

Handbook for Graduate Students in Astronomy

2020 - 2021



Version 1.0, 2020

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Introduction

Welcome to the UW-Madison Astronomy Department!

The goal of the graduate program is to prepare capable and creative astronomers for careers in research and education. The granting of the PhD degree indicates that the recipient has a mastery of the knowledge and techniques of modern astrophysics. A PhD candidate is expected to be both knowledgeable of problems at the frontiers of astrophysical research and able to carry out independent forefront research in a specialized area. Candidates are required to gain experience as teaching assistants and are encouraged to work with a variety of faculty and research staff members during the first two years of study. The program provides each student with a broad knowledge of modern observational and theoretical astrophysics, while emphasizing the development of independent research skills. Beginning with the first year in the program, graduate students play an active role in the department's research programs and have access to all research facilities. As teaching assistants, they also acquire experience as astronomy educators.

Role of the Handbook

This handbook is intended for graduate students who are pursuing PhD degrees in Astronomy. The UW-Madison Graduate School is the ultimate authority for granting graduate degrees at the University. The Department of Astronomy administers the PhD program under the authority of the Graduate School. The Graduate School's Academic Policies and Procedures provide essential information regarding general University requirements. Program authority to set degree requirements beyond the minimum required by the Graduate School lies with the Astronomy Department faculty. The policies described in this handbook have been approved by the Astronomy faculty as a whole. Degrees and course requirements may change over time. However, *students must meet the degree and course requirements in effect when they entered the program*. In addition, administrative procedures and processes can change over time. Students are required to follow the procedures and processes listed in the current handbook. The information in this handbook should also be supplemented by individual consultation with your advisor and committee so that individual needs, interests and all degree requirements are met. Additional information is available via the Department's Web page: <http://www.astro.wisc.edu>. Students may also wish to consult the Graduate School's Web page: <https://grad.wisc.edu>

Some flexibility will be given to these policies due to COVID-19. Check with the Department Chair if any exceptions are needed

Key Individuals

Department Chair: Dr. Richard Townsend (chair@astro.wisc.edu)

Graduate Program Coordinator: Heather Sauer (hsauer@wisc.edu)

Director of Graduate Studies: Dr. Christy Tremonti (tremonti@astro.wisc.edu)

Students should always reference this Handbook, the Astronomy Department's website (astro.wisc.edu), the Graduate School's website (grad.wisc.edu), and the Graduate School's Academic Policies and Procedures (grad.wisc.edu/acadpolicy/) for answers on various program-related questions. However, when students need further clarification on any of these policies or procedures, they should contact the Graduate Program Coordinator. The Graduate Program Coordinator may play a role with issues including satisfactory academic progress, academic

deadlines, graduation completion, program-related forms, advising/course holds and permissions, and course offerings.

Learning Outcomes

Introduction: The Doctoral program in Astronomy trains students to conduct research into the physical principles governing the formation and evolution of the Universe and to communicate their results to professional peers as well as to the general public. The technical, analytical, computational, writing, and speaking skills acquired in the program have proven to be an excellent foundation for a broad range of careers in addition to astronomy.

1) Knowledge: Students will:

- Demonstrate a broad understanding of core astrophysical topics including gravitational dynamics; radiative processes; the interstellar medium; the formation, structure, and evolution of stars and galaxies; cosmology; and observational and numerical techniques.
- Demonstrate academic mastery in their area of concentration, including a deep understanding of current theories, recent findings, and their broader implications for the field.
- Use their core knowledge and critical thinking skills to assess the work of others. They will examine the scientific literature, evaluate evidence for and against hypotheses, synthesize knowledge from disparate sources, and develop conclusions.

2) Research: Students will develop and complete original research that advances a specific field of study. In so doing, they will cultivate their critical thinking skills, creativity, and independence. They will:

- Evaluate scientific literature and use it to construct theoretical frameworks and testable predictions for their own research projects.
- Participate in writing competitive proposals to use research facilities and to obtain research support.
- Demonstrate mastery of modern instrumental, observational, or theoretical research techniques in their area of concentration.
- Formulate ideas, designs, or techniques that advance the boundaries of knowledge within their field.
- Critically evaluate the robustness of conclusions drawn from their research and the potential for future studies
- Foster ethical and professional conduct.

3) Communication: Students will:

- Write clear and concise research articles for publication in professional journals.
- Deliver articulate oral presentations on their research to diverse audiences including academic departments and conferences.
- Communicate the value of their work to the public through outreach and education activities.
- Work productively in a collaborative environment.

4) Teaching: Students will serve as teaching assistants for at least one semester. They will:

- Communicate complex scientific ideas in a clear and understandable manner.
- Employ techniques that enhance student engagement.
- Develop and carry out assessments of student progress.
- Foster ethical and professional conduct and serve as positive role models for their students.

Steps to a PhD in Astronomy

Below we summarize the key aspects of obtaining to a PhD in Astronomy. Subsequent chapters supply additional details.

Graduate Course Work

Students take 7 core courses during their first 2 years (Astron 500, 700, 702, 715, 720, 730, 735) as well as Astron 910 (Journal Club) and 990 (Research) every semester. They also complete the requirements for a graduate minor.

Research

Students begin research their first semester in graduate school. They are encouraged to work with a variety of faculty and scientists before committing to a thesis project in their third year. Students are typically funded as research associates for the majority of their time in graduate school. Students are encouraged to publish their research promptly, with a goal of having at 3 accepted journal papers by the time of their PhD defense.

Teaching

Students must serve as a Teaching Assistant for at least one semester. While students may teach more than this, TA slots are usually very limited.

Preliminary Examination

Students take written and oral preliminary examinations at the end of their second year. The written exam focuses on material from the core graduate astronomy courses. The oral exam is tailored to the student's area of research expertise. Students who fail the exams may retake them once. Students who fail a second time may be dismissed from the program or allowed to complete a terminal master's degree.

Thesis Proposal

Students must select a thesis topic and present their thesis proposal by the end of their 3rd year in graduate school. The thesis proposal consists of a 4-6 page written document and a 30 minute presentation to the department, followed by questions. The thesis proposal is not formally evaluated, but the faculty use this opportunity to give the candidate constructive feedback.

Dissertator Status

Students achieve dissertator status when they have:

- Completed their course work
- Completed their graduate minor

- Passed Prelims within the last 5 years
- Presented their Thesis Proposal

Dissertator status also comes with a pay raise.

PhD Defense

Students must prepare a written thesis following the guidelines outlined by the graduate school. The candidate must also give an oral presentation to the department, followed by a closed-door oral examination by the thesis committee.

The Department Code of Conduct

The ability to produce high-quality science and offer excellent educational opportunities is a hallmark of top academic research programs. Recognizing that scientific productivity and educational success are enabled by a respectful and professional environment the University of Wisconsin-Madison Department of Astronomy adopts this Code of Conduct. This Code aims to foster an environment where everyone may reach their full potential, be it in research, education, public outreach, administration, or studies. It applies to all members of the Department, including visitors, but does not supplant University policies and procedures.

Guidelines

- Be polite. The operation of the Department depends on people carrying out a wide range of necessary tasks. Civil behavior and timeliness helps everyone to work or study effectively.
- Behave professionally.
- All formal communications from members of the Department should be appropriate for a professional audience including people of many different backgrounds. Disrespectful or exclusionary language or imagery is not appropriate.
- Be respectful of the opinions, views, and rights of others.
- Be fair. We expect students and colleagues to be treated fairly and that standards for the assessment of performance will be applied equally.
- All members of the Department are expected to follow University policies for proper workplace behavior and to follow standard rules for ethical research practices (see <https://research.wisc.edu/respolcomp/resethics/>).
- The Department has an anti-retaliation policy that applies to complainants. A person making a complaint about violations of this code, or expressing a concern about the departmental climate, is protected from retaliatory actions.
- Harassment and sexist, racist, or exclusionary comments or jokes are not appropriate. Harassment includes unwelcome and sustained/repeated disruption of teaching, studying, talks or other department-related events or tasks; inappropriate physical contact, sexual attention or innuendo; deliberate intimidation; stalking; and photographing or recording of an individual without consent. It also includes offensive comments related to gender, sexual orientation, disability, physical appearance, body size, race, or religion.

Remediation

As a first option, any person who is concerned that someone violated the code of conduct is encouraged to bring that concern to a member of the Committee on Departmental Environment. The Committee is confidential and has the resources to assist in suggesting steps to resolve the issue.

Within the Department: Cases that cannot be resolved through the Committee on Departmental Environment described above can be brought directly to the attention of the Department Chair or Associate Chair. The Chair or Associate Chair then decides how to address the situation, which may

include the involvement of resources outside of the Department. The Chair/Associate Chair will seek information on the nature of the problem, will discuss the complaint with all parties involved and will appropriately inform the parties of the outcome of this process.

Outside of the Department: If discussion with the Department Chair or Associate Chair would be inappropriate, the option exists to bring a complaint to the attention of appropriate authorities outside of the Department. In this situation, the process depends on the status of the person making the complaint. Examples of possible remediation steps are listed, but other options may exist depending upon the particulars of the situation:

- The Dean of Student's office is ready and able to assist undergraduate and graduate students (see, e.g., <http://www.students.wisc.edu/doso/non-academic-misconduct> or similar sites). Graduate students also have the option to discuss issues with the office of the Dean of the Graduate School.
- Issues concerning faculty or instructors should be brought to the attention of our Associate Dean in the College of Letters and Science.
- Situations involving staff can contact the Associate Dean who can recommend an appropriate resource.
- Postdoctoral researchers and Scientists should contact either the College or the Graduate School as a first step.
- Our Ombud's Office (<http://ombuds.wisc.edu/>) and Title IX Office for Equity and Diversity (<https://compliance.wisc.edu/titleix/>) have resources to help any member of the Department deal with a range of situations.
- The National Science Foundation has recently introduced policies for reporting harassment or discrimination of any kind in the context of NSF-sponsored research; see <https://www.nsf.gov/od/odi/harassment.jsp>.

We expect the specifics of this list to be updated annually by the Committee on Departmental Environment. This committee also will ensure that this information is available to all members of the Department, including undergraduate students.

Committee on Departmental Environment

The Code of Conduct is intended to be a living document that reflects a shared responsibility for maintaining a professional environment in our workplace. The Chair will annually request nominations for elections to the Committee on Departmental Environment that is the caretaker of this Code.

Committee members will be nominated to be representatives from the following groups: faculty, graduate students, scientists, post-doctoral researchers, technical staff, and administrative/office staff. When more than one nominee is presented from any departmental group, the committee members will be elected by vote of the relevant component of the department. Once formed the Committee will annually elect its Chairperson and committee members may serve terms of up to 3 years that are renewable.

The Committee on Departmental Environment is responsible for making the first step in resolving a concern that is brought to their attention, reviewing campus options for remediation, and providing this information on a web page that is accessible to all members of the Department. Any complaints brought to the Committee will be held in confidence unless doing so would violate a College or University policy.

This Committee also is charged with maintaining the formal Code of Conduct, and as appropriate will present suggestions for revisions to the Chair and the Department.

In addition, the Chair of the Committee on Departmental Environment will provide an annual report to the Chair and Executive Committee on the departmental environment. This report normally will be presented in an executive session during the last departmental meeting of each academic year.

The Committee on Departmental Environment will cooperate with the Chair to ensure that we are sustaining a healthy workplace. To this end the Committee Chair may bring concerns to the Department Chair provided that the conditions for anonymity discussed above are not violated.

Faculty, Scientists, & Staff

Faculty

Amy Barger, Professor (Ph.D. University of Cambridge, 1997)

Observational cosmology, distant galaxies and supermassive black holes, observations at X-ray, optical, near-infrared, submillimeter and radio wavelengths, star formation and accretion histories of the Universe.

Matthew A. Bershad, Professor (Ph.D. University Of Chicago, 1994)

Extragalactic Astronomy and observational cosmology; galaxy kinematics, image structure, stellar populations; galaxy and quasar evolution; optical and IR observations and instrumentation.

Elena D'Onghia, Associate Professor (Ph.D. University of Milan, 2003)

Cosmology, nature of dark matter, large scale structure formation, galactic dynamics and galaxy formation.

