

## BIOMOLECULAR SCIENCE GATEWAY Ph.D. STUDENT HANDBOOK FALL 2018

### PROGRAM OVERVIEW

#### Mission Statement

Our mission is to recruit a diverse pool of creative and motivated individuals to join the dynamic research community at MSU for multidisciplinary training in the biological sciences.

#### Overview

The BioMolecular Science Gateway (BMS) offers admission to six graduate programs: Biochemistry and Molecular Biology, Cell and Molecular Biology, Genetics Program, Microbiology and Molecular Genetics, Pharmacology and Toxicology, and Physiology. Students have access to training in over 150 research laboratories with various research foci areas including, but not limited to, biochemistry, cancer, cell biology, genomics, genetics, immunology, microbiology, molecular biology, pharmacology, toxicology, physiology, plant molecular biology, structural biology, and virology. Michigan State University has state of the art facilities for microarray analysis, mass spectrometry, DNA and peptide synthesis, automated DNA and protein sequencing, amino acid analysis, cell sorting and microscopy.

The major objectives of the graduate programs in BMS are to help students to develop their creative potential and to prepare them for careers in research and teaching in the sciences. Individual programs of study are designed to develop independent thought as well as broad knowledge and technical skills, through formal and informal courses, laboratory experience, seminars, individual study, and, foremost, through original research that forms the basis for the student's thesis or dissertation.

Students rotate through three laboratories of potential Ph.D. mentors for ten weeks each and take four courses that fulfill the requirements of their disciplinary interests. In addition, students will attend biweekly research forum. In the spring semester of the first year, students have the opportunity to select the Ph.D. program that aligns most closely with their educational goals.

Students will also have the option to select joint degrees with affiliated academic departments or interdepartmental programs such as the Plant Breeding, Genetics & Biotechnology Program, the Center for Microbial Ecology and Chemistry, the DOE Plant Research Laboratory, the Quantitative Biology Program, and the Environmental and Integrated Toxicological Science Program. Students with a particular interest in College-level teaching can earn a Certificate in Teaching of College Science and Mathematics.

(<http://ns.msu.edu/index.php/admissions/graduate-studies-in-physical-mathematical-and-lifesciences/certification-in-teaching/>).

All BMS graduate students receive financial support throughout the course of their studies. First year BMS students are supported by graduate research assistantships or fellowships for their rotations. Subsequent years of support come primarily from the research mentor. Stipends are set

annually and are competitive with those provided by departments and other programs at MSU and other prominent universities in the USA. In addition, all graduate assistants receive up to nine credits tuition waiver per semester for Fall and Spring (six credit is full time for doctoral students) and five credits for summer semester, waiver of matriculation fees and paid health insurance.

## II. ADMISSION

The Ph.D. degree is the terminal degree for professional scientists who seek to design, execute, and direct independent research projects. The heart of the Ph.D. training program is an original and creative research project that forms the basis of the doctoral dissertation. The specific course of study is decided in consultation initially with the BMS Graduate Program Director or Associate Director and later with a Guidance Committee composed of five faculty members and chaired by the thesis advisor.

### Admission

The BioMolecular Science Gateway attempts to select those applicants with the most promise for superior achievement and does not establish minimum cut-off values on any indices. The following standards serve only as a general guideline. The successful applicant will typically have:

- Equivalent to a four year bachelor's degree that includes coursework that demonstrates proficiency in math and science. (The intermediate attainment of a master's degree is not required.)
- An undergraduate GPA of 3.5
- Research experience
- Strong letters of reference that include evaluation of the applicant's research experience
- 75th percentile quantitative reasoning and 70th percentile verbal reasoning scores on the required GRE General Test. A strong score on the GRE subject in chemistry, biochemistry, cell and molecular biology, or biology (depending on your interests) will enhance an applicant's prospects.
- International students will have TOEFL scores of at least 90 with no sub-score below 20 (23 writing section) (internet-based test) or 600 with no sub-score below 60 (paper-based test)

To apply to the BioMolecular Science Gateway:

1. Submit an MSU online application form which can be obtained through the MSU Graduate School website at <http://grad.msu.edu/apply/online.aspx>
2. The application requires an **academic statement**. This statement should discuss your motivations for pursuing a graduate degree and your experiences that are pertinent to the discipline, such as undergraduate research, publications, and workshops in which you have participated. The application also provides space for a **personal statement**. You

may discuss elements of your history that demonstrate leadership potential, your potential contribution to a diverse educational community, and your record of overcoming obstacles. If preferred, these may be combined into one academic statement.

