

AST309N (FALL 2023, #48275), “LIVES & DEATHS OF THE STARS: ELEMENTS OF THE COSMOS”

BASIC DATA:

Website: on [Canvas](#)

To contact the professor and TA: [Canvas mail](#)

Class Meeting Times: TuTh 9:30–10:45 AM

Location: Welch 3.502*

Course Modality: Face-to-Face (in person)

Instructor: Prof. Harriet Dinerstein

Professor Office Hours: (Subject to change)

Wed. 2:30-3:30 PM by Zoom (link on Canvas)

Thur. 11:10 AM-noon, PMA 17.230

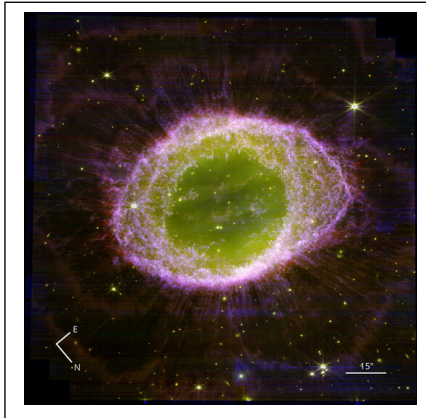
T.A.: Redacted

T.A. Office Hours: (Subject to change)

Redacted

Redacted

Help Sessions: To be announced



The Ring Nebula in infrared light, from program JWST-GO-01558. Obtained by the NASA/ESA/CSA James Webb Space Telescope.

* Wel 3.502 is a stand-alone auditorium behind (west) of the main multistory Welch building.

WHAT IS THIS COURSE ABOUT AND WHO IS IT FOR?

Ast 309N is a broad introduction to astronomy that focuses on the role of stars in our universe. Both the title and subtitle of the course *are meant to be taken literally!* We will describe the characteristics and life stories of all kinds of stars, and tell the story of how the elements in the Periodic Table were created. Nearly all of the elements other than hydrogen and helium were cooked up in the nuclear furnaces inside stars; this is what Carl Sagan meant when he said “We are star stuff.”

This course has no prerequisites. It is designed for and restricted to students who are *not* majoring in the Natural Sciences. It does not carry a quantitative reasoning (QR) flag, but it does count toward your Natural Science and Technology (N1) core requirement.

COURSE AND GRADING PHILOSOPHY:

This course is heavily conceptual, emphasizing basic as well as exotic properties of the nearby and distant universe. One theme will be an emphasis on understanding the (possibly surprising) methods used to discover what we know about distant objects. You will demonstrate your understanding of the course material through in-class responses and activities, homework, and exams. Credit is earned through frequent low-stakes classwork, to minimize the impact of occasional missed work.

The grade you earn will be based on *your own work* and mastery of the material. *There are no quotas on grades* (that is, no fixed limits on how many students can earn a given grade, including A’s!). We will be using a plus/minus grading scale. *Consistent engagement and participation throughout the semester are essential*, since many credits must be earned in class. However, we understand that you might miss an occasional class meeting or assignment for various good reasons. Instead of make-ups for individual missed events, we will provide opportunities to earn the lost credit with later, similar assignments, an approach I call “overbooking.” Also, there *will be* opportunities to earn extra credit!

EXPECTED LEARNING OUTCOMES:

After taking this course, you will be able to:

- A. Identify and compare the four fundamental forces of nature and explain where each of them “rules” (what they control).
- B. Summarize the properties of light and how studying light from astronomical objects is used to infer the nature and characteristics of the light source.
- C. Describe conditions in the early universe, and summarize the evidence and effects of dark matter and dark energy on the past, present, and future of the universe.
- D. Describe the properties of stars and how they produce the energy that makes them shine.
- E. Compare the life stories and end states of different types of stars.
- F. Name the major chemical element groups, and identify the reactions and places in the universe where they are created.
- G. Explain what neutron stars and black holes are and how they behave.
- H. Describe how the Solar System and Earth formed and evolved.

GENERAL COMPETENCIES FOR SCIENCE CORE COURSES:

The following are required components of science core (N1) courses.

1. Identify, analyze, and synthesize information needed to answer a scientific question.
2. Effectively communicate what scientific theories and methods tell us.
3. Work with others in approaching a scientific question.
4. Apply quantitative methods to a scientific question. In Ast 309N, this will mainly involve interpreting diagrams and applying the concepts of proportionality and upper/lower limits.