Sebastian Heinz, Professor (Ph.D. University Of Colorado, Boulder, 2000)

Relativistic jets, black holes, AGN, X-ray binaries, galaxy clusters, gamma ray bursts, interstellar and intergalactic medium.

Alex Lazarian, Professor (Ph.D. University Of Cambridge, 1995)

Magnetohydrodynamic turbulence, interstellar dynamics and statistics, magnetic reconnection, generation of magnetic field, interstellar polarization, dust-grain dynamics/alignment, microwave emissivity of dust, molecular clouds and star formation.

Robert D. Mathieu, Professor (Ph.D. University of California-Berkeley, 1983)

Observational studies of star formation, binary stars, and open star clusters, with an emphasis on the formation and evolution of binary stars. His work involves extensive high-precision stellar radial-velocity surveys, and study of optical, infrared and submillimeter spectral energy distributions and variability.

Snezana Stanimirovic, Professor (Ph.D. University of Western Sydney, 1999)

Galactic disk/halos, dust properties in low-metallicity environments, physics of the ISM, radio techniques and applications.

Richard H. Townsend, Associate Professor and Chair (Ph.D. University College London, 1997)

Stellar astrophysics, magnetic fields, stellar winds, massive stars.

Christy Tremonti, Associate Professor (Ph.D. Johns Hopkins University, 2003)

Observational investigations of galaxy evolution with a focus on UV and optical spectroscopy; post-starburst galaxies, galactic winds, galaxy chemical evolution.

Andrew Vanderburg, Assistant Professor (Ph.D. Harvard 2017)

Observational studies of exoplanets focusing on planet detection (developing new observational/data analysis techniques) and characterization of planet properties/system architectures.

Susana Widicus Weaver, Voza Professor (Ph.D. California Institute of Technology, 2005)
Astrochemistry, Star Formation, Planet Formation, Molecular Spectroscopy

Eric M. Wilcots, Professor and Dean (Ph.D. University of Washington, 1992)
Radio astronomy; observations of H I in galaxies and dynamics of galaxies; galaxy evolution; H II regions.

Ellen Zweibel, Professor (Ph.D. Princeton University, 1977)
Theoretical astrophysics, especially plasma astrophysics. Generation and evolution of astrophysical magnetic fields, interstellar astrophysics, star formation, stellar physics.

Ke Zhang, Assistant Professor (Ph.D. California Institute of Technology, 2015)
Planet formation, Extrasolar planets, Astrochemistry

Emeriti on Campus

Edward B. Churchwell, Professor Emeritus (Ph.D. University of Indiana, 1970)
Radio and infrared observations of massive star formation regions; atomic abundances and chemical evolution of the galaxy; chemistry and structure of interstellar molecular clouds.

John S. Gallagher, III, Professor Emeritus (Ph.D. University of Wisconsin, 1972)
Multi-wavelength observational investigations of physical processes that shape galaxies; the evolutionary states of galactic stellar populations and interstellar matter; relationships between stellar populations and the interstellar medium in actively star forming galaxies.

Kenneth Nordsieck, Professor Emeritus (Ph.D. University of California-Santa Cruz, 1972)
Instrumental, observational, and analytical applications of astronomical polarimetry; optical studies of supergiants and the polarization that arises from scattering by interstellar dust.

Scientists

Eric Hooper, WIYN Development Scientist (Ph.D. University of Arizona, 1997)
Galaxy and AGN evolution.

Ralf Kotulla, Scientist (Ph.D. University of Hertfordshire, 2010)
Galaxy formation and evolution, stellar populations in galaxies of different Hubble types and environments, star formation and its feedback processes, observation and modeling of spectral Energy Distributions (SEDs) of galaxies, dust absorption and reemission, galaxy transformation scenarios in galaxy clusters, astronomical data processing and reduction, pipelines

Marina Orio, Senior Scientist (Ph.D. Technion, Haifa, Israel, 1987)
Transients' populations, interacting binaries, accreting and hydrogen burning white dwarfs.

Jeffrey W. Percival, Senior Scientist (Ph.D. University of Wisconsin, 1979)
Instrument control software, telescope control systems, guidance and navigation for suborbital rockets.

Bastiaan Walker, Senior Scientist (Ph.D. Groningen, 1990)
The interstellar and intergalactic medium

Marsha Wolf, Senior Scientist (Ph.D. University of Texas-Austin, 2005)

Galaxy evolution, stellar populations in galaxies, merging galaxies, post-starburst galaxies, quasar host galaxies, astronomical instrumentation

Staff

Steve Anderson: Department Administrator

Sam Gabelt: Electronics Technician

Kurt Jaehnig: Washburn Labs Technical Staff

Kay Kriewald: Senior Outreach Specialist, Space Place

Jim Lattis: Director of Space Place

Angela Normington: Administrative Staff

Cole Piddington: Machinist

Heather Sauer: Student Coordinator

Eric Schueffner: Undergraduate Academic Advisor

Michael Smith: Washburn Labs Technical Staff

Aaron Teche: System Administrator

Rick Williams: Shop Staff

Research Facilities

Astronomical observations at UW–Madison trace their origin to the 15-inch refractor of Washburn Observatory, founded on the campus in 1878, and still open for public viewing. Wisconsin subsequently pioneered a multi-wavelength approach to astronomical observation. Faculty, research staff, and students are frequent observers on X-ray, ultraviolet, optical, infrared, radio, and submillimeter telescopes around the globe and in space. The department currently participates in the operation of a number of research-class observing facilities and is actively engaged in the development of cutting-edge instrumentation.

Current Research Facilities

- **WIYN** is an advanced technology 3.5m telescope at Kitt Peak, Arizona, optimized for wide-field imaging and spectroscopy. UW has about a 14% share of the telescope's time. Proposals are typically due in September and March.
- **SALT** (Southern African Large Telescope), the largest single aperture optical telescope in the Southern Hemisphere (11 meters). Washburn Labs built the telescope's workhorse visible light spectrograph (the Robert Stobie Spectrograph) and they are currently at work on a near infrared spectrograph. UW has about a 9% share in the telescope. Proposals are typically due in late July and late January.
- **NOEMA** (NOthern Extended Millimeter Array) is located on the Plateau de Bure in the French Alps. The telescope currently consists of ten antennas, each 15 meters in diameter, equipped with state-of-the-art high-sensitivity receivers. More antennas are being added each year. When complete, NOEMA will be the most advanced facility for millimeter radio astronomy in the Northern Hemisphere. The UW has access to 100 hours of observing time per year. Proposals are typically due in September and March.
- **Sloan Digital Sky Survey IV** is a massive spectroscopic survey of the distant Universe (eBOSS), nearby galaxies (MaNGA), and stars in the Milky Way (APOGEE-2). UW-Madison is playing an integral role in the survey: Prof. Matt Bershady is the Project Scientist and Washburn Laboratories led the design and testing of the MaNGA integral field units. UW is a full member in SDSS-IV which gives department members access to SDSS data prior to public releases and many networking opportunities within the collaboration.
- **Washburn Laboratories:** The department has a long history of developing astronomical instrumentation for both ground and space-based facilities. Current efforts center on the development of a near-infrared spectrograph and an integral field unit for SALT. UW scientists are also continuing to develop and operate an innovative and highly successful Star Tracker for sounding rocket and balloon-borne experiments.
- **Computational Facilities:** For large-scale simulations, the Department maintains priority access to the 'astro2' queue of the campus High Performance Computing cluster, hosted in the basement of the Wisconsin Institutes for Discovery. This queue comprises 24 nodes, connected via InfiniBand switched fabric. Each node contains 20 Intel Xeon cores running at 2.6GHz together with 128GB RAM. For large jobs, other nodes within the HPC cluster can also be used on a time-shared basis.

For smaller-scale simulations, the Department maintains a number of small clusters in-house; these are built on older hardware than the HPC cluster, and are typically used for prototyping, development and data processing.

For day-to-day computing, individual research groups purchase and maintain the computational resources they require.

The department is also actively involved in ASKAP and MEERKAT, precursor experiments for an array of radio telescopes one square kilometer in size.

The Research Advisor

The Advisors Role

The research advisor's role is to assist the student in acquiring the highest level of knowledge and competence in the field that is possible. In addition to supervising the student's research, the advisor will assist with academic planning, help identify research and funding opportunities, and monitor progress toward degree completion. The advisor must also come up with a plan to fund the student through a combination of grant funds, fellowships, and teaching assistantships.

The advisor may be an Astronomy faculty member or research scientist. If the advisor is a research scientist, the student must also have a faculty member act as a co-advisor. Since the advisor's role can vary, students should discuss roles and expectations with their advisors or prospective advisors. Both the student and the advisor have a responsibility to make their expectations clear to each other.

Advisor Selection

The advisor should be a faculty member whose expertise and project/research interests match closely with those that the student intends to acquire. Students are encouraged to gather information on potential advisors during their first campus visit as a prospective student. *It is not expected that students make a commitment to a particular advisor at this time.* The usual procedure for matching students and advisors is the following:

- In May/June the chair of the Admissions Committee will ask newly admitted students if they would like to participate in the student-advisor match-up process. (Students can opt-out if they have already decided to work with a particular advisor and the advisor has agreed.)
- Faculty members who are looking for a new student write-up a one paragraph description of their research project. The collected project descriptions are sent to the new students.
- The new students are asked to select three projects that interest them, and rank order them.
- Faculty are notified of the students' selections and an attempt is made to find the most mutually agreeable match for all parties.

Note that no faculty member is obliged to accept a student's request to serve as advisor. Advisors initially commit to supervising a student for 1 year only. Longer term commitments should be discussed at the end of the first academic year.

When a student has selected (or changed advisors) the student should notify the graduate program coordinator who will enter the advisor into the Student Information System (SIS). Students should see their official advisor listed in MyUW.

Changing Advisors

Students are encouraged to explore multiple research directions before selecting a thesis topic and this may require changing advisors. A student who would like to make a change should discuss the situation with their current advisor several months in advance. (Faculty and research scientists

typically have grant obligations to meet, and a sudden unexpected loss of personnel may make this difficult.) Students should seek advice from members of their mentoring committee on the transition.

For more information see the Advisor policy from the Graduate School,
<https://grad.wisc.edu/documents/advisor/>.

Mentoring

Each student will have both a graduate student mentor and a set of three faculty mentors, called a “Committee of Three” (or Co3 for short). The Co3’s are expected to evolve into a Thesis Committee as the student progress towards their degree.

Motivation for the Committee of Three:

- Provide students with a broader advising perspective
- Provide students with regular feedback on their progress
- Encourage early publication
- Ensure that no student falls behind
- Foster more departmental collaborations
- Plan for financial support

Operational Details:

- The committee consists of the research advisor + 2 faculty members, senior scientists, or emeritus faculty.
- Members are chosen by the Director of Graduate Studies taking into account student interests and the need to balance faculty workload. In the first two years, committee members are selected to provide research breadth. After that, the committee is tailored to the student’s research interests. Once the student achieves dissertator status, the Committee of Three becomes the Thesis Committee.
- First year students meet with their committees in both the spring and fall. All other students meet with their committees once per year.
- The meeting should be scheduled for 1 hour. The research mentor should attend only half of the meeting, since he/she does not need as much updating as the other committee members. This also provides an opportunity for the student to bring up any issues they may be having with their advisor.
- Faculty members will reserve the third Tuesday of each month from 3 - 5 PM for Co3 meetings
- Students are responsible for scheduling the meetings. A best faith effort must be made to have all members present - a minimum of 2 committee members is required. Remote participation via is fine when necessary.
- Prior to the meeting, the student sends a form to the committee outlining his/her progress over the past year. This acts as a starting point for discussion.

- The Director of Graduate Studies will send reminders about the meetings and has oversight responsibility. Students are not required to have a Committee of Three meeting, but they are strongly encouraged to do so.

Committee of Three Form

Student Name: _____ Meeting Date: _____

Current Research Mentor: _____

Committee Member 2: _____

Committee Member 3: _____

Year in grad school: _____ Prelims passed: ☐ Thesis proposal: ☐

Anticipated graduation date: _____

Papers in preparation or published this semester: (title, authorship, & student role)

Conferences/workshops attended this semester: (talk/poster?)

