

Astronomy 401/Physics 903  
Research Project  
Due **Thursday May 2, 2019**

The final class assignment will be a research project on a topic of your choice. The project has two parts:

1. Research paper: 4 pages minimum, no maximum
2. Short in-class presentation: aim for about 15 minutes, plus some time for questions

**Sources:** You must use at least four different sources, and both cite your sources within the paper and list them at the end. Suggested sources are books (both textbooks and popular science books) and magazines such as *Scientific American*, *Sky and Telescope*, *Astronomy*, *Discover*, etc. Many of these magazine articles are available online, but be extremely careful about sources from the internet. Wikipedia usually has good information about scientific topics and is a good place to start, but information from Wikipedia should be verified with other sources. There is a lot of incorrect information about astrophysics on the internet, so for the purposes of this project only online sources from reputable publications or institutions (universities, NASA, etc) are acceptable. **Students enrolled in Physics 903 must use and cite at least two journal articles of published original research.** Astronomy 401 students are encouraged to do this as well, but this is not required.

**Suggested topics:**

1. The first stars (Population III)
2. The first three minutes of the universe
3. Future large telescopes: JWST, TMT, GMT, ELT, SKA, etc.
4. Detecting reionization with radio telescopes
5. Black holes in the centers of galaxies
6. The origin of the elements
7. Cosmology with gravitational waves
8. Searches for the most distant galaxies
9. The cosmological constant and dark energy: history, prospects for measurement and detection
10. Cosmology with big data: the Dark Energy Survey, LSST
11. Age and history of the Milky Way
12. Dwarf galaxies in the Local Group
13. Other approved topic of your choice

Everyone should do a different topic so that the presentations will be different. We'll sign up for topics in class on **Thursday April 4** (or sooner if you decide sooner), so please choose a topic by then. The paper will be due on **Thursday May 2**, and presentations will begin on **May 2** and continue on **May 7-9**.