

Case Western Reserve University School of Medicine Biochemistry Ph.D. Program Student Handbook

The Ph.D. program helps students become productive research scientists. Three types of education are provided: First, coursework and seminars provide a framework of current knowledge. Second, both mental and manual research skills are honed by thesis research when students plan projects, carry out experiments and disseminate the results through publications and presentations. Finally, communication skills are developed through presentations in journal clubs, laboratory group meetings, seminars, prethesis committee meetings, and local, national, and international meetings.

Getting Started

Students enter the Biochemistry Ph.D. Program through the Biomedical Sciences Training Program (BSTP) or Medical Scientist Training Program (MSTP). When students join the Biochemistry Ph.D. Program, they should contact the Graduate Program Director (GPD; Dr. Hung-Ying Kao) and the Graduate Education Coordinator (Ms. Cynthia Ernst) as soon as possible and meet with them to discuss the academic and administrative details of joining the program.

The School of Medicine holds a “White Lab Coat” ceremony on the Friday before fall classes begin for incoming Ph.D. students. MSTP students participate in this ceremony in the year they join the Biochemistry Program.

Students who plan to work in a research lab must complete lab safety training offered by CWRU's Environmental Health and Safety program before they can begin work. They should consult with the GPD and the Education Coordinator to determine what training they need. The times and locations of classes are listed on the Environmental Health and Safety website (www.case.edu/ehs).

Students register for courses using the online Student Information System (SIS; sis.case.edu). Registration must be completed before the start of the semester. Late fees, which are the responsibility of the student, are assessed after classes start. The first two weeks of the semester are the Drop/Add period. Students can change their registration during this time freely and without penalty. The academic calendar (case.edu/registrar/dates-deadlines/academic-calendar) lists these dates for each semester.

Coursework

The Ph.D. degree requires research, the qualifying exam, and coursework. In the first year, about 50% of the student's time is devoted to coursework and 50% to laboratory time; in the second year is only about 25% to coursework. In subsequent years students spend more than 90% of their time working on their research.

The Graduate School requires 36 credit hours of coursework (24 graded) and 18 credit hours of BIOC 701 for the degree. Students who enter the Ph.D. program with an MS degree in biological sciences or who transfer from another CWRU graduate program can request that up to 12 graded credit hours of previously completed graded graduate courses be transferred. To request transfer credits for a completed graduate course taken outside CWRU, the student must provide a detailed

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course syllabus and specify an equivalent CWRU graduate course that is accepted in the Ph.D. program. The department's Graduate Education Committee will evaluate the course credit transfer request and make a final decision.

For BSTP students, courses in the first semester are taken under the direction of the BSTP. All subsequent courses are taken after they join the Biochemistry Ph.D. program. In the first semester, students take IBMS (formerly CBIO) 453, 455, 450, and 456. They also carry out laboratory rotations (as IBMS 400) to help choose a thesis advisor. After the first semester, students must take six additional graded classes (16 hours minimum); at least three of the six courses need to be in Biochemistry. One of these classes must be BIOC 412 or BIOC 434. Students select their courses in consultation with their advisor and thesis committee to acquire the knowledge required for their thesis research. For students with an MS or M.D. degree, course requirements will be determined on a case-by-case basis by the Graduate Education Committee. The goal is to choose graduate courses that provide training in biochemistry, molecular biology, cell biology, structural biology.

For students in the MD/Ph.D. program, the first two pre-clinical years are considered the equivalent of the first semester IBMS classes. Other course requirements for the Ph.D. degree are as discussed above.

Students who have not advanced to candidacy must register for at least 9 credit hours per semester (fall and spring) to be considered full-time students. Students who have advanced to Ph.D. candidacy register for at least one credit hour of BIOC 701 (see below). Students register for RSCH 650 (precandidacy) or 750 (advanced to candidacy) for 0 credit hours in the summer semester.

<u>Curriculum for the Biochemistry Ph.D. program</u> For students entering through the BSTP	
<u>Year 1, Fall</u> IBMS 453 Cell Biol (3) [†] IBMS 455 Molecular Biol (3) [†] IBMS 456 Nobel Biomedical Research (1) [†] IBMS 450 Fundamental Biostats (1) [*] BSTP 400 Research Rotation (1) [§]	<u>Year 1, Spring</u> BIOC 412 Proteins & Enzymes (3) [*] BIOC elective (3) [*] IBMS 500 RCR (1) [§] BIOC 601 Research (2) [§]
<u>Year 2, Fall</u> BIOC 434 Structural Biology (3) [*] BIOC 601 (3) [*] BIOC 611 Seminar (1) [§] BIOC elective (2) [*] (PHRM 526 (2) [*])	<u>Year 2, Spring</u> BIOC 601 (3) [§] BIOC 641 Qualifying Exam (2) [§] BIOC 612 Seminar (1) [§] BIOC elective (3) [*]
<u>Year 3, Fall</u> BIOC elective (3) [*] BIOC 701 Dissertation Research (3) [§]	<u>Year 3, Spring</u> BIOC elective (3) [*] BIOC 701 Dissertation Research (3)

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<u>Subsequent semesters</u> BIOC 701 Dissertation Research (to reach 18 credits)	*Graded Course (≥ 24 credits) §P/F Course (36 cr. required)
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BIOC 701: Students take this course if they have advanced to Ph.D. Candidacy (see below). Once a student registers for Dissertation Research (BIOC 701), they must continue to take this course every fall and spring semester. So long as a student is registered for at least one credit hour of BIOC 701, they are considered full-time. Students must take 18 credit hours of BIOC 701 to complete the degree; *they should plan to take their final credit hour of this course in the graduation semester*. Any hours accumulated beyond 18 are an unnecessary tuition expense. Students can take 1-9 hours of BIOC 701 in any semester.

For students transferring from the MS program, BIOC 500, 502, 511, and 601 credits are not transferrable. The required courses are the same as that required for the BSTP, except that IBMS 456 and BSTP 400 are electives. Transferred students will not receive an MS degree, regardless of when they transfer to the Ph.D. program.

<u>Curriculum for the Biochemistry Ph.D. program</u> <u>For students entering through MS transfer</u>	
<u>Year 1, Fall</u> IBMS 453 Cell Biol (3) [†] IBMS 455 Molecular Biol (3) [†] IBMS 450 Fundamental Biostats (1) [*] BIOC 601 Research (2) [§] or PHRM 526 (2) [*]	<u>Year 1, Spring</u> BIOC 412 Proteins & Enzymes (3) [*] BIOC 641 Qualifying Exam (2) [§] IBMS 500 RCR (1) [§] BIOC 601 Research (3) [§]
<u>Year 2, Fall</u> BIOC 434 Structural Biology (3) [*] BIOC701 Dissertation Research (2) [§] 611 Seminar (1) [§] BIOC elective (3) [*]	<u>Year 2, Spring</u> BIOC701 Dissertation Research (3) [§] BIOC elective (3) 612 Seminar (1) [§]
<u>Year 3, Fall</u> BIOC elective (3) [*] BIOC 701 Dissertation Research (3) [§]	<u>Year 3, Spring</u> BIOC elective (3) [*] BIOC 701 Dissertation Research (3)
<u>Subsequent semesters</u> BIOC 701 Dissertation Research (to reach 18 credits)	*Graded Course (≥ 24 credits) §P/F Course (36 cr. Required)

Grades

According to the Graduate School's regulations, Ph.D. students must have a B average (GPA ≥3.0) to graduate. A or B are passing grades for BIOC 434 or 412 and other Biochemistry courses. A grade of C is not acceptable, and the student must repeat the course. Passing grades for all other courses are A, B, C, or S. Research and seminar courses are satisfactory/unsatisfactory (S/U). If the course in which a grade of C was obtained is not offered the following year, an alternate course

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can be taken at the discretion of the Thesis Committee.