Departmental talks given:

Courses taken this semester:

Other significant milestones (proposals submitted, observing runs, etc.):

Goals for next semester:

Financial support this semester and plan for next semester:

Advice of committee:

Graduate Coursework

Core Courses

Students must take the following required courses:

- Astron 500: Techniques of Modern Observational Astrophysics (3 credits)
- Astron 700: Basic Astrophysics I (2 credits)
- Astron 702: Basic Astrophysics II (2 credits)
- Astron 715: Stellar Interiors and Evolution (2 credits)
- Astron 720: Interstellar Medium (2 credits)
- Astron 730: Galaxies (2 credits)
- Astron 735: Observational Cosmology (2 credits)
- Astron 910: Seminar in Astrophysics (1 credit)
- Astron 990: Research and Thesis (1 - 12 credits)

Astronomy 700/702 are offered every year, as are Astron 910 and 990. The other classes are offered in alternate years; therefore, students should sign up to take them if they are offered in order to complete their coursework in the expected 2-year time period. In their first two years, students should register for Astron 910 every semester unless it conflicts with another class. All students should register for 990 each semester.

Minor Requirement

The purpose of the Ph.D. minor is for the student to obtain breadth in their scientific training. There are two options: Minor Agreement Form

Option A (External): Students must fulfill the requirements for a minor from an external department. Astronomy students typically minor in Physics, but Computer Science, Chemistry, or Statistics might be appropriate depending on the students' research direction. Students opting for a minor other than Physics should consult their mentoring committee first. Minors in fields that do not have direct relevance to astronomy research (e.g., French, Sociology) are typically not allowed. The requirements for the minor are set by the external department and usually range between 9 and 12 credits.

Option B (Distributed): Students may create a distributed minor by choosing 9 credits of relevant coursework from two or more departments outside of Astronomy. The following rules apply:

- courses must fulfill the Graduate School's minimum course requirements for the minor (see below)
- one course should be taken in the Physics Department. (Exceptions to this may be made when sufficiently justified and approved by the student's mentoring committee.)
- no more than 3 credits of professional development coursework (e.g., a Delta class or a scientific writing class) may be counted
- students may not repeat classes that they have taken previously (i.e., as undergraduates)

Students selecting a distributed minor should have their courses approved by their mentoring committee ("Committee of Three") or the Director of Graduate Studies.

The Graduate School's minimum course requirements for the minor:

-
- An average GPA of 3.00 on all minor coursework
 - Coursework must be graded courses numbered 300 or above; no audits or pass/fail
 - Coursework may not be double counted for major requirements
 - Maximum of 3 credits of independent study (e.g., 699, 799, 899, 999)
 - Research and Thesis cannot be used to satisfy the minor (e.g., 790, 890, 990);
 - No more than 5 credits of coursework completed more than 5 years prior to admission to the doctoral program; coursework taken 10 years ago, or more may not be used.

Frequently Asked Questions about the Minor

- *Can an astronomy class that is not a required class count towards the distributed minor?* No.
- *Can a physics class, taught by an astronomy professor, count towards the distributed or physics minor?* Yes. (Some of our faculty have joint appointments in Physics.)
- *Is there an advantage to doing a physics minor rather than a distributed minor that includes some physics classes?* If your goal is to teach at a small college after graduation, you will want to make yourself marketable to physics departments. A physics minor may confer some advantage on your resume.
- *Can I retake some undergrad-level physics classes as part of my physics or distributed minor?* Re-taking classes is typically not allowed, but patching holes in your background is (e.g., if you are missing an upper-level undergrad quantum class, for example). Note that for the physics minor, the decision will be up to the Physics department.
- *Can I count relevant graduate level coursework taken elsewhere toward my minor?* Possibly, but see the Graduate School restrictions listed above. For external minors, the decision is entirely up to the external department. For the distributed minor, prior approval must be obtained from the Director of Graduate Studies. (See the Waivers section below.)
- *How do I know what minor courses will be most useful?* It's a great idea to ask your fellow graduate students as experience has shown that there's a lot of variation in the relevance of the classes and the workload.

Ph.D. Minor Agreement Form Department of Astronomy

Date	Is this an ___ Original or ___ Revised Minor Agreement Form? (Check one)
Student Name (Last, First, Middle)	
Student 10-digit ID number	
Name of minor option (i.e., A = Physics, B = Distributed)	

LIST COMPLETED AND PLANNED MINOR COURSES

Department Name	Course Number	Course Title	Credits	Grade	Sem/Year
<i>Biochem</i>	<i>904</i>	<i>[EXAMPLE] Seminar-Cell Biology (adv)</i>	<i>3</i>	<i>A</i>	<i>Fall 03</i>

Signature and Date: Major Advisor: Option A and B

Signature and Date: Minor Department: Option A

Signature and Date: Internal Minors Committee Chair, Option B-Internal Distributed

Signature and Date: Physics Department Chair: Option A and B

Language Requirement

None

Curricular Requirements

- A minimum of 51 credits must be taken prior to graduation.
- A minimum of 32 credits must be obtained while the student is in residence at UW-Madison
- Half of degree coursework (26 credits) must be completed at the graduate level.
- A minimum GPA of 3.0 is required in all graduate-level work (300 or above, excluding research, audit, credit/no credit, and pass/fail courses)
- A GPA of at least 3.0 is required in the core (required) courses.
- A student may have no more than 3 credits of a grade of C or below in core courses.
- A grade of “S” (Satisfactory) must be obtained in Astron 990: Research and Thesis before prelims may be taken

Typical Credit Load

Students typically take 12 credits per semester in their first two years. After the required courses are completed, students should take 3 credits directly related to their dissertation research (typically Astron 990) every semester. The Graduate School considers full-time enrollment to be 8-15 graded credits taken at 300 or above, excluding pass/fail and audit, during the fall and spring semesters, and 4-12 credits during the summer term. Dissertators are considered full-time at 3 credits. For details see: <https://grad.wisc.edu/documents/enrollment-requirements/>

Summer Session Enrollment

Students should enroll for 3 credits of Astron 990: Research and Thesis.

Waivers of Core Courses or Distributed Minor Courses

The Graduate School does not transfer credits. The Astronomy Department may decide to accept coursework completed at another institution if the course is rigorous and sufficiently similar to a course taught at UW-Madison. Requests for a waiver should be addressed in writing (email) to the Director of Graduate Studies. The request should include a short description of the class taken, a syllabus, a list of textbooks used, and the name of the UW-Madison class the student is seeking to opt out of. Approval of the waiver by the professor who teaches the class at UW-Madison will generally be required. Note that coursework from another institution will not appear on a UW-Madison transcript, it will not count towards the student's GPA, and it does not count toward the Graduate School's minimum graduate residence credit or graduate coursework (50%) requirements. For details see: <https://grad.wisc.edu/documents/prior-coursework/>

Grade Change Policy

Extra work to improve a final grade is not allowed. Faculty legislation states that final grades can be changed only because of clerical error. Once an instructor announces course grades, a decision to re-evaluate the coursework for all or some of the students breaks faith with those students. The University's primary concern is that all students in a course are treated consistently and fairly when assigned final grades. For more information, <https://grad.wisc.edu/acadpolicy/?policy=gradechange>

Incomplete Grades

An Incomplete may be reported for a student who has carried a subject with a passing grade until near the end of the semester and then, because of illness or other unusual and substantiated cause

beyond his/her control, has been unable to take or complete the final examination, or to complete some limited amount of term work. For graduate students, grades of Incomplete are considered to be unsatisfactory if they are not removed during the next semester in residence. For more information, <http://registrar.wisc.edu/incompletes.htm>

Continuous Enrollment Requirement

Once students achieve dissertator status, they are expected to maintain continuous enrollment until completion of the doctoral degree. Dissertators should enroll each fall and spring semester for exactly 3 credits of coursework directly related to their dissertation research (generally 990.) Students may wish to consult the Graduate School's detailed enrollment requirements: <https://grad.wisc.edu/documents/enrollment-requirements/>

An Example Course Schedule:

Fall

Astron 700: Basic Astrophysics I (2 cr)

Astron 730: Galaxies (2 cr)

Physics 525: Introduction to Plasmas (3 cr)

Astron 910: Seminar in Astrophysics (1 cr)

Astron 990: Research & Thesis (4 cr)

Total: 12 credits

Spring

Astron 702: Basic Astrophysics II (2 cr)

Astron 720: Interstellar Medium (2 cr)

EPD 654: Teaching in Science and Engineering:
The College Classroom (2 cr)

Astron 910: Seminar in Astrophysics (1 cr)

Astron 990: Research & Thesis (5 cr)

Total: 12 credits

The Preliminary Examination

The preliminary exam for graduate students in Astronomy consists of an oral and a written part. For Ph.D. candidacy, a student must pass both exams. Both exams should be taken at the end of the student's second year.

Motivation: The preliminary exams are a chance for the students to express the knowledge that they have gained since becoming a graduate student at the University. This is also a chance for the professors to make sure each student has made satisfactory progress in their research and overall understanding of astronomy.

Scope: The examination is not a test on a particular series of courses, but rather on the whole subject of astrophysics and related fields in physics. Candidates are expected to be familiar with the contents of textbooks, other course materials, and departmental colloquia and seminars, as well as research results in their field as reported in scientific journals.

Written Exam

The written exam's focus is on breadth. The exam is composed of short quantitative questions that are drawn from all areas of astronomy (not necessarily covered in one of the core classes). The exam will consist of a morning and an afternoon part with six questions each. Students may not consult textbooks, webpages, or notes during the exam. They may use calculators, but not cell phones. Copies of previous exams may be obtained from the Graduate Student Coordinator.

All faculty that are not on leave contribute questions to the written exam based on their areas of expertise. The exam is assembled by the Prelim Committee and then vetted by a graduate student committee to help identify any questions that are misleading, unclear, or overly long.

Grading: To minimize unconscious bias, student names are removed from the exams before they are distributed to faculty for grading. Faculty score each question on a scale of 1-10. Scores are tabulated and significant disagreements are discussed before averaging the scores. Student identities are not revealed until faculty have reached a final decision about which exams meet the threshold of 60% for passing.

Oral exam

The oral exam will focus on depth of knowledge in the student's area of research. The student will be asked to prepare a 30-minute conference-style talk about a topic related to research the student has done in graduate school (not restricted to the student's thesis project). Ideally, the student will talk about their research, however, if their work so far has been primarily technical (e.g., application of pipelines, ground-work in data reduction), the expectation is that the talk will cover the science underlying the student's project, not simply a list of tasks the student has performed. The talk is open to the committee only.

After the talk, the student will be examined in depth on their presentation and on topics related to their research in closed session. The focus will be on establishing that the student

- has developed a deep understanding of the topic

-
- displays physical thinking and can answer questions they might be confronted with at a scientific conference or after giving a seminar;
 - has developed an integrated understanding of associated research areas, as might be reasonably expected by an end-of-second-year student.

A three-person oral exam committee not including the student's advisor will be assembled separately for each student to comprise faculty knowledgeable in areas related to the student's research topic. The oral exam committee will consult with the student's advisor before the day of the exam to determine the general topics covered in the exam and to verify that questions are fair in the sense of being related to the research of the student (that is, it is reasonable to expect the student to be able to answer the question).

The exam performance will be evaluated on a rubric (see below). Pass-fail delineation will be based on the rubric as evaluated by the committee. The committee will inform the faculty of the performance of the student. Anonymized data collected from the rubric will become part of the department's graduate program assessment.

Scheduling

The exams are normally held shortly after finals. The Chair sets the date of the written Preliminary Examination after consultation with the faculty and with the students who will take it. The written examination will normally be given only once for all of the students who complete their second academic year at the same time. The oral exam shall be given within two weeks of the written exam. Extensions beyond this deadline require written approval from the chair.

Students will be informed at least a month before the date of the Preliminary Exam if the exam will be of a substantially different form (in the distribution and nature of the written and oral parts) from the previous exam.

Passing / Failing the Exams

The oral and written examinations are evaluated separately. Students must pass both exams and finish their required coursework to become dissertators. Students that are granted dissertator status will be awarded a master's degree.

