



# DEPARTMENT OF BIOLOGY MASTER OF SCIENCE

GUIDE FOR APPLICANTS, GRADUATE STUDENTS AND  
GRADUATE TEACHING ASSISTANTS

2023-2024

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## **GRADUATE PROGRAM DIRECTOR**

Dr. Chris Herlihy – Chris.Herlihy@mtsu.edu, 615-898-2611, SCI 1059

### **HISTORY AND CURRENT STATUS OF BIOLOGY GRADUATE EDUCATION**

Opened in 1911 as Middle Tennessee Normal School, the institution changed its name in 1925 to Middle Tennessee State Teachers College and then again in 1943 to Middle Tennessee State College. The college was advanced to University status in 1965, with a total enrollment of about 6000 students. Enrollment more than doubled by 1990, and increased to over 19,000 students by 2000. With current enrollments of over 19,000 undergraduate and almost 2300 graduate students, MTSU remains the second largest institution of higher education in Tennessee.

The MTSU College of Graduate Studies was established in 1951 and the first Master of Art (MA) degree in biology was granted in 1959. In 1966, the Biology Department discontinued the MA degree and instituted a thesis-based Master of Science (MS) degree emphasizing research and preparation for further graduate study as well as employment in public agencies, industry, and non-governmental organizations.

Members of the Biology department also participate in several other graduate programs within the College of Basic and Applied Sciences including the Master of Science in Professional Science (MSPS) program, and three interdisciplinary PhD programs: Molecular Biosciences, Computational Sciences, and Mathematics and Science Education.

The Biology Department's mission is to provide a high quality educational experience that prepares graduates for advanced study or employment. Through a commitment to excellence the Department strives to encourage and support research and scholarly activity by faculty and students.



**The 250,000 square foot MTSU Science building, open since 2014, is home to the Departments of Biology and Chemistry.**

## APPLICATION AND ADMISSION

### Minimum Requirements

Applicants to the Biology MS program must possess an undergraduate degree with a major in Biology, or a minor in Biology of at least 19 credit hours. Applicants should also have 12 credit hours of Chemistry, including at least one semester of Organic Chemistry or Biochemistry. Applicants receiving unconditional admission typically have overall (and biology coursework) undergraduate grade point averages (GPA) of at least 3.0 (on a 4.0 scale). All applicants must also have a thesis advisor identified who is willing to accept the applicant into their lab.

### Application Procedure

Applications for Summer or Fall enrollment are reviewed March 1. Applications for Spring enrollment are reviewed October 1. The application form can be completed at <http://www.mtsu.edu/graduate/apply.php>. On this page, you can also upload supporting documents (listed below).

In addition to the College of Graduate Studies application form the following materials are required. Only complete applications containing all of these items will be forwarded to the Biology Department for review:

- 1) Official transcripts from all colleges/universities attended
- 2) Three letters of recommendation. A link for your letter writers to submit their letters can be found at <http://www.mtsu.edu/graduate/apply.php>.
- 3) International students whose native language is not English must submit proof of English proficiency (TOEFL minimum IBT score 71, or IELTS minimum score of 6)
- 4) A personal statement outlining the student's rationale for pursuing graduate study at MTSU, areas of research interest, and thesis advisor

Applicants should also submit an application for a Graduate Teaching Assistantship directly through the College of Graduate Studies <https://www.mtsu.edu/graduate/funding.php>.

## **GRADUATE TEACHING ASSISTANTS**

Graduate Teaching Assistantships (GTAs) are available to students who show academic promise and potential as effective teachers. Assistantships cover all tuition costs and provide an academic year stipend of \$10,500. Students must meet the minimum GPA for admission to the Biology MS Program to be considered for a GTA.

### **Application Procedure**

Students seeking consideration for a GTA appointment should submit the GTA application form (<https://www.mtsu.edu/graduate/funding.php>) directly to the College of Graduate Studies.