Planned Program of Study

The Graduate School requires students to submit a Planned Program of Study (PPOS) through SIS by the end of their first year in the program. The PPOS contains all the courses the student plans to take to complete the degree, including courses already taken and planned courses. The PPOS is a planning document; students can change their plans and register for other courses. After the PPOS is submitted, the mentor reviews and approves it. Students can update their PPOS at any time. The revised plan must also go through the approval process. Instructions for submitting a PPOS are at case.edu/gradstudies/current-students/planned-program-study. *Graduate Studies puts a hold on the accounts of students who have not submitted a PPOS in time, which prevents the student from registering until a PPOS is submitted.*

The Pre-Thesis Committee

Within 6 months of joining the Biochemistry Ph.D. program, the student and their faculty mentor must select a Pre-Thesis Committee (June 30 for Ph.D. students; January 1 for MD/Ph.D. students). The committee must have at least four faculty members. It should include at least two members of the Biochemistry Program Faculty, one of whom is the thesis advisor. At least one member must be from outside the program. The committee chair must be a member of the primary faculty of the Biochemistry Department who is not the thesis advisor. MSTP students will select a committee that follows the more complex requirements of their program. Committee members should have expertise in the student's area of research, so they can provide constructive suggestions and supervision of the thesis research. As the student's work evolves, adding or substituting committee members may be appropriate, so the committee has the appropriate expertise.

The pre-thesis committee monitors the student's academic and research progress. It also provides advice and is a resource for planning and evaluating experiments. They are also a source of advice about career planning. The committee decides when the student has completed enough work to earn the degree and can help moderate issues between the student and mentor. This committee (without the thesis advisor) will be the examining committee for the student's Ph.D. qualifying examination. The committee also serves as the examining committee for the student's dissertation defense.

Prethesis committee meetings—The committee must meet at least twice each year. One meeting is usually held on the day of the student's annual seminar on the Biochemistry Program (see below). Students must have at least one committee meeting before they write and defend their qualifying exam. Because it can be challenging to find the time when all committee members can attend, meetings can be held with one member absent.

The student must submit a report to the committee at least one week before the meeting. The report provided for the committee meeting that is held when the student gives the annual seminar to the program should be at least 3 pages (single-spaced) and an appended unofficial transcript.

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This report must discuss the following topics:

- First page
 - updated 1-page specific aims for the student's research project
- Second page
 - ½ page, summary of progress and challenges during the past six months, or since the previous committee meeting
 - ½ page, summary of the committee's recommendations from the previous meeting and how the student has addressed them
- Third page
 - describe goals (research, papers, meetings, courses) planned for the next six months (until the next committee meeting)
 - provide a plan and timeline to complete thesis research
 - explain how the student has been meeting the PhD program expectations:
 - attending Biochemistry seminars regularly
 - attending scientific meetings/workshops
 - describe future career plans
- Appendix 1: unofficial transcript
- Appendix 2: detailed research update can be included as a separate Powerpoint presentation

A thorough presentation of these issues is important for completing an outstanding thesis in the shortest possible time. In the spring of the second year, when the student completes the qualifying exam (see below), the student submits the proposal for the exam instead of the normal prethesis report (see below).

During the prethesis committee meeting, the student usually makes a short presentation highlighting key results, experimental problems, and plans for future work. The meeting must also include a brief session with the mentor without the student present and a brief session with the student without the mentor present. These separate meetings provide an opportunity for a frank discussion of the student's progress and their relationship with the mentor.

Students and mentors should use the prethesis committee as a resource to help guide the project. Students should seek the committee's opinion about important decisions, including solving experimental problems, choosing the direction of the research, finding collaborators, making career decisions, and deciding when the student has enough research accomplishments to complete the degree.

At the conclusion of the meeting, the committee completes the Prethesis Committee Meeting Report Form (Appendix 1). The committee chair also writes a report summarizing the meeting

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and shares it with the student and committee members (usually several days after the meeting). This report must contain the committee's assessment of the student's work and expectations for work in the coming months. The student is responsible for i) bringing a copy of the form to the committee meeting and ii) making sure that the completed form, the student's report to the committee, and the chair's report are given to the Education Coordinator so they can be added to their file in the Biochemistry office.

Qualifying Exam

The qualifying exam consists of written and oral components. Students who enter through the BSTP will complete the exam in the spring semester of the second year. MSTP students will complete the exam during their first year in the Ph.D. program. Students transferring from the Biochemistry MS program will complete the exam in the spring semester of their first year in the Ph.D. program. Students write a comprehensive research proposal on their thesis topic in the format of an NIH F31 fellowship research grant application (NRSA, <https://www.nlm.nih.gov/ep/NRSAFellowshipGrants.html>). Three successful samples can be found on this link (<https://www.niaid.nih.gov/grants-contracts/three-new-f31-sample-applications>). The goal of the exam is to give the student the opportunity to explore the thesis topic in-depth, read the relevant literature, and gain experience in planning a research project. Appendix 2 contains a detailed description of the exam document and the examination process. The format for the proposal is as follows:

- No spacing, Arial font, size 11 for the main text and 8 for figure legends
- Project summary/abstract (30 lines)
- Narrative (3 sentences)
- Specific Aims (1 page)
- Research Strategy (6 pages)
- Applicant's background and goals for a) next 6 months (i.e. until next meeting, b) rest of PhD, and c) after PhD (1 page)
- Reference
- If you do not have preliminary data, you can use ones in the literature with a citation

The student presents their proposal to the examining committee in an oral exam. The examining committee consists of at least three members of the student's prethesis committee, but not the advisor. The student should be familiar with the areas of biochemistry that are related to his/her research proposal topic. The defense will focus on the feasibility, experimental design, and interpretation of the expected results. The possibility of alternative experimental outcomes in the project will also be discussed.

Students will receive a grade of Pass, Fail, or Provisional Pass. The latter is a common outcome. In this case, the committee provides the student with a critique highlighting parts of the proposal that need to be strengthened. The student makes the requested changes and submits a revised document to the committee. The committee will then make a final decision (Pass or Fail). The

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student must bring the report form (Appendix 3) to the exam and give the completed form to the Education Coordinator for inclusion in their file.

Most students pass their qualifying exam in the spring semester of their second year. Those who fail to pass are given a second attempt in the fall semester of their third year. Students who fail to pass the qualifying examination on the second attempt will leave the program with an MS degree after completing Exam 600.

Students are strongly encouraged to rework their proposal for the qualifying exam into an application for an outside pre-doctoral fellowship, with help from the mentor and the pre-thesis committee.

Candidacy for the Ph.D. Degree

The graduate school requires admission to candidacy for the Ph.D. degree. Biochemistry students advance to candidacy by passing the Qualifying Exam. Most Ph.D. students meet this milestone in the spring semester of the second year; MSTP students complete the exam in the spring of their third year in the MSTP. To advance to candidacy, students complete the form (case.edu/gradstudies/current-students/forms), give a copy to the Education Coordinator, and return the original to the School of Graduate Studies. Once a student has advanced to candidacy, they must register for BIOC 701 every semester to accumulate the hours needed for graduation.

Relationship Between Student and Mentor

The student and mentor work together closely as the student completes the thesis. This relationship plays an important role in the student's personal and professional development. Consequently, it is important that the student and the mentor have a highly interactive, open, and honest relationship. It is also important for the student and mentor to devote significant effort to the student's project and development as a young scientist. To this end, the program endorses the *Compact Between Biomedical Graduate Students and Their Research Advisors* from the Association of American Medical Colleges (Appendix 5). We encourage students and mentors to read and discuss this document when a student chooses a mentor.