REQUIRED COURSE MATERIALS AND AVAILABLE RESOURCES:

To participate in credit-earning in-class activities you will need a laptop, or another device such as a smartphone or tablet, that can hold its charge for a class period and be used with Canvas.

Many class materials will be posted on the Canvas site, including class slides; feedback on HW and quizzes; and links to free readings, animations, and custom video clips shown in class (videos will be viewable through links to UT Box). Recordings of class meetings through Lectures Online (LO) will be posted after class, and can be useful if you miss a class or want to refresh your memory, although they will not replace real-time attendance in terms of access to opportunities for participation credit.

We will make substantial use of the OER (Open Educational Resources) OpenStax textbook entitled **Astronomy** (by Fraknoi, Morrison, and Wolff). You can access the full book **for free** online at <https://openstax.org/details/books/astronomy-2e>. For your convenience, we will also post direct links to specific relevant sections. This textbook also offers links to additional outside resources.

If you would like to read about the course material in more depth – or just like actual books – we suggest the following **optional books**: (1) a small (roughly 100-page) paperback entitled **Stars: A Very Short Introduction**, by Andrew King. The physical book costs \$11.95 (new; used copies are cheaper), or you can buy a Kindle version for \$7.49 from Amazon. (2) If you like pictures and slick presentations, try **Gravity’s Fatal Attraction: Black Holes in the Universe**, Third Edition (2020) by M. Begelman and M. Rees (currently \$26.26 for a new paperback copy, or \$24.95 for the ebook). We have not ordered copies through the UT Co-op, but you can find them via online booksellers.

HOW TO SUCCEED IN THIS CLASS:

We want you to succeed in this class, and your teaching team is standing by ready to help you! Our advice is to attend and participate regularly in class, and keep up to date with the readings and assignments. When you don't understand something, **DO** ask the instructor or T.A. about it! There will be several opportunities each week to ask questions and get help. Both the instructor and T.A. will hold open consultation times ("office hours"), some of them in person and some over Zoom. We will hold weekly group help sessions at least on exam weeks, and possibly as often as every week if needed. At least some of the above will take place on Wednesdays, for optimal timing relative to exams and homework due dates. It is also possible to schedule individual meetings with the T.A. or instructor if the regularly scheduled times don't work; contact us in advance by Canvas mail to set up an appointment. In some cases, we may be able to answer your questions by email or through a discussion platform such as Chatter. If you have questions about due dates or course procedures, please first check the website and recent announcements to see whether the answer is already posted, *but by all means email us if you don't find the answer there or have follow-up questions!*

TAKING CARE OF YOURSELF AND OTHERS:

The world has mostly emerged from the COVID-19 pandemic, but the case rate could rise again as we advance into the fall and winter. Keep in mind that COVID remains a threat to individuals who are medically at risk. In that spirit, please be understanding if some people choose to wear a mask and maintain social distancing (this may include your instructor). **If you feel ill, please do not attend class in person.** Class lectures will be recorded and available for viewing at links on Canvas (the Lectures Online recordings are usually posted within an hour or two after class). However, if you need to miss more than an occasional class, please contact the instructor.

Your teaching team is concerned about your physical and mental health. Please make use of the many University resources if you need help (Student Health Center, counselors, BCCAL, Student Emergency Services, etc. – see the General Supplement for UT Students for info), but also don't hesitate to let us know if you are facing challenges that may impact your success in this course.

COMMUNICATION AT UT AND IN THIS COURSE:

It is UT policy that email is an approved mechanism for official University communications with students, and students must ensure that such emails will be received and read in a timely manner. Since some emails may be time-critical, it is recommended that you check your email every day. See <https://it.utexas.edu/policies/university-electronic-mail-student-notification-policy>. In addition, you should **ensure that your Canvas notification settings enable immediate delivery** of any course-related communications for Ast 309N, **including Announcements**.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES:

If you are a student with a disability (or think you may have a disability) and need accommodations, please contact the **Disability and Access (D&A)** office. You may refer to D&A's website for more information: <https://diversity.utexas.edu/disability/>. Students seeking accommodations should contact D&A as soon as possible. Once an Accommodation Letter has been prepared, it is **the student's responsibility** to contact the instructor as soon as possible, deliver the letter, and arrange a private meeting (which could be by Zoom), where we will discuss how to best meet your needs and ensure that you have an equal opportunity to participate fully in this course.

