ASTR 2 Projects

Over the course of the class, you will be required to complete two of the following projects centered around interacting with astronomy in a **non-scientific, outside-the-classroom context**. These projects are each designed to appeal to different kinds of people and how they might like to think about the subject, so read through all of the topics, weigh the pros and cons, and see which ones suit you best.

These are individual projects, so you must complete the final version of the project by yourself. You are allowed to talk with others about your progress and help each other out, but **everything you turn in must be your own work.**

Each of these projects will require you to **write a reflection** afterwards about what you felt you learned from the experience, and some will also require you to write other things during the project. This is not a writing class, so **I will not be assessing the quality of your writing**, just the information you convey in your reflection. I don't care about formatting or spacing as long as it's readable.

You will submit your projects **in the form of a PDF or a .doc/.docx**. Any images that accompany your project should also be included in the document ideally, but I will also accept separate uploads in .jpg/.jpeg or .png format. Any other digital media can be submitted in a form that is easily viewed on normal computers without specialized software (e.g. videos in a standard format like .mp4, .mpeg, or .wav and digital art in .svg or a raster image), and any physical objects or papers can be submitted to me in person in class, during office hours, or in my mailbox. Physical objects may not be returned unless special arrangements are made.

Timelines

Below are the suggested timelines for the various stages of the projects. Like all aspects of the course, you are free to work on whatever timeline suits you best, but **you are required to turn them both in by the end of the course**. Several of these projects will require large amounts of time and/or need to be spread out over several days or weeks (notably 2 and 5), so make sure you start your projects early enough to finish them on time. These projects will also **likely have to be worked on in parallel** at the same time in order to finish them in time, so budget your time well.

Task	Project 1	Project 2
Indicate which project you will do on your weekly homework	Thursday Week 2 (August 4)	Thursday Week 3 (August 11)
Discuss your progress on the project with a partner in class	Thursday Week 3 (August 11)	Thursday Week 4 (August 18)
Turn in the final version of the project	Friday Week 4 (August 19)	Friday Week 5 (August 26)

Project Options

Project 1: Creative Work

You will make **some sort of creative work** that is based on astronomy in some way. This could be almost anything, including (but not limited to): fiction, visual art, performance art, game, film/video, music, dance, etc. The goal of this project is to allow you to engage with astronomy in a medium that you feel comfortable in.

Choose this project if…

- You are a creative or artistic person
- You don't mind putting in extra time to make something you're proud of
- You want to challenge yourself to create something with constraints

Description

You can make whatever you want as long as it is:

1. **Your own new original work:** It can't have been created before this class. You must be the creative lead on the project (if it involves other people at all). Penalties for unoriginal work will be severe.
2. **Able to be consumed in 7 minutes or less**: I only have limited time to grade these, so be considerate. That means less than 2000 words if it's written text. You don't have to take up all of the time as long as you clearly put in effort, but I will dock points if you go over.
3. **Centered on astronomy:** Whatever you make *must* be focused on astronomy, and that astronomy *must be scientifically correct.* If you do not include enough astronomical concepts (or your astronomy isn't correct), you will lose points. Constraints breed creativity.

If you choose to do something written, you *will* be judged on the quality of your writing (contrary to what it says at the top of this page). Quality will be judged solely and subjectively by me.

Reflection

Accompanying your creative work, you will write a short reflection (no more than a page) about your experience doing the project. Write one paragraph about your creative process and how you went about creating the work, and write a second paragraph about how including astronomy in your project changed your usual creative process and what you learned from the experience.

Rubric

Requirement	100%	40-80%	20%
Quality (5 points)	The work is clearly high quality, as subjectively judged by the instructor	The work is okay quality	The work is low quality
Effort (5 points)	The student clearly put a lot of creative effort into the work	The student appears to have put some amount of work into the project	The student did not put much effort at all into the work
Astronomy (10 points)	The work contains several different astronomy concepts, and all of them are totally accurate or contain only tiny errors	The work contains only 1-2 astronomy concepts and/or the concepts in the work contain major errors	The work contains no real astronomy at all and/or the astronomy in it is completely inaccurate
Reflection (5 points)	The student gives a detailed overview of how they created the work and how they incorporated astronomy into their creative process	The student's description of their creative process lacks detail or evidence of learning	The reflection gives no insight into how the work was created or what the student was considering while making it

Project 2: Lunar Observation

You will **observe the Moon** over the course of its full cycle. You must go outside and observe the Moon on **at least 7 different days throughout a 4 week period**, including **at least one observation in each of the 4 weeks**. The goal of this project is to appreciate the full cycle of the Moon and practice making scientific observations and conclusions.

