Take-home Project Assignment

This take-home project gives you an opportunity to pursue your own interest in the history of science and technology from antiquity through the Scientific Revolution. It complements the exams by asking you to look at one topic in more depth.

You may choose one of three options for your project; within each option you can focus on a specific topic.

The project report will be graded on both content and presentation. That means you should carefully proofread it. If you choose option I, you should make sure your essay has a clear thesis and argument.

The project will be due on Tuesday, December 3, at the beginning of class. For every working day that it is late, the maximum grade will be reduced by one-half letter grade.

I. Traditional expository essay

For this option, you should select a topic from the following three and write a 4-5 page (1200-1500 word) expository essay. You should present a thesis and then defend the thesis with an argument based on all relevant information from readings and lectures. If you choose this option, you should consult the essay grading guidelines that are available on the course web page. If you want to write on a different topic, you may, but you must see Prof. Ogilvie with a written description of the topic you would like to write about and get his signature; otherwise your essay will not be accepted.

1. In his “Letter to the Grand Dutchess Christina,” Galileo argued that theologians should not become involved in scientific controversies. Explain his arguments in favor of this conclusion. How do they illuminate the relationship between science and religion in the early seventeenth century? To help organize your paper, consider the following questions and Galileo’s answers: For whom was the Bible written? What kind of language did it employ? How did St. Augustine describe the relationship between scientific conclusions and theology? In what sense is theology the queen of the sciences? Can the Bible be mistaken about theological matters? How might a theologian have responded to Galileo’s arguments? Please note: this paper topic asks you to understand and explain Galileo’s arguments. It does not ask you to decide whether Galileo was right or wrong. Our job as historians is to understand the past, not to pass judgment on it according to modern standards.

2. From its invention up through the Industrial Revolution, agriculture has been the chief productive activity of human beings. Compare the agrarian revolution that led to the origins of early civilizations (e.g. in Egypt, Mesopotamia, China, the Yucatan) with the agrarian revolution of medieval Europe, as described and explained by Lynn White, Jr. How did the organization of agricultural change differ, and why? To help organize your paper, consider the following questions: What were the important changes in agriculture, according to the course readings and lectures? What kind of social organization was required to bring about these changes? On what scale were the changes implemented? What political changes went along with the technological changes? Who
made the decisions? Who benefited from the changes? What sources of power were used?

3. Explain Francis Bacon’s plan for renewing science, as explained in “The Great Instauration” (in Bacon, pp. 1-33). What was the goal of Bacon’s renewal? Was it practical, abstract, or both? If both, how did the practical and abstract goals relate to one another. To help organize your paper, consider the following questions and Bacon’s answers: How does Bacon’s understanding of the method of scientific inquiry compare with Aristotle’s? Where did Aristotle and other ancient thinkers go wrong, according to Bacon? What is the relationship between empirical investigation (experience) and scientific theories? Can one person accomplish everything that Bacon wants to accomplish? Is the ultimate goal of scientific investigation understanding or action? What does Bacon mean by “induction,” and what role does it play in his system?

II. Internet research report

For this option, you should choose a topic from the course that interests you and find out what you can about it from the Internet. (The course web page should be your starting point, but not your ending point.) Then you should go to a reference librarian at the DuBois Library (the tower library) and ask for research assistance on your topic, to see what kind of information is available in print on the topic. You should then write a report about your experience with the research, setting out in 4-5 pages (1200-1500 words):

• Your topic. Your topic should be relatively specific: not “the Scientific Revolution” (too broad), but more like “the role of scientific societies in the Scientific Revolution,” or “the calendar system of the Mayans.”

• The amount of information available on the Internet about it. Count the number of websites or pages that are specifically on your subject or contain much information on it, and compare it with the number of hits you get from a search engine. Do searches produce a lot of irrelevant links?

• The reliability of information from the Internet (including why you think the information is reliable). Who wrote it, and what are their qualifications? Do they indicate sources?

• The depth of interpretation in what you find on the Internet—that is, how thoughtful and insightful is it?

• The amount of information you could find out from printed sources, with the aid of a reference librarian. Count the number of books and scholarly articles that are specifically on your subject or contain much information on it, and compare it with the number of false leads you got.

• The reliability of information available in print (including why you think the information is reliable). Who wrote it, and what are their qualifications? Do they indicate sources?

• The depth of interpretation in what you find in print—that is, how thoughtful and insightful is it?

• Conclusions on the scope and reliability of Internet information on your topic, compared with what is available in print. In the end, if you are looking for the best information in the least amount of time, should you go to the WWW or to a reference librarian?
Please note that this option is not any easier than option I, though it might appear to be so at first glance. To fit this report in 4-5 pages, you will have to choose your words carefully.

III. Galileo’s telescopic observations

For this project, you will build a telescope and use it to repeat Galileo’s observations. You will need Galileo’s “Starry Messenger” (in Discoveries and Opinions of Galileo; you might want to consult the translation by Albert Van Helden in Sidereus Nuncius too) and the following equipment:

1. A notebook for recording observations. The notebook should be large enough for you to write easily in it but small enough you can carry it around at night.

2. A simple refracting telescope kit. You will need to either buy a kit or acquire the parts separately. Refracting telescope kits are available from scientific vendors; one source is StarLab (http://www.starlab.com); their kit, product no. PS-04B/Single, sells for $8. If you want to acquire individual parts and experiment with telescopes of different magnifying power, you can get parts from Science Kit & Boreal Laboratories (http://www.sciencekit.com) or other vendors. NOTE: I am not endorsing these particular vendors, merely indicating them for your convenience. Your telescope should be Galilean or Keplerian; for an explanation of these terms and of telescope optics, see the “Galilean and Keplerian Telescopes” link on the course web page. The telescope should be at least fifteen-powered.

3. A star chart (or sky map) for the northern hemisphere. You can get a free, detailed star chart showing the evening sky online at skymaps.com; stardate.org is another source of useful information. You can also get an inexpensive plastic sky map that can be adjusted to any time of the night at many bookstores.

After you have built your telescope, following the instructions in your kit or the “Galilean and Keplerian Telescopes” web page, use it to repeat some of Galileo’s historic celestial observations:

- The moon’s phases and the apparent irregularities on its surface.
- The presence of stars that cannot be seen with the naked eye.
- The Milky Way.
- The moons of Jupiter. Jupiter is rising after midnight now, so the best time for viewing is probably early morning (at least if you go to bed before midnight!). You will need to spend several days attempting to observe Jupiter’s moons in order to see their motion.

Like Galileo, you may find that you need a stand to steady your telescope while making observations.

You should keep a log of your observations in your notebook. Record the day and time that you began observing, the time that you stopped, and descriptions of what you observed, including any problems. If you intend to observe and are prevented by bad weather (clouds or precipitation), record that fact.
Your report should summarize your experiences with building a telescope and making observations. It should also address the role of telescopic observations in the transformation of astronomy and physics in the seventeenth century. Here are some questions to think about:

- How much skill is required to make careful telescopic observations?
- How confident are you that your observations are reliable?
- Did opponents of early telescopic observations have a point about the limitations of the instrument?

If you are interested in reading further on Galileo’s opponents, see Paul Feyerabend’s book *Against Method*, revised edition (London and New York: Verso, 1988), chapters 8-11. Note: Feyerabend’s book makes a complex, often counterintuitive series of arguments. Reading it is NOT a requirement for this project; this is a suggestion only.