



Astronomical Questions and Science Writing

WRPS194

Instructor Info —



Prof. Karen Masters



Student Hrs: Drop-in
time TBD, or book at:
<https://calendly.com/karenlmasters>



Observatory A



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Course Info —



Prereq: None



Tue/Thur



1-2.30pm



Observatory

Overview

In this seminar we will explore the biggest questions in the Universe, along with other recent developments in astrophysics via a series of writing assignments. Topics are likely to include black holes, dark matter, dark energy, the Big Bang, exoplanets and life in the Universe.

As with all First Year Writing Seminars, you will have opportunity to develop the reading, research and writing skills necessary for success writing about any topic with clarity and appropriate conciseness. Our practice texts will relate to questions in astrophysics - as explained to a variety of audiences, and in a variety of writing styles.

You cannot write about a topic without understanding it first. Class-time will be a mixture of discussion of the astrophysical content that you will need to understand in order to be able to articulate the questions, and a set of topics aimed at covering different aspects of the writing process. We will also cover some of the estimation techniques of scientists, which are so useful for gaining a basic physical understanding of objects in space.

Assignments and Tutorial Sessions

All written assignments should be handed in via Moodle submission. In almost all cases there will be an opportunity for revision. Each of the first drafts will be worth a small percent of your final grade; the revisions will also be counted. The deadline will always be Monday (11.59pm).

After each draft submission all students will be required to attend a tutorial session in a group which I will assign. Students will read the drafts of the other students in their group. In this session we will discuss each draft, before resubmission.

You will not be able to participate fully in class if you do not keep up with the writing assignment schedule. In particular extensions are not possible for first drafts (due to the tutorial schedule). Always just hand in your best draft at the time of the deadline. However, if requested in advance, a 48 hour extension will be granted no questions asked for any final (revised) submission. If you do not ask in advance, or go beyond 48 hours, 10% credit will be lost each day that any assignment is late, up to 50% off. Any assignment can be handed in late for 50% marks.

Grading Scheme

The expectation is that you will attend every class (please email about classes you miss due to illness - preferably in advance). Please do not come to class with Covid symptoms. Participation will be graded; this is evaluated via your success handing in material (including drafts) on time, your engagement in reviewing work by your peers, and your engagement in class discussions (I value all types of contributions - from those who find it easy to speak up in class, and those who don't).

5%	Participation
5%	First Assignment
10%	Second Assignment (5% draft; 5% resubmission)
15%	Third Assignment (5% draft; 10% resubmission)
5%	Presentation
20%	Fourth Assignment (5% draft; 15% resubmission)
40%	Final Project (10% on presentation - 5% each on two drafts and 20% on final submission)

FAQs

? Will I learn how to use a telescope in this class?

! No. But you are encouraged to attend Public Observing or even join the Public Observing Team if you wish to learn to use the telescopes.

? What is astrophysics?

! The use of physics to understand and learn about objects in the night sky. All areas of physics, as well as a lot of chemistry (and some biology) are important to the full understanding of astrophysical objects.

? What's the difference between astronomy and astrophysics?

! There really isn't a difference in the modern usage. An Astronomer is someone who observes objects in the night skies, while an Astrophysicist is someone who uses physics to interpret objects in the Universe. All professional astronomers these days are also astrophysicists. At Haverford the Astrophysics Major is basically the same as the Physics Major with an Astro emphasis, while the Astronomy Major has more astronomy and less core physics.

? What is your favorite astronomical object?

! Galaxies. These are giant collections of stars, gas, dust and dark matter, which contain most of the material in the Universe.

Reading Material

Students will be asked to read selected sections from a variety of sources which are attempting to explain or describe the Universe we live in (provided on reserve, or electronically). This variety will allow us to bring in diverse voices on the topics covered. Readings will include sections from the following books:

The Edge of the Sky, by Roberto Trotta

How Do you Find an Exoplanet, by John Asher Johnson

A Grand and Bold Thing, by Ann Finkbeiner

The Glass Universe, by Dava Sobel

There is no need to buy these. E-copies of all should be available through the library, and I will make copies of pages set as required reading.

Diversity and Inclusivity Statement

Our classroom should be a place where all members will be treated with respect. I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability - and other visible and non-visible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

Science is done by people, and is historically built on a small subset of privileged voices. In this class, we will make an effort to read work from a diverse group of scientists, but limits still exist on this diversity. I believe that integrating a diverse set of experiences is important for a more comprehensive understanding of science. We may discuss issues of diversity in astrophysics as part of the course from time to time. Please contact me (in person or electronically) or submit anonymous feedback if you have any suggestions to improve the quality of the course materials.