Students who fail the written examination have the opportunity to re-take it once. The department chair will work with the student and their advisor on determining an optimal time for a re-take based on the additional preparation the student needs and other relevant logistical factors. In some cases, the student will re-take the exam a year later with the next year's class; in other cases, the exam may be offered sooner.

Students who fail the oral exam on their first try will have one opportunity to re-take the oral at least two months from their first oral exam but no later than the second week of classes of their sixth semester. The department chair will work with the student and their advisor on determining an optimal timeframe. The oral exam committee for the second exam may be different than it was for the first exam.

Students who fail either the oral or written examination a second time will be asked to leave the program within 3 months. Students who have met the minimum coursework requirements for a Master's Degree (see <https://guide.wisc.edu/graduate/astronomy/astronomy-ms/#requirements>) will have the option to complete a master's thesis and receive a terminal Master's Degree. The master's thesis must be completed within 3 months and approved by the faculty advisor.

Guidelines on the master's thesis can be found at: <https://grad.wisc.edu/current-students/masters-guide/>

Frequently Asked Questions about Prelims

- *May I take the written exam as a first-year student? If I did that and failed, would it count towards my two attempts?* Yes, you may take the exam in your first year, but a failure would count.
- *May I delay taking the prelim if I don't feel prepared?* See the policy on Medical and Family Leave if this applies to your particular case. Delays are generally not allowed for other reasons.
- *May I take the prelim if I have not completed some of the required coursework or I have failed a required class?* Yes, you may take the prelim if required coursework is incomplete. However, dissertator status would only be granted upon completion of the coursework.
- *May I bring snacks/coffee for the oral exam committee?* No, please do not bring anything for the committee but you are welcome to bring water, coffee, etc. for yourself.
- *If I plan to leave with a master's degree, must I take the prelim?* There are two ways to obtain a master's degree: 1) Pass both the oral and written prelim; OR 2) write a master's thesis. If you select option 2, you do not need to take prelims. In both cases you need to have completed the minimum coursework requirements for the master's degree.

Oral Prelim Rubric

On a Pass/Fail scale, rate the student's performance in the oral prelim:

1. Research readiness: The student...

- ... has **engaged meaningfully in a substantive research** project at UW-Madison []
- ... has internalized and applies **scientific ethics** []
- ... clearly understands **scientific methodology** and applies it to their research []

On a scale of 1 (poor) to 5 (excellent), where 3 denotes the pass-fail demarcation, rate the student's performance in the oral prelim:

2. Research presentation: The student...

- ... explained the **scientific background** of their research clearly []
- ... presented the research at a **level** appropriate for a set of peers from a related discipline at a scientific conference []
- ... showed clear understanding of the literature cited in their presentation []

3. Questioning on research presentation: The student...

- ... was able to **answer** questions about their **research** correctly []
- ... displayed clear grasp of the **scientific** aspects of the research presented []
- ... displayed clear grasp of the **technical** aspects of the research presented []
- ... displayed clear grasp of the sources and implications of **uncertainty and error** in their research []

4. Questioning on topics broadly relating to student's research: The student displayed solid understanding of science areas associated with their research by ...

- ... answering **questions** about material in areas of astronomy relevant to their research correctly []
- ... displaying the ability to **reason** through questions (physical reasoning) []
- ... displaying a clear awareness and grasp of the **astronomical literature relevant** to their research []

The Thesis Proposal

Purpose:

- Enable students to take an active role in crafting a long-term plan for their dissertation
- Help students finish their PhD more quickly by creating a clear road map early in their career
- Ensure that students and advisors are in agreement on the contents and timeline of the thesis
- Provide a forum for faculty and scientists outside of the student's mentoring committee to provide constructive feedback
- Identify sources of risk in the thesis plan and formulate mitigation strategies

Requirements:

Written Document:

- 4 - 6 pages in journal paper form. It should include the following sections:
 - An introduction to the topic suitable for non-experts in the field. It should establish the state of past work on the topic and motivate the student's proposed work.
 - A description of each planned project/paper. Clearly spell the scientific goals and any datasets that need to be acquired, simulations that need to be run, etc.
 - An expected timeline that includes a clear mapping of projects into papers. Also include a brief discussion of potential schedule risks and back-up plans.
 - A statement about how the work will be funded
- See the rubric on the following page for some additional guidance

Oral Presentation:

30-minute talk covering the same general topics as the written document. The talk will be open to the department and should be understandable to astronomers outside the student's sub-field

- The talk will be followed by 10 minutes of questions from the audience
- After the talk concludes, the faculty present will meet with the student to provide constructive feedback on the thesis. Any faculty that are absent are encouraged to provide feedback on the written document.
- Talks should be scheduled well in advance, if possible, on the 1st or 4th Tuesday in the month in the 3-5 PM time slot. (2nd and 3rd Tuesdays are reserved for faculty meetings and mentoring meetings respectively.) When possible, students should pick dates when their committee of 3 members will be present.

Timeline: The thesis proposal should be done in the student's third year. After prelims are passed and the thesis proposal is completed, the student is considered a dissertator and will receive a pay raise. Students should confer with the graduate student administrator after the oral presentation to ensure that the pay raise is implemented promptly.

Feedback: Faculty present for the talk will provide constructive oral feedback aimed at improving the thesis or mitigating schedule risk. Faculty who are absent will provide written or oral feedback based on the written document. In addition, faculty will fill out the rubric on the following page. The aggregate results will be given to the student by the thesis advisor.

Thesis Proposal Rubric

Faculty and scientists are to evaluate the student's performance in the areas below using the following codes:

A = exceeds expectations

B = meets expectations

C = does not meet expectations

Knowledge: The student ...

- clearly explained the broad significance of the proposed research
- placed the project in context of previous work
- demonstrated knowledge of forefront issues in the discipline

Proposed research: The student ...

- clearly articulated why his/her approach was new and would lead to progress in the field
- displayed a solid understanding of the methodologies to be employed
- demonstrated creativity and ownership of the project
- demonstrated that the research was feasible (e.g., by showing preliminary results)
- made reasonable estimates of the time and resources needed to accomplish the research goals

Presentation:

- the proposal document was clear and well written
- the oral presentation was clear and engaging
- the student thoroughly answered questions about the proposed research and demonstrated the ability to think on his/her feet

Frequently Asked Questions about the Thesis Proposal

Is the thesis proposal evaluative? There is no pass/fail evaluation of the thesis proposal, only feedback and constructive comments.

If it's not evaluative, what's the purpose of the rubric? The rubric serves two functions. One is to give the student and advisor some guidance on areas that could be improved. For example, the rubric scores might indicate that the student needs more practice explaining their work to non-experts. The second use of the rubric is to provide some data on how well the Astronomy Department is accomplishing their graduate program learning goals. Aggregate scores from students in a 3-year period are reported to the graduate school.

Is the thesis proposal biding? Consider the thesis proposal like an observing proposal or a funding proposal. It should be your best faith plan at the time you write it, but it is understood that circumstances may require alterations to the plan. Students should discuss major changes to the thesis plan with their mentoring committee.

Can I include published work in the thesis proposal? If you've written a paper prior to your thesis proposal, congrats, you are off to a great start! If you intend for the published paper to be part of the thesis, by all means include it in the proposal, but keep the discussion of this project relatively brief and refer readers to your published work. Some self-plagiarism is allowed: ie., it's ok to copy sentences from your published work to your thesis proposal.

What if I just switched projects? If you changed advisors in your second or third year, it's still important to get your thesis proposal done in your third year. In this case, having a clear roadmap to the thesis will be extra important to help you finish on time. The faculty understand that your thesis plan may be less well developed since you will not have had time to carry out much preliminary work.

Can the thesis proposal be delayed beyond the 3rd year? If there are important reasons for delay, they should be discussed with the mentoring committee and the Director of Graduate Studies. One example might be if a student were at risk of being scooped on a project and needed 100% of their time to work on getting a paper out. In general, however, delays should be discouraged. The utility of the thesis proposal is diminished if it is left too late.

The Dissertation & Thesis Defense

The Thesis Warrant

Students must obtain a warrant to defend their thesis. To apply for a warrant, a student should email the Graduate Student Coordinator at least three weeks prior to the defense date with the following information:

- 1) the proposed title of the student's thesis
- 2) the names of the committee members
- 3) the proposed date of the final oral examination

Once the warrant document has been obtained, it is the student's responsibility to print it out, bring it to the thesis defense, and obtain committee member signatures. Once the final warrant has been signed, it should be returned to the graduate student coordinator who will make an electronic copy and upload it to the student's record. The original signed hard copy of the final warrant should be kept by the student or the graduate program coordinator.

Students that want their name to be printed in the commencement program must additionally submit an "Apply to Graduate" application through their MyUW Student Center.

The Thesis Committee

Students and their advisors are responsible for assembling a doctoral committee. The committee must meet the following requirements:

- 1) The committee must have at least **five** members.
- 2) The chair or one of the co-chairs of the committee must be faculty in the UW Astronomy Department. (If the thesis advisor is a faculty member, they should serve as the chair. If a research scientist is the thesis advisor, they should serve as a co-chair.)
- 3) The committee must have at least one member from a UW-Madison department outside of Astronomy. The extra-departmental member should be qualified to provide feedback on the candidate's scientific work. Members drawn from departments other than Physics should be approved by the thesis advisor and the department chair.
- 4) Three of the committee members must be UW-Madison graduate faculty or former UW-Madison graduate faculty up to one year after resignation or retirement.
- 5) Additional members may be from any of the following categories: graduate faculty, emeritus faculty, visiting faculty, faculty from other institutions, scientists, research associates, and other individuals deemed qualified by the thesis advisor and the department chair. A committee member external to UW-Madison is encouraged.
- 6) Committee members must not have conflicts of interest as outlined below.
- 7) Effort should be made to have a committee with a balance of relevant expertise and independence (e.g., some committee members who are not also close collaborators of the candidate/advisor.)

-
- 8) At least three of the committee members must be physically present for the defense.
 - 9) All committee members should be designated as readers (e.g., they commit to reading the dissertation.)
 - 10) All committee members have voting rights. To receive a doctoral degree, students cannot receive more than one dissenting vote from their committee on the final degree warrant.

Conflicts of Interests

Thesis committee members (excepting the candidate's advisor) must be able to provide a fair and unbiased evaluation of the candidate's work. Conflicts of interest include:

- having financial ties to the candidate including being a current or future employer
- being related to the candidate or the candidate's spouse/partner
- being a close personal friend of the candidate or the candidate's spouse/partner

Issues which do **not** constitute a conflict of interest include:

- having supported a candidate from a grant, award, or fellowship
- typical support provided by a mentor related to scholarly activity (including writing letters of reference or co-authoring papers)

External committee members should also not have conflicts of interest related to the thesis advisor such as:

- being a former student or postdoc of the advisor within 10 years of PhD/postdoctoral employment
- being a co-investigator on an active grant for which the thesis adviser is the PI

Some Examples of Thesis Committees

- 1) Thesis advisor, UW-Madison Astronomy faculty (chair)
 - 2) UW-Madison Physics faculty member
 - 3) UW-Madison Astronomy faculty member
 - 4) UW-Madison Astronomy research scientist
 - 5) Staff Scientist at NRAO (via Skype)
-
- 1) Thesis advisor, UW-Madison research scientist (co-chair)
 - 2) UW-Madison Astronomy faculty member (co-chair)
 - 3) UW-Madison Chemistry faculty member
 - 4) UW-Madison Astronomy faculty
 - 5) Faculty member at U. Chicago

The Doctoral Dissertation

Students must prepare a written dissertation that will be evaluated by the student's doctoral committee. The dissertation must be the student's own work. If it is the result of research enterprises in which others have collaborated, a predominant portion must represent the dissertator's own contribution and the other research participants must be identified.

Contents: The specific content of the dissertation should be discussed with the thesis advisor and the mentoring committee. A good rule of thumb is that the thesis should, at minimum, contain the equivalent of three first author journal papers, with at least one paper accepted and another submitted.

Published papers may be reproduced in the dissertation with minor modifications to comply with the graduate school formatting guidelines. Work that is accepted or submitted to a journal should be indicated at the start of the respective thesis chapter.

Dissertations should include a comprehensive introduction as well as a section outlining the conclusions and potential for future work.

