



HANDBOOK FOR GRADUATE STUDENTS
Department of Biology

Version 2019

This Handbook for Graduate Students was written in 2000 by Beatrice Holton during her tenure (1996-2002) as the department's first Graduate Coordinator. It was updated somewhat by Stephen Bentivenga during his term (2002-2005), and revised in 2006 and 2008 by Thomas Lammers (2005-2010). It was revised in 2012, 2016, 2017 and 2019 by Robert Stelzer, the current Graduate Coordinator.

Welcome!

The faculty and staff of the Department of Biology welcome you as you begin graduate studies with us. Some of you completed your undergraduate degree with us; others are coming here from other universities. Some of you have been attending school continuously since kindergarten, while for others, it has been quite a few years since you were in a classroom. Some of you have definite goals in mind; others are still exploring. Whatever your situation, we pledge to do our best to make your time here a period of substantial growth and personal development.

Some people think graduate school is like the old campfire song: “second verse, same as the first, little bit louder, little bit worse.” That is far from an accurate assessment. Just as poets and philosophers dispute whether humans are one step up from the beasts or one step down from the angels, graduate students are dualistic in nature: much more than overgrown undergraduates but not quite young professionals yet. Perhaps the best analogy for graduate education is the apprenticeship. In graduate school, you find a master craftsman (your major professor) and attach yourself to that person for a few years so that you may learn through *experience*. The degree we offer, the Master of Science (M.S.), is a research degree. Though you will still take some standard coursework, most of your learning will take place *outside* a formal classroom setting: in the laboratory and field, in the library and on-line, in seminars and conferences, and in seemingly casual discussions with faculty and your fellow graduate students. A premier characteristic of graduate education is the *diversity* of ways by which you learn and grow. The more of these opportunities you embrace, the richer and more productive your experience will be.

This *Handbook* represents an “owner’s manual” for your graduate work, providing the basic information that you need to make your time here productive. This includes not only items specific to the program here in the Department of Biology and Microbiology, but also the broader requirements that all graduate students at this university must meet. Much additional information will be found in the current issue of the *Office of Graduate Studies Bulletin* and on the university’s website at <http://www.uwosh.edu/gradstudies/>.

May we offer some advice? We understand that your pursuit of a graduate degree can be complicated by your personal situation; employment, home, family, and other interests and obligations compete for limited time and resources. However, please bear in mind that society values a graduate degree *precisely* because it takes an inordinate amount of sacrifice, effort, and determination to achieve one. It is not something that you can obtain by simply showing up regularly and exerting a modicum of effort; it is not something that can be earned in your spare time. Think about it: if obtaining a master’s degree were relatively painless, society would value it no more highly than a high school diploma. Much of your previous education involved simply remembering and appreciating pertinent facts. Now, you must *build* on that basis, honing your analytical skills, and becoming adept at *using* the facts you have acquired, to solve problems and expand our knowledge base. It is now time to walk the walk and talk the talk. It is time to become a *biologist!*

Our Mission

Completion of a master's thesis in our department will enable students to ...

- be knowledgeable about the factual and theoretical principles of biology and microbiology;
- have in-depth knowledge of the advanced principles specific to the majors or emphases;
- be competent in basic quantitative skills relevant to biology and microbiology;
- think logically, interpret biological literature, and evaluate experimental results;
- communicate effectively in written form about the biological sciences;
- relate biological phenomena to broader societal issues;
- be satisfied with their biology education upon graduation; *and*
- attain an intellectual foundation necessary to pursue further education or employment.

In pursuing this mission,

our faculty members devote themselves not only to **teaching** students,
but also to broadening knowledge through **research**, *and*
to being of **service** to the campus, the community, and the world at large.

People You Need to Know

One of the first things you learn when you begin graduate studies here at the University of Wisconsin Oshkosh (UWO) is that a *lot* of people are involved in its administration and operation. Successfully navigating the various requirements of the next two years will require you to become familiar with all of the following.

Office of Graduate Studies

The primary responsibility for graduate education at UWO resides in the Office of Graduate Studies and its Director. It is this office to which you applied for admission, and to which you will return at various milestones in your graduate career. All forms mentioned herein that are to be submitted to this office (*e.g.*, Admission to Candidacy form, Graduate Assistantship application, etc.) are available on their website (<http://www.uwosh.edu/gradstudies/>).