Thesis Research

The thesis research should be the student's primary focus once they have chosen a mentor. This research must represent a significant contribution to existing knowledge in the student's field. Performing the research provides the student with an opportunity to master research techniques and hone technical skills. More importantly, the student will learn about formulating and testing hypotheses, making scientific presentations, and publishing their work. These represent key skills for future work as a scientist. Because scientific research is a highly interactive endeavor, the thesis research will be a collaborative effort between the student, the mentor, other members of the mentor's lab, the pre-thesis committee, and collaborators at CWRU and outside the university. Forming and using collaborations is also a key skill for all scientists.

As proof of their accomplishments and to acquire skills in preparing and publishing research, all

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students must have at least one first-authored research manuscript in a peer-reviewed journal. This work must be published or in press. In recent years, students in the program have averaged 2.4 first-author papers and 5 total referred publications. Consequently, the publication requirement should be viewed as a minimum, not the goal for graduation.

Students need two papers as a co-first authors to meet this requirement. In some circumstances, students may be allowed to use one co-first-author paper to meet this requirement if the student's contributions to the article could have been a first-author publication in a different journal. The thesis committee and the Graduate Education Committee will make the decision.

The Ph.D. Thesis

The Ph.D. thesis is the culmination of the thesis research. It presents major research findings and allows students to share their growth as scientists and their scientific accomplishments. In preparing the thesis, students should observe the following guidelines:

The student must receive approval from the thesis committee before writing the thesis. Students should present an outline of the thesis to the committee 3-6 months before beginning to write. This allows discussion and agreement on the contents of the thesis while there is still time to add or change experiments. Students should consult the committee again to obtain final approval to begin writing the thesis when their research is complete.

The writing in the thesis must be the student's own work. However, students are strongly encouraged to obtain advice and comments from the mentor and their lab colleagues to ensure that the writing is of the highest quality and that the material is presented in a way that is thoroughly understandable to all readers.

The thesis must be formatted to follow the university's requirements. It is the student's responsibility to understand and follow these guidelines (case.edu/gradstudies/current-students/electronic-theses-and-dissertation-guidelines). The student should follow the style of a biochemical journal for references, abbreviations, etc. Choose a style for references that include the title of each article.

The thesis should contain the following chapters:

1. Introduction This chapter should present a comprehensive and scholarly review of the field of research. It should be similar to published review articles in its depth, presentation of current knowledge, and consideration of major outstanding questions. *The student is strongly encouraged to write a strong, thoughtful chapter that can be submitted for publication as a review article after minor revision.*
2. Research chapters These chapters report the findings of the thesis research, showing key data and explaining the important conclusions. The methods used for the research must also be described. Methods may be reported in a separate chapter or as a section in each chapter.

Work that has already been published may be reported in chapters that are based on the papers

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with minimal reformatting. If this is done:

- The work must be reformatted to meet the university's guidelines for margins, tables, figures, and figure legends.
- All references must be collected in a single bibliography at the end of the thesis, following the university's rules.
- Most published papers are collaborative works that contain contributions from several authors. If work from others is included in the thesis, *each figure and table must be clearly labeled to identify the collaborator's contributions.*
- The student is responsible for obtaining permission to use copyrighted work, even if they are the author.

3. Discussion and conclusions This chapter discuss the key findings of the work and a lucid consideration of their importance, as well as key unanswered questions. It should also discuss principal directions for future research. This chapter provides an opportunity for the student to summarize their work, suggest avenues for future research, and discuss how their findings will impact future research.

4. Incomplete projects Most students have research projects not complete when they graduate. It is important to leave a well-documented record so others can complete the work. The thesis advisor may request that this incomplete work be included as a chapter of the thesis as a guide for others who will continue these projects.

Thesis Review Process The student must give a complete draft of the thesis to the advisor and one other member of the pre-thesis committee (the reader) at least 6 weeks before the thesis defense. The reader will return the draft with comments within 2 weeks. This allows time for the student to incorporate the comments into the final document. This process ensures that the thesis is written to the highest standards.

Thesis Defense - During the thesis defense, the committee members will ask the candidate to discuss the thesis work, focusing on key findings, experimental problems, work for the future, and unanswered questions. This is an opportunity to explore the thesis work in the broadest context and is a way for the student to demonstrate mastery of their research, area of study, and contributions to science.

The School of Graduate Studies has procedures and deadlines for completing the degree. Students must apply for graduation, schedule their defenses, submit their dissertation in electronic form, and submit a final certification with the Graduate School (case.edu/gradstudies/current-students/graduation/doctoral-graduation). Students are responsible for knowing the deadlines, obtaining the necessary forms and signatures, and submitting the forms and documents (with support from their pre-thesis committee, the Education Coordinator, and the Graduate Program Director).

The pre-thesis committee serves as the committee for the thesis defense. Additional members

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may be added by the student and/or mentor if additional expertise is required. The thesis defense must be scheduled with the School of Graduate Studies at least 3 weeks before the defense using the *Notification for Scheduling the Final Oral Exam* form. The student must present the thesis work to the Biochemistry program in a seminar. This is most commonly presented immediately before the thesis defense. The student must provide a seminar title and schedule the defense and seminar with the Education Coordinator at least 3 weeks before the defense to allow enough time to reserve rooms and publicize the seminar.

The thesis must be distributed to the committee members at least 2 weeks before the defense. Committee members may receive the thesis on paper or in electronic form. Students are responsible for supplying a paper copy of the thesis to members who chose to read the thesis on paper!

Upon completion of the defense, committee members will sign the *Final Certification for the Ph.D. Degree* form. Usually, the committee members will give the student a list of changes that need to be made to the thesis. The committee chair will sign the form a second time after completing these changes. The student must deliver the completed form to the Graduate School. The student must also submit the thesis in electronic form, and the *ETD Document Approval Form*.

Program Seminars

The program has two weekly seminar series in the fall and spring semesters. Ph.D. students must attend both seminar series and must sign in so attendance can be verified.

Monday Ph.D. Student Seminars-Every Ph.D. student must give a seminar on their thesis research to the program every year beginning in their first full year in the Biochemistry program. The first presentation will cover the student's research proposal that has been prepared for the qualifying exam. After the seminar, there is a discussion and questions from the audience. In order to encourage student participation, Ph.D. students in the audience must ask the first questions.

After the seminar is complete, the student speaker will meet with the faculty to receive comments about the presentation of the seminar. The goal of these comments is to help students improve their presentation skills. Some suggestions for giving better talks are included in Appendix 4.

Ph.D. students in the audience provide comments about the talk. These are shared with the speaker to help them improve their presentation skills. Evaluations are submitted online at tinyurl.com/biochemistry-seminar-eval immediately after the seminar. Please remember to write polite, thoughtful comments.

Thursday Biochemistry Research Seminars-The Biochemistry Department sponsors a research seminar series. Speakers from CWRU and outside the university present their research work. Groups of Ph.D. students are invited to lunch with the speaker immediately following the seminar. These seminars are an excellent opportunity for students to meet visiting scientists, build their professional network, and expand their scientific knowledge.

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Financial Assistance to Ph.D. Students

Full-time students in the Biochemistry Ph.D. Program receive tuition and stipend support. They also receive health coverage. 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 progress toward the degree. The stipend level for 2019-2020 is \$35,000 for 12 months.