According to graduate school policy, students must acknowledge in the dissertation contributions received from other individuals, including co-authors of published work that appears in the document, such as in designing the research, executing the research, analyzing the data, interpreting the data/research, or writing, proofing, or copyediting the manuscript.

Formatting: The dissertation must comply to the graduate school's formatting guidelines. For details, see: <https://grad.wisc.edu/current-students/doctoral-guide/> Latex macros may be available from previous graduate students, but students should be sure to check them against the latest requirements.

Revisions: The dissertation committee may request that changes be made the dissertation before it is deposited with the graduate school. The PhD advisor is responsible for ensuring that suitable revisions are made. Students should allow sufficient time for revisions when planning their defense date.

Dissertation Submission: Publication of the doctoral dissertation is required. The university uses ProQuest UMI ETD Administrator to publish the dissertation electronically and on microfilm and to publish an abstract of the dissertation in Dissertation Abstracts, a monthly publication. Dissertators must pay the cost of processing the dissertation and publishing the abstract. All doctoral dissertations are reviewed by the Graduate School's Office of Academic Services. Guidelines on the electronic submission of the dissertation can be found at: <https://grad.wisc.edu/current-students/doctoral-guide/>

The Thesis Defense

Students must present their thesis work to the Astronomy Department in a 45 minute talk. The talk will be followed by 15 minutes of questions from the audience. After the open question period, everyone in the audience except the doctoral committee will leave the room. The committee will then conduct an oral examination of the candidate. At the conclusion of the exam, the candidate will be asked to leave the room while the committee discusses their assessment. Committee members who decide that the candidate has passed will sign the warrant and return it to the student. To receive a doctoral degree, students cannot receive more than one dissenting vote from their committee on the final degree warrant.

Relevant Deadlines

Students must be enrolled during the semester they defend and deposit their thesis, including the summer term.

The dissertation must be submitted to the graduate school by certain dates (usually in late December, early May, and late August) to avoid paying tuition for the next semester. Students should be sure to check the exact dates at: <https://grad.wisc.edu/current-students/doctoral-guide/>

The dissertation must be sent to the thesis committee at least **three weeks** prior to the oral defense except by mutual consent of the committee.

The thesis presentation should be announced to department at least two weeks prior to the event.

A candidate for a Ph.D. degree who fails to take the final oral examination and deposit the dissertation within five years after passing the preliminary examination is required to take another preliminary examination and to be admitted to candidacy a second time.

Dissertation Support:

The final stages of graduate school can be stressful. Campus offers dissertator support groups, dissertation writing camps, writing guides, and other resources.

<https://grad.wisc.edu/current-students/dissertation/>

Frequently Asked Questions about the Thesis Defense and Dissertation

Can committee members attend the defense remotely? Up to 2 committee members may attend remotely if no other solution can be found. The following guidelines should be applied:

- Remote attendees must connect via video (skype, GoToMeeting, etc.). The connection must be to a laptop other than the one being used for the candidate's presentation.
- The candidate must nominate another member of the department to monitor each remote connection during the open portion of the defense. This job can be handed off to the committee for the closed portion.
- The monitor and remote attendees must exchange email addresses and phone numbers. In the case of connection problems, text message may be the preferred way to communicate to minimize disruption of the presentation.
- Remote attendees should have a pdf copy of the candidate's slides.
- Remote attendees should participate fully in all aspects of the exam, e.g., they should ask questions during the oral exam and participate in the final evaluation of the candidate.
- The research presentation portion may be recorded with the consent of the candidate. If this is done, the audience must be notified at the start of the presentation.
- The candidate should make arrangements with the Graduate Program Coordinator for the signing of the warrant by remote attendees.

What if one of my committee members doesn't show up? Try to avoid this situation by sending lots of reminders before the event. If this situation does arise, the candidate should not delay their research presentation by more than 15 minutes. If the missing committee member cannot be found, another faculty member may be asked to step in to evaluate the oral portion of the defense. The missing committee member is still responsible for evaluating the written dissertation and signing the warrant after consultation with the faculty member who attended the oral defense.

What if someone who committed to serve on my thesis committee cancels at the last minute?

If this happens less than 4 weeks before the date of the defense, it is the responsibility of the person who canceled and the thesis advisor to find a suitable replacement. (This stressful situation should not fall to the student to resolve.)

Can a paper led by undergraduate or another graduate student be included in my dissertation if my contributions were substantial?

Generally, not, but the specific situation should be discussed with the thesis advisor. If allowed, the candidate's specific contributions must be spelled out very clearly.

Can parents or friends attend the defense? Yes, anyone may attend the open portion of the defense. Only the candidate and committee may be present for the final oral exam.

Do I need to provide coffee or other refreshments? This is strictly optional.

Criteria for Satisfactory Progress: Academic Expectations

The Graduate School sets minimum standards that all graduate students in the university must meet. Each department may additionally add requirements. The Astronomy Department's requirements and policies are listed at:

<https://guide.wisc.edu/graduate/astronomy/astronomy-phd/#requirementstext>

<https://guide.wisc.edu/graduate/astronomy/astronomy-phd/#policiestext>

We summarize them briefly below:

- Students must obtain at least 51 credits of coursework to be eligible for the PhD
 - 32 of these credits must be obtained while the student is in residence
 - 26 of these credits must be graduate-level coursework
 - A minimum GPA of 3.0 is required in all graduate-level work (300 or above, excluding research, audit, credit/no credit, and pass/fail courses)
 - Students must resolve incomplete grades one semester after they are obtained
- Students must complete all of the core (required) Astronomy courses (Astron 500, 700, 702, 715, 720, 730, 735, 910, 990)
 - A GPA of at least 3.0 is required in the core courses.
 - A student may have no more than one C grade or below in core courses.
 - A grade of "S" (Satisfactory) must be obtained in Astron 990: Research and Thesis before prelims may be taken
- Students must complete the requirements for a graduate minor. They may either meet the minor requirements set by an external department or they may choose a Distributed Minor. The Distributed minor requires 9 credits in two or more departments outside of Astronomy.
- Students must pass the written and oral preliminary examinations. These will be given at the end of the second academic year. Students who fail either exam will be given one chance to repeat the exam. Students who fail one of the exams a second time will be asked to leave the program.
- Students must present their thesis proposal by the end of their third year
- Students must maintain continuous enrollment after they achieve dissertator status
- Students must prepare a written dissertation and defend their thesis before a faculty committee.
- The PhD thesis must be defended and deposited no more than 5 years after the student has passed prelims; otherwise the student must re-take the prelims and be re-admitted to candidacy. (This is a graduate school requirement.)

A student's failure to comply with the above-mentioned expectations for satisfactory progress may result in loss of guaranteed funding, disciplinary action, or dismissal. A student may be placed on

probation or suspended from the Graduate School — see <https://grad.wisc.edu/documents/probation/>. In special cases the Graduate School permits students who do not meet these minimum standards to continue on probation upon recommendation and support of their advisor.

Timeline for Satisfactory Progress

By the end of the **first-year** students should have:

- obtained at least 16 credits of coursework and met GPA requirements
- completed Astron 700, 702, and two other core courses (excluding 990/910)
- taken credits of Astron 990 each semester and at least 1 credit of 910

By the end of **second year** students should have:

- obtained at least 32 credits of coursework and met GPA requirements
- completed all core courses and met GPA/grade requirements
- taken at least 10 credits of Astron 990 and at least 2 credits of 910
- completed the graduate minor and met relevant GPA requirements
- taken the written and oral preliminary exams

By the end of the **third-year** students should have:

- passed the written and oral preliminary exams
- presented the thesis proposal

By the end of **seventh** year students should have:

- completed 51 credits of coursework and met all curricular requirements
- defended and deposited the dissertation

Criteria for Satisfactory Progress: Conduct Expectations

This graduate program, the Graduate School, and the Division of Student Life all uphold the UW-System policies and procedures in place for academic and non-academic misconduct. In addition, graduate students are held to the same standards of responsible conduct of research as faculty and staff. Furthermore, unprofessional behavior towards faculty, staff, peers and the public are significant issues in the evaluation and promotion of students. In turn, we hold expectations for the highest level of academic integrity and expect professional, ethical, and respectful conduct in all interactions. Students may be disciplined or dismissed from the graduate program for misconduct or disregard for professional conduct expectations regardless of their academic standing in the program. Students are responsible for reading the information here as well as the information published on all the relevant web sites. Lack of knowledge of this information does not excuse any infraction.

Professional Conduct

All students are expected to adhere to the highest standards of professional behavior and ethics and to conduct themselves according to the standards expected of members of their profession. Students shall interact with peers, faculty, staff and those they encounter in their professional capacity in a manner that is respectful, considerate, and professional as outlined in the UW Student Code of Conduct and the Astronomy Department Code of Conduct.

Professional conduct includes, but is not limited to, attending all scheduled meetings, honoring agreed upon work schedules, being on-time and prepared for work/meetings, contributing collaboratively to the team, keeping the lines of communication open, offering prompt response to inquiries, and employing respectful use of available equipment/technology/resources. Chronic or unexplained absences are unprofessional in the workplace and could be grounds for termination or removal of funding. To facilitate the free and open exchange of ideas, any criticism shall be offered in a constructive manner, and the right of others to hold different opinions shall be respected.

Concerns about infractions of Professional Conduct may be effectively handled informally between the instructor/advisor and the student. If a resolution is not achieved, a graduate program representative may be included in the discussion. Separate and apart from a violation of Professional Conduct, a student may face University disciplinary action with regard to the same action.

[The following sections are graduate school policy and should remain as written]

Academic Misconduct

Academic misconduct is an act in which a student (UWS 14.03(1)):

1. seeks to claim credit for the work or efforts of another without authorization or citation;
2. uses unauthorized materials or fabricated data in any academic exercise;
3. forges or falsifies academic documents or records;
4. intentionally impedes or damages the academic work of others;

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5. engages in conduct aimed at making false representation of a student's academic performance; or
 6. assists other students in any of these acts.

Examples of academic misconduct include but are not limited to:

1. cutting and pasting text from the Web without quotation marks or proper citation;
2. paraphrasing from the Web without crediting the source;
3. using notes or a programmable calculator in an exam when such use is not allowed;
4. using another person's ideas, words, or research and presenting it as one's own by not properly crediting the originator;
5. stealing examinations or course materials;
6. changing or creating data in a lab experiment;
7. altering a transcript;
8. signing another person's name to an attendance sheet;
9. hiding a book knowing that another student needs it to prepare for an assignment;
10. collaboration that is contrary to the stated rules of the course; or
11. tampering with a lab experiment or computer program of another student.

Additional information regarding Academic Misconduct:

Graduate School Policy & Procedure: Misconduct, Academic:

<https://grad.wisc.edu/documents/misconduct-academic/>

Dean of Students Office: Information for Students: Why should I know about academic misconduct? How do I avoid academic misconduct? What happens if I engage in academic misconduct? What should I do if I know a classmate is cheating? <https://conduct.students.wisc.edu/academic-integrity/> (near bottom)

Dean of Students Office: Academic Misconduct Flowchart:

<https://conduct.students.wisc.edu/documents/academic-misconduct-flow-chart/>

University of Wisconsin System: Chapter UWS 14: Student Academic Disciplinary Procedures:

https://docs.legis.wisconsin.gov/code/admin_code/uws/14

Non-Academic Misconduct

The university may discipline a student in non-academic matters in the following situations:

1. for conduct which constitutes a serious danger to the personal safety of a member of the university community or guest;
2. for stalking or harassment;
3. for conduct that seriously damages or destroys university property or attempts to damage or destroy university property, or the property of a member of the university community or guest;
4. for conduct that obstructs or seriously impairs university-run or university-authorized activities, or that interferes with or impedes the ability of a member of the university community, or guest, to participate in university-run or university-authorized activities;
5. for unauthorized possession of university property or property of another member of the university community or guest;
6. for acts which violate the provisions of UWS 18, Conduct on University Lands;
7. for knowingly making a false statement to any university employee or agent on a university-related matter, or for refusing to identify oneself to such employee or agent;

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8. for violating a standard of conduct, or other requirement or restriction imposed in connection with disciplinary action.