3. Three letters of recommendation from individuals that can attest to your academic and/or research experience. The Michigan State University online application process will allow you to submit **electronic letters of recommendations**. Through the MSU Admissions student portal, “Be A Spartan” at <https://admissions.msu.edu/portal/Login.aspx> where you can submit the name and email addresses of faculty that you would like to provide letters of recommendation on your behalf. The system will automatically notify the recommenders of your request and instruct the recommenders of the procedure to submit the letters electronically. Or the recommenders may send letters directly to the BMS office in sealed envelopes.
4. Official transcripts from **all** undergraduate institutions.
5. GRE scores. The General Test is required. The MSU Institution code is 1465, the BMS Program Code is 0206. A subject test in chemistry, biochemistry, cell and molecular biology, or biology (depending upon your interests) is strongly suggested but is not required.
6. TOEFL scores for international students.

Application materials should be received by December 1 for the following fall admission to receive full consideration of admission and funding opportunities.

Graduate student usually begin the graduate studies in late August (Fall semester). Students admitted for Fall semester may elect to “start early” by completing their first rotation during the preceding summer. This option must be approved by the BMS director and is not available to international students.

### III. BMS PROGRAM REQUIREMENTS

Students must meet the course and program requirements specified below:

- Participation in the BMS Retreat (generally held the Monday before Fall classes begin)
- Three 8-week laboratory rotations to facilitate selection of a thesis advisor.
- Participation in a bi-weekly Research Forum (BMS 800)
- Students in the BMS program are required to take 4 core courses in their first two semesters. Two of these courses must be selected from the main course list below, using the course requirements for the PhD program she/he is likely to join at the end of the first year as a guide. The remaining 2 courses can be selected from the main or supplemental course listings below.

Exceptions to these requirements require approval by the Director.

## Main Course List

<a href="#">BMB 801:</a>	Molecular Biology
<a href="#">BMB 805:</a>	Protein Structure, Design, and Mechanism
<a href="#">BMB 825:</a>	Cell Structure and Function
<a href="#">BMB 829:</a>	Methods of Macromolecular Analysis and Synthesis
<a href="#">BMS 800:</a>	BioMolecular Science Research Forum
<a href="#">MMG 801:</a>	Integrative Microbial Biology
<a href="#">MMG 833:</a>	Microbial Genetics
<a href="#">MMG 835:</a>	Eukaryotic Molecular Genetics
<a href="#">PHM 827:</a>	Physiology and Pharmacology of Excitable Cells
<a href="#">PHM 801:</a>	Fundamental Principles of Pharmacology and Toxicology
<a href="#">PHM 802:</a>	Cellular and Molecular Integrative Systems Pharmacology and Toxicology
<a href="#">PLB 865:</a>	Plant Growth and Development
<a href="#">PSL 828:</a>	Cellular and Integrative Physiology
<a href="#">PSL 910:</a>	Cellular and Molecular Physiology

## Supplemental Course List

<a href="#">BMB 802:</a>	Metabolic Regulation and Signal Transduction
<a href="#">BMB 856:</a>	Plant Molecular and Omic Biology
<a href="#">BMB 864:</a>	Plant Biochemistry
<a href="#">MMG 813:</a>	Molecular Virology
<a href="#">MMG 851:</a>	Immunology
<a href="#">MMG 861:</a>	Advanced Microbial Pathogenesis
<a href="#">PHM 802:</a>	Cellular, Molecular and Integrated Systems Pharmacology
<a href="#">PHM 830:</a>	Experimental Design & Data Analysis