### **Responsibilities**

Full-time GTAs are required to do the following:

- 1) Attend a Laboratory Safety Training course
- 2) Work 8 contact hours per week in laboratory supervision
- 3) Enroll in a minimum of 6 graduate credit hours each semester
- 4) Hold office hours of at least 5 hours per week to consult with students
- 5) Attend weekly laboratory orientation meetings with their Laboratory Coordinator

### **Retention**

Graduate Teaching Assistant academic progress and teaching performance are reviewed each semester. A minimum 3.0 GPA for all graduate coursework and satisfactory performance reviews are required for GTA contract renewal. Contracts may be renewed for a maximum of 6 semesters.

### **GTA Office Space and Office Hours**

Graduate Teaching Assistants are provided office space in the Science Building. When classes begin GTA office hours, plus all class hours and room/building locations, should be posted on a card outside the GTA's office or work area. The entire schedule also should be reported to the Biology Department office.

## MS DEGREE REQUIREMENTS CHECKLIST & TIMELINE

Below is a checklist of required items for the MS degree in Biology, as well as a general timeline for completion of each item. More detailed descriptions of each item begin on page 6. College of Graduate Studies forms can be found at <https://www.mtsu.edu/graduate/forms.php>. Completion of the MS degree in biology includes the following:

- 1) Plan for Coursework:** Admitted students, in consultation with their thesis advisor, should develop a schedule of which classes will be taken during each semester. Advanced planning is critical since many graduate classes are only taught one semester every other year.
- 2) Curriculum:** 30 hours of coursework, including at least 21 hours at the 6000 level. At least 16 hours of BIOL courses.
- 3) Seminar (BIOL 6650, BIOL 6660):** Should be taken during the first two semesters.
- 4) Biological Research (BIOL 6620):** Should be taken during the first semester.
- 5) Form thesis committee, prepare & defend thesis proposal:** Should be completed by the end of the second semester
- 6) Thesis Advisory Committee Form:** Should be filled out once the thesis committee is formed.
- 7) Thesis Research (BIOL 6640):** Students should register for at least 1 hour of Thesis Research per semester after completing BIOL 6620. (BIOL 6640 may be taken multiple times, but only 3 hours count towards the 30 hour degree).
- 8) Comprehensive Exams:** Should be taken the semester prior to the semester of intended graduation.
- 9) Intent to Graduate Form:** Submitted during the first two weeks of the semester of intended graduation.
- 10) Submit thesis to the Biology Department:** Submit electronic copy of thesis (PDF or Word), and thesis advertisement to Dr. Herlihy and Becky Elrod at least one week prior to thesis defense date. Contact Biology department office to book a room for the defense.
- 11) Thesis defense:** It is advisable to schedule the defense at least several days before the College of Graduate Studies deadline to allow time for revision. When possible, defenses should be scheduled during the departmental seminar time.
- 12) Submit final Thesis to College of Graduate Studies:** Note that the deadline to submit a thesis is typically much earlier than the end of the semester. Deadlines can be found at: <http://mtsu.edu/graduate/student/calendar.php>

## THE GRADUATE CURRICULUM

The Master of Science in Biology requires a minimum of 30 credit hours (including at least 21 credit hours at the 6000 level or above). At least 16 credit hours must come from Biology courses. Additional courses to meet the 30 hour requirement may include approved graduate courses in biology, chemistry, mathematics, physics, or other related disciplines.

The Biology major consists of at least 16 hours of Biology classes, including the following 9 required hours:

**6650 Seminar (1 hour; fall)** - *should be taken during the first year*

This course provides an introduction to discussion and critical evaluation of the primary scientific literature, particularly associated with thesis proposal development. Responsible conduct of research topics including data management, publication practices, peer review, and collaborative science will be emphasized.

**6660 Seminar (2 hours; spring)** - *should be taken during the first year*

This course focuses on developing written and oral communication skills relevant to obtaining research funding and presenting research results. Responsible conduct of research topics including mentor/trainee relationships, human subjects, animal research, research misconduct, and conflicts of interest will be emphasized. BIOL 6650 is a recommend prerequisite.

**6620 Biological Research (3 hours; fall, spring, summer)\***

Students should complete this course during their first semester of graduate study. Successful completion of Biological Research will include identification of the thesis topic, literature review, and preliminary data collection. While taking Biological Research, students will also identify their thesis advisory committee, and begin preparation of their thesis proposal.