Graduate Coordinator

One professor in our department is elected by the faculty to serve a three-year term as Graduate Coordinator. This person is responsible for the daily supervision and administration of the department's graduate program, serving as liaison between the department and the Office of Graduate Studies, and between the department and our graduate students. For newly admitted graduate students, the Graduate Coordinator serves as academic advisor until a major professor has been obtained.

Graduate Committee

The policies and rules governing our graduate program are the responsibility of the department's Graduate Committee, a group of three professors elected in September to a one-year term, with the Graduate Coordinator serving *ex officio*. The Graduate Committee formulates recommendations which are then brought by its Chair to the entire departmental faculty for vote.

Co-chairs

Supervision of all administrative aspects of the Department of Biology and Microbiology resides in two professors elected to three-year terms as Co-chairs. As part of their responsibility to assign job duties within the department, the Co-chairs determine work assignments for those graduate students who hold a Graduate Assistantship.

Major professor

A central aspect of traditional graduate study is the major professor, the faculty member most directly responsible for your education on a day-to-day basis. As noted above, your relationship to your major professor is like that of an apprentice to a master craftsman. In essence, you have come to this person and said, “Teach me what you know.” Your major professor is a research advisor, an academic advisor, a mentor, and a boss. (You may sometimes be tempted to add “nemesis” or “bane of my existence,” but rest assured that everything your major professor asks of you *is* for your benefit.) The camaraderie of research often forges special bonds between graduate student and major professor; odds are that many of your professors are still in contact with *their* major professors from graduate school, and have turned to them for advice periodically.

Because of the important role the major professor plays in your graduate education, it is *absolutely imperative* that you obtain a commitment from a faculty member to serve in this capacity as soon as possible. Ideally, you had at least a tentative commitment from a faculty member to serve as your major professor before you even submitted your application. In this way, you are under his or her wing from your first day on campus. If you did not, then by all means do so *before finishing your first semester*. To do this, speak to professors whose research interests parallel your own, who can provide the expertise you need to achieve your goals. Take the classes they offer and participate actively. Once a professor has agreed to serve as your major professor, request that he or she send the Graduate Coordinator a memo confirming that fact.

Individual committees

Besides the major professor, you will receive guidance from two individual committees. Both consist of your major professor plus two additional professors (ordinarily from our department but not necessarily so); the membership of the two committees often is the same but may be different. Both are selected by you, with advice from your major professor.

You will establish a **Thesis Committee** early in the program, ideally by the end of the first semester you enroll. The responsibility of this committee is to guide you during your thesis research, offering its expertise as need be. You should call a meeting of this committee at least three times. At the first meeting you will outline your proposed thesis project and present any preliminary results. At the second meeting you will present your research project in its near-final form. Data should be compiled and analyzed as they will be in the thesis, and any work remaining outlined thoroughly. This meeting will be the only opportunity for the committee to point out problems or deficiencies in the data or conclusions before you hand them your thesis to read. The final meeting (shortly before graduation) will be part of your public thesis defense. In most cases the **Thesis Committee** will also serve as the **Advancement to Candidacy Committee**. This committee chooses questions for your **Advancement to Candidacy Exam**, which is described near the end of this document.

Graduate Faculty

All members of our faculty who are qualified to guide graduate research and teach graduate-level courses (*i.e.*, our entire faculty) are listed here. The thumbnail sketch following each name provides information on (1) highest degree earned, (2) academic rank, (3) specialization within biology, and (4) research interests. Additional information may be obtained from the individual web pages that most maintain on the departmental website.

Gregory Adler, Ph.D., Boston University, 1986.

Professor. Ecologist. Population and community ecology of tropical mammals.

Stephen Bentivenga, Ph.D., Kansas State University, 1991.

Professor. Mycologist. Plant-fungus interactions; soil microbiology.

Morgan Churchill, Ph.D., University of Wyoming, 2014

Assistant Professor. Vertebrate Anatomist. Evolution & paleoecology of living & fossil marine mammals, morphometric & comparative phylogenetic methods

Sheldon Cooper, Ph.D., Utah State University, 1998.

Professor and Co-Chair. Physiological Ecologist. Animal ecological physiology; vertebrate energetics and thermoregulation.