Individual Pre-doctoral Grant Support

Obtaining a fellowship can significantly enhance a student's CV, giving them a distinct competitive advantage in the academic marketplace. Students are encouraged to apply for individual grant support. The *National Science Foundation* (<http://fastlane.nsf.gov/grfp>), the *American Heart Association* (<http://www.americanheart.org>), and the NIH are common sources of such fellowships. Many funding agencies require applications to be submitted early in graduate training. Students should discuss the possibility of applying for an individual funding with their thesis advisor. *A good time to submit is in the second year when students are completing their qualifying exam; the research proposal for the exam can be reworked into a fellowship application.*

Expectations for Ph.D. Student Effort

It takes a strong commitment to earning a Ph.D. degree. The program expects students to pursue laboratory research as a full-time endeavor. To this end, students should commit at least 50-60 hours each week toward their work. Equally important, students should strive to become independent in all phases of their work, including performing experiments, interpreting data, preparing results for presentation, and choosing research questions. These challenging goals can only be achieved if students strive to attain them throughout their time in the program.

Ph.D. Student Leave

Students are entitled to vacation (2 weeks per year), sick leave, family leave, and parental leave. The program follows the Graduate School's policy (bulletin.case.edu/schoolofgraduatestudies/academicpolicies/).

Annual Review of Ph.D. Student Performance

Every year, the Graduate Education Committee reviews each student's progress. If there is evidence of unsatisfactory progress (low GPA or unsatisfactory grades in research courses (BIOC 601 and 701), the student will be placed on probation. If there is a second semester of unsatisfactory progress, the student may be separated from the Program. In case of doubt, the decision will be in the student's favor, and they will be permitted to enroll in the next semester's work contingent upon improvement over the previous year's performance. If the student is not making satisfactory progress by the end of that semester the student may be separated or offered the alternative of completing the MS degree.

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According to the School of Medicine policy, there is a time limit for completing the degree (6 years for MD/PhD and 7 years for Ph.D. students; Appendix 6). Students who do not complete their degrees by this time must file a request for an extension with the SOM Graduate Education Office and the Graduate Studies. Approval of the extension requires a meeting with the Associate Dean and two other faculty members. The School of Graduate Studies has a similar time limit: students must complete the degree 5 years after they start to take BIOC 701. Once the time limit is reached, the student can continue by submitting an extension request to the Graduate School. These rules aim to ensure students complete their degrees in a timely way and do not get "stuck" in the latter stages of their thesis work.

Attendance at Scientific Meetings

Ph.D. and MD/PhD students are encouraged to attend one major scientific meeting each year once they advance to candidacy. Making scientific presentations and building a network of scientific colleagues is a key component of students' professional development. The Biochemistry Department and mentors will provide funds for travel as available. Many scientific societies offer awards to help students attend meetings. Students are strongly encouraged to apply for these awards.

The student's attendance at meetings, including meetings, attended and plans for future meetings, must be discussed at prethesis committee meetings.

Responsibilities of Ph.D. Students

Research and scholastic achievement are most important, but the student's departmental responsibilities are also considered in evaluating a graduate student's performance. The responsibilities of Ph.D. students fall into the following categories.

- Teaching. Some students may be asked to grade homework and exams for undergraduate Biochemistry courses or hold review sessions.
- Maintaining equipment or carrying out other duties such as care of cold rooms, conference rooms, and library.
- Cooperating in maintaining all departmental equipment, conference rooms, store rooms, cold rooms, etc.
- Participating in seminars and journal clubs.
- Maintaining the laboratory bench and the laboratory in which the student works in a clean and safe condition.
- Making suggestions and plans for the general improvement of the program.
- Students are also strongly encouraged to participate in all departmental social activities (picnics, happy hours, winter solstice party, etc.).
- Participation in the annual retreat

Authorship and Credit for Work

Students must receive credit for their scientific work in publications. In a collaborative effort in which a student makes a major scientific contribution, the student's name should be the first

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author. Students should receive coauthorship for lesser contributions. Everyone who supervises the work of graduate students should work to ensure that students receive proper credit. If a student believes that a proper credit assignment has not been made, the collaborators should first discuss the questions. The dispute should be submitted to the Graduate Education Committee if an agreement is not reached.

Professional Development

Many elements of the Biochemistry program enhance students' development as professional scientists. These include the Individual Development Plan (IDP, see below), seminars, attending scientific meetings, and performing and publishing research. In addition, the program and the School of Medicine have many activities designed to enhance understanding of the opportunities for careers in science and of the responsibilities of practicing scientists. These include:

- **Responsible Conduct of Research.** Students are introduced to this topic in their first year in the IBMS 500 course. Students also need to take additional courses during their education, particularly in their 4th and subsequent years.
- **Rigor and Reproducibility.** The IBMS 450 component of the first-year curriculum assesses the rigor and reproducibility of research results. The Graduate Education Office organizes several sessions on this topic throughout the year. Students are encouraged to attend as many of these as they can.
- **Issues surrounding a career choice and the skills required to succeed** are important for success during training and after students embark on their careers. Many organizations in the School of Medicine organize talks and workshops that help students navigate these issues. These include Career Opportunities for Trainees Series (COTS) and the Professional Enrichment for Trainees Series (PETS) organized by the Graduate Education Office.
- ***Individual Development Plan (IDP).*** The Individual Development Plan is a program mandated by the NIH. Students must submit IDPs annually discussing their career goals and plans. The purpose is to help students think about and solidify their career plans. Plans are due by December of each year. The student then needs to review the plan with a faculty member of their choosing. This person can be the mentor, the thesis committee chair, or another person. These meetings are to occur prior to May 1 as well. The student is responsible for setting up all meetings and for ensuring that the completed form is placed in their file. case.edu/medicine/admissions-programs/graduate-programs/career-professional-development.

Leaving the Program After Graduation

All research materials generated during the student's research are the property of the university by the rules of federal funding agencies. Because others will use these materials in future experiments, these materials (cells, proteins, plasmids, etc.) must be cataloged and shared with others in the lab. After consultation with their advisor, the student may discard all materials that

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do not have further use. Similarly, all research records (notebooks, computer files, etc.) are the university's property. They must be cataloged and left in the advisor's laboratory. Students may make copies of their research records. All university materials (ID cards, keys, etc.) should be returned following CWRU procedures.

PRACTICAL MATTERS

Portions of this section are based on the student handbook of the Physiology and Biophysics program.

International Students

International students often face additional challenges, especially if they are first-time visitors to the US. *International Student Services* (ISS; Tomlinson Hall 143; studentaffairs.case.edu/international; international@case.edu) provides information and support for incoming and current international students. ISS assists a population of more than 1,000 international students from over 80 countries. ISS helps students obtain visas and provides help with all immigration and visa issues. They can also help with various non-academic issues (housing, personal, financial, legal) that international students may encounter during their studies at CWRU. The office has walk-in hours and also responds promptly to email requests. It is especially important for students to use their expertise in all immigration- and visa-related matters.

Health Insurance

The University Health Services (UHS, 2145 Adelbert Road) provides health coverage to our students. CWRU also has an outside insurer for the Student/Dependent Medical Plan (students.case.edu/medicalplan/); details of plan coverage can be found online. Health professionals staff UHS with interest in student health. These include physicians, nurse practitioners, psychologists, psychiatrists, social workers, and registered nurses. More information may be obtained by visiting the UHS website (<http://studentaffairs.case.edu/health>) or by calling one of these numbers:

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 should seek care through UHS before utilizing other providers because many preventive and regular well-person services can be obtained at no cost through UHS.

Dental Care

The CWRU School of Dental Medicine has dental clinics to provide training for pre-doctoral dental health professionals. Participants in the Student/Dependent Medical plan are eligible to receive free and discounted care through the School of Dental Medicine. Treatment is

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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. More information is available at: students.case.edu/medicalplan/.