Examples of non-academic misconduct include but are not limited to:

1. engaging in conduct that is a crime involving danger to property or persons, as defined in UWS 18.06(22)(d);
2. attacking or otherwise physically abusing, threatening to physically injure, or physically intimidating a member of the university community or a guest;
3. attacking or throwing rocks or other dangerous objects at law enforcement personnel, or inciting others to do so;
4. selling or delivering a controlled substance, as defined in 161 Wis. Stats., or possessing a controlled substance with intent to sell or deliver;
5. removing, tampering with, or otherwise rendering useless university equipment or property intended for use in preserving or protecting the safety of members of the university community, such as fire alarms, fire extinguisher, fire exit signs, first aid equipment, or emergency telephones; or obstructing fire escape routes;
6. preventing or blocking physical entry to or exit from a university building, corridor, or room;
7. engaging in shouted interruptions, whistling, or similar means of interfering with a classroom presentation or a university-sponsored speech or program;
8. obstructing a university officer or employee engaged in the lawful performance of duties;
9. obstructing or interfering with a student engaged in attending classes or participating in university-run or university-authorized activities;
10. knowingly disrupting access to university computing resources or misusing university computing resources.

Additional information regarding Non-Academic Misconduct

Graduate School Academic Policies & Procedures: Misconduct, Non-Academic:

<https://grad.wisc.edu/documents/misconduct-nonacademic/>

Dean of Students Office: Non-Academic Misconduct Standards Statement:

<https://conduct.students.wisc.edu/nonacademic-misconduct/>

Dean of Students Office: Non-Academic Misconduct Process

<https://conduct.students.wisc.edu/nonacademic-misconduct/nonac-procedures/>

University of Wisconsin System: Chapter UWS 17: Student Non-Academic Disciplinary Procedures:

https://docs.legis.wisconsin.gov/code/admin_code/uws/17

University of Wisconsin System: Chapter UWS 18: Conduct on University Lands:

https://docs.legis.wisconsin.gov/code/admin_code/uws/18

Research Misconduct

Much of graduate education is carried out not in classrooms, but in laboratories and other research venues, often supported by federal or other external funding sources. Indeed, it is often difficult to distinguish between academic misconduct and cases of research misconduct. Graduate students are held to the same standards of responsible conduct of research as faculty and staff. The Graduate School is responsible for investigating allegations of research misconduct. This is often done in

consultation with the Division of Student Life as well as with federal and state agencies to monitor, investigate, determine sanctions, and train about the responsible conduct of research. For more information, contact the Associate Vice Chancellor for Research Policy, 333 Bascom Hall, (608) 262-1044. Some additional information regarding Research Misconduct can be found below:

Responsible Conduct:

Graduate School Policies & Procedures: Responsible Conduct of Research

<https://grad.wisc.edu/documents/responsible-conduct-of-research/>

Office of the Vice Chancellor for Research and Graduate Education's - Office of Research Policy:

Introduction & Guide to Resources on Research Ethics:

research.wisc.edu/respolcomp/resetethics/

Office of the Vice Chancellor for Research and Graduate Education's Office of Research Policy:

Policies, Responsibilities, and Procedures: Reporting Misconduct

kb.wisc.edu/gsadminkb/page.php?id=34486

Office of the Vice Chancellor for Research and Graduate Education's Office of Research Policy:

Policies, Responsibilities, and Procedures: Responsible Conduct of Research Resources

kb.wisc.edu/gsadminkb/search.php?cat=2907

Teaching

UNDER REVIEW

Teacher training is an integral part of the Astronomy graduate program, and an essential aspect of preparation for the PhD. The department is committed to helping students develop their teaching skills through direct classroom experience, training programs, and mentoring.

Teaching Assistantships

A teaching assistantship allows the student to gain valuable teaching experience, enhances knowledge of undergraduate physics and astronomy, and provides a means of support for graduate study. PhD candidates are required to hold a teaching assistantship for one semester and are encouraged to do so for two semesters, if possible. (However, TA positions are very limited.) TA positions are assigned by the department chair after consultation with the faculty.

The charts below list the typical TA workload for a 50% appointment for the most commonly taught classes. The distribution of duties may vary from week-to-week.

Astronomy 103, 104 duties	Hours
Attend 2 lectures each week for 15 weeks	30
Conduct 6 discussion sections each week for 15 weeks	90
Preparation time for discussion sections	45
Office hours (7 hours per week) for 14 weeks	98
Orientation/training, weekly meetings with the professor	21
Conduct evening observing sessions	19
Assist with preparation of exams	6
Clerical work (e.g., recoding results of homework, quizzes)	45
Conduct extra sessions (e.g. exam reviews)	6
Total	360

Astronomy 170 duties	Hours
Attend 2 lectures each week for 15 weeks	30
Office hours (X hours per week) for 14 weeks	
Orientation/training, weekly meetings with the professor	
Assist with preparation of exams	
Clerical work (e.g., recoding results of homework, quizzes)	
Total	

TA Evaluation

In accordance with the UW-Madison Policy on Teaching Assistants, faculty members are expected to visit a discussion section of every teaching assistant during the first weeks of class. The faculty member must provide at least 24 hours' notice prior to the visit. During the visit the faculty member will use the following questions to evaluate the TA's performance.

- 1) Does the TA speak clearly and audibly?
- 2) Is the class well organized/structured?
- 3) Are the students encouraged to participate? (i.e. drawn out)
- 4) Does the TA have any distracting habits?
- 5) Does the TA display confidence in knowledge of the material?
- 6) Does the TA try to make the subject interesting?
- 7) Overall ranking of TA (scale of 1-5, 1 being poor, 5 being excellent):

The result of the evaluation will be discussed with the TA and constructive suggestions provided. Results will also be stored in anonymized form as part of department's Learning Goals Assessment.

TAs will also be assessed via a set of specific questions included in the on-line course evaluations at the end of the semester.

Opportunities for Teacher Training

The **Delta** program, founded by Astronomy Professor Bob Mathieu, promotes the development of a future national faculty that is committed to advancing effective teaching practices for diverse student audiences. Delta offers a variety of courses and workshops where students learn skills such as assessment, curriculum design, teaching methods including blended courses and flipped classrooms, and mentoring. One Delta course may be counted toward a Distributed Minor. Students with an especially strong interest in postgraduate teaching may wish to pursue a Delta Certificate. For additional information see: <https://delta.wisc.edu>

The **Collaborative for Advancing Learning and Teaching** is a partnership of cross-campus units at UW-Madison that unites and leverages a collective wealth of wide-ranging expertise to advance teaching and learning in the classroom and beyond. They offer a variety of resources for graduate students: <https://teachlearn.provost.wisc.edu/teaching-professional-development-for-graduate-students-and-postdocs/>

Financial Support

Financial support for graduate students is provided through University fellowships or Departmental assistantships. Contingent on satisfactory progress, the length of guaranteed student support is **four continuous years** for those with no prior graduate work. Three continuous years are guaranteed for those with one year or more of prior graduate work. In either case, it is almost always the case that students remain fully funded through their thesis defense.

Students are paid at a maximum 50% appointment level throughout their graduate school career. The full-time rate will increase after taking prelims, as well as after the student completes their thesis proposal and achieves dissertator status.

Tuition is remitted for TA and RA appointments. However, all students must still pay the segregated fees, which are about \$725 per semester for full-time students, and any additional university fees.

In astronomy (compared to many other fields), we are lucky that graduate students do not have to pay tuition and receive a stipend to perform their graduate studies. This stipend typically comes in the form of research assistantships, supplemented with some teaching (typically two semesters over the course of the Ph.D.), which provide enough support for reasonably comfortable subsistence. However, it is important not to consider this stipend as simply an hourly position you perform for somebody else's benefit. It is an investment the department, the university, and the taxpayer make in your future.

If your stipend is funded through a research grant, it is particularly important that you understand the scope of the project and the expectations placed on you as part of the team doing the research. Federally funded projects recognize the importance of graduate education, providing you with the opportunity to participate in forefront research and engage in professional development (of which research is the major part). This brings with it a fiduciary responsibility to the funding agency and the tax-payer to put in your best effort. To provide some context: one full year of graduate student funding in astronomy will cost taxpayers/funding agencies between \$63,000 and \$76,000 in 2020 dollars.

Medical & Family Leave Policy

There is currently no policy at the Graduate School level which deals with medical or parental leave for Research Assistants (RAs). Teaching Assistants (TAs) and Project Assistants (PAs) are covered by the TAA contract. In order to establish a modern working environment and to support graduate student families, the Astronomy Department has adopted a policy to facilitate continuing the education of graduate students in the context of medical needs and family choices.

Astronomy Medical and Family Leave Policy

This policy shall provide all Astronomy Department Research Assistants (RAs) with

- up to twelve weeks of leave in case of serious illness or disability affecting the RA or his/her dependent and
- up to twelve weeks of parental leave.

While on leave, RAs shall retain health insurance benefits. On return from leave, RAs shall be entitled to be restored to the position held by the RA when the leave commenced or to an equivalent position with equivalent benefits, pay, and other conditions of employment.

Teaching Assistants and Project Assistants are subject to the Teaching Assistants' Association contract (<http://taa-madison.org/2009-contract/>) and are not covered by this policy.

1. Entitlement to Leave

Paid medical and family leave, with benefits, shall be granted to any Astronomy Research Assistant in the following situations:

- For a serious health condition that prohibits the RA from performing the functions of his/her RA position.
- "Serious health condition" means an illness, injury, impairment, or physical or mental condition that involves (1) inpatient care in a hospital, hospice, or residential medical care facility, including any period of incapacity or subsequent treatment; (2) a period of incapacity of more than three consecutive calendar days that also involves treatment two or more times by a health care provider or treatment which results in a regimen of continuing treatment under the supervision of the health care provider; (3) any period of incapacity due to pregnancy or for prenatal care; (4) a chronic condition which requires periodic treatments, continues over an extended period of time, and may cause episodic rather than a continuing period of incapacity (e.g., asthma, diabetes, epilepsy, etc.); (5) a period of incapacity which is permanent or long-term due to a condition for which treatment may not be effective, requiring continuing supervision of a health care provider (e.g., Alzheimer's, severe stroke, terminal stages of a disease); or (6) multiple treatments either for restorative surgery after an accident or other injury, or for a condition that would likely result in a period of incapacity of more than three calendar days in the absence of medical intervention or treatments, such as cancer (chemotherapy, radiation), severe arthritis (physical therapy), kidney disease (dialysis).
- For the care of spouse, domestic partner, child, parent, or other dependent in case of a serious health condition. Serious health condition is defined in (A) above.

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- "Child" includes biological, adopted, foster, stepchild, legal ward, or child of a person standing in loco parentis who is under 18 years of age, or over age 18 but incapable of self-care due to a mental or physical disability. "Parent" is as defined by the Family and Medical Leave Act (FMLA) as a biological parent, stepparent, or an individual who stood in loco parentis to an RA. A leave of absence to care for a parent-in-law may be granted to RAs under the University's sick leave and other leave policies.
 - *Note:* RAs are not employees of the University and thus are not covered by the FMLA, however, the FMLA definitions are used for this clause.
 - For the birth of a child of the RA or placement of a child with the RA for adoption or foster care.

2. Notice of Leave

In any case in which the necessity for leave is foreseeable (expected birth or adoption, planned medical treatment), the RA shall, on a confidential basis, disclose his/her plan to take leave to his/her research advisor, the Department chair, and the Graduate Student Coordinator. This disclosure should occur no less than 5 months in advance for an expected birth or adoption, and no less than 30 calendar days in advance for planned medical treatment. If not foreseeable 30 days in advance, the RA shall, in good faith, provide notice as soon as possible.

2.1 Written Leave Plan

Once an RA has disclosed his/her desire for leave, the RA will work together with his/her research advisor, the Department Chair, and the Graduate Student Coordinator to develop a plan to progress towards the PhD and implement any necessary work accommodations. The Department recognizes that each case will be unique and creative problem solving may be required. The Graduate Student Coordinator will provide the agreed-upon plan in writing to the RA, the research advisor, and the Department Chair.

3. Academic Progress

All satisfactory progress deadlines and classroom deadlines will be extended by the amount of leave taken.