David Dilkes, Ph.D., University of Toronto, 1993

Associate Professor. Paleontologist. Comparative and human anatomy; biology of early amphibians and reptiles; evolution.

Lisa Dorn, Ph.D., University of Montana, 1995.

Associate Professor. Geneticist. Mapping plant genes; molecular genetic influence on the evolution of ecologically relevant life history traits.

Todd Kostman, Ph.D., Washington State University, 1999.

Associate Professor and Co-Chair. Plant biologist. Plant cell biology; physiology of calcium regulation in plants.

Courtney Kurtz, Ph.D., University of Wisconsin-Madison, 2006.

Assistant Professor. Physiologist. Immunophysiology of hibernating mammals.

Jessica Lucas, Ph.D. Ohio State University, 2007

Cell & Developmental Biology. Molecular mechanisms underpinning plant development, structure and physiology. Her main techniques are quantitative & fluorescence microscopy, genetics, cell & molecular biology.

Eric Matson, Ph.D., Iowa State University, 2004.

Assistant Professor. Microbiologist. Composition and function of complex microbial communities and microbe-host interactions. Anaerobic, lignocellulose-degrading microbial communities

Colleen McDermott, D.V.M., Iowa State University, 1986; Ph.D., Kansas State University, 1990.

Professor. Microbiologist. Immunology; medical microbiology; detection of cyanobacterial toxins; microbial contamination of beach waters.

Elsbeth (Misty) McPhee, Ph.D., University of Michigan, 2002.

Associate Professor. Conservation Biologist. Response of animal populations to environmental change; behavior, morphology, & physiology of captive-bred animals.

Dana Merriman, Ph.D., University of California at Santa Barbara, 1988.

Professor. Neurobiologist. Cellular neuroscience; structure and function of vertebrate retina with hereditary disease and/or oxidative stress.

Michelle Michalski, Ph.D., Washington University School of Medicine, 2000.

Professor. Parasitologist. Molecular microbiology; microbial pathogenesis.

Rob Mitchell, Ph.D., University of Illinois at Urbana-Champaign, 2012.

Assistant Professor. Entomologist. Chemical ecology of insects; Discovery and field testing of novel compounds, sequencing molecular chemoreceptors, and mapping neural pathways involved in chemoreception

Sabrina Mueller-Spitz, Ph.D., University of Cincinnati, 2006; M.S., UW-Madison, 2001. *Associate Professor. Microbiologist. Characterizing Anthropogenic Influences on Bacterial Community Structure and Function.*

Robert Pillsbury, Ph.D., Bowling Green State University, 1993.

Professor. Ecologist. Algal taxonomy and ecology; wetland ecology.

Teri Shors, Ph.D., Arizona State University, 1995.

Professor. Virologist. Animal virology; pox viruses.

Robert Stelzer, Ph.D., University of Notre Dame, 2000.

Professor. Ecologist. Aquatic ecology; biogeochemistry; groundwater-surface water interactions in streams; stream and lake food webs.

Adjunct Graduate Faculty

Gregory Kleinheinz, Ph.D., Michigan Technological University, 1997.

Professor (Department of Engineering Technology). Microbiologist. Industrial and public health microbiology; beach water quality; industrial biofiltration; microbial food testing.

Program Assistants

The day-to-day operations of the departmental office (142 Halsey Science Center) are performed by two Program Assistants. You will turn to them most frequently when having to fill out certain paperwork relating to your graduate program (e.g., Graduate Assistantship work assignments) or when obtaining keys, office space, a mailbox, etc.

Lab-mates and other graduate students

Each faculty member maintains a research laboratory in which he or she expands our knowledge of life through careful scientific investigations. It is in such a laboratory that you will conduct the research that will form your thesis. Often, there are others in the lab besides yourself and the major professor: other graduate students, interested undergraduates, visiting scholars, volunteers, etc. Develop a genuine *esprit de corps* about the lab to which you belong. Look to your lab-mates for help and ideas, and be ready to do the same for them. The synergistic mix of intelligent and interesting personalities that one finds in a lab is a key characteristic of the life of a scientist, and one of the most enjoyable.

In the same vein, we encourage you to get to know the other graduate students in our department, to see yourself as *belonging* to a group that shares many common goals and experiences. Interact, both academically and recreationally, as much as possible. Arrange outings and get-togethers where you can network and commiserate with folks who are going through the same things you are. This sense of camaraderie can make the challenges of graduate school that much easier to surmount, and will forge professional relationships that will persist throughout your career as a biologist.

