

## **Biochemistry Graduate Program Expectations for Graduate Student Mentoring**

### **Key goals of the Biochemistry Graduate Program**

The primary goal of the Biochemistry Graduate Program is to educate students to do independent research and advance knowledge in an area of biochemistry. Students and mentors are mutually responsible for achieving this goal.

Students should work to acquire:

- knowledge and experience in the experimental, analytical, and/or theoretical approaches that are appropriate to their field,
- the ability to design and perform experiments and to analyze and interpret the results,
- breadth of knowledge in their field, beyond their immediate research topic,
- the ability to learn on their own from, e.g., the scientific literature,
- the ability to communicate science in written and oral formats,
- knowledge of and adherence to the ethical norms of the field for data collection, reporting, and publication,
- knowledge of and adherence to the standards of good citizenship in the laboratory and the research group, and experience in working collaboratively, and
- knowledge of career options available to PhD holders in biochemistry.

Faculty who mentor PhD graduate students in the Biochemistry Graduate Program aim to foster the development of students toward these goals. Students should be cognizant that the success of the mentee-mentor relationship depends on both parties. Individual faculty may set and apply the expectations listed below in their own way depending on factors including but not limited to the specific nature of their research and their research field, the number of students in their research group, available funding, and individual working habits.

### **1. Getting started in the program and choosing a research mentor**

Students choose a mentor and advisor for their dissertation research during their first semester in the program. The dissertation research advisor serves as the student's mentor and advisor for academics and research. "Advisor" and "mentor" are used interchangeably in this document. Students may also seek and receive guidance and advice from the faculty who are members of their candidacy exam committee (constituted during their second year), their course instructors, and the Director of Graduate Studies for the program.

Students choose advisors after laboratory rotations with at least three different faculty. The rotations provide the opportunity to learn about the specific research projects in the lab, the faculty member's mentoring style, and the lab environment. Students begin their dissertation research under the guidance of their advisor by the start of the second semester in the program. Students are advised for courses at the start of the first semester by program faculty and by the Graduate Director.

Graduate students in the Biochemistry PhD program are guaranteed financial support from the Department of Chemistry and Biochemistry as long as they are in good standing in the program. A student must have a research advisor and maintain a grade point average greater than

3.0 to be in good standing. Students may be supported as a teaching assistant or a research assistant. A research assistantship is funded by research grants obtained by the student's advisor. A research assistantship allows a student to devote full-time to their dissertation research. A teaching assistantship entails at most 20 hours per week devoted to the teaching assignment. The specific teaching duties are laid out by the course instructor.

## **2. Research direction**

All graduate students and mentors are required by the Graduate School to fill out the [Statement of Mutual Expectations for Graduate Assistants and Supervisors](#) at the start of their assistantship. Students and their mentors must meet annually thereafter to review and update the expectations.

Mentors should meet individually with their student mentees frequently (at least monthly, but usually more often) to discuss progress in research. The mentor and mentee may review their latest experimental data or other results as well as discuss the short-term research plan (the next weeks or months), as appropriate for the experience level of the student. The mentor should guide the student on how to plan their activities and analyze their results, and the student should proactively facilitate the mentor's efforts to these ends. Students and mentors should work toward independence of the student, a key trait of a successful scientist holding a PhD degree.

Mentors should hold regular meetings of the entire research group (at least monthly) and the student should attend and participate actively in those meetings. The format may involve oral presentation by the student or by several/all students in the group, presentation and/or discussion of material from the scientific literature, etc. Students will thereby gain experience in preparing and delivering a scientific presentation, learn from fellow students about research methods and scientific areas outside of their own, and receive feedback from fellow students and their mentor on their research and on their presentation skills.

## **3. Time to degree**

Mentors and students should be mindful of the calendar as the student moves through the program. The mentor and the student should strive for a time-to-degree of 5-6 years, a typical time-to-degree for a PhD in biochemistry at universities nationwide. Mentors and students should work towards a reasonable time-to-degree by periodic discussion and review of the overall research goals and the feasibility of achieving those goals. It may be necessary to consider change of direction or modification of the research goals. Mentors and students may also benefit from frank discussion of the student's overall progress and the level of student effort or lack thereof. These strategic reviews and discussions should occur at least every six months and they may be combined with the committee meetings described below.

