

# Center for Biological Chemistry

## Graduate Handbook

Through a combination of coursework, seminars, and original research, CBC graduate students will complete a graduate degree and acquire the skills needed to become independent research scientists. Our four major research training areas are:

- Structural and chemical basis of protein function
- Metabolism and metabolic engineering
- Molecular mechanisms of disease
- Plant and microbial biochemistry and biotechnology

### Orientation

The Graduate Committee will assist all students in initial course selections and research rotation choices. A poster session will be held to allow students to interact with each faculty member and/or members of their labs to find out about their research and get an overview of the active research areas in Biochemistry. This will help students in choosing a research advisor and Supervisory Committee. Students will also have a one-on-one guidance interview with the Chair of the Graduate Committee to learn about the program in Biochemistry and choose courses for the first semester.

### Courses

All CBC graduate students are required to take the following courses:

BIOC 932, Proteins, 2 credits

BIOC 933, Enzymes, 2 credits

BIOC 934, Genome Dynamics and Gene Expression, 3 credits

BIOC 935, Metabolic Function and Dysfunction, 3 credits

BIOC 836, Physical Basis of Macromolecular Function, 3 credits

In addition, all students in the Ph.D. program are required to register for the graduate seminar every semester throughout their program, receiving *one credit per semester* (BIOC 992k) for a total of 8 credits over four years.

Students in the M.S. program take BIOC 992k for at least two years (4 credits).

Other course requirements are arranged in consultation with the Supervisory Committee. The student and advisor then submit a Program of Studies (for the Ph.D.) or Memorandum of Courses (for the M.S.) that details the student's course work requirements to the Graduate College before one half of the courses are complete. Forms can be found on the Graduate Studies website (<http://www.unl.edu/gradstudies/home>).

Successful completion of the Ph.D. degree requires 90 credit hours, of which 35 credits are coursework and the remainder thesis research. No more than 55 of the 90 credit hours may be dissertation research, and 45 credit hours must be in Biochemistry offerings (including dissertation research, BIOC 999).

## **Rotation Selection Process and Thesis Advisor Selection**

A Ph.D. in the Center for Biological Chemistry is granted for original research that makes a new contribution to biochemistry. This original contribution to scholarship is the product of years of mentored student research in the laboratory of an advisor that the student selects, culminating in a thesis containing published or publication-quality scholarship.

Students typically choose an advisor based on a shared research interests and a good rapport with that faculty member. The program is set up to allow students to rotate for two 8-week sessions during the first semester (a third rotation may be done in the second semester if the student is a part of the MMoD program, see below). Each student is encouraged to contact potential mentors and discuss their interests and availability to serve as a rotation mentor. After these conversations but before the start of each 8-week rotation period, students will submit a list a three potential advisors to the Chair of the Graduate Program Committee. The Grad Chair and the Department Chair will consult and then inform students of their rotation mentor shortly after these lists are submitted. Every effort is made to ensure that students receive their first choice of rotation advisor. However, in rare cases, second or third-choice advisors will be chosen. Students are encouraged to communicate with the Grad Chair prior to rotation choices about preferences or special considerations. After the final rotation period, all students will submit their choices for an advisor to the Graduate Committee, and final assignments will be made upon consultation with the Chair of Biochemistry.

## **Molecular Mechanisms of Disease (MMoD) Students**

Per NIH policy, only US citizens or permanent residents are eligible for direct support through MMoD. However, all students are invited to participate in MMoD sponsored activities including the annual symposium, seminars and workshops. Students selected for the MMoD program will follow the same trajectory as all other CBC graduate students with some minor differences. First year MMoD students will do three rotations, the third of which will be performed at the start of the Spring semester of their first year. As the MMoD program focuses on interdisciplinary training with two co-mentors, it will be important to rotate in diverse laboratories so that the student gains the information that they will need to choose both co-mentors. MMoD fellowships for years 2 and 3 of the Ph.D. degree program are awarded based on a competitive application process. Applications for MMoD fellowships are due in April/May of the Spring semester with funding decisions completed in June.

Additional requirements for MMoD students include participation in MMoD monthly works-in-progress seminar, career development workshops, and annual symposium. All CBC students typically attend MMoD activities as well. Because the MMoD training grant prohibits teaching during the two-year period of support, students in MMoD will need to perform their required teaching starting in their fourth year in the Ph.D. program.

## **Supervisory Committee**

Shortly after students have chosen a mentor and started working in their lab (*i.e.* in the second semester), students will confer with their research mentor to form a Supervisory Committee. The approval form for the Supervisory Committee can be downloaded from the Graduate Studies website. The purpose of this committee is to evaluate student progress in the degree program, to offer a support network within the University, and to assist students with practical guidance in their research project. The supervisory committee is chaired by the

primary research advisor and must consist additionally of three other Biochemistry faculty and one faculty member from outside the Department.