First Year Basics

The table on the preceding page provides an example of the sequence of events that characterize the average two-year graduate career in our department. In this section of the *Handbook*, we provide information on a variety of topics (listed alphabetically) that may arise during your first year, prior to your admission to candidacy.

Courses

A total of 30 credits are required to graduate with the degree Master of Science. Some of this will be standard lecture and/or lab courses, while others will take less conventional formats. Typically, most of your coursework will be completed during your first three semesters. If you were admitted on probation, you will need to maintain a GPA of 3.0 or higher in 9 credits of graduate-level coursework to reach full academic standing. You will not be admitted to candidacy for the master's degree until you are in full standing and have passed the Advancement to Candidacy Exam (see below). Note also that undergraduate courses taken to remediate deficiencies on your admission form do *not* count toward the 30 credit total.

At least fifteen of the 30 credits must be at the **700**-level (*i.e.*, courses open only to graduate students). The required courses described below account for 14 of these credits. The single remaining credit needed is usually achieved by enrolling in an Independent Study (Biol 796) with your major professor, or by taking Advanced Topics or Seminar a third time.

- **Biostatistics** (Biol 710, 2 cr.) Almost every research project in our department, irrespective of discipline or methodology, involves some sort of analysis of quantitative data. For this reason, all of our students take this course in statistical methods appropriate for the life sciences. This course replaces Introduction to Research (Biol 709 or 769). Spring Semester *only*.
- **Seminar** (Biol 748, 1 cr.) Instead of lecture or lab, *you* will make one or two short presentations on a research topic gleaned from the scientific literature, which will be critiqued by those in the audience. Doing so serves a dual function. First, you will increase your familiarity with current research in your area of interest and with scientific journals pertinent to it. Second, you will learn how to organize a scientific presentation, a skill you will need to master for your thesis defense and possibly for job interviews and your career. You will take this course twice, but we recommend that you *not* enroll during your first semester. Instead, you should just attend the presentations, which are open to the public. In this way, you can see what is expected of the speakers and gain useful ideas before having to present a talk yourself. Fall & Spring Semesters.
- **Advanced Topics** (Biol 765 or 766, 2 cr.) This course is designed to provide you with an in-depth look at a specific discipline within the life sciences. Instruction of the course rotates among the faculty each semester; the exact topic to be covered in any semester will depend on the instructor. You will take this course twice. Fall & Spring Semesters.

- **Thesis** (Biol 795, 6 cr. maximum). This is simply a bookkeeping device to give you credit for the time you spend on your research project. You cannot enroll until you have passed the Advancement to Candidacy Exam. A typical approach is to sign up for three credits in each of your last two semesters, though the credits may be distributed as you like.

The remaining credits (usually about 15) will be courses at the **500-** or **600-**level. These courses are dual-listed at the 300- and 400-level for undergraduates, and so will contain a mix of undergraduate and graduate students in the same classroom or lab. The specific courses you take will be determined by the recommendations of your major professor and Advancement to Candidacy Committee (or the Graduate Coordinator, if you are newly admitted and have not yet obtained a major professor), based on your interests and professional goals. Details regarding these courses are found in the *Office of Graduate Studies Bulletin* and on the university's Titan Web system. In addition to courses in our department, you may be advised to take courses in Chemistry, Geography, Geology, Mathematics, Physics, or Psychology, depending on the nature of your research, professional interests, and career goals.

Full-time status

A student who has not been awarded a Graduate Assistantship (*see below*) is considered to be a full-time student if he or she is enrolled in a minimum of **nine (9) credits** of coursework for the semester. Those who do have an assistantship are considered full-time with a minimum of **six (6) credits**. International students are required by the federal government to be at full-time status each semester.

Students without assistantships are not to take more than twelve (12) credits per semester; those with assistantships are not to take more than nine (9). Students desiring to take credit loads exceeding these maxima must formally request a waiver from the Office of Graduate Studies to do so.