3.1 Classes

If leave requires an RA to miss a required class that is not offered again prior to the RA's preliminary examination, the Department shall arrange for the RA to cover the missed material in an 800-level reading course which will be sufficient to meet the requirements of the Master of Science degree in Astronomy. The Department Chair shall identify a faculty member to supervise the reading course. Other solutions to missed coursework may be discussed between the RA, the Department Chair, and the Graduate Student Coordinator and be included in the written plan for leave.

3.2 Preliminary examination

If the RA has not yet taken the preliminary examination, the examination for the RA will be delayed to a date agreed upon by the RA, the Department Chair, and the prelim committee chair. The prelim delay shall be no longer than the amount of leave taken or three months (whichever is longer), or the prelim will occur no more than one month after the RA has completed missed coursework.

3.3 Enrollment

If the RA has dissertator status, he/she shall remain enrolled in Astronomy 990 (Research and Thesis) as required by the Graduate School to maintain satisfactory progress towards the PhD. If the RA is in compliance with the written leave plan while enrolled in Astronomy 990, the research advisor shall consider Astronomy 990 requirements as being met¹. If necessary, the Graduate Student Coordinator will arrange with the Graduate School for extension of the five-year time limit for depositing of the PhD thesis after successful completion of the preliminary exam.

The Graduate School has allowed dissertators to break continuous enrollment with medical documentation. In cases requiring a leave longer than 12 weeks in which remaining enrolled in Astronomy 990 is not possible, the written leave plan shall require a request to the graduate school for a break in continuous enrollment.

4. Paid Leave

For any academic term in which the RA goes on partial or full leave under this policy, the Department will provide funds such that the RA retains a minimum average appointment level of 34% over the course of the term. At this level, student status, tuition remission, and health insurance benefits will be retained. The Department shall provide funds such that the RA's pay per month shall at no point be reduced to less than equivalent to a 34% appointment. If possible, the Department will provide necessary funds to maintain the RA at the same pay equivalent to their full appointment when the leave began.

If the RA is an international student, the minimum average appointment level under this policy will be adjusted to meet the minimum income standards set by federal law to maintain visa requirements.

4.1 Funding

Salary and benefits during leave shall be paid using Department discretionary funds, unless otherwise agreed upon by the RA, the research advisor, the Department Chair, and the principal investigator(s) of the grant(s) funding the RA.

5. Length of Leave Entitlement

The leave entitlement for each condition shall be as follows:

- Twelve weeks for a serious health condition affecting the RA.
- Twelve weeks for a serious health condition affecting the spouse, domestic partner, child, parent, or other dependent of the RA.
- Twelve weeks for a birth, adoption, or foster care placement of a child of the RA. Entitlement expires at the end of the 12-month period beginning on the date of birth for a biological child or date of placement for a foster or adopted child. If leave for a foster or adopted child began before actual placement because absence from work was required in order for the placement to

¹Typically, students are expected to work approximately three hours of work per week per credit hour. For 3 credits of Astronomy 990, this corresponds to 9 hours of work per week. Over the course of a 15-week semester, this adds up to 135 hours of work. Dissertators work substantially more than 9 hours per week; the remaining hours are covered by a paid research assistantship, accounting for 30 hours per week on a maximal 75% appointment. For 12 weeks of leave occurring entirely within one semester, the RA must work approximately 45 hours per week during the remaining 3 weeks (for a total of 135 hours) to satisfy the expected Astronomy 990 workload

proceed, entitlement expires at the end of the 12-month period beginning on the last day worked.

Each RA is entitled to the leave stated above once per occurrence of a condition.

5.1 Extended Leave

If a situation arises where an RA's leave will extend beyond twelve weeks due to a condition covered by this policy, the written leave plan will address what additional actions will be necessary for the RA to continue progress toward the PhD. If an official leave of absence from the University is required for the amount of leave taken, this plan may include reapplication to the Department.

5.2 Part Time Leave

The leave may be taken on a full time or part time basis and need not be continuous. If the leave is taken on a part time basis, the total leave entitlement shall remain equal in working hours to a full time leave of the same number of working hours. The structure and work schedule of part time leave shall be established in the written leave plan.

Travel Policies

Students will have many opportunities for research-related travel at UW. When travel is to be paid for by the University (aka by a research advisor's grant or by a UW-based travel fellowship) certain procedures must be followed. You can find all the information you will need at the following site <https://businessservices.wisc.edu/travel-reimbursement/planning-a-trip/>. Some travel basics are summarized below. Any questions should be addressed to Angela Normington (angela@astro.wisc.edu) in the main department office.

Air Travel

Travel, Inc., is the University's contracted travel agency for individual travel. Concur is the online booking portal administered by Travel, Inc. Prior to booking travel in Concur, employees must set up a profile. All airfare must be booked through the Concur online booking tool or directly with an agent and the University's contracted travel agency. Call (877) 811-9898 for individual travel reservations. **Use of a third-party online travel booking site (e.g. Travelocity, Orbitz) or booking directly with an airline is prohibited.**

You will need to register with Concur (see the UW link above for a link to the registration form). After you are in the system, it is a good idea to ask Angela to add the department's purchasing card number to your account. That way, your airfare gets charged to the department directly rather than your credit card. (Note you will still need to include your airfare on your travel reimbursement, just mark it as Pre-Paid.)

You are unfortunately stuck with what is available on Concur if you want your trip to be reimbursed. Note, if your flight is delayed and you need to rebook you must still work through Travel, Inc. They will send you a reminder about this when you purchase your tickets. Note that most US government-based research grants have a requirement that travelers use a US airline when possible (even if it is more expensive.) Students should consult their advisor for guidelines.

Once you have purchased your airline tickets using the department purchasing card, immediately forward a copy of your itinerary to Angela Normington (angela@astro.wisc.edu). Briefly explain what the trip is for, give your advisor's grant number if you know it, and copy your advisor on the email. Angela needs to track all purchasing card expenses, and if you don't let her know promptly, she'll need to email the whole department to find out who made the charge.

Car Travel

Any employee who will be operating a vehicle on UW business must be an authorized driver prior to traveling. This includes rental vehicles, fleet vehicles and personally owned vehicles. Details can be found here:

<https://businessservices.wisc.edu/travel-reimbursement/planning-a-trip/booking-rental-car-fleet-vehicle/>

Other Ground Transportation

Local transportation while in travel status is reimbursable to the extent it is supported by a business purpose. Travel by taxi, shuttle, subway, Uber/Lyft/rideshares, bus, train, or any other necessary

means of transportation is allowable. Travelers should choose the most reasonable, cost-effective means of traveling locally. Reimbursement for tips is limited to 20%. Travelers must obtain a receipt if they wish to be reimbursed.

Lodging

All lodging must be reserved through the Concur online system, directly with an agent at Travel, Inc. or by booking directly with the lodging facility.

Travel arrangers are expected to research rates and reserve lodging using Concur or by contacting an agent at Travel, Inc. If more cost-effective rates are available outside of Concur/Travel, Inc., travel arrangers may reserve lodging directly with a lodging property or, for conference reservations, with a conference service/site. Airbnb is an allowable lodging option. Use of other internet-based lodging brokers or third-party sites (e.g. Expedia, Hotels.com, Kayak, Priceline, VRBO, Hotwire) is prohibited. Lodging must be within allowed maximums pursuant to the University's Lodging Policy. Lodging for Guest travel can be paid for with a University Purchasing Card.

The University has defined a daily maximum lodging rate that is dependent on location. Please use the calculator at https://portal.sfs.wisconsin.edu/psc/sfs/EMPLOYEE/ERP/c/UW_EX_CUSTOM.UW_EX_PDCALC.GBL?& to see the daily rates for the dates and location of the trip. Travelers attending conferences may exceed the lodging rate for the location if staying at the conference site or another hotel recommended by the conference organizer. Include a conference brochure as justification with the reimbursement request. A receipt is required for lodging reimbursement.

Meals and Other Expenses

Travelers are reimbursed for meal and incidental expenses while in travel status requiring an overnight stay. These expenses are reimbursed on a per diem basis; travelers are not reimbursed for actual

costs. See https://portal.sfs.wisconsin.edu/psc/sfs/EMPLOYEE/ERP/c/UW_EX_CUSTOM.UW_EX_PDCALC.GBL?& to determine the relevant meal maximums for the location and date of the trip.

Receipts for meals are NOT required. Additional details can be found at:

<https://businessservices.wisc.edu/travel-reimbursement/planning-a-trip/meals-and-incidentals/>

Conference Registration Fees

Conference registration fees often have to be paid a few months in advance of the trip. Therefore, it may be desirable to have them charged directly to the department purchasing card. Students should make arrangements with Angela for this. (It's often most efficient to bring your laptop to her office with the registration information all filled in except for the payment details.) A receipt must be obtained for the registration fee. Sometimes receipts will be given out at the meeting; check with the conference organizer if you are not sure.

Reimbursement

Details on reimbursement procedures can be found at the link

below. <https://businessservices.wisc.edu/travel-reimbursement/getting-reimbursed/>

Students should use the University's on-line tool which will guide them through most steps. A few things of note:

- Students should obtain their advisor's grant number to enter into the payment section
- Students will be asked for a short description of the purpose of the trip. Please avoid using acronyms like NOAO, NASA, etc.

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- Students must include items like airfare paid off the department purchasing card, being sure to mark them as pre-paid
 - All receipts (lodging, taxi, conference registration fee) should be scanned and uploaded as pdf attachments. Please keep the originals as back-up until the reimbursement is processed.
 - All reimbursement requests must be filed within 90 days of the trip

Graduate Student Governance

Organizational Structure

The astronomy graduate students are highly self-organized and have their own governance structure. Each year they elect a 'czar' to be in charge of graduate student affairs and to serve as a point of contact for the department chair on student-related issues. The czar represents the students at faculty meetings.

Meetings

Students meet on Thursdays at noon in the colloquium room to have lunch together and to discuss any issues at hand.

Student Jobs

Students carry out a large number of critical roles in the department. To ensure that the work is equitably distributed, students have defined a set of jobs and each year they select specific students to fill these positions.

Elected positions include:

- Czar
- Climate committee representative
- Admissions committee representatives (2)
- MloWSA grad student chair (elected by grad student members of MloWSA)

Other jobs include:

- Orientation committee / Peer mentor committee chair
- TAA union liaison
- Prospective student committee (3)
- Social committee (2)
- Telescopes steward
- Undergrad counselor
- Outreach organizer
- "Meet the Speaker" organizer
- Science lunch committee representative
- Enforcer
- Slack admin / wiki manager

The procedure to fill the non-elected positions is as follows: students select their top three job choices (plus one job they would absolutely NOT want to do) and submit their selections to the czar. The czar then assigns jobs based on those preferences and, if multiple people are vying for the same job, seniority.

Campus Opportunities

There are also opportunities for students to become engaged in campus-wide student governance.

Associated Students of Madison (ASM) - The Associated Students of Madison (ASM) is the campus-wide student governance organization at UW–Madison. Graduate and undergraduate representatives are elected to the 33-member ASM Student Council based on their respective college or school. The student council has regular biweekly meetings open to all students. Learn more here: asm.wisc.edu/

Teaching Assistants' Association (TAA) - The Teaching Assistants' Association (AFT Local 3220) is the labor union for TAs and PAs at UW-Madison. As a result of decades of organizing and by working together as a union, graduate students at UW-Madison have achieved good health benefits, tuition remission, and many other gains. The TAA is a democratic union run by the members. All key policy decisions are made at monthly membership meetings. Learn more here: taa-madison.org/

Fellowships, Awards, & Travel Grants

Research Fellowships:

The department offers two fellowships, typically to first year students. The **Fluno Fellowship** provides one year of research funding and the **Diermeir Fellowship** provides roughly 2/3 of a year of funding. The fellowships do not impact student paychecks in any way, but they give the recipient freedom to work with a wider range of faculty (e.g., faculty have an interesting project but insufficient grant money to support a new student.) The awarding of fellowships is typically based on recommendations by the admissions committee.

Awards:

Two awards are given annually for student research.

