**Intro to Astronomy Research: Final Project Assignment**

**Written by Sarah Blunt**

**Motivation:**

Many undergraduate research internships do not have dedicated time for students to do literature reviews and come up with their own ideas. This project is an opportunity to do just that. We believe this project will compliment your future research experiences, and help to complete your understanding of the research process.

**Assignment:**

Select and read at least 3 scientific papers on a particular topic in astronomy using [SAO/NASA ADS](http://adsabs.harvard.edu/abstract_service.html). At least one of these should be a review paper. You may choose your own topic or choose from the list we’ve compiled below. As you read, come up with an idea for an original research project that could contribute to the field you’ve chosen. Your idea doesn’t have to be doable, but it must by original and advance knowledge in your chosen field.

Write a proposal convincing the reader that your idea should be funded based on the results of your reading. You may assume your reader has infinite money, but must decide between your proposal and many others.

Proposal Requirements:

* 2 or more pages (double spaced, 12-pt font)
* Must propose to carry out an original idea (i.e. something nobody else has done, to the best of your knowledge)
* Must contribute knowledge to chosen field in astronomy.

Proposal Guidelines:

* The first ~75% of your proposal should summarize the papers you’ve read and set the stage for your idea. The remaining 25% should describe your idea and convince the reader that this project would advance knowledge in your chosen field.

Possible Topics**:**

* exoplanet atmospheres
* exoplanet formation
* exoplanet dynamics & interactions
* astrobiology
* Search for Extraterrestrial Intelligence (SETI)
* exoplanet transits
* exoplanet radial velocities
* exoplanet imaging
* exoplanet microlensing
* asteroseismology
* exoplanet population statistics

**Timeline:**

You will spend the last two weeks of the course working on this project.

Week 1:

Select and read the 3 papers you will include in your report. You will meet virtually with an instructor twice this week to discuss your progress. Suggested meeting topics for this week:

* **Meeting 1**: Choice of research topic & papers
  + Please select your 3 papers before this meeting
* **Meeting 2**: Developing your original idea
  + Please read your 3 papers before this meeting

Week 2:

Outline and write your proposal. Again, you will meet virtually with an instructor every few days to discuss your progress. Suggested meeting topics for this week:

* **Meeting 2**: Feedback on a draft of your proposal
  + Please write a draft of your proposal before this meeting

You will receive comments from all instructors once you submit your final proposal draft. You are encouraged but not required to make these changes. We encourage you to share this proposal with potential research advisers and it on research internship applications.

**Example Projects and Resources:**

This assignment is modeled after the [NSF Graduate Research Fellowship](https://www.nsfgrfp.org/) proposal application essays. For many excellent example NSF essays, see [Alex Lang’s website](http://www.alexhunterlang.com/nsf-fellowship#TOC-Examples-of-Successful-Essays) (click on any “proposal” link in the table). Your proposals should be shorter than the NSF proposals, but other than that, you can model yours exactly after the NSF ones.

Sarah will also email around an example observing proposal for those who are curious what a “grown-up” astronomy proposal looks like.

Isabel has compiled a list of advice for writing an effective proposal [here](https://github.com/howardisaacson/Introduction-to-Astronomy-Research/blob/master/Week8/Writing%20a%20Proposal.md).

In addition, the next two pages provide an awesome quick overview of proposal writing. There are many other [excellent proposal-writing resources](https://www.google.com/search?q=how+to+write+a+scientific+proposal&oq=how+to+write+a+scientific+proposal&aqs=chrome..69i57j0l5.9064j0j7&sourceid=chrome&ie=UTF-8) online. Please read through as many of them as is helpful!





**Teaching Notes:**

**Complimentary Lesson Topics:**

* Searching for papers about a certain topic (leveraging ADS, reading an abstract)
  + Classifying papers: review articles vs theory papers vs observation papers, etc.
* Parsing scientific papers
  + Reading for big ideas
  + Outlining effectively
  + Actively reading: looking for opportunities for further research as you read
* Proposal writing
  + Writing a literature review
  + Building an argument