Graduate Assistantships

A Graduate assistantship is a taxable salary paid to a qualified student in exchange for work performed in the department. It represents a win-win situation for both the student and the department, serving a three-fold function. First, it prepares the student for a future career by providing useful work experience in the life sciences. Second, it helps offset some of the student's educational expenses. Third, the department gets valuable and necessary work performed. Ordinarily, the assistantship covers an entire academic year (two semesters), and involves no more than 13.5 hours of work per week.

Eligibility. Only graduate students with full-time status are eligible for a Graduate Assistantship. Students who are on probation are not eligible for a Graduate Assistantship, nor are students who have more than one Incomplete on their grade record.

Selection process. Because of budget constraints, it usually is not possible to support every student who is eligible. As a result, Graduate Assistantships are awarded on a competitive basis. If you wish to be considered for a Graduate Assistantship, notify the Graduate Coordinator. The Graduate Coordinator will separate the applicants into categories based on length of time in the program (typically newly admitted vs. finishing first year). Within each category, applicants will be ranked by (1) grade-point average (undergraduate if newly admitted, graduate if finishing first year); (2) GRE Scores; (3) performance on the ACE (if taken); and (4) their major professor's assessment of their progress in their thesis research. This ranked list of applicants will then be reviewed by the Graduate Committee. The Graduate Committee evaluates the information provided for each applicant, then recommends to the Co-Chairs the students to be awarded an assistantship. The Co-Chairs, with the advice of the Graduate Coordinator, will then award Graduate Assistantships for the coming academic year to the highest ranked applicants in late May or early June. Occasionally, Graduate Assistantships from the department also become available for spring semester but most are awarded such that students begin the Graduate Assistantship in the fall.

Assignments. During early summer, faculty members submit requests to the Co-Chairs for student workers for the coming academic year. Most of the jobs to be filled involve course preparation, particularly for laboratory courses, while others may involve routine lab or greenhouse work or tutoring undergraduates. The Co-Chairs, with the advice of Graduate Coordinator, compare the list of requests to the list of Graduate Assistantship awardees and attempt to match the skills and interests of the student to job requirements. Every attempt is made to keep all assignments equitable. Students will receive their specific work assignments for Fall Semester and a tentative assignment for Spring Semester in August; final assignments for Spring Semester will be made in January.

Application. Students interested in applying for a Graduate Assistantship must complete an application form before they are hired. An application is available on the Graduate Studies web page

Grants, scholarships, and fellowships

In addition to Graduate Assistantships, there are a number of other opportunities on campus that might allow you to offset some of your educational expenses. Those that seem most appropriate to our students are described below. You should also watch the bulletin boards near the departmental office (142 Halsey Science) for additional opportunities on campus. Your major professor may also be aware of national grant and scholarship opportunities pertinent to specific disciplines (e.g., the American Society of Plant Taxonomists' Graduate Student Research Awards).

Faculty/Student Collaborative Research Program. Financial support for your thesis research during the summer might be obtained through this program, which pays you a stipend of \$3,000 plus \$500 to purchase supplies. The deadline to file a proposal is

in February. Contact the UWO Office of Grants and Faculty Development for more information.

American Association of University Women (Oshkosh Branch) Scholarship. A \$1000 scholarship to a female graduate student. For more information visit: <https://www.uwosh.edu/gradstudies/tuition-financial-assistance-and-employment-opportunities/scholarships-and-grants/scholarships/aauw-graduate-scholarship-for-women>

Leslie Allen Fellowship. An award of \$500 to an outstanding biology major (graduate or undergraduate) with a demonstrated interest in ecology or field biology and at least one semester remaining before graduation. The deadline is in February. Contact the Department of Biology and Microbiology (142 Halsey Science Center; 920-424-1102) for more information.

Probation

A graduate student with a grade-point average (GPA) **less than 3.00** is placed on probation. For a newly admitted student, this is based on undergraduate GPA (*i.e.*, admitted on probation); for all others, this is based on graduate GPA.

Students on probation are not eligible for a Graduate Assistantship; cannot advance to candidacy; and ordinarily cannot enroll in Independent Study (Biol 796). A waiver to the last may be granted by the Office of Graduate Studies. To obtain such a waiver, the student's major professor must justify the overriding need for the course for this particular student, and testify to his or her potential to complete it successfully and benefit from it.

Probationary status is lifted once the student has completed nine (9) more credits of graduate work with a cumulative GPA above 3.00. Failure to do so results in suspension from the program.