University Counseling Services (UCS)

Graduate school is 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 staff of the University Counseling Services to help them gain perspective and lay the groundwork for personal change. For many, the change can become a 'Turning Point' in their lives. UCS (case.edu/studentlife/healthcounseling) offers students help with their 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. Most services are provided without cost.

220 Sears Library

Monday – Friday 8:30 – 4:30

Phone: 368-5872 (24/7)

Legal Services

The *Milton A. Kramer Law Clinic Center* at CWRU provides legal services to community members 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. Go to:

law.case.edu/Academics/Experiential-Education/Milton-A-Kramer-Law-Clinic-Center

Housing

Most graduate students elect to rent housing in one of the many nearby neighborhoods. The University Housing office publishes the *Off-Campus Housing Bulletin* (my.case.edu/OCHB/Search.aspx, which contains apartment and house 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. Many neighborhoods also have housing offices and guided tours of available rental properties. Contact local city governments for further information. Another alternative is the Steiner House Cooperative, a student-run organization offering to house graduate students (steinerhouse.org).

Parking

The *Parking Services* (case.edu/parking) manages the University's parking program. All commuter students are eligible for parking permits upon enrollment. Students who need

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parking should contact *Access Services* (368-2273, parking@case.edu, lower level, Crawford Hall). Most graduate students park in surface lots or the Veale Garage (S-53), which are the most cost-effective lots nearest the School of Medicine.

Shuttle Services

Many free shuttle bus routes serve the campus, University Circle, and some neighborhoods in Cleveland Heights. Visitors may use UCI's public routes to reach various University Circle institutions. Service is provided approximately 18 hours daily, Monday through Friday, with reduced service on weekends and holidays. Bus route schedules and maps are available at (case.edu/access-services/transportation/shuttles). There is also an app for mobile devices that shows the locations of buses in real-time (case.edu/access-services/transportation/shuttles/shuttle-tracking).

Safe Ride Program

This program (case.edu/access-services/transportation/shuttles/safe-ride-program) provides safe transportation around campus and the surrounding CWRU community between 7 pm and 3 am. The goal is to provide students with safe transportation late at night. You can request a pickup at saferide.case.edu or 216-368-3000.

Student Mail

Student mailboxes are located in the lunchroom (W429). Please check your box regularly for mail. Be sure to use the 9-digit zip code for the Biochemistry Department (44106-4935). Using your CWRU address for private mail or packages is not allowed.

Building and Department Access

All Medical School buildings require ID card access. Biochemistry office personnel get card access for you using University ID. Activation usually takes 24 to 48 hrs. If you have forgotten your ID or your ID will not activate the card reader, you can call the CWRU Police Department at 368-4360 or visit the security desk in the Biomedical Research Building, and an officer will be dispatched to let you in. You will need to present a picture ID.

Campus Security

The University provides various 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). Security personnel patrol the campus and respond to emergencies, fire alarms, and routine security incidents. The Police Department can be reached at 368-3333 for emergencies and 368-4630 for non-emergencies.

Case Western Reserve University School of Medicine Biochemistry Ph.D. Program Student Handbook

CWRU has a safe campus, but everyone must contribute to their safety. We strongly encourage everyone to:

- Be aware of your surroundings
- Use *Safe Ride* late at night
- Install the Rave Guardian app on your mobile device, which lets you communicate directly with CWRU police
- Sign up for safety alerts (text, email, voice). Go to getrave.com to sign up.

Computer Information and Tips for Biochemistry Students

E-mail—You must activate your CWRU net e-mail account: The University has created an email account for you. You must be able to receive mail sent to this address! We will use this address to send you information about classes, rotations, and program activities. Because this is the address published in the University directory, faculty members and other students will also use the address. You can check mail directly in this account or have it forwarded to another address (see below).

Activating your account: You should have received an email from the School of Graduate Studies that describes how to activate your account.

Your email address: Each email account can be addressed in several different ways. Your account name (e.g abc123) or firstname.lastname are accepted. You can also create other aliases (its-services.case.edu/mailalias/).

How to check your e-mail: All email accounts are run through Gmail. You can check your mail using the web (webmail.case.edu) or a separate mail client. If you already have another e-mail account that you wish to keep using, you can have your CWRU mail forwarded to that account. From webmail.case.edu, click the Settings link. You'll see a tab that lets you set up automatic forwarding of your mail. Just remember that you **must** receive mail sent to your CWRU account in a timely way.

Google Apps: CWRU provides applications from Google (G Suite) that include many useful functions. You can learn about them at case.edu/utech/help/knowledge-base/g-suite-education/g-suite-education-information.

Connecting your computer

Laptop computers can connect to the University network through a wireless or ethernet connection. Go to <https://its-services.case.edu/NetworkTools/IPDB/systemRegistrationForm.html> to get your computer registered for a wired ethernet connection. For wireless connections, use CaseWireless and log in with your network ID and password. If you use this connection, you are considered an on-campus user. You are an off-campus user for any other wireless connection (including

Case Western Reserve University School of Medicine Biochemistry Ph.D. Program Student Handbook

CaseGuest). You will need VPN to access some services, including the Software Center and electronic journals that require a subscription (see below)

The Help Desk

The university operates a Help Desk staffed with knowledgeable and helpful people. You reach the help desk in several ways: Call 368-4357 (HELP) or go to help.case.edu. They can answer most questions about computers, software, and networking. Everyone is entitled to one free walk-in visit to a help center annually.

Electronic Journals

Electronic journals can be accessed from any CWRU net computer through the Health Sciences Library. Go to case.edu/chslibrary/electronic-resources/electronic-journals on the Health Sciences Library website for a complete listing. This page will take you to sites that will let you download articles as PDF files. This is the surest way to find online journals. Other links (e.g., the ones in Pubmed that take you to the publishers' sites) do not always work because they do not recognize the University's subscriptions.

The University purchases licenses for electronic journals. Access these on campus from a wired connection or using CaseWireless. Access from off-campus requires VPN. Install the VPN client on your computer (vpnsetup.case.edu). To use the VPN client, open the software and log on with your Case ID and password using two-factor authentication. Once this is done, your computer will behave as if it were part of the on-campus network.

PubMed

PubMed is available to you over the web in lots of different ways. One favorite is pubmed.com.

Electronic Resources for Learning and Research

Many other electronic resources are available through the University library. For more information go to: <http://library.case.edu/ksl/index.html> (Kelvin Smith Library)

<http://www.cwru.edu/chsl/homepage.htm> (Cleveland Health Sciences Library). The Electronic Books link at this site contains a list of sites with texts and protocols. In addition to the obvious ones, AccessMedicine and MDConsult have introductory science textbooks.

Software

There's a lot of useful software for your personal computer that is either free or available at a greatly reduced cost. It's available at softwarecenter.case.edu. To use the Software Center, you must connect from a University ethernet connection, CaseWireless, or with a VPN connection.

Some software titles can only be downloaded once. If you start a download and cancel it, this counts as a download, so be careful!

**Case Western Reserve University School of Medicine Biochemistry Ph.D. Program
Student Handbook**

Appendices

- Appendix 1 Prethesis Committee Meeting Report Form
- Appendix 2 Qualifying Examination Information
- Appendix 3 Qualifying Examination Evaluation Form
- Appendix 4 Tips for giving better seminars
- Appendix 5 SOM Best Practices. Monitoring Student Progress and Ensuring Timely Completion of the Ph.D.
- Appendix 6 AAMC Compact Between Biomedical Graduates and Their Research Advisors

Guidelines and checklist for a Biochemistry PhD pre-thesis committee meeting

The student and committee members should follow these guidelines and at a minimum complete both the checklist below and the 2-page report form. Either the student or any committee member can bring up additional relevant topics for discussion.

