

Astronomy 142: Extra Credit Assignment

This *optional* extra-credit assignment is due on Wednesday, March 11. It can be turned in in class or delivered to my mailbox in 4055 McPherson Lab *by 5 pm*. It will be graded on a 4-point scale and added to your average course grade from other assignments, with a weight of 0.1. For example, a grade of B+ (3.33) on this assignment would raise your course grade by 0.333, the difference of B to B+, B+ to A-, etc.

The Assignment

Write a 3-page (typed, double-spaced) essay on one of the three topics below. (More specifically, your essay should be more than 2 pages and less than 5, and if you want to write on a topic other than the three below you must clear it with me first.) Essays will be graded based on clarity of expression and level of insight — a good essay should be well organized and well written, and it should have something interesting to say.

Your essay must be in your own words, and you should clearly identify any direct quotes from other sources. You do not need to give detailed footnotes, but if you use sources in addition to those mentioned below you should list them in a brief bibliography.

Topic Choices

1. Based on Chapter 10 of *Black Holes and Time Warps* and the web sites <http://www.ligo.caltech.edu> and <http://lisa.nasa.gov>,

describe the *LIGO* and *LISA* projects. What are their goals, and how do they work? What are the similarities and differences between them? What are the main sources of gravity waves that the two observatories hope to detect?

2. Based on Chapters 5 and 6 of *Black Holes and Time Warps*, summarize the roles that J. Robert Oppenheimer and John Archibald Wheeler played in the development of the atomic (fission) bomb and the hydrogen (fusion) bomb. (If you are interested in learning more about this subject, I highly recommend the superb book *The Making of the Atomic Bomb*, by Richard Rhodes.)

3. Black holes have become an element of culture far beyond pure science — as objects in science fiction books and films, and as metaphors in the social sciences, literature, and art. Describe two specific examples of the appearance of black holes in one of these realms. What is the correspondence between the properties of real black holes (as we understand them scientifically) and the way that they are portrayed in these examples? Why have black holes become objects of popular fascination and powerful cultural metaphors?