The **Stebbins Award** is intended to honor a significant research achievement made during the previous year, such as an important discovery published or accepted by a refereed journal, a research-based press release, an invited presentation at a scientific meeting, or an exceptional research initiative. Scientific creativity, visibility, and initiative are especially valued for the Stebbins.

The **Jansky** and **Whitford Livingston** Awards are given out in alternate years. These awards are intended to recognize outstanding research conducted throughout a graduate student's time at UW. In the case of two nearly equal candidates, the Jansky is awarded to the student doing research in radio astronomy.

Students must be nominated for awards by a faculty member. All nominated students will be asked to submit a CV and a short research statement highlighting their achievements. Faculty that are not conflicted read these materials and provide a rank ordering of the candidates.

There will be a special awards lunch where the recipients are honored and asked to give a short research presentation.

Travel Grants:

Graduate School Travel Grants: The UW Graduate School provides a limited amount of funding for dissertators whose research has been accepted for presentation at a conference. In addition, the Graduate School runs the Travel Research Grants competition which provides funds to support travel related to dissertation research. (This must be non-conference travel, such as an observing run.) See: <https://grad.wisc.edu/funding/grants-competition/>

American Astronomical Society International Travel Grants are another a great way to fund international conference travel. See: <https://aas.org/grants-and-prizes/international-travel-grants/>

An **Individual Development Plan (IDP)** is a tool to assist graduate students in career and personal development. It provides a comprehensive set of materials and exercises that will guide students through the process of self-assessment, career exploration, goal setting, and implementation of their plan. An IDP is *not* a performance evaluation tool or a one-time activity.

Individual Development Plans

Students beginning graduate school may find that an IDP is helps to:

- Assess current skills and strengths
- Make a plan for developing skills to help you meet your academic and professional goals
- Communicate with your advisors and mentors about your evolving goals and related skills.

The IDP you create is a document you will want to revisit again and again, to update and refine as your goals change and/or come into focus, and to record your progress and accomplishments.

The IDP also serves to start – and maintain – the conversation with your faculty advisor about your career goals and professional development needs. The IDP itself remains private to you, and you choose which parts to share with which mentors.

The onus to engage in the IDP process is on you, although your mentor, PI, or others may encourage and support you in doing so. In practice, some astronomy students have found an IDP to be extremely helpful while others have not.

We recommend using one of the following two IDP tools.

UW-Madison IDP template:

<https://grad.wisc.edu/professional-development/individual-development-plan/>

The American Association for the Advancement of Science (AAAS) online tool “myIDP”:

myidp.sciencecareers.org

Student Health & Wellness

UW-Madison has a holistic resource for all things wellness called “UWell”. The site includes information and opportunities for wellness for your work/school, financial, environmental, physical, emotional, spiritual, and community. Go to uwell.wisc.edu/

Students who pay segregated fees are eligible for University Health Services (<https://www.uhs.wisc.edu/>). There is no charge to students for many basic services including counseling sessions, because services are paid through tuition and fees. Personal health and wellness services are also available in addition to medical services.

Securing Health Insurance Coverage

Graduate students who hold an appointment as an assistant of 33.33% or more or who have a fellowship may be eligible for health insurance and other benefits beyond University Health Services. Contact the staff benefits and payroll coordinator in the unit where you have been hired to select one of several healthcare plans within 30 days of your hire date.

Graduate students without an assistantship or fellowship who are currently enrolled can use the services of University Health Services (UHS), the campus health clinic. Many services are provided at no extra cost, including outpatient medical care during regular business hours, Monday through Friday. UHS is located in the Student Services Tower at 333 East Campus Mall, 608-265-5000. For more info, visit the UHS web site at uhs.wisc.edu.

Prescription medications, emergency room visits and hospitalization are not included in UHS benefits. Therefore, supplemental insurance covering these drugs and services is recommended for all students and is required for international students. The UHS Student Health Insurance Plan (SHIP) is an excellent option for many students. Contact the SHIP office at 608-265-5600 for more information.

Disability Information

Students with disabilities have access to disability resources through UW-Madison’s McBurney Disability Resource Center. As an admitted student, you should first go through the steps to “Become a McBurney Client” at mcburney.wisc.edu/students/howto.php.

Mental Health Resources On and Off Campus

University Health Services (UHS) is the primary mental health provider for students on campus. UHS Counseling and Consultation Services offers a wide range of services to the diverse student population of UW-Madison. They offer immediate crisis counseling, same day appointments and ongoing treatment. Go to <https://www.uhs.wisc.edu/mental-health/> or call 608-265-5600. UHS service costs are covered for students through tuition and fees.

There are many mental health resources throughout the Madison community, but UHS Counseling and Consultation Services is the best resource for referrals to off-campus providers. Call 608-265-5600 for assistance in finding an off-campus provider.

Information for International Students

International Student Services (ISS)

International Student Services (ISS) is your main resource on campus and has advisors who can assist you with visa, social and employment issues. Visit their website for more information at iss.wisc.edu or to schedule an appointment.

Student Visas

Graduate Admissions issues the federal I-20 form for initial F-1 Visa procurement. Initial J-1 Visa document (DS-2019) is handled by [International Student Services](https://iss.wisc.edu) (ISS). The Graduate Admissions office sometimes must collect financial information for the DS-2019, which is then forwarded to ISS. After the student is enrolled, all Visa matters are handled by ISS.

Documents required of new international students

Many students are admitted with a condition that they submit their final academic documents after arrival on campus. Please submit your documents to the admissions office at 232 Bascom Hall. [Or departments may collect the documents and send them to the admissions office via campus mail.](#) The admissions requirements page <https://grad.wisc.edu/apply/requirements/> lists the documents required for each country.

Students with ESL requirements

Any student who was admitted with a TOEFL score below 92, or an IELTS score below 6.5 will be required to take the English as a Second Language Assessment Test (ESLAT) <https://esl.wisc.edu/international-students/placement/> and any required English course during their first semester.

Funding for International Students

International students are eligible for Teaching, Project, and Research Assistantships on campus as well as university fellowships through the Graduate School. They may not be employed more than 20 hours per week on campus while enrolled full-time.

New international students with assistantships should work with International Students Services to obtain a social security number (iss.wisc.edu/employment/social-security). New students with fellowships and no other appointment types are not considered employees and are not eligible for social security numbers. These students should work with ISS to obtain an International Taxpayer Identification Number (ITIN, <https://iss.wisc.edu/employment/individual-taxpayer-identification-number-itin/>).

Academic Exceptions & Leaves of Absence

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Exceptions

Academic exceptions outside of those covered in the Medical and Family Leave Policy are considered on an individual case by case basis and should not be considered a precedent. Deviations from normal progress are discouraged, but the program recognizes that there are in some cases extenuating academic and personal circumstances. Petitions for exceptions to coursework or the Satisfactory Progress Expectations shall be directed to the Director of Graduate Studies and the Department Chair. The following procedures apply to all petitions:

1. The specific requirement/rule/expectation pertinent to the petition must be identified.
2. The student's academic advisor must provide written support for the petition.
3. All course work substitutions and equivalencies will be decided by appropriate area-group faculty or curriculum chair.

More generally, the Director of Graduate Studies, in consultation with the student's advisor, may grant extensions to normal progress requirements for students who face circumstances (similar to tenure extensions) as noted in university regulations, this includes childbirth, adoption, significant responsibilities with respect to elder or dependent care obligations, disability or chronic illness, or circumstances beyond one's personal control. Where warranted, the petition should provide good evidence of plans and ability to return to conformance with the standard and to acceptably complete the program. The normal extension will be one semester; anything beyond this will be granted *only in the event of highly extraordinary circumstances*. Extensions will be granted formally with a note of explanation to be placed in the student's file.

Leave of Absence

While in most cases participation in the program is continuous through time, students sometimes find it necessary to take a temporary leave of absence. A student requesting a leave of absence should submit a timeline for the leave and reasons for the request. Written requests for a one semester or full year leave of absence should be addressed to the Department Chair and turned into the Graduate Coordinator. If a student is granted a one semester leave of absence, the milestone due dates and terminal deadlines are pushed back approximately one semester. If a student is granted a full year leave of absence, all due dates and deadlines are pushed back one year. Students may be granted a leave of absence for no more than one year. Students who do not register for more than one year will be considered inactive.

Reentry Policy

Graduate students who leave the program in good standing may request re-entry to the program by completing the Graduate School application for admission. The Department Admissions Committee in consultation with the student's advisor will review the request and approve the request based on information provided. A leave of absence request on file will enhance the re-entry approval process.

Grievance Procedures

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The College of Letters and Sciences is currently working on creating a college-wide grievance policy which will be added here when available.

If a student feels unfairly treated or aggrieved by faculty, staff, or another student, the University offers several avenues to resolve the grievance. Students should begin by consulting the Astronomy Department Code of Conduct: <http://www.astro.wisc.edu/about-us/code-of-conduct/>

For more information see the Graduate School Academic Policies & Procedures: Grievances & Appeals: <https://grad.wisc.edu/documents/grievances-and-appeals/>

Reporting Misconduct & Crime

The campus has established policies governing student conduct, academic dishonesty, discrimination, and harassment/abuse as well as specific reporting requirements in certain cases. If you have a grievance regarding unfair treatment towards yourself, please reference the procedures and resources identified above. If you learn about, observe, or witness misconduct or other wrongdoing you may be required to report that misconduct or abuse. Depending on the situation, it may be appropriate to consult with your advisor, Graduate Program Coordinator, or other campus resources.

Research Misconduct Reporting

The University of Wisconsin-Madison strives to foster the highest scholarly and ethical standards among its students, faculty, and staff. Graduate students and research associates are among the most vulnerable groups when reporting misconduct because their source of financial support and the progress in their careers may be at risk by raising questions of wrongdoing. They are also often the closest witnesses to wrongdoing when it occurs and therefore must be appropriately protected from the consequences of reporting wrongdoing and be informed of their rights. Please find full details at research.wisc.edu/respolcomp/resethics/

Academic Misconduct Reporting

If you know a classmate is cheating on an exam or other academic exercise, notify your professor, teaching assistant or proctor of the exam. As a part of the university community, you are expected to uphold the standards of the university. Also, consider how your classmate's dishonesty may affect the overall grading curve and integrity of the program.

Sexual Assault Reporting

UW-Madison prohibits sexual harassment, sexual assault, dating violence, domestic violence, and stalking. These offenses violate UW-Madison policies and are subject to disciplinary action. Sanctions can range from reprimand to expulsion from UW-Madison. In many cases, these offenses also violate Wisconsin criminal law and could lead to arrest and criminal prosecution.

Students who experience sexual harassment, sexual assault, domestic violence, dating violence, and/or stalking have many options and services available to them on and off campus, including mental health counseling, victim advocacy and access to the criminal and campus disciplinary systems. For a list a confidential support and reporting options, please visit <https://www.uhs.wisc.edu/prevention/violence-prevention/resources/>

Faculty, staff, teaching assistants, and others who work directly with students at UW-Madison are required by law to report first-hand knowledge or disclosures of sexual assault to university officials for statistical purposes. In addition, disclosures made to certain university employees, such as academic advisors or university administrators, may be forwarded to the campus Title IX coordinator for a response. For more information, please visit <https://doso.students.wisc.edu/sexual-assault-dating-and-domestic-violence/>

Child Abuse Reporting

As a UW-Madison employee (under [Wisconsin Executive Order #54](#)), you are required to immediately report child abuse or neglect to Child Protective Services (CPS) or law enforcement if, in the course of employment, the employee observes an incident or threat of child abuse or neglect, or learns of an

incident or threat of child abuse or neglect, and the employee has reasonable cause to believe that child abuse or neglect has occurred or will occur. Volunteers working for UW-Madison sponsored programs or activities are also expected to report suspected abuse or neglect. Please find full details at <https://oed.wisc.edu/> (midway down, right hand side)

Reporting and Response to Incidents of Bias/Hate

The University of Wisconsin-Madison values a diverse community where all members are able to participate fully in the Wisconsin Experience. Incidents of Bias/Hate affecting a person or group create a hostile climate and negatively impact the quality of the Wisconsin Experience for community members. UW-Madison takes such incidents seriously and will investigate and respond to reported or observed incidents of bias/hate. Please find full details at <https://doso.students.wisc.edu/services/bias-reporting-process/>.