**6640 Thesis Research (3 hours; fall, spring, summer)\***

Completion of the research problem begun in BIOL 6620. Students may register for 1–6 credit hours in any single semester. Students must complete a minimum of 3 credits and only 3 credits count toward the 30 hours required for the MS degree.

\* Students need to contact Tammy Howell in the Biology Department office to set up a unique course section to enroll in research classes (BIOL 6620 and BIOL 6640)

### Biology Elective Courses, grouped by general topic:

#### BIOTECHNOLOGY, GENETICS AND MICROBIOLOGY

5050/5051	Parasitology	3	spring
5460/5461	Human Genetics	3	spring
5510	Food/Industrial Microbiology	4	fall, spring
6080/6081	Advanced Mycology	4	fall, even years
6200	Speciation	3	fall, even years
6250	Genomics	3	fall, odd years
6380/6381	Experimental Immunology	4	fall, spring

6430	Clinical and Pathogenic Microbiology	4	fall, spring
6440	Advanced Virology	4	fall
6450	Advancements in Molecular Genetics	4	fall, spring
6730	Adv. Microbial Physiology/Biochemistry	4	spring, even years
6750	Adv. Plant Biotechnology	4	occasionally
6770	Issues in Biotechnology	2	fall
6780	Principles of Systematics	4	fall, odd years
7010	Analysis of Genetic Markers	4	spring, even years

### **ORGANISMAL BIOLOGY AND ECOLOGY**

5040	General Entomology	3	fall, odd years
5140/5141	Invertebrate Zoology	4	spring, even years
5180/5181	Vertebrate Zoology	4	fall
5220/5221	Ichthyology	4	fall, even years
5390/5391	Ethology	4	spring, odd years
5420	Plant Ecology and Evolution	4	spring, odd years
5580/5581	Marine Biology	4	spring, odd years
6080/6081	Advanced Mycology	4	fall, even years
6090	Forest Ecology	4	fall, odd years
6120	Aquatic Ecology	3	fall, odd years
6130/6131	Ornithology	3	spring, even years
6190	Animal Physiological Ecology	4	occasionally
6200	Speciation	3	fall, even years
6220/6221	Herpetology	3	spring, odd years
6460	Conservation Biology	4	spring, odd years
6780	Principles of Systematics	4	fall, odd years
7010	Analysis of Genetic Markers	4	spring, even years

### **PHYSIOLOGY AND CELLULAR/MOLECULAR BIOLOGY**

5170	Endocrinology	3	spring
5500	Plant Physiology	4	spring
5560/5561	Neurobiology	4	fall
5570/5571	Principles of Toxicology	3	spring
6190	Animal Physiological Ecology	4	occasionally
6270	Cell Metabolism and Human Disease	3	spring, even years
6380/6381	Experimental Immunology	4	fall, spring
6390/6391	Advanced Cell and Molecular Biology	4	fall
6440	Advanced Virology	4	fall
6590	Environmental Toxicology	4	fall, odd years
6720/6721	Advanced Animal Developmental Biology	4	spring
6730	Adv. Microbial Physiology/Biochemistry	4	spring, even years



## RESEARCH TOOLS

5550	Biotechnology	3	fall
5770	Biostatistical Programming	3	spring, even years
6290	Adv. Scanning Electron Microscopy	4	fall
6350/6351	Biostatistical Analysis	4	spring
6360	Energy Dispersive X-ray Theory and Analysis	1	spring
6410	Adv. Transmitting Electron Microscopy	4	spring
6500	Special Problems in Biology	1 - 4	fall, spring
6760	Bioinformatics	4	spring, odd year

## COURSE LOADS AND RECOMMENDED SEQUENCE

Full-time	9 hours (6 hours for graduate teaching assistants)
Maximum load	12 hours (10 hours for graduate teaching assistants)