Honor Code and Academic Integrity

The Honor Code is one of the things I value most about Haverford, and I will trust students in my class to abide by its principles. Collaboration is an important part of science, and is encouraged, however please give credit to those whose contributions or feedback aided your work.

Plagiarism is the practice of taking someone else's work or ideas and passing them off as your own. In my experience in science writing it can be a tricky concept to learn to recognize the crucial differences between quoting, paraphrasing and plagiarism, and when and how to cite other work. We will discuss these issues, along with what is and what isn't plagiarism in class, and if you are ever unsure please discuss with me.

Accommodation Statement

Haverford College is committed to providing equal access to students with a disability. If you have (or think you have) a learning difference or disability - including mental health, medical, or physical impairment, please contact the Office of Access and Disability Services (ADS) at hc-ads@haverford.edu. The Coordinator will confidentially discuss the process to establish reasonable accommodations.

Students who have already been approved to receive academic accommodations and want to use their accommodations in this course should share their verification letter with me and also make arrangements to meet with me as soon as possible to discuss their the specific accommodations. Please note that accommodations are not retroactive and require advance notice to implement.

It is a state law in Pennsylvania that individuals must be given advance notice if they are to be recorded. Therefore, any student who has a disability-related need to audio record this class must first be approved for this accommodation from the Coordinator of Access and Disability Services and then must speak with me. Other class members will need to be aware that this class may be recorded.

Draft Class Schedule

Fundamentals

Date	Topic	Assignment/Reading
Week 1: Jan 17th	Introductory Material, astronomy vocab game and estimation skills	-
Week 1: Jan 19th	<i>Citation and avoiding Plagiarism in Astro/physics. Discussion of ChatGPT</i>	Read materials on Moodle on Plagiarism, including the writing centre statement.

Black Holes

Week 2: Jan 24th	How to Make a Black Hole. Step 1: Stars	Assignment 1 (A1): "Letter"
Week 2: Jan 26th	How to Make a Black Hole. Step 2: The Deaths of Stars – <i>Techniques for brainstorming and planning</i>	Reading: Ch12 of <i>The Glass Universe</i>
Week 3: Jan 31st	Black Holes and Other Dead Stars	A: Find an example of a black hole in popular culture
Week 3: Feb 2nd	<i>Visit from Science Librarian</i> – Weird Science of Black Holes	Reading: "It Starts with a Bang" (blog post)
Week 4: Feb 7th	<i>TBC: Visit from Writing Center Tutor</i> – Black Holes in Popular Culture – <i>Peer Feedback</i>	A2: The Real Science of a BH in Popular Culture (draft due)
Week 4: Feb 9th	More Black Holes – <i>The Superpower that is Close Reading</i> – <i>How to use Wikipedia appropriately</i>	Reading: TBC (close reading practice)
Week 5: Feb 14th	TUTORIALS on Assignment 2 Draft	A: Peer feedback
Week 5: Feb 16th	TUTORIALS on Assignment 2 Draft	

The Universe

Week 6: Feb 21st	How to Build the Universe? (The Big Bang) – <i>Public Speaking for Scientists</i>	A2: The Real Science of a BH in Popular Culture (second submission)
Week 6: Feb 23rd	What is Dark Matter? – What is Dark Energy? – <i>Jargon Busting</i> – <i>Choosing the right language for your audience</i>	Selected reading from "The Edge of the Sky". Watch selected YouTube videos of scientists speaking.
Week 7: Feb 28th	TUTORIALS on Assignment 3 Draft	A3 - Jargon Busting (first draft)
Week 7: Mar 2nd	TUTORIALS on Assignment 3 Draft	Reading: Peer Feedback on Jargon Busting drafts

Spring Break Mar 6-12th

Date	Topic	Assignment/Reading
The Universe Cont.		
Week 8: Mar 14th	Mapping the Universe – <i>Writing Formal emails</i>	A3 - Jargon Busting (second submission)
Week 8: Mar 16th	Special Collections Visit.	Selected readings from <i>A Grand and Bold Thing</i> .
Life in The Universe		
Week 9: Mar 21st	How to Detect an Exoplanet – <i>The Lab Report – Formal Scientific Writing</i>	A: Research paper proposal “email”
Week 9: Mar 23rd	What Would it be like to Visit an Exoplanet?	Selected reading from <i>How Do you Find an Exoplanet</i> , by John Asher Johnson. Close reading of a NASA “Exoplanet Travel Poster” caption.
Week 10: Mar 27th	Student led TUTORIALS on Assignment 4 Draft	A4 - Exoplanet Travel Brochure
Week 10: Mar 30th	Student led TUTORIALS on Assignment 4 Draft	Selected reading from <i>How Do you Find an Exoplanet</i> , by John Asher Johnson.
Week 11: Apr 4th	Is there Life in the Solar System (outside Earth)? – <i>Workshop on LaTeX - Typesetting yourself, and handing large reference lists</i>	A4 - Exoplanet travel (2nd draft)
Week 11: Apr 6th	The Drake Equation (estimation in practice) – <i>Including Equations and Mathematics in Writing</i>	Reading: TBA
Other Big Questions		
Week 12: Apr 11th	Pitches for “Big Question”	Presentation Practice assignment
Week 12: Apr 13th	<i>What have we learned? Discussion of writing in the sciences</i>	Reading: Something on science writing
Week 13: Apr 18th	Short TUTORIALS on Draft Introduction	A: Draft Introduction for Research Paper
Week 13: Apr 20th	Topic on Astrophysics Selected by Class	Reading TBD.
Week 14: Apr 25th	Presentations on Research paper	Full Draft of Research Paper
Week 14: Apr 27th	Presentations on Research paper	
Week 14:	TUTORIALS on Final Research Paper Draft	
Exam Period May 1-12th - Research paper deadline May 12th		