RELIGIOUS HOLIDAYS:

If you will miss a class or be unable to meet a course requirement due to a schedule conflict with observance of a religious holiday, please let the instructor know at least two weeks in advance. You will still be responsible for material covered in class, but missed activities and HW can be made up through later ones, and missed exams are made up by taking an optional final exam (see below).

EXPECTATIONS FOR CLASSROOM BEHAVIOR:

It is expected that you will make the effort to arrive in time for the beginning of class and not to leave before the end of the class time. Please avoid talking to others once the class begins, so that other students can hear the instructor. *Obviously, this does not apply when we ask you to discuss questions with neighbors as part of an assigned activity!*

Please also resist the temptation to conduct unrelated online activities. Such activity is distracting to other students sitting near you, and has been demonstrated to adversely affect (lower) not only the grades of the students who use their devices for purposes unrelated to what is happening in class, but also to lower the grades of their neighbors. Be respectful of your classmates, instructor, and T.A., so that our class time is as pleasant and productive as possible; *make the most of your time in class.*

ACADEMIC INTEGRITY AND MISCONDUCT:

The University of Texas' Honor Code says: "I pledge, as a member of the University of Texas community, to do my work honestly, respectfully, and through the intentional pursuit of learning and scholarship." This includes pledging to be honest about what you create and to acknowledge what you use that belongs to others; pledging to value the *process* of learning itself, not just its outcome; and applying these principles to all your academic and scholarly endeavors.

Presenting someone else's work as your own is academic dishonesty, unacceptable, and is subject to academic disciplinary action. Closely paraphrasing other people's writing (or an AI's, see below) is also considered **plagiarism**. Even if you do cite your sources, submitting work that consists largely of quotations is unacceptable if the assignment is to explain a concept in your own words. For further information: <https://deanofstudents.utexas.edu/conduct/standardsconduct.php>. Students who violate University rules on academic misconduct are subject to the student conduct process and potential disciplinary action. These may include impact on the student's grade, ranging from zero on the assignment to a failing grade in the course. Serious misconduct could lead to probation, suspension, or dismissal from the University: <http://deanofstudents.utexas.edu/conduct>.

ON USING A.I. OR SEARCH ENGINES:

There is a lot of excitement about the "Generative Artificial Intelligence" tools that have recently become available: ChatGPT, Bard, etc. These go beyond the capabilities of search engines such as Google, Bing, etc. by composing original prose in response to prompts. **You are not allowed to use AI tools for assignments in Ast 309N.** Firstly, this defeats the purpose of our assignments. The homework in this course is designed to help you practice with the material, so doing the HW is basically an investment of studying for the exams ahead of time. Don't outsource your learning to AI! Secondly, AIs learn from the general Web, and there's an awful lot of misinformation out there. Your instructor input sample questions to AI and found that about 50% of the answers were wrong or nonsensical. *Your responses in Ast 309N must be based on the definitions, terms, and concepts of astronomy as taught in this class, or else they will not receive credit.*

SHARING MATERIALS WITH OUTSIDERS IS PROHIBITED:

Materials from this class, including but not limited to Instructor's Notes, class slides, assignments, exams, recordings, and other materials **must not be shared** online or outside the class membership unless you have explicit written permission of the instructor. (You may share your own notes with classmates, but note that they will have access to the same materials as you do through Canvas.) Unauthorized sharing of materials is academic dishonesty and a violation of the University's Honor Code. We are aware that unauthorized academic materials are posted on certain websites; if any of this course's materials are found there and are associated with you, it will be reported to the Office of the Dean of Students, which may have serious consequences (see previous paragraph).

CLASS RECORDINGS MUST BE KEPT CONFIDENTIAL:

Class recordings are reserved *only for the students in this class* to use for educational purposes and are protected under FERPA rules. The recordings should not be shared outside the class in any form. Violation of this restriction by a student could lead to Student Misconduct proceedings.

COURSEWORK AND GRADES:

The coursework components are listed below, with their weights towards the course grade. Some items are "overbooked" and you can receive full credit even if you miss a couple of activities or one HW. Instead of make-ups for individual missed assignments, you can make up for them by earning the *equivalent credit* from a later similar item. In the case of a missed unit exam, the make-up is the optional final. Extra credit can be earned on top of the course total *and is available to everyone!*

Unit and Optional Final Exams: We will have four "unit exams" based on material covered in the few weeks prior to each, as listed in the Preliminary Schedule (below). The highest 3 exam scores each count for **20% of the course grade**, while **the lowest exam score counts for 10%** (total exams = **70%**). If you miss an exam, you should plan to take the optional final exam to replace it. Even if you did not miss a unit exam, you can still take the optional final to try for a better grade. The main drawbacks are that the final will cover the entire semester (so that it can serve as a make-up for any of the unit exams), and that it is scheduled on Monday, Dec. 11, starting at 1:00 PM. However, a silver lining is that it will count *only* if it improves your grade. (Otherwise we ignore it.)