Checklist

- Student should complete page 1 of the report form and email to all members of the committee at least 1 day prior to the meeting.
- Student should email other required materials (as specified in the Biochemistry PhD student handbook or by the Biochemistry graduate program director) to all members of the committee at least 1 day prior to the meeting.
- The committee chair should bring a laptop to the meeting so that they can complete page 2 of the report form during the meeting.
- At the beginning of the meeting, the committee chair should ask the student to leave, and the mentor will have an opportunity to share information/concerns with the committee.
- The committee chair will next ask the student to return and the mentor to leave, so that the student has an opportunity to share information/concerns with the committee.
- The student will be asked to return and provide an update of their research project and progress. The committee meeting discussion topics should cover all the information and questions on the report form, and include scientific and technical feedback.
 - A formal powerpoint presentation is not required if the committee meeting is immediately after the student's annual departmental seminar.
 - The student's update should include how they addressed the committee's recommendations from their previous meeting.
- The student and/or mentor should take detailed notes of the feedback and recommendations from the committee.
- After the student update, questions, and discussion, the student will be asked to leave and the committee will discuss. The committee chair should use their laptop during this discussion, and include the consensually agreed feedback, recommendations, and concerns in page 2 of the report form.
- The committee chair will ask the student to return and the committee chair will share the feedback, recommendations, and concerns.
- The chair should sign the form on behalf of the entire committee with a digital signature in the PDF. After the meeting, the chair should email the signed completed report form to the student, all members of the committee, Dr. Hung-Ying Kao, and Cynthia Ernst.

Page 1 (completed by student)

Student name:	Meeting date:
Enrollment date:	Previous meeting date:
Pre-thesis committee #:	Advanced to candidacy date:
Completed coursework? (Y/N)	Expected graduation date:
Name of committee chair:	
Names of other committee members:	
Papers (published, in press, or submitted; provide citations)	
Meetings (attended or planned within next 6 months; provide name, date, location)	
Major recommendations from last committee meeting (bullet point form):	
Long-term career goal:	

Page 2 (completed by committee chair)

Did the committee meet with the student without the advisor present?
Did the committee meet with the advisor without the student present?
Is the research project reasonable and appropriate?
Is the student's research progress appropriate?
Will the student be able to fulfill the degree requirements?
Has the student been regularly attending departmental seminars?
Has the student attended or do they have plans to attend a scientific meeting?
Was the student's IDP plan discussed?
What is the updated expected graduation date:
Committee feedback (recommendations, concerns, comments, etc. in bullet point form):

Committee chair signature confirming agreement of committee members on feedback:

Signature:

Date:

BIOCHEMISTRY PhD PROGRAM
Qualifying Examination

EXAMINING COMMITTEE: The examining committee will consist of at least three members of the student's prethesis committee, but not the advisor.

EVALUATION: The committee will grade both the written and oral components of the proposition for feasibility, knowledge, and presentation. An overall grade of "Pass", "Conditional Pass" or "Fail" will be determined by the committee. If a grade of "conditional pass" is given, specific weakness(es) in the student's performance will be identified and only that portion of the initial component of the proposition need be repeated. The committee will schedule a new completion date (usually no more than two weeks) for the additional material. In the event of a "Fail" grade, the entire proposition, both written and oral must be retaken including the choice of a new topic. The committee will recommend types of improvements which need to be made in the second research proposal which were not present in the first. Failure to pass the second proposition/qualifying exam will result in the termination of the student's participation in the PhD program. At this point, the student may obtain a Master's degree if all of the requirements for this degree are met.

Biochemistry PhD Program Qualifying Exam Report



Student: _____

Date: _____

Proposal Title: _____

	Name (printed)	Signature
Member 1	_____	_____
Member 2	_____	_____
Committee Chair	_____	_____

Please score the following areas of the proposal (Use the 1-9 NIH scale)			
	Feasibility	Knowledge	Presentation
Member 1			
Member 2			
Committee Chair			

Exam Result: **Pass** **Fail** **Conditional Pass** (Circle One)

Note: A Conditional Pass requires additional action from the student to obtain a passing grade.

Comments and/or Remedial Instructions: (comments may be attached on a separate sheet)

Seminar Tips From The Biochemistry Faculty

When students in the Biochemistry program give talks in the Monday series, faculty members share comments about the students' presentations. Based on the advice we offer to the students, we've distilled some important tips that students can use as they prepare their talks.

Choose your key conclusions. Then organize the seminar to present those conclusions

You will present lots of material in your seminar. Your audience will forget most of it by the next day. As you prepare your seminar, choose your key conclusions. Then organize your seminar to help your audience understand and remember those conclusions. Make sure you emphasize your conclusions at the end of the talk!

Design the talk for your audience

The audience in a department seminar is less familiar with your subject than your lab group. Keep this in mind when you prepare your talk. You need a clear introduction and conclusion, as well as experimental details that people outside your lab might not know. And leave your lab jargon in the lab!

Make sure your slides are easy to read

Your slides will be harder to see in the seminar room than on your computer screen. They'll seem smaller and the colors won't be as bright. Design your slides for the worst conditions you'll encounter. It's a good idea to look at your slides from the back of the seminar room ahead of time to make sure they're clear.

Prepare your slides so you can give your talk with the room lights on, which will prevent people from dozing. And remember that ~8% of males are colorblind, so make sure the key points of your slides will be clear to everyone.

Give your audience a chance to think about each slide

After you finish speaking about a slide, pause for a few seconds. This lets your audience think about what you said, look at the slide and reformulate the information in a way that makes sense to them. This helps your audience remember the important information.

Speak slowly and clearly

Many students speak quickly because they're nervous. They also tend to speed up and speak less distinctly at the ends of sentences. The last thing you say about a slide is usually the most important (your conclusion), so make sure you say it clearly! And remember that you're speaking to people, not to your computer or the screen. You'll be a better speaker if you look at your audience and talk to them.

Practice and get advice

You'll become a great speaker with thought and practice. As you prepare your seminar, leave time to practice and to get advice from others.

Martin Snider, May 2015

SOM Best Practices. Monitoring Student Progress and Ensuring Timely Completion of the PhD Minimal Guidelines for all PhD Programs in SOM

Developed by the Graduate Program Directors Leadership Council - approved 02/08/2018
Approved and endorsed by the Council of Basic Science Chairs - 02/09/2018

The average time-to-degree for PhD students in the SOM over the past decade has been 5.7 years, a timeframe that is consistent with the national average for biomedical PhD programs. However, roughly 20 % of our students graduate after 6.5 years or longer, with some taking as many as 8-10 years to graduate. A longer time-to-degree has significant downsides: 1) it reflects negatively on NIH-sponsored programs, 2) it limits the number of available slots for new incoming graduate students, and 3) it delays a student's movement into a productive career. The NIH is encouraging programs to develop initiatives aimed at reducing the time to degree for PhD students. Our goal is to increase the percentage of SOM Ph.D. candidates that complete their PhD degree by 5 years, thus allowing our graduates to secure post-doctoral training and academic positions earlier in their careers.

All incoming and current students in all SOM Ph.D. programs will be informed through their academic programs that their goal is to complete a Ph.D. within 5 years. Inadequate progress on the part of the student during this time frame may result in a terminal master's degree. Student progress will be evaluated throughout the PhD degree using a variety of mechanisms (e.g., annual IDPs, annual review of students, thesis committee meetings, 701 evaluations, and others). Mentors, thesis committees, Chairs, and Graduate Program Directors (GPDs) must communicate to students honestly and openly whether expectations are being met or not. Similarly, students must also communicate with mentors and other leaders to ensure that their needs are being met as well.

The minimum guidelines to promote student progress and development in SOM PhD programs are delineated below. Individual programs may adopt additional processes to improve progress in their programs.

