A105 – Stars and Galaxies - Course Projects List
FALL 2006

All students are expected to complete one project during the semester. Projects are due in class on Nov. 30, but projects may be turned in early. Projects turned in after 5 PM on Nov. 30 will receive partial credit, and no projects will be accepted after Dec. 7.

Your project should be selected from the list below (also posted on Oncourse). Several choices are available. Students who wish to carry out a project not on the list should first consult with one of the instructors for permission.

Projects will automatically earn 70 points (a low C) if the basic requirements of the project are met, *but up to 30 additional points may be awarded for an exceptionally good project*. The extra points will be awarded for projects that indicate substantial effort, demonstrate significant scholarship, and provide evidence that you have learned some astronomy while completing the project. Suggestions for what might constitute that "extra effort" worthy of additional points are given for each project.

General Requirements: For projects that include writing, length requirements are based on a 12-point font with 1.25 inch margins, double-spaced.

Projects must be submitted on paper; no electronic submissions will be accepted for a grade. The reason for this is the time and effort involved in keeping track of electronic projects and in printing and grading them. They are too easy to lose.

Plagiarism – Plagiarism is the use of other people's words and ideas as your own. **Plagiarism will not be accepted in students' work in this class**. Give credit by citing the sources you use. This includes noting where you paraphrase others' work. If you paraphrase, you must do more than just change a few words or reorder phrases. To paraphrase correctly, use your own words, and give credit for ideas. You must use your own words in all written assignments. Cutting and pasting text from the Web, the text, or other sources is not acceptable. A good refresher on what constitutes plagiarism is available at the School of Education website at: http://education.indiana.edu/~frick/plagiarism/.

SPECIFIC PROJECT REQUIREMENTS

1. **What's in the News? -** Find three news articles about current (within the last 2 years) discoveries in astronomy within one general area (solar system, stars, galaxies, neutron stars, black holes, cosmology, extrasolar planets, etc.) on the Web or in the newspapers or magazines.

   Basic requirement: Write a 3-page discussion of these discoveries and how they relate to each other and to material covered in A105. The articles MUST be related in some way.

Beyond the basic requirement: going beyond the basic requirements might entail an analysis of how the media reports the stories, or how scientists' understanding of the topic of the stories has changed or evolved over time as a result of the discoveries. One approach might be to select one story reported in several places, and analyze how the reporting of the story differs for different media or for different audiences (e.g. a newspaper, a web site, a children's magazine). Another option might be to analyze how the writer deals with possible misconceptions a reader might have about the story, or to analyze how the writer reports the stories in an accurate or understandable way. The goal is for YOU to go beyond simply reporting or summarizing the stories and add your own intellectual content. To get more than the basic 70 points, the grader of the project must find your ideas to be intellectually interesting and original.

Copies of the news articles must be submitted with your paper.

2. **Read a book** suggested for extra reading on the Just-for-Fun reading list, and write a two-page book report. Include a summary of the main ideas in the book and your evaluation of the ideas. Also include a recommendation on whether other students should read the book (or not!) and why. You may select a book that is not on the extra reading after consultation with one of the instructors, if you wish.

   Basic requirement: Summarize the book and the main ideas.

   Beyond the basic requirement: Analyze the impact of the book on public understanding of science; evaluate how the book addresses misconceptions about science; place the book in the context of its time and compare it to our understanding of science today; explore how the scientific method is or is not conveyed by the author. Be a scholar! Again, the grader of the project must find your ideas to be intellectually interesting and original for your project to be awarded more than the basic 70 points.

3. **Write a 3-page biography of a <u>living</u> astronomer**, using sources from the Web. Describe your astronomer's major scientific contributions, and how those contributions have impacted the field of astronomy. Use at least three sources, and include the URLs with the paper. Be careful to paraphrase, rather than plagiarize, and DON'T cut and paste! You may select an astronomer mentioned in class, one you find in a news story (check www.space.com or the NY Times), or one you have heard of outside of class. (Note: *If you choose to write about an astronomer who has already died, you will receive no more than half credit!*)

   Basic requirement: write the basic biography as described above.

   Beyond the basic requirement: Some ideas: Discuss how your astronomer exemplifies your conceptions or mis-conceptions about science and/or the scientific method. Discuss how our understanding of the astronomer's scientific field has changed during the lifetime of your astronomer. Discuss how our modern cultural

context has affected your astronomer and his/her work. Again, the grader of the project must find your ideas to be intellectually interesting and original for the project to be awarded more than the basic 70 points.

4. **Write a children's book** – Write and illustrate (with images and/or original art) a children's book that teaches some of the basic ideas in one of the units we cover in the textbook at a middle or high school level. Include a 1-paragraph "forward" describing why the ideas you have selected for the book are important for kids to learn. Include citations for any images you select. NOTE: *NO books about the seasons or phases of the Moon or "ABCs of Astronomy" will receive project credit.*

   Basic requirement: Pick a relatively simple concept (e.g. a "tour" of the Universe, or a specific object (the Sun, the Milky Way....).

   Beyond the basic requirement: Pick a more complex topic (e.g. star formation, cosmology, stellar evolution, nucleosynthesis, neutron stars, chemical evolution, galaxy formation, etc.) involving processes in astronomy, evaluate what concepts will be particularly difficult for your audience, and write a book that helps your readers understand those concepts. Include in your forward an additional paragraph identifying those difficult concepts and why you think your explanations will help your readers understand the concepts.