Students in the Biochemistry Graduate Program must meet annually with their candidacy exam committee. The committee is constituted in the fall of the second year and the exam for advancement to candidacy takes place at the end of the fourth semester. The committee meets with the student annually thereafter and administers the dissertation defense. The annual meetings provide students with the opportunity to review their research progress and present a summary to the committee. Students receive feedback and suggestions from the committee members on the technical aspects of their research. The committee can also help the student and

mentor assess the overall direction of the research project.

#### **4. Communication between mentor and student**

Scientific research is inherently difficult. Mentors should give criticism in a constructive way, and students must be receptive of criticism. Students who are unable to receive and respond to criticism, even when painful, usually will not advance efficiently toward the PhD.

Mentors are advised to be transparent as to their standards for frequency and mode of two-way communication (e.g., email, telephone, face-to-face, etc.). Mentors are advised to also make clear their expectations of the student for time to be spent in the lab or on other aspects of the work, and acceptable vacation time for the student. Students should communicate difficulties and challenges they face academically, and provide timely notification of disruptions that may impact their ability to perform their duties. Students and mentors should be mutually respectful of the demands on their time from other obligations in addition to those specific to the dissertation research. This includes fostering a work-life balance that is conducive to the student and the mentor. Since students are financially supported by their TA or RA, “other obligations” may not include substantive outside employment.

Students and mentors should aim to resolve conflicts as soon as possible. Students should bring issues to the attention of the mentor to ensure a productive and healthy mentor-mentee relationship. Students should not assume that the mentor is aware of challenges that the student may be facing. Students may seek independent advice and assistance from the program’s Director of Graduate Studies, who may also serve as a mediator for difficult mentor-mentee situations.

Other sources of support for graduate students in distress are the [Ombuds Officer](#) in the Graduate School and the University [Counseling Center](#). Students may in unusual circumstances request from the Graduate School a one- or two-semester [leave of absence](#). These are typically granted for situations such as childbearing, adoption, serious health condition, dependent care, or financial hardship.

The mentor or the student may decide that the relationship is not working and that the student should leave the mentor’s research group. In this situation, both parties must follow the procedures laid out in the [Dissolution of a Graduate Student/Faculty Advisor Research Relationship](#) document that is available on the department web-site. In case of dissolution, the mentor, the student, and the program should work together to best place the student within or outside of the program.

#### **5. Professional behavior**

Mentors should set an example of commitment to excellence, rigorous and skeptical interpretation of data, and integrity in presenting and publishing the work. Mentors should reinforce ethical standards as they interact with individual students and with their research group as a whole. All students must be made aware of and must follow ethical standards in all aspects of their work and uphold the [Code of Academic Integrity](#) standards of the University of Maryland.

The mentor and the graduate program should ensure that students receive appropriate

general training in laboratory safety practices, available through the [Department of Environmental Safety, Sustainability, and Risk](#) (ESSR) in the University. Students must be aware of and be trained in lab-specific safety considerations and mitigations before engaging in any activity that may pose danger to their health. Mentors should ensure that students follow the appropriate procedures and rules in their day-to-day research, including general lab hygiene and appropriate use and care of instruments and equipment, particularly of shared equipment. However, safety is a shared responsibility. Students must be active participants in maintaining safety, and mentors cannot be expected to monitor students' compliance constantly.

## 6. Expectations of the student

Success in graduate school and in a subsequent career in science depend as much on the student's actions as they do on effective mentoring by the advisor. Students share the responsibility with their advisor to carry a research project forward to a point where it can be published in the scientific literature and constitute a dissertation, and to learn the skills that enable them to act as independent researchers after graduation. Some student responsibilities in the mentoring relationship are listed in this section and also where relevant in other sections of this document. Note that the following list is not exhaustive!