Each year, students will schedule a meeting with their Supervisory Committee. At the meeting, the student will present a ~30-minute talk about their research progress to date, and their goals for the coming year. The Committee will ask questions during the presentation to ascertain the student's level of development as a scientist, and will advise the Graduate Program Committee whether the student is making satisfactory progress toward the degree objective. Students should bring a CBC Annual Meeting Form (available from the Biochemistry office) to each committee meeting. The Supervisory Committee will check a box indicating either "satisfactory" or "unsatisfactory" progress, and then sign this form. If progress is deemed unsatisfactory, it is the responsibility of the Supervisory Committee to provide recommendations for improvement, probation, or termination (where warranted) to the student and to notify the Grad Chair.

### **Individual Development Plan**

An Individual Development Plan (IDP) is a tool that allows you to reflect on your goals, progress, and needs for your graduate career. Discussing your IDP with your advisor is a chance for you to step back from your daily lab work, assess your progress, and plan for the future. Meeting with your advisor about this document provides an opportunity to discuss topics that are important to you. You are highly encouraged to complete an IDP in consultation with your advisor during each year of your program. IDP templates are available from the Biochemistry Office for you to use for year 1, year 2, and years 3-5.

### **Comprehensive Exam**

Students are required to pass a Comprehensive Examination consisting of written and oral components. This exam must be taken in the fifth semester. If the exam is not completed by the end of the 5<sup>th</sup> semester, the Supervisory Committee should issue an "unsatisfactory" evaluation on the student's CBC Annual Meeting Form. Brief delays for life-altering events can be made by the Graduate Chair only in extreme circumstances. The exam consists of both a written and oral portion, although the details of the exam are determined by the Supervisory Committee. Typically, students are required to write a research proposal in the style of an external grant application on a topic of their choosing. The topic must be different from the student's research area. The student will then schedule a meeting with their Supervisory Committee, give a presentation of the proposal, and defend it against the Committee's questions. We ask that students circulate the proposal to the members of your committee at least two weeks before the meeting. The exam will probe the depth and breadth of the student's biochemistry knowledge, and the sophistication of their scientific thought process.

Passing the Comprehensive Examination results in the student being recommended for Ph.D. candidacy. The student must be admitted to candidacy at least seven months prior to the final oral dissertation defense. Also, the Graduate College stipulates that if a student does not graduate within three years of passing the Comprehensive Examination, the Supervisory Committee must give another such exam.

### **Seminars**

The development of oral communication skills is an essential component of professional

development. Students give regular presentations in laboratory meetings, journal clubs, and other informal settings. The required credit hours in seminar courses (BIOC 992k) are expected to give the student experience in formal presentations. All Ph.D. students are required to give a formal, research-based, public seminar related to their dissertation research.

In addition to giving seminars, it is equally important for students to educate themselves by attending seminars. External speakers are regularly invited in to several seminar series and annual symposia that we urge our students to attend. In particular, you should attend the weekly Biochemistry Departmental Seminar, at which eminent speakers present their research at the invitation of our own faculty.

## Teaching

Learning to communicate effectively as a teacher is also critical to a student's future career as a scientist. To facilitate this aspect of their development, students will be required to assist with teaching biochemistry courses for two semesters. This responsibility may be fulfilled in some cases by providing teaching assistance in a lab course, or in others by assisting course instructors with grading and fielding student questions. Teaching assignments are coordinated by Dr. Jing Zhang.

International students must attend and pass a three-week intensive training session (ITA training) in the summer after their first year to prepare for their teaching assignments. Information can be found online.

## Dissertation

The dissertation must be submitted and approved by Graduate Studies two weeks prior to the semester deadline. The doctoral candidate should allow the thesis committee at least two weeks to read and review the dissertation prior to the defense. All committee members should read and comment on the document. During this time, the committee is advised to make recommendation for any corrections that need to be made on the written document. On the day of the thesis defense, there should be at most only minor modifications (syntax, spelling, grammar) corrections to the written document. An example of how this would look is if the semester deadline is April 22, the dissertation should be submitted and approved by OGS by April 8, and the written component is distributed to the committee members by March 25. Between March 25 and April 8, major changes at the request of the committee can be made. The oral defense and minor corrections to the written thesis (if needed) may be held anytime up to April 21.

## Timeline for Ph.D.

Average time to completion of a Ph.D. is a little over 5 years. This is how that breaks down as milestones for students, with mandatory UNL Graduate Studies paperwork in *italics*:

See: <https://www.unl.edu/gradstudies/academics/degrees/doctoral#finalize>

### ***First year: complete core courses in Biochemistry; first year of seminar***

- First semester: rotations and selection of a lab.
- Second semester: select supervisory committee, complete *Appointment of Supervisory Committee* form and file with Graduate Studies; first meeting of supervisory committee, complete *Program of Study* form, and file with Graduate

Studies; select coursework for second year of study.