Homework: Homework assignments will consist of a few questions that call for you to write short narrative responses **in your own words** (that means, not someone else's words on a website or an AI-generated essay). This will help you review the material, uncover points that you don't fully understand so that you can ask about them, and prepare you for the exams. Partial credit will be available, and the lowest (or one missed) HW will be dropped from the HW total. HW will be submitted as a Canvas assignment. The overall HW score counts for **15%** of the course grade.

Participation: To do well in this course it is important to attend most class meetings and actively engage with the material, especially if some of it seems confusing or unclear. Research on how people learn has demonstrated that challenging yourself to answer questions on subjects you're not sure you've mastered yet turns out to be an effective way to accomplish just that. We will often pose questions in class and ask you to respond with your best guesses, either individually or after brief discussions with nearby classmates. These responses will be documented by having you enter responses on Canvas (using Instapoll or other Canvas features). Participation credit is cumulative and will be overbooked, so you can earn all of the available participation credit even if you had to miss a few classes. The participation total will count for **15%** of the course grade.

Extra Credit: Extra credit is available to every student in the class, and is added to the course total score, on top of the other assignments described above. You can do any or all of these!

Star Parties: One way to earn extra credit is by attending up to 2 “Star Parties” (viewing through telescopes). These are offered on Wednesday, Friday, and Saturday evenings during the semester, (but only when the sky is clear!) Details will be posted. You must obtain an official attendance slip from the person in charge and submit it to the T.A. to receive credit (1 point per Star Party).

Public Lectures: Sometimes there are public lectures on campus on topics relevant to our course. When they are available, we will announce them in advance. You can earn up to 2 points of extra credit by listening to these talks and submitting a short report in your own words, relating what you heard to what you have learned in this class. If there are few or no such opportunities this semester, we will provide links to free talks you can watch online and write similar reports.

The expected correspondence of letter grades to numerical scores is as follows. There will be no rounding up or down. (Adjustments are unlikely, but if made they will be in your favor.)

A	A–	B+	B	B–	C+	C	C–	D	F
≥ 90.00	87.00- 89.99	84.00- 86.99	80.00- 83.99	77.00- 79.99	74.00- 76.99	70.00- 73.99	67.00- 69.99	60.00- 66.99	≤ 59.99

KEY DATES FOR FALL 2023:

Last day to add a class without instructor permission: **Thurs., Aug. 24**

Last Day to drop a class without instructor permission: **Wed., Sep. 6**

Last day to Q-drop or change between letter grade and pass/fail: **Mon., Oct. 23**

(After this date, drops require dean’s approval and are *only* for non-academic reasons.)

Thanksgiving Break (no classes): **Nov. 20 - 24**

Last class meeting: **Thurs., Nov. 30**

Optional final exam: **Mon., Dec. 11, 1:00-2:00 PM** (serves as the make-up for any missed exam)

PRELIMINARY SCHEDULE OF TOPICS: (subject to revision)

Unit	Planned Dates	Topics	Goals (p. 2)	Exam Dates & Units covered
1	8/22, 24	Atoms, Force, & Energy	A	
2	8/29, 31	The Sun: Our Star	A, D	
3	9/5, 7	Messages from Light	B	9/14 (units 1-3)
4	9/12, 14, 19	The Present & Future of the Universe	C, F	
5	9/21, 26	The Big Bang & Early Universe	C, F	
6	9/28, 10/3, 5	The Measures of the Stars	D	10/12 (4-6)
7	10/10, 17	Lives & Deaths of Low-Mass Stars	E, F	
8	10/17, 19	Lives & Deaths of High-Mass Stars	E, F, G	
9	10/24, 26	Black Holes	G	11/9 (7-9)
10	10/31, 11/2	Binaries, Explosions, & Gravitational Waves	F, G	
11	11/14, 16	Formation of the Solar System & Earth	H	
12	11/28	Planets around Other Stars (if time permits)	bonus	11/30 (10-12)