5. **Investigate Some BAD ASTRONOMY -** Visit the "Bad Astronomy" website at www.badastronomy.com and review commentary and links on common misconceptions in astronomy.

   Basic requirement: Write a 2 page paper describing the misconceptions involved and how the misconceptions come to be accepted by the public. The Bad Astronomy web page with the links to discussions of misconceptions is: www.badastronomy.com/bad/misc/index.html. Acceptable choices for topics for your paper are listed below.

   - Planet X Nonsense
   - Debating Pseudoscientists
   - Another Face in the Crowd
   - Will Galileo Make Jupiter a Star?
   - Bad Moon Rising (Were the Apollo Moon landings faked?)
   - Bad Idioms

   Beyond the basic requirement: After reviewing the various pages on astronomical misconceptions discussed on the *Bad Astronomy* website, write a 3 page paper about the role such misconceptions play in society and why these misconceptions are popular and persistent. What do these misconceptions reveal about the nature of our society, and in what ways might they affect the future of our society? Another option might be to review a science fiction movie or book to evaluate what misconceptions or scientific errors occur in the work and what the author/screenwriter might have

done to make the work more believable without harming the plot or story. Again, the grader of the project must find your ideas to be intellectually interesting and original for the project to receive more than the basic 70 points.

6. **The Reason for the Seasons**: Work with a group of 3 students to survey IU student misconceptions about the cause of the seasons. Develop a survey form that identifies frequent misconceptions about the cause of the seasons, and use it to survey at least 100 of your fellow students who are NOT taking a 100-level astronomy course. Evaluate your results. What are the most frequent misconceptions, and how do you think people come to have these misconceptions? The group should write up a 3-page report outlining your methods and results. Include a copy of your survey form with your report.

   Beyond the basic project: Investigate the causes of the misconceptions and add an additional page to the report to discuss what you think needs to change in our educational system to improve science literacy among your peers. This portion of the project should be your own work, not the work of the group. Again, the grader of the project must find your ideas to be intellectually interesting and original.

7. **Size and Scale** - Create an accurate scale model of the solar system, the local solar neighborhood, the Milky Way, the local group, or the local supercluster using everyday items. Your model should be accurate to scale in both distance and size of objects. Photograph your model and turn in a printed copy of the photograph or photographs along with a written, 1-2 page description of how your model is scaled to reflect the true dimensions of the system portrayed.

   Going beyond: Use your model to develop a lesson plan to assist A105 students to grasp the relative sizes and distances of objects in the Universe. A lesson plan should include learning goals, a class activity, and an assessment plan to evaluate student learning.

8. **Be artistic** – Create an original work of art related to a theme or idea covered in one of the units in the book. Submit with the work (or a photograph of the work) with a one page explanation of how the artwork illustrates that theme or idea and is related to material we have covered in A105. To receive basic credit, the artwork must demonstrate a level of subject mastery consistent with the standards of the course. A quick sketch will not be awarded credit.

   Going beyond: Instead of portraying an astrophysical object, try to convey the central ideas of a natural process that occurs in the Universe (gravitational contraction, hydrostatic equilibrium, accretion, the Doppler shift, orbital motion… the list is endless!). Projects that fulfill this goal and demonstrate quality and skill in execution may receive the additional points. The one-page explanation must also be submitted.

9. **Investigate Careers** - Explore one of the many career opportunities available to students with an interest in astronomy, including science journalism,

telecommunications, education and public outreach, information technology, and science policy. Pick *one* of these areas and investigate several aspects, including preparation for the career, potential employers, the type of work that someone in this career would do, contributions of these professionals to society and to the field of astronomy, etc. Identify three people who have been successful in this career, and profile their careers and contributions. Information on all these topics can be found on the web. Good places to look include:

- The careers link on the website of the American Astronomical Society (www.aas.org),
- The Congressional Fellows program of the American Physical Society
- http://www.aps.org/public_affairs/fellow/
- The American Association for the Advancement of Science Science Policy website at http://fellowships.aaas.org/
- The National Association of Science Writers at http://www.nasw.org/
- The International Planetarium Society at http://www.nasw.org/
- And many others…

This is a new project this semester, so criteria for "going beyond" are still being developed. Evaluation will be based on the quality of your report. Minimum length: 2 pages.

10. **Prepare a Podcast -** Put together a digital audio program of up to 10 minutes length that informs the general public about some topic of astronomy. The audio program should be posted in the Oncourse Drop Box, and a script and show notes should be handed in on paper in class. Your show notes should contain all cited references and a breakdown by time-code of your show (by topic or whatever other marker is appropriate). Subject matter should relate to the A105 course and should be appropriate to play in class (some podcasts may be played in class).

    As with all projects, avoid plagiarism! Cite all sources clearly, including URLs.

    Several examples of podcasts (and other digital audio formats) are available on the web to serve as examples. Check out:

    - Stardate: http://www.stardate.org
    - SlackerAstronomy: www.slackerastronomy.org
    - The Hubble Space Telescope: www.hubblesite.org
    - The Spitzer Space Telescope: http://www.spitzer.caltech.edu/features/podcasts/index.shtml
    - IU's own "A Moment of Science (at http://amos.indiana.edu/

    This is a new project this semester, so criteria for "going beyond" are still being developed. Evaluation will be based on the quality of your podcast. Minimum length: 5 minutes. Part of the evaluation will include the complexity of difficulty of the topic of your podcast.