List of Assignments

Assignment 1 (5%): Letter Writing

This assignment is a simple letter to a non-scientist friend/family member (real or imaginary) talking about your assignment into this first year writing seminar ("Astronomical Questions and Science Writing").

A good letter will

- reference at least one item on the syllabus you are particularly excited about, and one thing you find confusing/are worried about
- be formatted like a proper letter (i.e. include an Address, Date, Dear (Name), Opening, Body, Closing, Signature - see: <https://owlcation.com/academia/Examples-of-how-to-write-informal-letters-in-English-Personal>)
- include minimal spelling and grammatical errors
- be approximately a page long (~200-500 words)
- be submitted as a PDF

Assignment 2 (10%): Black Holes in Popular Culture

This assignment (which you will hand in as a draft, and a resubmission) is a short description and discussion of the real science behind a representation of a Black Hole found somewhere in popular culture.

Both submissions are required. There will also be a peer feedback step. A good submission will

- be 1-3 pages long (~200-900 words).
- be neither too brief or unnecessarily wordy
- be submitted as a PDF
- be in informal language (e.g. imagine you are writing a blog post)
- describe in a couple of sentences how/where the Black Hole is described or visualised, this might also include an image/screengrab of the black hole which has a caption including credit line (not required if the black hole is only described in words)
- include a full reference for the reader to find the Black Hole (e.g. link to a Youtube video if possible)
- describe in detail how the representation should differ to describe (or how it is accurately portraying) the real science behind Black Holes as you have explained them
- total your submission should include at least two aspects of the physics of a Black holes. The point is to hook a science article about what black holes are really like around the representation you found in a popular culture reference, in the way Phil Plait used movies to talk about astronomy, so you must both explain black holes, and use the black hole you found as the hook to draw the reader in.

Assignment 3 (15%): Jargon Busting

The book *The Edge of the Sky*, by Roberto Trotta, attempts to explain concepts in cosmology using only the 1000 most common words in English. The "Simple Wikipedia" (https://simple.wikipedia.org/wiki/Main_Page), similarly using only basic English vocabulary. For this assignment you will provide two versions of an explanation of "The Big Bang" model of the Universe. In the one explanation you may (must!) use technical language, and explain the concept to other scientists at a University writing level. In the other version, you should aim to write an explanation suitable for a 3rd grader (8 year old), using English vocabulary suitable to the grade.

Presentation Practice (5%): Topic Pitch

This will be a 90s (1.5 minute) persuasive talk, supported by 1 slide, in which you will present a question in astrophysics to the class that you would like to see as the final topic we cover. The class will reach the final decision by a discussion until consensus is reached.

Assignment 4 (20%): Exoplanet Travel Brochure

In the style of a travel brochure, you will describe a real exoplanet which you pick (or are assigned). The description should be no more than a page long, and include at least one estimate of a physical condition (e.g. temperature, surface gravity) done by you. You may use artists impressions found on the web (properly credited) to illustrate your guidebook. We will combine all entries into a travel brochure to be shared with the whole class.

Final Assignment (10% on presentation; 30% on report): Research Paper

In this final assignment, you will pick a topic of particular interest to you in astrophysics and write a "typical" research paper (meaning a paper in which you research a topic). The assignment will comprise multiple parts with several deadlines:

1. A proposal. This should be in the format of an email to an imaginary Professor who is an expert on the topic, laying out the reasons for your choice and asking for their advice on your selection.
2. A draft of the introduction (1-2 pages of text, plus figures as needed) (5%)
3. A full draft of the paper (aiming for 10-15 pages) (5%)
4. A class presentation (5-7 minutes each; in the last week of class; 10%)
5. Submission of the final paper (during finals week; 20%)