Choose this project if…

- You like the Moon and going outside to look at it
- You can plan ahead and remember to do observations every week
- You are looking for a classic project that isn't that much actual work

Description

Each observation will consist of:

1. **Observation information:** the date, time, location, and sky conditions of the observation
2. **Sketch:** A hand-drawn sketch of what the Moon looks like that day. You will not be judged on artistic quality but the shape of the Moon must be discernible.
3. **Position:** The Moon's position in the sky. This can be relative to features on the ground like the landscape or buildings, or absolute position relative to the Sun or stars
4. **Changes:** A detailed description of how the Moon's appearance and location have changed since your last observation

This project obviously takes a fixed amount of time, so **you must start this project no later than the middle of Week 2**. I *strongly* recommend not doing this project as your second project because you will likely run out of time. **Make sure you will actually have time** to complete this project before you start it because you will be docked substantially for not observing a complete cycle.

Reflection

Accompanying your observation logs, you will also write a reflection (no more than a page), with one paragraph synthesizing the information you gathered into a detailed narrative of how the Moon changed over the course of the month from start to finish, and a second paragraph describing anything you learned about the Moon and its appearance during the month.

Rubric

Requirement	100%	40-80%	20%
Observations (10 points)	The student has an adequate number of observations of the Moon over the course of the month and at least one observation each week	The student has 5-6 observations than required and/or missed missed 1 week of observations	The student has fewer than 5 observations and/or missed multiple weeks of observations
Log Quality (10 points)	The logs provide plentiful detail, allowing the reader to fully visualize the time, location, appearance, and movement of the Moon	The logs contain some information, but not enough to reconstruct the exact characteristics of the Moon on each day	The logs contain little information and do not provide a useful description of the Moon
Reflection (5 points)	The student gives a detailed narrative about how the Moon changed throughout their observations and provides useful insights into their experience	The student does not fully synthesize the information in their logs in a broader context and/or their insights into the observation process is lacking	The student makes no attempt at tying their observations together into a cohesive story and does not show engagement with Moon observation

Project 3: News Article Comparison

You will find **news articles about astronomy** from mainstream popular news sources and find corresponding articles from a more scientific news source on the same topics, **comparing the information in the articles** and the choices the authors made while writing their articles. The goals of this project are to learn to critically examine news articles at different scientific levels and to recognize how scientific information is communicated.

Choose this project if…

- You like reading astronomy news articles
- You like journalism or scientific communication
- You're looking for something that can be done relatively quickly

Description

When writing an article, journalists must consider the audience that will be reading the article and tailor their writing to suit that audience. In astronomy journalism, there are three broad categories of audiences: the general public, scientifically literate readers, and experts in the field. Journalists make different choices about how to write their articles based on which audience they are catering to, leading to the same information being presented in different ways.

In this project, you will **choose 3 pairs of astronomy articles**. Each pair will consist of two articles covering the same story: one article for the general public from a mainstream news source catering to the general public and one article from a scientific publication catering to scientifically literate readers. The pairs of articles can be drawn from the same sources, but they must be on different topics. Examples of sources in these two categories are:

- **Mainstream:** Newspapers (New York Times, Washington Post, San Francisco Chronicle, etc.), news organizations (NBC, CNN, NPR, Huffington Post, etc.), blogs (CNet, The Verge, Engadget, etc.)
- **Scientific:** Astronomy publications (Astronomy.com, Space.com, Skyandtelescope.org), scientific blogs (Phys.org, Astrobites.org), academic sources (university websites, observatory websites)

The above list of sources is not complete, so you are **free to use other sources** that fall into these categories. You can often find links to more scientific articles inside mainstream articles. You'll probably want to stay away from journal articles because those are aimed at an audience of astronomy experts. If you are unsure whether a source is at the appropriate level, feel free to ask.