- **Interactions with the mentor** Critical feedback is essential in scientific research and in graduate education. The student and mentor must work together to advance a research project that is new and for which results can be forecast but cannot be predicted with certainty. Students must accept criticism in a thoughtful way. Students may offer counter arguments or propose new experiments with the goal of advancing the work towards a successful conclusion.
- **Be prepared and proactive** Students should come to individual meetings with the advisor prepared to discuss in depth their recent experiments. Students should also learn to be proactive by thinking about the direction of their research, both short-term and long-term. Students should seek out and read the background literature relevant for their project. Students should not rely solely on the advisor to provide background information and readings.
- **Commitment** Graduate school is a training experience, not a job. Scientific research and attainment of a PhD requires a substantial time commitment that may go well beyond that of a typical 40-hours per week job. Experiments may sometimes require procedures be carried out at odd hours.
- **Intellectual Ownership** By the time the student graduates, they should be the world's top expert on the specific area of their own research. This requires constant effort to contribute intellectually as well as technically to the project and to take full responsibility for the quality of the work.
- **Be respectful of the mentor's time** Faculty have many obligations, some of them time-sensitive, beyond their interactions with an individual student.
- **Be a good lab citizen** Students work within a larger research group and as part of the graduate program. Students should be mutually supportive where possible, but also keep in mind that all students face the same pressures and stresses that are inevitable in graduate school.

Students must learn and follow all laboratory rules for safety, proper use of lab

equipment and instrumentation, and proper disposal of chemical, biological, and other waste materials, according to University requirements.

## **7. Diversity and inclusion**

Students and mentors should be aware of the challenges faced by members of underrepresented and marginalized groups. All parties should strive to ensure that all members of the research group and the program treat each other respectfully and collegially. Students and mentors should be aware of resources that are available from the University's [Office of Diversity & Inclusion](#).

## **8. Oral presentation skills**

Mentors are advised to provide opportunities for students to develop skills in oral scientific presentations, most commonly via regular research group meetings. Students are expected to take full advantage of opportunities presented to them to develop presentation skills. Local and regional conferences and meetings are excellent opportunities for students. Mentors are advised to give feedback on the student's presentation skills in addition to critique and analysis of scientific data and conclusions.

Mentors are advised to encourage students to attend scientific conferences when appropriate given the student's experience, progress in their research, and the availability of funding. Students should be mindful of funding for travel that may be obtained through the department, the university, and from external sources.

## **9. Scientific writing**

Mentors should give students prompt feedback on written documents and presentations, especially candidacy proposals, manuscript drafts, and the dissertation. For time-sensitive documents like the candidacy proposal, the student and the mentor should agree ahead of time on a suitable schedule for drafts and comments. Students should participate in writing manuscripts for publication as far as is possible. The mentor is advised to provide feedback and guidance, including on standard practices and ethics of publication. Mentors must make good-faith efforts to ensure that student work of publishable quality is published in a timely manner during and/or soon after the student's time in graduate school.

## **10. Career development**

Mentors should be willing to discuss the student's long-term career goals and provide guidance where possible. Students should take every opportunity, from local and regional workshops to organized events, to become familiar with the modern job market. Students should be cognizant that mentors work in academia and may not be familiar with all career opportunities. The weekly Biochemistry seminar program will expose students to research being done outside the department, and students should attend those seminars. The program will seek

to bring in seminar speakers from varied backgrounds or conduct formal workshops to acquaint the students with various career options.

Mentors should support students in their career exploration by writing reference letters. Students should be aware that they may need reference letters from faculty other than their primary mentor, such as their candidacy/dissertation committee members. Mentors may also work to enhance students' networking opportunities by, for example, encouraging interactions with visiting seminar speakers and introductions to the mentor's network through research collaborations or at conferences.

## **11. Departmental and University policies for graduate students**

Mentors and students can find forms and information about policies and procedures for graduate students at the [Graduate Programs](#) page of the Department web-site and at the [Graduate School](#) web-site. Assistance is also available through the Graduate Office in the Department of Chemistry and Biochemistry and from the Director of Graduate Studies for the program.