of Advancement, will be composed of the Director of Advancement, the Director of the Ph.D. Program, and 3 other members of the Graduate Education Committee chosen by the Director of Advancement. The faculty member with whom the student wishes to do their dissertation research will be invited as an observer at the oral exam but will not be a voting member of the 5-member examining committee.

Students are required to pass both parts of this examination. Once the exam and appropriate credits are accumulated, the student is admitted to candidacy and start taking the thesis research course PHOL701. Any student who does not pass the exam may petition the Graduate Education Committee for an opportunity to take the

examination a second time. Students who pass the examination, may be asked to remediate certain material that they did not exam adequately over. Students who do not pass the examination will be dismissed from the Ph.D. program and, at the discretion of the Graduate Education Committee, awarded a terminal Masters degree, either Type A or Type B (see the Graduate School Handbook), upon completion of the requirements of the degree.

DISSERTATION/THESIS PROPOSAL

Ph.D. and Tech Masters students must submit their research proposal (in the format described below) to their graduate advisory committee two weeks before its first meeting of the committee. Students may consult with their advisor on the Specific Aims of the proposal but the writing has to be the work of the student and is not to be based on grant proposals written by the advisor. The advisor will be asked to certify the originality of the proposal. The student will give an oral presentation of the research proposal to the advisory committee at its first meeting. The student may consult with the advisor between submission of the proposal and the first committee meeting. The advisory committee members will vote pass/fail on the quality of the proposal, with the majority determining the final grade. The committee may ask the student to rewrite all or parts of the proposal. The research proposal must be approved by the student's graduate advisory committee in order for the student to proceed in the program. For Ph.D. students, this approval should take place in January/February of year 2. For Tech Masters students, approval of their thesis should take place by the end of the first semester they are enrolled in the program.

Important Note: In science, the publication of original work is a highly valued enterprise. Thus, plagiarism of any kind will not be tolerated. The Department defines plagiarism as "the taking and using of even a single intact sentence from another person's proposal, manuscript or review." This includes copying any segment of the Methods section from another source. It also includes the use of diagrams or example data figures without attribution. Any student who plagiarizes will be dismissed from the program. (See Academic Integrity section below).

Format of the Research Proposal

The Thesis Research proposal should be in the form of an R01 type NIH grant application and include the following sections: Abstract, Specific Aims, Research Strategy, Literature Cited.

All sections are to be in 12 or 11 point font, single-spaced with one inch margins (top, bottom and sides), and the pages must be numbered and follow consecutively. The body of the proposal may not exceed ten pages. This does not include the literature cited.

Abstract (approximately 200-250 words). Summarize the goals of the proposed research, specific hypotheses to be tested and experimental approaches used.

Specific Aims (1 page). 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.

Research Strategy. Organize the Research Strategy in the specified order and using the instructions provided below. Start each section with the appropriate section heading – *Significance, Innovation, Preliminary Results, Approach*. The total page limit for all these sections is 12 pages.

(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) *Innovation*

- Explain how the application challenges and seeks to shift current research or clinical practice paradigms.
- Describe any novel theoretical concepts, approaches or methodologies, instrumentation or interventions to be developed or used, and any advantage over existing methodologies, instrumentation, or interventions.
- Explain any refinements, improvements, or new applications of theoretical concepts, approaches or methodologies, instrumentation, or interventions.

(c) *Preliminary Results*

This section presents results from the student's work in the advisor's lab, relevant to the *Specific Aims* of the proposal. Figures and/or Tables may be included. Text in Tables, Figures, and Figure Legends may be smaller than 12 point but should be easily legible.

(d) *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 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.

Literature Cited (2-3 pages)

This section is to provide a complete list of all literature that is cited in the text of grant proposal. It should consist of no more than 60 references. Each reference should include the names of all authors, as well as the full title of the article, in addition to the title of the journal/book, volume, page numbers, and year of publication. Follow the format used in a leading journal in the field.

GRADUATE ADVISORY COMMITTEE

A graduate advisory committee is created specifically for each Ph.D. and Tech Masters student. The members of this committee serve two roles. Firstly, they act as advisors, helping the student to assess research questions and to overcome problems associated with the research. Secondly, the members assess the student's progress. Committee members are intended to be active participants in all stages of the research project, and students are encouraged to draw on their professional expertise and judgment.

The Director of the Ph.D. Program will appoint the chair each of the graduate advisory committees. The chair must also be a member of the departmental Graduate Education Committee. Membership of the committee includes the chair of the committee, the student's advisor and at least three other faculty members: two must have primary or secondary appointments in Physiology and Biophysics; one must have a primary appointment outside of Physiology and Biophysics. The student and his/her advisor will submit a recommendation of the composition of the committee to the Director of the Ph.D. Program who will make the appointments. A quorum for any thesis committee meeting requires the presence of the advisor and at least three other committee members.