For each of your pairs of articles, provide the following information:

1. Titles, sources, and links to the articles
2. What is the **topic** of the articles?

3. How are the two articles **similar**? What information did the mainstream journalist keep/emphasize in their article?
4. How are the two articles **different**? What information did the scientific article have but the mainstream article did not?
5. Would you have made any **different choices** in what content to include in the mainstream article?
6. Using your astronomy background from our class, is there **any more contextual information** you would have included in either of the articles?

Reflection

Accompanying your article analyses, you will also write a short reflection (no more than one page), with one paragraph describing any broad trends you observed in how mainstream articles are written compared to scientific articles, and one paragraph describing what you learned about scientific journalism and the choices journalists make.

Rubric

Requirement	100%	40-80%	20%
Article comparisons (5 points each, 15 points total)	The student gives detailed information on the similarities and differences between the articles and provides apt commentary on their journalistic choices	The student's analysis of the similarities and differences is incomplete and/or their commentary is lacking	The student's comparisons do not contain enough information to adequately understand the two articles
Sources (5 points)	All of the sources the student chose were appropriate in level	Some of the sources the student chose were not the appropriate level	None of the sources the student chose were the appropriate level
Reflection (5 points)	The student has insightful comments on scientific journalism and the choices journalists make	The student has some thoughts on journalistic choice for their specific articles but their broader analysis is lacking	The student has no real commentary on scientific journalism

Project 4: Explaining APOD

You will choose **three different Astronomy Pictures of the Day** (APOD, www.apod.nasa.gov) over the course of the quarter, read about what is being shown in them, and explain what you find interesting about the picture **to a friend or family member**, answering any of their questions to the best of your ability. The goal of this project is to improve your understanding of astronomy through teaching and to spread information from this class to your community.

Choose this project if…

- You want to bring your knowledge back to your community
- You like doing your own research
- You like teaching

Description

You cannot choose any APODs from Tuesdays or Thursdays during the quarter as we will be discussing those in class. You are allowed to look through the APOD archive to choose images from the past if you like. In order to learn more about the day's APOD, I recommend:

- **Reading the caption:** The caption is the most useful resource available to you. It is written each day by the curators of APOD to simply and succinctly explain what is interesting about the image, and the links it contains often go into greater detail about any subjects you want to know more about.
- **Online resources:** Google is your friend, and googling the name of the object in the image or other key terms will often lead you to useful resources for learning more. Sometimes the APOD is tied to a current event that has also been written about in news articles. Wikipedia can be useful but it is oftentimes very technical.
- **Class notes/the textbook:** Our class is a survey course that covers many of the topics showcased in APOD, so it might give you a good excuse to look back through your notes. You may also want to read the relevant section of our textbook (even if we haven't gotten to it yet!)

Once you feel you have a good background on the subject of the APOD, **choose a friend or family member** to explain the image to, spending a couple of minutes showing them the image and describing it to them before **asking whether they have questions** and doing your best to answer them. There are no requirements on who you can choose to teach as long as they are not also in this class and they can understand you when you talk to them. It does not have to be the same person each time.

After each teaching session, you will write a short summary of how the experience went. Include the following information:

- **Which APOD you were explaining:** include a link
- **Who you were explaining it to:** a brief description of who they are and their level of astronomy knowledge

- **What resources you used:** Give a description of how you went about researching the day's APOD. This does not have to be exhaustive, but it should indicate what your major sources were.
- **How it went:** Did the person understand the image and/or find it interesting? What worked about how you explained it? What didn't work and could be improved for next time? This should be anywhere between a few sentences and a short paragraph

Reflection

Accompanying you summaries of your teaching, you will also write a short reflection (no more than one page), with one paragraph describing what you learned about astronomy by researching the APODs, and a second paragraph describing what you learned about teaching from these experiences.