## IV. ROTATION SYSTEM

A research rotation system allows students to complete three rotations during their first two semesters. Laboratory rotations are approximately 10 weeks each in the laboratory of three different faculty members. The purpose for rotations is twofold. One is to provide a means for students to work in a focus area, become familiar with major objectives of an area of research, and to learn methods used to probe research problems. The second purpose of the laboratory rotation is to identify a research mentor and to discuss and investigate potential thesis projects with that prospective mentor. Rotations provide an excellent opportunity for students to learn first-hand the research activities of various laboratories. In turn, this is an opportunity for faculty to observe and evaluate the research potential of rotation students, and to interact on a personal level.

The BMS requires the first-year students to participate in at least three research rotations. However, under exceptional conditions, a student may petition the BMS Director for a waiver of the requirement for one or more rotation.

## **Rotation selection**

The BioMolecular Science Gateway has over 200 faculty associated with the six participating units. However, not all faculty will have space or funding to accommodate rotation students. Faculty may accept two or three rotation students, but have funding to accept only one student into the lab. Students should be mindful of the likelihood of joining the lab when making the rotation selection.

In the week prior to beginning the Fall semester, students in BioMolecular Science Gateway participate in an orientation program. During this week, principal investigators from Biochemistry and Molecular Biology, Cell and Molecular Biology, Genetics Program, Microbiology and Molecular Genetics, Physiology, and Pharmacology and Toxicology present short talks on their work, with the goal being to familiarize students with the breadth of research performed on this campus and to help them choose laboratories in which to rotate.

Students are encouraged to view BMS and departmental faculty web sites that describe the research interests and recent publications. BMS students have additional opportunities to familiarize themselves with faculty at the BMS Fall Retreat, and the bi-weekly BMS Research Forum. It is suggested that the student read one or two recent publications written by a faculty member in whose laboratory he/she might wish to do a rotation, and then meet with the faculty member and discuss the possibility of a laboratory rotation. At that meeting, the issue of funding should be discussed. Do not hesitate to raise the issue if the faculty member does not address it.

The student may request assistance from the BMS Director or Unit Graduate Programs Director in selecting a laboratory, particularly if difficulties in selecting a mentor are encountered.

Rotation assignments must be approved by the BMS Director or Associate Director in consultation with the student and faculty member. Students have the option to select all three rotations at the beginning of the academic year, or to select appropriate laboratories for additional rotations as the academic year progresses.

Students may elect to complete one or more of their rotations at the Van Andel Research Institute in Grand Rapids, Michigan. To help defray the cost of commuting, students may apply for a Road Fellowship of \$500.

## **Rotation Participation**

Emphasis during the rotation period should be on: 1) active participation and intellectual engagement in laboratory research, 2) gaining a working knowledge of the field, and 3) production of sufficient experimental results that a valid evaluation of the student's potential for a career in research can be made. Students should plan on spending at least 20 hours per week on the rotation assignment. The specific activities in each rotation may vary among laboratories; these activities and expectations should be defined at the outset by the faculty member. These activities are likely to include reading background and project-specific scientific literature;

design, execution and analysis of experiments; discussion of research project opportunities; interactions with other lab members; and presentation of the rotation project effort at a lab group meeting.

### **Rotation Evaluation**

Each faculty member with whom the student works during the rotation periods will make continuous evaluation of a student's performance. The student should initiate frequent meetings with the faculty member during the rotation period to discuss his/her progress in the laboratory. At the end of each rotation period, a written evaluation will be discussed with and signed by the student. The rotation faculty advisor will discuss the student's performance during a meeting at the end of each research rotation. The written evaluation will be maintained in the student's file.

## **IV. SELECTION OF THESIS/DISSERTATION ADVISOR and DEPARTMENT/PROGRAM**

It must be understood that selection of a dissertation research advisor by the student does not guarantee acceptance by the faculty member. Space and funding limitations and differences of research attitude are necessary factors that must be considered.

After a mutual agreement is reached between a student and a professor, the student must immediately notify the BioMolecular Science Gateway director and the department or graduate program directors in writing so that departmental approval and administrative records can be established.