			<b>Total Hours*</b>
<b>Semester 1</b>			
BIOL 6620	Biological Research	3	
BIOL 6650 or BIOL 6660	Seminar	1 or 2	
Elective		3-4	6-9
<b>Semester 2</b>			
BIOL 6640	Thesis Research	1	
BIOL 6650 or BIOL 6660	Seminar	1 or 2	
Electives			6-9
<b>Semester 3</b>			
BIOL 6640	Thesis Research	1	
Electives			6-9
<b>Semester 4</b>			
BIOL 6640	Thesis Research	1	
Electives			6-9

\* Minimum total hours = 30 (21 at the 6000 level)

## Thesis Committee

The thesis committee consists of the thesis advisor and at least two other committee members. Committee members may be MTSU Biology faculty, or faculty from other related departments. Faculty from other universities, or other qualified individuals (industry, state or federal agencies etc.) who hold similar academic credentials to a faculty member, and possess specific expertise pertinent to the proposed research may also serve as committee members. External committee members need to apply for adjunct graduate faculty status at MTSU:

<http://www.mtsu.edu/graduate/faculty/gfmember.php>

If changes to the composition of the committee need to be made, a committee change form must be signed by the graduate director, and approved by the College of Graduate Studies:

<https://www.mtsu.edu/graduate/forms.php>

## Thesis Proposal

After the Thesis Advisory Committee has been identified, each student will prepare a proposal outlining the problem to be investigated and the experimental procedures and/or methods of inquiry. The student should anticipate the necessary supplies, equipment, and work-space required for the conduct of the proposed research. The proposal should contain the following elements:

- Introduction to and background for the question/problem, Literature review
- Concise statement of hypotheses and/or objectives
- Detailed research plan and methods
- Study design
- Data analysis methods
- Timeline for completion of the proposed research
- Preliminary Budget
- Discussion of Potential problems or concerns that could alter the research plan

Students should prepare the thesis proposal in consultation with their thesis advisor and committee. When the proposal is complete, the student should schedule a time to defend the proposal with the full committee. The thesis proposal should be distributed to committee members at least one week prior to the defense to give committee members adequate time to review the proposal.

If the proposed research involves animal or human subjects, students also must provide documentation of training and approval by the appropriate review board. Protocols involving live animals are reviewed by the Institutional Animal Care and Use Review Committee (IACUC) and human subject's protocols are reviewed by the Institutional Review Board (IRB). Students are referred to the Office of Compliance website (<http://www.mtsu.edu/compliance/>) for additional information and forms. IACUC/IRB approval must be obtained before initiating studies.

## Proposal Defense

The student is expected to make a formal presentation of the thesis proposal to the full Committee. This presentation should include background on the project, details of the proposed research, and any preliminary data collected to date. The presentation is followed by a rigorous questioning period in

which the committee will ask the student questions about the proposed research, and about the research topic in general to ensure that the student has a sufficient depth of background knowledge in Biology to be able to complete the proposed research.

The proposal must be unanimously approved by the thesis advisory committee. It may be approved as written at the time of the defense, or the committee may request that revisions be made to the proposal. If revisions are needed, these must be approved by the committee before the research and thesis approval form is signed. Once the proposal is approved, the signed Thesis Advisory Committee form and the proposal should be submitted to the Graduate Director (Dr. Herlihy).

## COMPREHENSIVE EXAMINATION

Students in good standing (GPA of at least 3.0 after completing 24 hours of graduate credit) are eligible to take the comprehensive exam. The comprehensive exam must be completed at least one semester prior to the anticipated semester of graduation. **Students must successfully complete the comprehensive examination (with grade of B or above) before defending the thesis.**

The objective of the comprehensive exam is to assess the student's knowledge of basic biological terminology and concepts. Students are encouraged to systematically review notes taken during the graduate program and to review a good, up-to-date, general biology textbook. However, the exam will be more than a re-examination of completed coursework. The examinee must demonstrate the ability to integrate information from several sources, to argue for or against a given position and, in some instances, to demonstrate an in-depth understanding of a particular process, concept, or theory.