1) Student and mentor expectations need to be clearly delineated and communicated at the beginning of the PhD program. This is best accomplished by:

- a. outlining general expectations early during student orientations and C3MB bootcamp
- b. providing clear language in departmental student handbooks
- c. requiring that all students and mentors agree to follow the AAMC compact at match time. This must be a part of all student-mentor match process.

2) Thesis Committees

- a. Thesis committees should be formed early and no later than end of fall semester of Y2. Earlier mentoring or advising committees that meet regularly with the student from the beginning are expected, in order to guide early progress.
- b. The student and mentor will work together to mutually agree upon thesis committee members.
- c. The student's primary research mentor cannot be the chair of the thesis committee.
- d. The composition of the committee should be considered carefully to avoid stacking. An independent program leader (chair or GPD) needs to approve the composition of all committees.
- e. The first thesis committee meeting should not be an examination of the student and it should occur prior to the qualification exam.
- f. Committees should adopt the use of a common SOM thesis committee meeting report form. This will be a minimal, common form developed by the Graduate Program Directors Leadership Council. Individual programs may choose to expand on this form to meet unique programmatic needs. Written and verbal feedback should be provided to the student following each meeting. The mentor and/or the committee chair should meet with the student to discuss the meeting, form, and feedback after each meeting. The main objectives are to aid the student in accomplishing their research goals and advocate for rigorous and reproducible research progress.
- g. Following each meeting, it is important that the committee clearly indicate to the student whether they are "meeting or not meeting expectations" on progress toward the PhD degree.
- h. Committees are expected to meet every 6 months. To promote a consistent 6-month frequency, future-meeting dates should be arranged before the current meeting is adjourned and there should be flexibility in allowing a meeting to occur if one faculty member is unavailable.

i. At the beginning of each meeting, time should be designated for the committee to meet with the mentor in the absence of the student and for the student to meet with the committee in the absence of the mentor.

j. Following completion of the 4th year (8 semesters) in graduate school, the thesis committee should consider increasing the frequency of thesis committee meetings.

3) Timing of Thesis Proposal. The thesis proposal should be developed and defended in a thesis committee meeting early, but no later than spring semester of the second year.

4) Annual Review of Students. All programs should hold an annual review of students as directed by the Annual Review of PhD Students Policy developed by the School of Graduate Studies and approved by the Faculty Senate.

5) Individual Development Plans. All students should complete an annual Individual Development Plan as directed by the School of Medicine IDP Policy. This must include a face-to-face meeting and discussion of the IDP between student and mentor.

6) Publication Requirement. The minimal requirement for all PhD programs in the School of Medicine is one first author publication accepted in a peer-reviewed journal before the degree can be conferred. The SOM considers first author and co-first author publications equally. Individual programs may have additional requirements. Exceptions to the minimal SOM requirement must be approved by the Associate Dean for Graduate Education in the SOM. Individual programs should have a process to handle exceptions to any additional publication requirements.

7) For PhD students completing their 7th year (6th year for MSTPs); the student, mentor, and dissertation committee chair must meet with two external faculty and the Associate Dean for Graduate Education. During this meeting the student, advisor, and thesis committee chair will summarize areas that have slowed progress and present their concrete plans for the student to expeditiously defend the dissertation or arrange other outcomes. For details, please refer to the *SOM Policy on Time-to-Degree Limitations for PhD students*.



Tomorrow's Doctors, Tomorrow's Cures®

Compact Between **Biomedical Graduate Students** and Their **Research Advisors**

A framework for aligning the graduate student mentor-mentee relationship

January 2017

The following members of the compact review team are gratefully acknowledged for their contributions to this update:

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Patricia Cameron, PhD, Augusta University

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The AAMC is a not-for-profit association representing all 147 accredited U.S. medical schools, nearly 400 major teaching hospitals and health systems, and more than 80 academic and scientific societies. Through these institutions and organizations, the AAMC represents nearly 160,000 faculty members, 83,000 medical students, 115,000 resident physicians, and thousands of graduate students and postdoctoral trainees in the biomedical sciences.

To download this document, go to www.aamc.org/gradcompact.

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Introduction

The *Compact Between Biomedical Graduate Students and Their Research Advisors* presents guiding principles intended to support the development of positive mentoring relationships between predoctoral students and their research advisors. A successful student-mentor relationship requires commitment from the student, mentor, graduate program, and institution. This document offers a set of broad guidelines that are meant to initiate discussions at the local and national levels about the student-mentor relationship.

There are several potential uses for this document. Among those suggested are the following:

- As a starting point for discussions between predoctoral students, research advisors, and institutional administrators about the issues addressed by the compact
- As part of the orientation for new predoctoral students
- As part of a regular and ongoing discussion between predoctoral students and their research advisors
- As a source of topics to be discussed in graduate research programs
- As a part of the orientation for new research faculty
- As a source of topics to be discussed in faculty mentorship programs
- As a component of faculty evaluations
- As a tool to initiate the development of additional programs and support services for predoctoral students within a graduate research program

This compact was originally drafted in 2008 in collaboration with representatives of the AAMC Group on Graduate Research, Education, and Training (GREAT Group) and is modeled on the AAMC's *Compact Between Postdoctoral Appointees and Their Mentors*, available at www.aamc.org/postdoccompact. Input on this document was received from GREAT Group representatives and members of the AAMC governance. The document was endorsed by the then AAMC Executive Council on September 25, 2008. In 2016, a team consisting of representatives from the GREAT Group and the AAMC Council of Faculty and Academic Societies (CFAS) reviewed and updated the document. The GREAT Group, CFAS, and AAMC staff leadership provided input on the revised draft.

Compact Between Biomedical Graduate Students and Their Research Advisors

Predoctoral training entails both formal education in a specific discipline and research experience in which the graduate student trains under the supervision of one or more investigators who will mentor the student through graduate school. A positive mentoring relationship between the predoctoral student and the research advisor is a vital component of the student's preparation for future careers and mentoring roles.

Individuals who pursue a biomedical graduate degree are embarking on a path of lifelong learning and are therefore expected to take responsibility for their scientific and professional learning and development from the onset. Graduate students must be in charge and take ownership of their progress through the graduate program. This means seeking guidance on and knowledge about course requirements and program requirements, policies, and procedures. Students must also commit to working on an individual development plan. Faculty members who advise students—with the backing of the graduate program and institution—are expected to fulfill the role of mentor, which includes providing scientific training, guidance, instruction in the responsible conduct of research and research ethics, and financial support. The faculty advisor also serves as a scientific and professional role model for the graduate student. In addition, the advisor offers encouragement as the graduate student prepares an individual development plan and facilitates the experiences and professional skills development essential for a broad set of career paths.

Core Tenets of Predoctoral Training

Institutional Commitment

Institutions that train biomedical graduate students must be committed to establishing and maintaining rigorous graduate programs with the highest scientific and ethical standards. Institutions should work to ensure that students who complete their programs possess the foundational knowledge, skills, and values that will allow them to mature into scientific professionals of integrity. They should have oversight of the graduate curricula, length of study, stipend levels, benefits, career guidance, grievance procedures, and other matters relevant to the education of biomedical graduate students (e.g., consideration of, preparation for, and exposure to various career paths). Institutions should recognize and reward their graduate-training faculty. With changing and diversified biomedical workforce needs, institutions should recognize the necessity of faculty development around multiple career paths for trainees and provide opportunities for faculty to acquire such skills and experiences. Additionally, institutions should also foster an environment that is diverse and inclusive.