## **V. ACADEMIC PERFORMANCE**

The BioMolecular Science program accepts only those students who are believed to have the potential to successfully complete the degree program. A student is expected to maintain a minimum GPA of 3.0 (out of 4.0). After three rotations, she/he must have identified a faculty mentor and laboratory in which to complete the dissertation research. Where a student encounters difficulties in meeting the requirements of the program, the BMS Director and Associate Director will work together with the student to overcome these problems.

Should lack of such success be evident, actions including an additional rotation, dismissal or a leave of absence may be implemented at the discretion of the BMS Director, in consultation with BMS faculty.

## **VI. Rights, Responsibilities and Ethical Standards**

The Academic Freedom for Students at Michigan State University (AFR) and the Graduate Student Rights and Responsibilities (GSRR) documents establish the rights and responsibilities of MSU students and prescribe procedures to resolve allegations of violations of those rights

through formal grievance hearings. In accordance with the AFR and the GSRR, the BioMolecular Science Gateway will adhere to the procedure set forth by the MSU Ombudsperson to address academic grievances.

Graduate students in the BMS are expected to adhere to the ethical standards set forth in University regulations ([www.grad.msu.edu/researchintegrity/](http://www.grad.msu.edu/researchintegrity/)) and those conventionally used in the conduct of scientific research. The department endorses and adheres to MSU's Rights and Responsibilities of Graduate Students and Regulations (<http://splife.studentlife.msu.edu/graduate-student-rights-and-responsibilities>).

All units participating in the BioMolecular Science Gateway require the Certificate of Attendance for the Graduate School's Responsible Conduct of Research workshop series. This workshop series highlights these key principles and emphasizes that research and scholarly integrity is a fundamental characteristic of quality research/scholarship in all disciplines. To receive a Certificate of Attendance, students must attend seven workshops. More information can be found at the Graduate School's website at [grad.msu.edu/rcr](http://grad.msu.edu/rcr).

## VII PROGRAM POLICIES

### **Financial Support**

All students accepted into the BMS Gateway will receive financial support in the form of a fellowship or a graduate assistantship during their rotation period. This will include a stipend, graduate student health insurance, and a tuition waiver.

Thereafter, graduate assistantships are generally funded from research grants or other sources available to the student's major professor(s). BMS students should discuss future funding with potential mentors during the lab selection process.

### **Work Hours**

Students should be actively engaged in course work, research, literature reviews, or some other phase of the doctoral program, even during semester breaks.

All students, regardless of the type of the financial support, are viewed by the Department as accepting a responsibility equivalent to that of a half-time graduate assistant. A graduate assistant is entitled to a total of one month's annual vacation plus those University staff holidays designated in the University calendar. Between-semester periods and Spring break are not considered to be holidays. Any absence from the University, except those authorized for scientific meetings, etc., must be considered to be part of the one-month annual vacation. Vacations must be arranged with the rotation professor and with the BioMolecular Science Gateway Director.

**Illness/injury/pregnancy leave**

A graduate assistant unable to fulfill the duties of his/her appointment because of illness or injury shall notify the BMS Director or Associate Director as soon as circumstances permit. Similarly, a graduate assistant unable to fulfill the duties of her appointment because of pregnancy shall notify the BMS Director or Associate Director as soon as circumstances permit.

During the illness, injury, or pregnancy the BMS Director, in consultation with the rotation mentor, shall adjust (reduce, waive, or reschedule) the graduate assistant's duties as those duties and the assistant's physical circumstances reasonably dictate. If total absence from duties becomes necessary, the BMS shall maintain the stipend of the appointment, provided the graduate assistant is still enrolled, for a period of two months, or to the end of the appointment period or of the semester, whichever should occur first.

The graduate assistant shall have the right to return to the assistantship, within the original terms of the appointment, at such time as he/she is able to reassume the duties of the position.

**Academic Files**

Students may access their academic file by request. Students have the right to review their academic file (excepting confidential admissions recommendation letters) and challenge the accuracy of its contents by writing a rebuttal that becomes part of their file.