Admission to Candidacy

At the end of your first year of graduate study, you will apply to become a candidate for the M.S. degree. Being a candidate means that you have satisfactorily demonstrated your capabilities and the university has judged that you have a good chance to complete all requirements and earn your degree. The main factor determining whether you are admitted to candidacy is your performance on the Advancement to Candidacy Exam (ACE).

Nature of the ACE

The questions comprising your ACE are selected especially for you by your Advancement to Candidacy Committee. The committee may write original questions specifically for you, or select standardized questions from a pool developed for this purpose. Questions selected from the pool may have been written by professors who are not members of your committee.

Each ACE comprises **six essay questions**. The first three are considered **general** questions, covering material that the faculty believes all biology or microbiology students should have mastered. Reviewing a good introductory textbook should prepare you for these questions. Although they are considered to represent a general level of knowledge, they may still be discipline-specific, e.g., general physiology questions or general virology questions. The other three are considered **advanced** questions related to your specific field of interest and/or planned research project. These are questions that the faculty believes a person planning to undertake a certain research project must know in order to carry it out successfully. Reviewing your classroom notes and textbooks from classes in your specialization is a good method of preparation; your committee may suggest additional means of preparation.

The exam is administered by the Graduate Coordinator on a secure computer, using Microsoft Word® word-processing software. You will not be allowed any sort of outside resources. Ordinarily, you will be given the general questions in the morning and the advanced questions after a break for lunch.

Eligibility

To be eligible to sit for the ACE, you must (1) be a student in full standing, as defined above; (2) have completed any and all deficiencies noted on your admission form; and (3) have completed at least nine (9) credits of graduate (500- to 700-level) coursework. The process thus will most likely begin upon completion of your second semester of graduate work. Because most students start their program with Fall Semester, this will occur during Spring Interim (mid- to late May), while for those who started with Spring Semester, it will come during Fall Interim (mid-December to early January).

Sitting for the Exam

Your **Graduate/Advancement to Candidacy Committee** will choose the questions for your exam. This is often done at the first meeting of your committee after you have updated your committee on plans for your thesis research and have sought their feedback about your planned research and coursework for the remainder of your program. For the Exam, the committee members may craft questions specifically for you, or select questions from a pool prepared by the Graduate Faculty. The six questions (three general and three advanced) that they select are then forwarded to the Graduate Coordinator for compilation and administration. After this meeting, contact the Graduate Coordinator to **set a time** for you to sit for your ACE.

Evaluation and results

Once you have completed the exam, the Graduate Coordinator will distribute your answers for **grading**. Each answer will be graded by the faculty member who wrote the question, thus assuring consistency from one student to the next. You will know the identity of each grader as you are taking the exam. Your exam will be identified solely by a code number, not by name, to eliminate any possibility of bias in grading. Only two grades are utilized: Pass or Fail.

Once all six questions have been graded and returned, the Graduate Coordinator will forward a memo to your major professor, informing him or her of the **results**. Your major professor in turn will report the results to you and discuss them with you. If you fail one or more questions, you must call a meeting of your Advancement to Candidacy Committee to determine how to remediate this shortcoming. To do this, they may require you to take a specific course or courses to address the perceived deficiency, or to retake the failed question(s) or one(s) like it at a later date. If in their opinion, your results are beyond remediation, you will be asked to leave the graduate program. If you pass all six questions, you then complete an **Admission to Candidacy form** (available on-line at the Graduate Studies web site) and submit it to the Office of Graduate Studies, where the Director of Graduate Admissions and Records will review the facts and render a decision.

Your Thesis

The capstone of your graduate experience is your thesis. In our department, the thesis presents the details of a major research project (typically hypothesis-driven and embracing the experimental method), from its inception to its successful conclusion. It represents an original contribution to knowledge, expanding what the world of science knows about living things and how they operate. In structure, it parallels the peer-reviewed research papers published in scientific journals. In fact, your goal should be to craft one or more such publications from your thesis, once it is complete, and submit them to appropriate venues.

Selecting a thesis topic can be one of the most agonizing steps of your graduate career. It will involve a great deal of reading and thought on your part, and cogent discussions with your major professor and Thesis Committee members. While you will want to pursue a problem of significance and merit, this desire will be tempered by pragmatic considerations, *i.e.*, can the project be brought to completion with the resources available and in the time allotted? To help you get started in this important process, we have included a reprint of an article that may be useful to read. Although it is directed at students undertaking a doctoral dissertation rather than a master's thesis, most of the points articulated therein are equally valid for you. You and your major professor may find the flow-chart particularly useful.