The comprehensive exam includes both a written exam and an oral exam. The written exam includes essay/problem questions prepared by the candidate's Thesis advisory committee. Questions may emphasize the chosen area of specialization, especially as it relates to the research topic. The number and design of questions will be at the discretion of each committee member. Typically, each committee member will provide a list of 2-3 long answer (discussion) and 3-5 short answer questions and direct the student to answer 1-2 long-answer and 2-3 short-answer questions. Students must answer at least one short answer and one essay question from each committee member. It is the Thesis Advisor's responsibility to insure the number of questions is appropriate for the time allotted (4 hours). Students passing the written exam with a grade of B or above will then schedule an oral exam with their committee within two weeks of the written exam.

Students failing the written exam must wait until the next semester to retake the exam. **Failure to successfully complete either the written exam on the second attempt will terminate the degree program in Biology.**

All completed comprehensive exams, including questions, answers, and scores, must be filed with the Graduate Director **within three weeks of the written exam date**. The Graduate Director will forward the pass/fail status of each student to the College of Graduate Studies, and all exam materials will remain in the student's file for a minimum of five years.

## THESIS

The College of Graduate Studies provides the following resources to help the student ensure all parts of the thesis are included and to make certain all theses follow a consistent format:

<https://www.mtsu.edu/graduate/student/thesis.php>

### Intent to Graduate

Students must inform the College of Graduate Studies of their intent to graduate during the first two weeks of the semester of intended graduation. Graduate students must be registered for at least one semester hour of graduate credit during the semester of graduation. The intent to graduate form may be submitted online at: <https://mtsu.edu/graduate/forms.php>

### Thesis Submission and Defense

Be aware that the last day to defend a thesis and submit it to the College of Graduate Studies occurs well before the end of the semester. The thesis must be submitted to the Biology Department at least a week prior to this date. See the graduate calendar at: <http://mtsu.edu/graduate/student/calendar.php> for thesis deadlines.

Completed theses may be submitted electronically (Word or PDF format) to the graduate director (Dr. Herlihy) at least one week prior to the defense date. The electronic version will then be made available to Biology faculty members for their review. The Biology Department no longer requires a hard copy of the thesis to be submitted. Students should also submit the information for the seminar announcement including title, abstract, date/time/location of defense, and the names of committee members.

When submitting a thesis, students should contact the Biology Department office to schedule a room for the defense. All thesis defenses at MTSU are open to the public, and faculty and students are encouraged to attend. As such, defenses may not be scheduled during periods when faculty and students are likely to be away from campus (university holidays, spring break, winter break etc.).

The thesis defense usually includes a brief introduction of the candidate's academic and professional accomplishments followed by a 30–40 minute oral presentation and a 10–20 minute question-and-answer period. Questions are generally restricted to the thesis topic. Candidates should be prepared to defend the appropriateness of the research, the validity of procedures used, and the conclusions reached. The oral presentation also should demonstrate a thorough command of pertinent literature. After the question and answer period, the candidate will be excused and the student's Thesis Advisory Committee will convene to discuss and vote on whether to accept the final thesis.

The Thesis Advisory Committee and the department chair must approve the Thesis before submission to the College of Graduate Studies. The signed Thesis Approval Page and a Thesis/Dissertation Publishing Agreement must be submitted to the College of Graduate Studies. The Thesis will be submitted electronically via the MTSU ProQuest website: <http://www.etdadmin.com/mtsu>.

## RETENTION STANDARDS

A cumulative minimum graduate GPA of 3.0 is required to earn the Biology MS degree. Any student whose GPA falls below 3.0 will be placed on **academic probation**. A student who fails to achieve a 3.0 GPA by the end of the semester after being placed on probation will be **suspended** and the degree program terminated. Under special circumstances, a suspended student may re-apply and be re-admitted to a degree program. *[NOTE: These retention standards are higher than those imposed by the College of Graduate Studies.]*

**Once enrolled in the graduate program, a student must maintain continuous enrollment (a minimum of one hour of graduate credit per semester) until graduation.** This stipulation does not pertain to summer enrollment. If a student ceases to enroll and later wishes to return to the program, he/she must apply for readmission. The time limit to complete the MS degree is six years from matriculation.

