

Astronomy 2115

Fall 2025

Term Project

The final project for the class will be either a written report **or** an oral presentation on a scientific paper.

The written report should be 5 pages long (one paragraph or so over or under is fine) with 1 inch margins, single-spaced, and written in Times fontsize 12 (or equivalent).

The presentation can be performed in powerpoint, keynote, google slides, or a similar presentation software. The length needs to be 10 minutes (+ 2-3 minutes for questions).

The Papers:

- 1) The merger that led to the formation of the Milky Way's inner stellar halo and thick disk: <https://arxiv.org/abs/1806.06038>
- 2) Origin of the heavy elements in binary neutron-star mergers from a gravitational wave event: <https://arxiv.org/abs/1710.05463>
- 3) A triple protostar system formed via fragmentation of a gravitationally unstable disk: <https://arxiv.org/abs/1610.08524>
- 4) Asteroseismology can reveal strong internal magnetic fields in red giant stars: <https://arxiv.org/abs/1510.06960>
- 5) The Sun is less active than other solar-like stars: <https://arxiv.org/abs/2005.01401>
- 6) The tidal remnant of an unusually metal-poor globular cluster: <https://arxiv.org/abs/2007.14577>
- 7) A binary pulsar in a 53-minute orbit: <https://www.nature.com/articles/s41586-023-06308-w>
- 8) The cool brown dwarf Gliese 229 B is a close binary: <https://arxiv.org/abs/2410.11953>
- 9) A very luminous jet from the disruption of a star by a massive black hole: <https://arxiv.org/abs/2211.16530>
- 10) Detection of stellar light from quasar host galaxies at redshifts above 6: <https://arxiv.org/abs/2211.14329>
- 11) Witnessing the onset of reionization through Lyman- α emission at redshift 13: <https://arxiv.org/abs/2408.16608>
- 12) Accelerated formation of ultra-massive galaxies in the first billion years: <https://arxiv.org/abs/2309.02492>
- 13) Most of the photons that reionized the Universe came from dwarf galaxies: <https://arxiv.org/abs/2308.08540>

Detailed instructions:

Scan through (at least) a few of those papers, before picking one to report on. **Make sure you read at least the abstract before selecting (or dismissing) a paper.**

Content and structure:

I recommend the following for structuring your report or presentation. If you have a different idea for how to organize your report/presentation, please check with me first.

Introduction: Background to the topic of the paper you chose. Do not simply summarize the paper's introduction, but instead **use this section to ensure that not just me but your classmates (who only the background they have seen in freshman science classes and ASTR 2110+2115) will understand the rest of your report or presentation.**

For sources, use both material from the class, **and other papers referenced in your chosen paper's introduction.**

Description: description of the paper's methods and results

Follow-up: look up papers on the topic that appeared after your selected paper (look at papers that cite your paper!), and determine how the topic addressed in the paper has evolved since it came out (e.g. has it been proven wrong? Is there consensus in the astronomy community? Or is the result from your paper controversial, with the community not having fully settled on one side or the other?)

Conclusion: Approximately half a page/one-slide summary that wraps up the paper/presentation and overall current state of the topic.

Reflection: Provide your own thoughts on the paper (and overall topic it deals with) you presented on. Some prompts:

- What science did the authors get right? What did they get wrong?
- Do authors of subsequent papers believe their results?
- What are you still curious about?
- Where do you think the research will take us? What are the implications if the results hold up?

Searching for sources (cited papers, or papers that cite the one you choose):

I like to use the [ADS digital library](#) to search for papers. Find the paper you chose on that website. Then, in the menu on the left, you will see both "Citations" (subsequent papers that cite this one) and "References" (previous papers that are being cited by this one).

Grading rubric:

- quality of research into background and motivation of the paper (including at least a cursory investigation of previous papers on the topic)
- effective representation and argumentation of the paper's methods and results
- effective research and representation of related published work that followed the paper

- writing style (for report)
- grammar, spelling and punctuation (for report)
- keeping to page number recommendation (for report)
- Structure of the slide deck; slide content and format (for oral presentation)
- Delivery (for oral presentation): non-verbal, eye contact, articulation, volume, speed
- Keeping to allowed time (for oral presentation)
- Independent insight See my suggestions under for the Reflection section above. As much as possible, be quantitative in your thoughts and arguments about the paper/overall topic (e.g. do the calculations to back up your arguments and show these calculations in your presentation; look for and include related calculations that we have done in class).

Steps and deadlines:

Paper selection and written/oral decision (by email! No more than two students per paper – first come, first served) – **due October 14, 2025, 11am**

Report – **due November 25, 11am**

Slides – **due November 25, 11am**

Presentations will take place during the final 2 lectures of the semester (Dec. 2 and 4).