In a nutshell, you should begin to read extensively during your first semester, thinking about interesting and worthwhile problems to pursue. Frequent conversations with your major professor and others will help direct you in this. One of the most important lessons in science is that research is seldom a straightforward process. You will chase down blind alleys, be stumped, backtrack, and try new leads repeatedly. Do not let this discourage you – it is the very essence of research!

Because the methodologies of biological research vary enormously, depending on the exact discipline involved, we will not deal here with actual research protocols, methods of data analysis, or other scientific content of theses. This will be up to you, your major professor, and other committee members. Instead, we will concern ourselves solely with the mechanics of submitting a thesis to the university.

Similarly, the actual writing of the thesis, once the data have been gathered and analyzed, is largely a matter to be determined by you, your major professor and Thesis Committee. However, we will offer this one bit of advice: *Writing a thesis always takes far longer than you anticipate!* Students accustomed to writing lab reports and term papers have a difficult time conceiving all that is involved in actually writing a thesis. It is, after all, a small book, divided into chapters. Selecting the best logical flow of topics and the right verbiage to express them is only part of the challenge. Simply complying with the university's format requirements can prove absolutely maddening. A good rule of thumb: take whatever seems like a reasonable length of time ... and *triple* it!

Research Proposal form

The process of thesis submission begins once you have been admitted to candidacy. Dissolve your Advancement to Candidacy Committee and establish in its place your Thesis Committee. (As noted above, the membership of the two may be identical.) At its first meeting, you will outline your proposed thesis project, present any preliminary results, and begin preparing your Research Proposal form (available on-line at the Graduate Studies web site). This form details the problem you will be addressing and your methods for addressing it. Once the form has been finalized, submit it to the Office of Graduate Studies for their approval. Note that you cannot enroll for Thesis (Biol 795) until you have done so, and that this form must be filed at least one semester before you plan to graduate.

Application to graduate

At the *beginning* of the semester that you plan to graduate, you must submit an application to graduate. To do so go to the Office of Graduate Studies (<http://www.uwosh.edu/gradstudies/resources/forms/application-to-graduation/>). A graduation check will then be performed by that office once all grades for the semester have been submitted.

Committee review

You will write the thesis under the direction of your major professor. Procedural details are left up to you two to establish. Some professors wish to see a full outline and critique drafts of one chapter before you go on to the next; others prefer to examine a complete first draft before offering feedback. Ask your major professor how he or she wishes you to proceed.

Once you have a complete draft of your thesis with which your major professor is reasonably satisfied, it is time to give it to the other members of your Thesis Committee for their input. Remember that professors are busy people, with many teaching, research, and service obligations of their own. A failure to plan ahead on your part does *not* constitute an emergency on their part! Courtesy demands that you give your committee members a *bare minimum* of **one week**, and preferably **two**, to read your thesis, mark it up, and return it to you. Perhaps one or both will tell you that they will be satisfied if you make the changes they suggest, or perhaps they will want to see a *second* draft. Thus, you will want to give them your *first* draft early enough to allow time to review a subsequent draft, as well as the time you will need to prepare it. They may wish to see this next draft before you defend the thesis, or they may be content to receive it after the defense.

Thesis format approval

The Office of Graduate Studies has *very* exacting standards for thesis preparation (e.g., paper, margins, fonts, pagination, binding) with which you *must* comply. For

complete details on thesis preparation, consult the *Format Policy and Style Manual* produced by the Office of Graduate Studies and available for download their web site. A draft of your thesis must be submitted to the Office of Graduate Studies to check for compliance with format requirements in the *Format Policy and Style Manual* no later than **three weeks prior** to the last day of the semester in which you plan to graduate.

Public defense

Once your Thesis Committee has reviewed your thesis, you are ready to defend it publicly. You will make a 40- to 45-minute public presentation of your research that will be attended by your Thesis Committee, the Graduate Coordinator, and other interested parties.

As soon as the date for your defense is scheduled, contact a Program Assistant about arranging for a room in which to hold it. About a week before the date selected, give the Program Assistant an electronic copy of your abstract to distribute to the faculty and staff via e-mail, and to post on the departmental bulletin boards.