For Ph.D. students, the first committee meeting must be held before the end of the Spring Semester of Year 2. Subsequent meetings must occur every six months unless the committee feels that a shorter interval is desirable. For Masters Plan A students – either Tech Masters or Medical Masters – there are only two scheduled meetings of

the committee. The first meeting must be held before the end of the first term of research (to evaluate the thesis proposal) and the second to evaluate the completed thesis. At this second meeting, the student presents his/her thesis research to the committee in both an oral and written format. Two weeks before these meetings, the MS students should provide their thesis committee with their thesis proposal/completed thesis.

For Ph.D. students, one week prior to the graduate advisory committee meeting, the student must provide a brief report (~2 pages) to the Educational Program Coordinator, who will then see that it is distributed to all members of the committee. This report must contain the student's name, that days date, a brief description of the background and significance of the proposed work, the hypotheses being tested, the specific aims, the experimental approach, pertinent experimental results (data), any conclusions, and future plans. If the student's report is not received by the faculty one week before the meeting of the advisory committee, the meeting must be rescheduled.

Thesis committee meetings are to last no more than 1 hour total duration. Each committee meeting is to be conducted in several stages: 1) brief opening discussion of student progress led by the student's advisor (without the student present); 2) presentation by the student of new research findings (approximately 15 min); 3) committee discussion with the advisor present (without the student); 4) private committee deliberation (without the advisor or student present); 5) closing discussion with student alone - verbal discussion of committee report with student, 6) transmission of written report (prepared by the Chair of the Advisory Committee) to the student, all committee members and Jean Davis.

The student presentation is a talk that is limited to approximately 15 min. It must include a title, a schematic description of the experimental system, the physiological and pathophysiological importance of the work, the hypotheses that are being tested, the experimental methods being used, any results obtained, conclusions, and future directions. Faculty members are allowed to stop the student during the presentation to ask questions.

The student's write-up to the committee, the recommendations of the committee, and a record of the thesis meetings will be maintained in the student's official departmental file.

GUIDELINES FOR DISSERTATION/THESIS RESEARCH

Dissertation/thesis research should be the primary focus of students once they have chosen a laboratory in which to complete their research. Although the actual writing of the dissertation/thesis may be some years off, students should bear in mind the following guidelines during the formative stages of their project.

Goals for Graduate Students:

- Students must develop, with their advisor, a research project that yields a coherent and original body of work.
- The dissertation/thesis must be written in a scholarly manner with a detailed historical introduction and a critical discussion.
- The dissertation/thesis must be the original and individual effort of the student. The final version submitted to the Graduate Advisory Committee should be a polished document developed in consultation with the mentor.
- In the written dissertation thesis, dissertation defense, and dissertation seminar, students should demonstrate expertise in their field of research.
- Before the dissertation seminar and oral dissertation defense can be scheduled for the Ph.D., students must have a minimum of one (1) first author manuscripts published or accepted for publication in a peer-reviewed journal and have a second manuscript ready for submission or in submission. The student must also have the approval of their graduate advisory committee to start writing the dissertation. The student will schedule a meeting of their Graduate Advisory Committee for the purpose of reviewing the student's body of work. It must be emphasized that the publication of 1 first-authored manuscript and preparation of a second manuscript ready for submission or in submission is only one of the requirements for the Ph.D. At this meeting, for the student to be given permission to start writing their dissertation, the graduate advisory committee must determine that: 1) the student's body of work is adequate for the Ph.D.; 2) the student is ready to defend their dissertation; 3) the student has satisfied all departmental and university requirements for the Ph.D., AND; 4) the student has a GPA > 3.0. It is the student's responsibility upon approval of the graduate advisory committee, to schedule the thesis seminar and the oral defense with the School of Graduate Studies. At least two weeks before the scheduled oral dissertation defense, the student must provide a final copy of their thesis (approved by their advisor) to all members of the graduate advisory committee.
- Students should seek opportunities to present data generated in the course of their graduate research at one or more national or international meetings.

Role of Training Faculty:

- The 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 advisor, in conjunction with the graduate advisory committee, is responsible for developing and implementing a training plan with the student, including the elaboration of an independent research project.
- The advisor is responsible for providing the physical, financial, and intellectual resources necessary for completing the research plan.
- The advisor should work regularly with the student to develop strong communication skills, both oral and written.

- The 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.