Program Commitment

Graduate programs should establish training that prepares students with broad and deep scientific knowledge and the technical, professional, and leadership skills necessary for a successful career in the biomedical sciences. Programs should closely monitor the progress of graduate students during their course of study by establishing milestones and clear parameters for outcomes assessment, as well as maintain and make available career outcomes data.

Quality Mentoring

Effective mentoring is crucial for graduate school trainees as they begin their scientific careers. Faculty mentors must commit to dedicating substantial time to the scientific, professional, and personal development of the graduate student. Whether a faculty member acts as the primary research advisor or sits on a student's advisory committee, a relationship of mutual trust and respect between mentor and graduate student is essential for healthy interactions and to encourage individual growth. Effective mentoring should include teaching the scientific method, providing regular feedback in the form of both positive support and constructive criticism to foster individual growth, teaching the "ways" of the scientific enterprise, and promoting careers by providing or directing students to appropriate opportunities. The best mentors are careful listeners who actively promote and appreciate diversity. They possess and consistently maintain high ethical standards, acknowledge and recognize the contributions of students—in publications and intellectual property, for example—and have a record of research accomplishments and financial support. Finally, it should be recognized that mentoring does not end with a student's completion of the graduate program but continues throughout the student's professional life.

Skill Sets and Counseling for a Broad Range of Career Choices

The institution, training programs, and mentor should provide training relevant to a broad variety of careers that will allow graduate students to appreciate, navigate, discuss, and develop career choices. Effective and regular career guidance activities should be offered.

Commitments of Graduate Students

- **I acknowledge that I have the primary responsibility for the successful completion of my degree.** I will be committed to my graduate education and will demonstrate this by my efforts in the classroom, the research laboratory, and all other related academic and professional activities. I will maintain a high level of professionalism, self-motivation, initiative, engagement, scientific curiosity, and ethical standards, including complying with institutional and research group standards for contributing to an inclusive research environment.
- **I will meet regularly with my research advisor to provide updates on the progress and results of my course work, research, and professional and career development activities.**
- **I will work with my research advisor to develop a thesis/dissertation project.** This will include establishing a timeline for each phase of my work. I will strive to keep engaged with the work, discuss experimental findings and any pitfalls, and meet the established goals and deadlines.
- **I will work with my research advisor to select a thesis/dissertation committee.** I will commit to meeting with this committee at least annually (or more frequently, according to program guidelines). I will discuss my progress to date and be responsive to the advice and constructive criticism from my committee.
- **I will be a good lab citizen.** I agree to take part in shared laboratory responsibilities and will use laboratory resources carefully and frugally. I will maintain a safe and clean laboratory space. I will be respectful of, tolerant of, and work collegially with all laboratory personnel. I will be an active contributing member to all team efforts and collaborations and will respect individual contributions. I will also contribute to an environment that is safe, equitable, and free of harassment.
- **I will maintain detailed, organized, and accurate research records. With respect to data ownership, I acknowledge that original notebooks, digital files, and tangible research materials belong to the institution and will remain in the lab when I finish my thesis/dissertation so that other individuals can reproduce and carry on related research, in accordance with institutional policy.** Only with the explicit approval from my research mentor and in accordance with institutional policy may I make copies of my notebooks and digital files and have access to tangible research materials that I helped to generate during my graduate training.
- **I will discuss policies on work hours, medical leave, and vacation with my graduate program and research advisor.** I will consult with my advisor in advance of any planned absences and apprise my advisor of any unexpected absences due to illness or other issues.
- **I will discuss policies on authorship and attendance at professional meetings with my research advisor.** I will work with my advisor to disseminate all relevant research results in a timely manner before completion of all degree requirements.

- **I will be knowledgeable of the policies and requirements of my graduate program, graduate school, and institution.** I will commit to meeting these requirements in the appropriate time frame and will abide by all institutional policies and procedures.
- **I will attend and actively participate in laboratory meetings, seminars, and journal clubs that are part of my educational program.** To enhance research, leadership, and additional professional skills, I will seek out other enrichment opportunities, such as participation in professional organizations and meetings, student representation on institutional committees, and coordination of departmental events.
- **I will be knowledgeable of all institutional research policies.** I will comply with all institutional laboratory safety practices and animal-use and human-research policies. I will participate in my institution's Responsible Conduct of Research Training Program and practice the guidelines presented therein while conducting my research. I will also seek input on and comply with institutional policies regarding my research design and data analysis.
- **I acknowledge that I have the primary responsibility for the development of my own career.** I recognize that I need to explore career opportunities and paths that match and develop my individual skills, values, and interests to achieve my desired career goals. I understand that there are tools such as the individual development plan that I should use to help me define my career goals and develop my training plan. I will seek guidance throughout my graduate education from my research advisor, career counseling services, thesis/dissertation committee, other mentors, and any other resources that can offer advice on career planning and the wide range of opportunities available in the biomedical workforce.

Commitments of Research Advisors

- **Throughout the graduate student's time in my laboratory, I will be supportive, equitable, accessible, encouraging, and respectful.** I will foster the graduate student's professional confidence and encourage intellectual development, critical thinking, curiosity, and creativity. I will continue my interest and involvement as the student moves forward into a career.
- **I will be committed to meeting one-on-one with the student on a regular basis. I will regularly review the student's progress and provide timely feedback and goal-setting advice.**
- **I will be committed to the graduate student's research project.** I will work with the student to help plan and guide the research project, set reasonable and attainable goals, and establish a timeline for completion of the project.
- **I will help the graduate student select a thesis/dissertation committee.** I will assure that this committee meets at least annually (or more frequently, according to program guidelines) to review and discuss the graduate student's progress and future directions. I understand that the function of this committee is to help the student complete the doctoral research, and I will respect the ideas and suggestions of my colleagues on the committee.
- **I will provide an environment that is intellectually stimulating, emotionally supportive, safe, equitable, and free of harassment.**
- **I will demonstrate respect for all graduate students as individuals without regard to gender, race, national origin, religion, disability or sexual orientation, and I will cultivate a culture of tolerance among the entire laboratory.**
- **I will be committed to providing financial resources, as appropriate and according to my institution's guidelines, for the graduate student to conduct thesis/dissertation research.** I will not require the graduate student to perform tasks that are unrelated to the training program and professional development.
- **I will expect the graduate student to share common laboratory responsibilities and use resources carefully and frugally.** I will also regularly meet with the graduate student to review data management, storage, and record keeping. I will discuss with the student intellectual policy issues regarding disclosure, patent rights, and publishing research discoveries.
- **I will discuss with the graduate student authorship policies regarding papers.** I will acknowledge the graduate student's scientific contributions to the work in my laboratory, and I will provide assistance in getting the student's work published in a timely manner.
- **I will be knowledgeable of and guide the graduate student through the requirements and deadlines of the graduate program and the institution, as well as teaching requirements, if any, and human resources guidelines.**

- **I will encourage the graduate student to attend and present their research at scientific/professional meetings and make an effort to secure and facilitate funding for such activities. In addition, I will provide opportunities for the student to discuss science and their research findings with colleagues and fellow scientists within the institution and broader scientific community—for example, at lab meetings, research days, and seminars.**
- **I will promote the training of the graduate student in professional skills needed for a successful career. These skills include but are not limited to oral and written communication, grant writing, management and leadership, collaborative research, responsible conduct of research, teaching, and mentoring.** I will encourage the student to seek opportunities to develop skills in other areas, even if not specifically required by the student's program. I will also encourage the graduate student to seek input from multiple mentors.
- **I will create an environment in which the student can discuss and explore career opportunities and paths that match their skills, values, and interests and be supportive of their career path choices.** I will be accessible to give advice and feedback on career goals. I will work with the student on an individual development plan to help define career goals and identify training milestones. I will provide letters of recommendation for the student's next phase of professional development.



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