### Request to Stop-Out

If you are unable to maintain continuous enrollment, you should request permission to interrupt your studies on a temporary basis. This is referred to as a “stop-out.” The form must be signed by your graduate program director and approved by the College of Graduate Studies prior to the beginning of the stop-out period.

If approved, the period of the stop-out is not counted toward the time limit for degree completion, and readmission to the degree program is automatically granted if you are in good academic standing. A stop-out may not be used more than once during the time limit for your degree. If the stop-out exceeds one academic year, you may be required to reenter your studies under the current catalog year.

## ACADEMIC MISCONDUCT

Academic misconduct includes plagiarism, cheating, fabrication, or facilitating any such act. The MTSU policies regarding plagiarism and academic integrity, as stated in the MTSU Graduate Catalog, are included below for reference. Given the increasing ease of access to information from a variety of sources it is critical that students be vigilant in avoiding even the possible appearance of plagiarism.

**Plagiarism—** The use or reproduction of material from another person’s work (e.g., publications, productions, or intellectual property) without revealing the source and/or clearly acknowledging the degree of dependency. If materials are reproduced verbatim from another source, or even reproduced in large part with only minor modification, proper citation **must** occur. To avoid allegations of plagiarism, clearly cite the source and use quotations marks to identify the excerpts, or clearly acknowledge the source by indenting and single-spacing the reproduced selection.

**Academic Integrity—** Students at MTSU are expected to be intellectually honest and forthright in their academic activities. Proper credit should be given to sources of all work done. To attempt to use the ideas or words of others or to falsify data is to plagiarize (i.e., adopt, present, or reproduce ideas, statements, images, or works of others as one’s own without proper acknowledgment) or fabricate (i.e., falsify any information or citation) respectively, neither of which is acceptable. Appropriate action will be taken as deemed necessary by the College of

Graduate Studies, up to and including expulsion from MTSU and the rescinding of any graduate degree awarded as a result of a breach in academic integrity.

**Important Note Regarding the Thesis**— Although minor changes may be made to a student's thesis based on feedback stemming from the general Departmental review of the submitted work and the thesis defense, a thesis will be considered in a "final" form regarding issues involving academic misconduct when it is submitted to a MS Graduate Program Director for the purpose of the broad departmental review that occurs just prior to the thesis defense.

## DEPARTMENTAL CHAIR AND COORDINATORS

**Dr. Dennis Mullen (SCI 2044)**

Departmental Chair

**Dr. Chris Herlihy (SCI 1059)**

Coordinates the Biology MS program

**Jonathan Jackson (SCI 2139)**

Coordinates provision of supplies and materials for the freshman laboratories including BIOL 1030, BIOL 1110, and BIOL 1120.

**Tammy Jessen (SCI 1088)**

Coordinates media preparation for the microbiology laboratories and maintains the Biology stockroom.

**Dr. Matt Elrod-Erickson (SCI 2028)**

Coordinates the General Biology course (BIOL 1110) and is responsible for the GTAs who teach the course.

**Dr. Mary Farone (SCI 2085)**

Coordinates the Microbiology courses (BIOL 2100 and BIOL 2230) and is responsible for the GTAs who teach the course.

**Dr. Matt Klukowski (SCI 1151)**

Coordinates the Human Anatomy and Physiology courses (BIOL 2010 and BIOL 2020) and is responsible for the GTAs who teach the course.

**Dr. Dennis Mullen (SCI 1085)**

Coordinates the General Biology course (BIOL 1120) and is responsible for the GTAs who teach the course.

**Dr. John Zamora (SCI 2155)**

Coordinates the Topics in Biology course (BIOL 1030) and is responsible for the GTAs who teach the course.

## BIولوجY DEPARTMENT FINANCIAL SUPPORT AND SCHOLARSHIPS

The Department of Biology administers multiple endowed awards and scholarships that are exclusively for graduate students in the M.S. Program in Biology. These awards are intended to support thesis research, travel to and from field sites or scientific meetings, and summer stipends. More information about these awards can be found at: <http://mtsu.edu/biology/graduate-scholarships.php>.