Residency Requirement

Before a student may graduate, they must meet the University and Department residency requirements. The University's Graduate Student Handbook states that:

“Graduate students are considered to be in residence when they are fully engaged in academic work.” ... “Regardless of the nature of the work, the student's regular presence at the university is expected during fulfillment of the residency requirement.”

Although University rules require a minimum of six semesters of residency, the Department of Physiology and Biophysics requires continuous residency and registration for PHOL 701 until successful completion of the oral defense. Exceptions to this policy may be considered by the Graduate Education Committee but only in rare circumstances and only upon the request of the student's graduate advisory committee. Students who leave the *University* before all Ph.D. requirements are met put themselves at risk of not being able to return to complete these requirements should thesis concerns or manuscript issues arise that require additional bench work. Exceptions to the residency policy are therefore considered highly undesirable and will not be granted lightly. Outside employment by full-time Ph.D. candidates during residency is not permitted unless explicitly approved by the Graduate Education Committee. For part-time students (Tech Ph.D.) students, employment should be limited to the host laboratory. Cases in which students hold outside employment will be referred to the Graduate Education Committee and may lead to dismissal from the program.

It is the responsibility of the graduate advisory committee to approve (or not) the shift in a student's priorities from conducting experiments to writing the dissertation. How long it takes each student to reach this point will vary. However, it is expected that after five years of enrollment, the project should be complete, or very nearly so. Moreover, students who are 5 years past their advancement to candidacy must petition the School of Graduate Studies for permission to register and continue in the program. Forms that must be filed for students who are 5+ years after advancement to candidacy status to petition to register are available online (<http://www.case.edu/gradstudies/current-students/forms/>). Therefore, for a student to continue enrollment and receive a stipend beyond the fifth year, the student and advisor must agree upon a well-defined plan for concluding the dissertation and have it approved by the Graduate Education Committee. This plan should concisely describe progress to date, the specific tasks (experiments, manuscripts, etc.) to be completed, and a realistic estimate of the time that will be required to finish. The Graduate Education Committee will continue to monitor the student's progress until

graduation and take appropriate action if the dissertation is not completed in a timely fashion.

Graduation procedures:

In order to graduate at the end of any given semester, there are certain forms that must be completed and submitted to the School of Graduate Studies by a particular date. If these forms are not received by the Graduate School by these dates, a student cannot graduate until the next semester. Specific dates for a given semester can be found on the School of Graduate Studies web page (<http://gradstudies.case.edu/current/calendars/calendar.html>).

ACADEMIC INTEGRITY

The importance of this topic cannot be over-emphasized. The goal of the scientist enterprise is to carry out original work, and 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 Office of Research Integrity (ORI), which is the regulatory arm of the National Institutes of Health, considers plagiarism "...the theft or misappropriation of intellectual property and the substantial unattributed textual copying of another's work".

"Substantial unattributed textual copying of another's work means the unattributed verbatim or nearly verbatim copying of sentences and paragraphs which materially mislead the ordinary reader regarding the contributions of the author." This and other ethical issues will be covered in IBMS 500 (On Being a Professional Scientist: Ethics and Biomedical Research). More information may also be found by visiting the ORI website at <http://ori.dhhs.gov>.

Other issues concerning research ethics, such as suspected fraud or falsification, mis- or selective presentation or interpretation of data, are best initially discussed in private with the parties concerned, and should this fail, with the Director of Graduate Studies.

The School of Graduate Studies Handbook – page 2 -

(http://gradstudies.case.edu/webfm_send/100) contains the following Statement of Ethics:

"Universities seek to preserve, disseminate, and advance knowledge. At Case, as elsewhere, we recognize that to fulfill these purposes requires a norm of expected conduct shared by all in the University community, governed by truthfulness, openness to new ideas, and consideration for the individual rights of others, including the right to hold and express opinions different from our own. The University's mission rests on the premise of intellectual honesty in the classroom, the laboratory, the office, and the solitary examination desk. Without a prevailing ethic of honor and integrity not only in scientific pursuits but also in all scholarly activity,

the very search for knowledge is impaired. In these respects, each of us—especially but not exclusively faculty — must regard ourselves as mentors for others.

These principles we strive to uphold make it possible for the larger society to place trust in the degrees we confer, the research we produce, the scholarship we represent and disseminate, and the critical assessments we make of the performance of students and faculty, as well as judgments of staff and administrators. To safeguard the standards on which we all depend, each of us must, therefore, accept individual responsibility for our behavior and our work and refrain from taking credit for the work of others. The culture of a university also requires that the rights of all be protected, particularly by those entrusted with authority for judgment of the work of others.