After your presentation, you will answer questions from the audience. After they have left, you will meet with the Thesis Committee, who may ask you additional questions. If they are *completely* satisfied with your thesis, they will sign its title page at this time. Alternatively, one or more members may wish to see further revisions before he or she will sign.

Final submission

The final version of your thesis, with its cover page signed by all three members of your Thesis Committee, must be submitted to the Office of Graduate Studies no later than the **last day of classes** of the semester in which you plan to graduate. They require two copies, both of which are deposited in Polk Library. One is deposited in the Archives, as permanent evidence of a student's successful completion of the thesis requirement, the other goes to Acquisitions, for incorporation in the library's circulating collection.

Distinguished Master's Thesis Award

The Office of Graduate Studies each year selects one thesis for this \$500 award. The winning entry is then submitted to the Midwestern Association of Graduate Students' annual Distinguished Master's Thesis competition. To be considered, your major professor must nominate you.

Advancement to Candidacy and Thesis Credits

Instructions for submitting an Advancement to Candidacy Form, signing up for thesis credits, and submitting a thesis proposal form.

Once you have passed your Advancement to Candidacy Exam (ACE) you will have to complete an **Advancement to Candidacy Application (ACA)** to formally become a candidate for the MS in Biology/Microbiology. You will find the application and instructions here:

<https://www.uwosh.edu/gradstudies/forms-and-policies/forms/all-applicants/forms/all-applicants/webcandform.pdf>

<https://www.uwosh.edu/gradstudies/forms-and-policies/forms/all-applicants/general-candidacy-instructions>

To sign up for **thesis credits** (Bio 795) you will need to request and fill out an add card which is available in the main office of the Department of Biology. Students most typically sign up for 6 thesis credits in their final or penultimate semester. Taking 3 credits per semester in consecutive semesters is also common (recall you are required to take 6 total thesis credits while in the MS Program). You will need an approved **ACA** before you can enroll in thesis credits. **In practice most students submit an ACA, add card for thesis credits, and thesis proposal form simultaneously to the Graduate Studies Office.** Note that these forms require signatures from your advisor, the Graduate Coordinator in Biology and, in some cases, your other committee members.

Before you can apply for graduation you will need to submit a **Thesis Proposal Form**. The form and instructions can be found here:

<https://www.uwosh.edu/gradstudies/forms-and-policies/forms/all-applicants/rsrchapplfrm.pdf>

<https://www.uwosh.edu/gradstudies/forms-and-policies/forms/all-applicants/Research%20Approval%20Form%20Cover%20Memo%20MN.pdf>

Example of a typical timeline for earning a master's degree in biology or microbiology at UWO
(Assumes a student admitted in full standing for Fall Semester)

Area	First year			Second year		
	Fall	Spring	Summer	Fall	Spring	Summer
Coursework	Advanced Topics (765 or 766, 2 cr.) 500- and 600-level courses to make full-time load Attend Seminar	Biostatistics (710, 2 cr.) Seminar (728, 748, or 768; 1 cr.)* 500- and 600-level courses to make full-time load		Advanced Topics (765 or 766, 2 cr.)* Thesis (795, 3 cr.) Independent Study (796, 1 cr.) Attend Seminar	Seminar (728, 748, or 768; 1 cr.) Thesis (795, 3 cr.) Any remaining 500- or 600-level courses to make 30 cr. total	
Thesis	Begin reading extensively in possible areas of interest	Apply for Collaborative Research Grant (January) Continue reading and honing plan Begin gathering preliminary data	Establish and meet with Thesis Cmte. (once admitted to candidacy) Submit Research Proposal form Perform lab experiments and/or field research	Continue lab experiments and/or field research	Begin data analysis Meet with Thesis Cmte. to present results Write draft	Give draft to Thesis Cmte. Submit draft for format approval Write final version Defend thesis Submit thesis
Other	Secure a major professor Establish and meet with Advancement to Candidacy Cmte.	Apply for Graduate Assistantship Meet with Advancement to Candidacy Cmte. Sit for ACE (Spring Interim)	Submit Admission to Candidacy form (after passing ACE)			Apply for graduation (beginning of semester) <i>Receive M.S.!</i>

* These may be switched at your discretion.