Rubric

Requirement	100%	40-80%	20%
Teaching Logs (5 points each, 15 points total)	The student gives a detailed description of how their teaching session went, allowing the reader to understand what did and did not go well for the person being taught	The student gives an adequate description of their teaching session, but not with sufficient detail to fully understand how the session actually went	The student gives only a barebones description of the session which does not allow the reader to reconstruct how it went
Research (5 points)	The student gives detailed logs of how they researched their APODs, showing that they attempted to gain a full understanding of the topic	The student put in some amount of effort to prepare for teaching, but not enough to gain a full understanding	The student put in little to no effort preparing for the session
Reflection (5 points)	The student thoroughly describes what they learned about astronomy and teaching from this experience	The student's description of what they learned about astronomy and/or teaching does not fully encompass the material shown in their logs	The student indicates little or no learning in astronomy or teaching

Project 5: Kerbal Space Program

You will play the **rocket simulation video game "Kerbal Space Program"** and progress to the point where you can send a crewed mission to the moon and bring your astronaut(s) back safely. The goal of this project is to allow you to learn more about rockets and orbital mechanics in a fun, hands-on environment.

Choose this project if…

- You like video games
- You don't mind putting in extra work over a long period of time to complete a challenge
- You like rockets and space exploration

Description

Kerbal Space Program is a video game that allows you to construct custom rockets for Kerbals (small green aliens) and fly the rockets through their solar system with accurate physics. The possibilities in this game are endless, but anything you do must obey the laws of physics. Even doing something simple like reaching orbit requires a relatively deep understanding of rockets and orbital mechanics. I have personally found that playing this game has given me a better mastery of orbital mechanics than even my graduate-level orbital dynamics class.

In this project, you will have to **bring at least one Kerbal to the Mun** (the Kerbal equivalent of the Moon) **and back to Kerbin safely**. This task is not easy and will require lots of experimentation and outside learning. I recommend looking up online guides and tutorials for help (Scott Manley has playlists of tutorials on Youtube that are particularly useful). I am also happy to provide guidance over email or during office hours. Learning the necessary information and improving your gameplay to this level **can take 10+ hours**, so budget your time well.

You are ineligible for this project if you have already played this game and landed a Kerbal on the Mun. You can use any game mode you like, but you **can't use any mods, cheats, or exploits**.

You will be required to **submit pictures of your screen (not screenshots)** to prove your accomplishments. In each picture, hold a card or piece of paper with **your handwritten name** on it next to the screen in such a way that I can clearly see **your rocket, the situation it is in, and the timer** in the top corner. Poor photos may lead to lost points. The milestones you must photograph are:

1. Your rocket on the launch pad
2. Your rocket in Kerbin orbit
3. Your lander on the surface of the Mun
4. A Kerbal next to a flag on the surface of the Mun
5. Your capsule back on Kerbin with your Kerbal (alive) next to it

Kerbal Space Program can be bought from the Steam store for $40 (it's unlikely to go on sale during our class). The minimum hardware requirements are somewhat low by modern standards because the game was released in 2015, but it can still be taxing in some cases, so you may want to skip this project if you're not sure whether your computer can play video games acceptably. It is also available for Xbox One and PlayStation 4 but I have never played those versions so I can't vouch for how good they are (some say they're harder to control than PC).

Reflection

Accompanying your pictures showing your project, you will also write a short reflection (no more than one page), with one paragraph describing your rocket and why you designed it the way you did, and another paragraph describing what you learned about rockets and orbital mechanics while playing the game and what resources you used.

Rubric

Requirement	100%	40-80%	20%
Screenshots (4 points each, [2 points for milestone, 2 points for name & info], 20 points total)	The student has pictures of their screen for each of the required milestones that clearly show the required information	The student is missing some of the required pictures and/or some of the pictures do no clearly show each piece of information	The student did not complete the required tasks
Reflection (5 points)	The student thoroughly describes what they learned about rockets and orbital mechanics and gives a detailed list of their sources	The student does not fully describe their takeaways from the project and/or they do not give a complete and detailed list of sources	The student indicates little or no learning and does not give sources