The University being a human community is subject to human failings, ambiguities, and errors. It is, therefore, the responsibility of the bodies regulating the affairs of faculty, students, and staff to maintain processes for judging and resolving instances where these principles may have been violated. However, all such systems depend for their effectiveness, in turn, on the acceptance of common norms of contact—the ties of trust which bind the university community together.”

More on this topic can be found on page 20 of the School of Graduate Studies Handbook.

The CWRU School of Graduate Studies has a detailed list of Procedures and Rules that will be followed should there be an allegation of a breach in academic ethics. This document is found at: <http://gradstudies.case.edu/downloads/AcadInteg.pdf>

FACULTY RESPONSIBILITIES:

The Faculty should take whatever steps are reasonably necessary to discourage academic dishonesty. During the administration of examinations, the faculty member or one of their designated proctors must be present at all times within the examination room to monitor the process. It is recommended that more than one proctor be present, but it is required that one be monitoring the test at all times. It is the responsibility of the Faculty or the designated proctor to ensure that no students are seated adjacent to each other and that all backpacks, handbags, and jackets are placed at the front of the room before each examination, and that those items are monitored throughout the exam. If a cell phone is discovered to be turned on and located on a student’s person, it is the responsibility of the Faculty to confiscate and hold that phone until the examination is complete. If a student takes a break from an examination to use the bathroom or for any other reason, any cell phones or other communication devices should be held by the proctor until the student returns. Above all, the Faculty or designated proctor is responsible for monitoring the exam room throughout the examination for signs of cheating or misconduct.

STUDENT RESPONSIBILITIES:

It is the responsibility of the Student to take whatever steps are reasonably necessary to discourage academic dishonesty or any violation of the Case Western Reserve University ethical standards. It is the responsibility of the student to ensure that cell phones and other communication devices are turned off during the examination. It is the student's responsibility to not communicate in any way with other students during the examination unless under the supervision of the proctor. If a student suspects misconduct on the part of another student taking the exam, s/he should immediately notify the responsible Faculty member or proctor.

SEMINARS AND JOURNAL CLUBS

The departmental seminars and journal club are considered invaluable components of a student's training experience. These activities provide students (and faculty) with opportunities to learn about the cutting edge of science. In some cases this will be directly relevant to the student's own research interests. In other cases, the subject matter may seem far afield, but these are often times the experiences that are most influential. In order to gain a meaningful perspective and learn how to achieve one's own research goals using the best approach, it is important to be exposed to a wide range of techniques and disciplines. It is for that reason that a great deal of emphasis is placed on not just attendance but active participation in seminars and the journal club.

PHOL 701 Credit

Journal club and Departmental seminar attendance are required components of Thesis Research (PHOL 701). Adequate research progress and performance at thesis committee meetings are also expected. Failure to meet these requirements will result in a grade of "U" (unsatisfactory) for PHOL 701. The Department considers this the same as receiving a grade of "C". A student who receives an unsatisfactory grade in PHOL 701 will be expected make up the deficiency during the next semester. The student must register for any make up credits in addition to the normally required PHOL 701 credits. These extra credits will not be paid for by the Department. The student will be expected to pay the cost of retaking the deficient PHOL 701 credits.

Please note that the graduate college requires that a PHOL 701 grade of unsatisfactory be successfully repeated during the subsequent semester - failure to do so results in dismissal. An unsatisfactory grade "U" in PHOL 701 will remain permanently on a student's transcript and the credits cannot be counted toward the total of 18 credits of PHOL701 required for graduation. The student will also be placed on probation.

Seminar Requirements

All Ph.D. and Tech Masters students are required to attend at least 75% of the Monday Physiology and Biophysics seminars (4:00- 5:00 PM in E-501). In addition, students are expected to attend ALL Physiology and Biophysics dissertation seminars. Students are also expected to attend the Department's annual *Frontiers*

Seminar. For all students, seminar attendance is required for PHOL 498 credit during the first two semesters of the program. For Ph.D. and Tech Masters students, attendance is also required for a Satisfactory grade in PHOL 601 in the third semester and PHOL 701 credit for all subsequent semesters. Unexcused absences are not permitted. Students are expected to notify the Director of the Physiology Seminar if they are unable to attend a seminar in any given week. Failure to attend at least 75% of the required seminars will result in a grade of “U” or unsatisfactory (see above). Ph.D. and Tech Masters students are required to submit a report to the Educational Program Coordinator by the first of each month listing for each week of the month the: 1) Date of the seminar attended; 2) Name of the person presenting the seminar; 3) Title of the seminar. Students are on their honor to report this information accurately. Inaccurately reporting seminar attendance will be considered a serious breach of research ethics and will result in disciplinary action that could include expulsion of the student from the program. MS students taking the course over the Internet should send the Director of Physiology Seminars a list of seminars they have watched online (either as a live stream at: <https://connect.case.edu/physiology> or as a recorded seminar on Blackboard) immediately after the last required seminar of the semester.