**Second year: continue/complete all coursework; continue meeting research and seminar requirements**

- Second semester: second meeting of supervisory committee; select format / topic for written and oral portions of comprehensive exam.

**Third year: continue meeting research and seminar requirements; first semester of teaching**

- First semester: complete comprehensive exam; complete *Application for Admission to Candidacy* and file with Graduate Studies.
- Second semester: third meeting of supervisory committee.

**Fourth year: continue meeting research and seminar requirements; complete teaching assignment**

- Second semester: fourth meeting of supervisory committee; discuss time to graduation.

**Fifth year: complete research; write thesis; final defense of thesis work; final examination by supervisory committee; Ph.D. conferred**

- In the graduation year, complete *Application for Graduation* and *Application for Final Oral Exam* forms and file with Graduate Studies.

## **BCGSA**

Graduate students in the Department formed the Biological Chemistry Graduate Student Association (BCGSA). The purpose of this organization is to represent our graduate students in communications among members of the Biochemistry community, and also to promote unity, camaraderie, and active participation in departmental affairs. Membership is open to all Biochemistry graduate students. Meetings are typically on a monthly basis. To join the group or seek additional information, contact President Tristen Mier (Cahoon lab); email: [tmier2@huskers.unl.edu](mailto:tmier2@huskers.unl.edu).

The elected BCGSA officers for 2023-2024 are:

President - Tristen Mier  
Secretary - Cailin Smith  
Treasurer - Fatema Yeasmin Tanni  
Social Chair - Cole Dolemore  
Faculty Rep - Rachelle Nelson  
GSA Representative - Emmanuel Biney  
Akerson Lecturer Organizer - Daisy Guiza Beltran

## **Research Equipment**

### **Core Facilities**

Bioinformatics (<http://bioinformatics.unl.edu>)

Mass Spectrometry and Metabolomics (contact Dr. Javier Seravalli: [jseravalli1@unl.edu](mailto:jseravalli1@unl.edu) & Toshi Obata: [tobata2@unl.edu](mailto:tobata2@unl.edu))

Biophysical instrumentation (contact Javier Seravalli: [jseravalli1@unl.edu](mailto:jseravalli1@unl.edu))

Microscopy (contact Joe Zhou: [yzhou2@unl.edu](mailto:yzhou2@unl.edu))

Plant Transformation (contact Tom Clemente: [tclemente1@unl.edu](mailto:tclemente1@unl.edu))

Flow Cytometry (contact Dirk Anderson: [dirk.anderson@unl.edu](mailto:dirk.anderson@unl.edu))

## Departmental Equipment

The Biochemistry Department has numerous pieces of shared equipment available for use by any member of the Department. Below is a partial list of this equipment and its current location. Please contact the appropriate lab before using instruments.

Analytical ultracentrifuge	Biophysical Core: contact Javier Seravalli
Dynamic Light Scattering	Biophysical Core: contact Javier Seravalli
Real time PCR thermocycler	Sun, Harris, Glowacka, others labs
Flow cytometer	2 <sup>nd</sup> floor common room, far north corridor
FPLC	Becker, Wilson labs
HPLC/UPLC	Khalimonchuk lab
Seahorse Flux Analyzer	Khalimonchuk lab
Clarity RSM-spectrometer	Becker, Khalimonchuk labs
Microinjection system	Khalimonchuk lab
epMotion robotic platform	2 <sup>nd</sup> floor common room
Bio-Rad Gel Doc	1 <sup>st</sup> floor, 2 <sup>nd</sup> floor common rooms
Odyssey near-infrared imager	2 <sup>nd</sup> floor common room
Film developing equipment	1 <sup>st</sup> floor, 2 <sup>nd</sup> floor common corridors
Stopped flow spectrofluorimeter	Biophysical Core: contact Javier Seravalli
Circular Dichroism	Biophysical Core: contact Javier Seravalli
ITC and DSC (calorimeters)	Biophysical Core: contact Javier Seravalli
Sonicator	Becker, Wilson labs, and others
Anaerobic glove box	Becker, Zhang, and Buan labs
High-speed centrifuge	Lee labs, and common equipment rooms
X-ray generator	Zhang and Wilson, first floor
Multi-angle light scattering	Harris Lab
BioLayer Interferometry Instrument	Biophysical Core: contact Javier Seravalli
Microscale thermophoresis (MST)	2 <sup>nd</sup> floor common room

Many additional common items are available, including autoclaves, dishwashers, walk-in warm and cold rooms, scintillation counters, low-speed ultracentrifuges, floor shakers for large scale culture, spectrophotometers, conventional thermocyclers. Inquire!