Graduate Student/Post-Doc Seminar Series

Graduate students and Post-Docs at all stages of their training are encouraged to participate in this monthly seminar series organized by the graduate students. No faculty are invited to these seminars which are intended as informal talks where students can share with other students the results of their research efforts.

Journal Club Requirements

Ph.D. students are required to attend the Departmental Journal Club as soon as they enter the graduate program, though during the first two semesters they are not required to make presentations or lead the discussions. Participation in the Journal Club is required to receive credit for PHOL 498 in the first two semesters, PHOL 601 credit in the third semester and PHOL 701 credit in subsequent semesters.

PROFESSIONAL DEVELOPMENT

In addition to the requirements described above, students are encouraged to participate in other activities, many of them student-run, in order to further their professional development. Some examples are listed below.

Departmental Committees

Student representatives are encouraged to participate in many Departmental committees. This includes, for example, the seminar committee, where students are given the opportunity to host seminar speakers of their choosing. In the fall of each year, the students should elect one of the advanced graduate students to serve as the student representative to the Graduate Education Committee.

Departmental Retreat

The Department sponsors an offsite retreat every other year. In odd-numbered years, this includes two full days (and evenings) of scientific presentations in a relaxed and friendly atmosphere, usually held at a nearby state park and conference center. In even-numbered years, this includes a single day of activities at a site down-town Cleveland. Activities involving students, postdoctoral fellows, and faculty encourage collaboration and foster collegiality among all members of the Department. Attendance is required of ALL physiology graduate students. Special arrangements will be made for Internet students.

Biomedical Graduate Student Symposium

The Biomedical Graduate Student Symposium at CASE is an annual meeting organized and led by a student-run committee. It is designed to promote and recognize the exceptional biomedical science research accomplishments of graduate students at Case Western Reserve University and to encourage dialogue between students of diverse interests and fields. We advise that all Physiology and Biophysics students participate in this symposium.

Research ShowCASE

This annual event is an opportunity for faculty, researchers, undergraduate and professional/graduate students and postdoctoral fellows from CASE and its affiliated research institutions to display their latest research. Affiliated research institutions include the Cleveland Clinic Foundation, the Louis Stokes Veterans Affairs Medical Center, the MetroHealth Medical System and University Hospitals of Cleveland.

Graduate Student Senate

"The Graduate Student Senate (GSS) is a representative government for graduate students pursuing advanced degrees in the School of Graduate Studies at Case Western Reserve University. The GSS serves as a forum of graduate students whose focus is to meet, discuss, and take action on academic, social, and professional affairs. The GSS actively represents students' individual and collective interests by pledging to lobby faculty and university administrators on their behalf. All departments under the School of Graduate Studies are afforded senators who regularly attend monthly general assembly meetings of the GSS and help shape university policies directly affecting graduate students through their dialogue with the university administration. All graduate students are members of the GSS and all are welcome to attend its meetings, forums, and sit on its committees."

The Department of Physiology and Biophysics also has its own student organization for both graduate students and post-doctoral fellows called the Graduate Professional Council of Representatives (GPCR). The GPCR: 1) maintains and develops an intellectually stimulating atmosphere and a high level of academic excellence; 2) promotes and maintains the exchange of information between students and faculty; 3) acts in the best interest of the department and student body, providing a representative voice through which student's opinion may be expressed. GPCR

activities, including their monthly Students and Science Luncheons, will be announced throughout the year.

The GPCR is much more than just a group of people that want to talk to faculty once in a while. Membership is composed of people who want to play an active role in developing our department and solving problems which face us as graduate trainees. This is achieved through representation on a number of departmental committees (New Student Orientation Committee, Seminar Committee, Admissions Committee, Publicity Committee) and interdepartmental organizations (Women in Science, Graduate Student Senate). Any student who is interested in working on some aspect of the department (public outreach, etc.) is welcome to work with the GPCR to make positive change to our department.

Communication & Representation

Please contact any of the representatives with ideas/issues and/or to become involved:

GPCR Coordinators: Amrita Samanta (axs958@case.edu)

Graduate Student Senators: Amrita Samanta (axs958@case.edu)

Postdoctoral Representative: Adjunct Instructor Dr. Jessica Berthiaume (Jessica.berthiaume@case.edu)