

ASTRONOMY 110
The Hubble Space Telescope
Fall Quarter 2010

INSTRUCTOR: Dave Meyer
OFFICE: Dearborn Observatory #6 (491-4516)
EMAIL: davemeyer@northwestern.edu
OFFICE HOURS: MWF 12:30 - 1:30 PM
DISCUSSIONS: MWF at 11:00 – 11:50 AM in Tech LG68
TEXTBOOKS: *The Universe in a Mirror* (Zimmerman)
Universe: Stars and Galaxies (4th edition) (Freedman, Geller, & Kaufmann)

Grading Policy

The course grade will be based on three 3 - 5 page papers (15% each) due October 8, October 29, and November 19, one 6 - 8 page paper (30%) due December 6, and participation in class discussion (25%). There will be no exams, final or otherwise.

Class Discussion

As a freshman seminar, this course is meant to be conducted in a discussion format - in other words, there will be no lengthy lectures by the instructor. In order to make such a course work, it is important that the students complete the weekly reading assignments before the relevant Hubble topics and images are discussed in class each week. In order to encourage class participation, each student will make a 15-20 minute oral presentation on one of the Hubble images and lead its discussion during the quarter. These student presentations will follow the schedule outlined below between Oct. 13 and Nov. 19 (the listed websites give the details on each Hubble image to be discussed). The students will select the images for their presentations via a lottery process at our first meeting on Sep. 22.

The Papers

One of the most important goals of a freshman seminar is to foster better writing skills. Consequently, the chief evaluative component of this course will be four paper assignments as listed below. Papers will be graded on the basis of clear and concise thinking, originality, and grammatical style. If you need some help in organizing and writing your papers, check out NU's The Writing Place. The instructor will be happy to look over paper drafts well before the due dates. No late papers will be accepted. The particular assignments are as follows:

Assignment #1 (3 - 5 pages)

Due: Friday, October 8, 2010

With a total cost over \$10 billion and counting, the Hubble Space Telescope is arguably the most expensive scientific instrument ever built. Has the public benefit from Hubble been worth this

expense? Would the money have been better spent on some other area of scientific research? Would it have been better spent on something other than science? Discuss your reasoning.

Assignment #2 (3 - 5 pages)

Due: Friday, October 29, 2010

Imagine that you were awarded one week of Hubble telescope time to observe anything in the sky. What would you choose to observe? Why? Should Hubble observing time be awarded solely on the scientific merits of a proposal? Why or why not?

Assignment #3 (3 - 5 pages)

Due: Friday, November 19, 2010

Critique the Hubble image presentation of one of your classmates. What did you find most illuminating? What could have been improved? What, if anything, did we miss in the class discussion of this image? How would you have told the story behind this image?

Assignment #4 (6 - 8 pages)

Due: Monday, December 6, 2010

Choose a recent (within the past 6 months) newspaper or magazine article in a reputable (no tabloids!) publication reporting on a Hubble discovery and critique it. The article you choose should be longer than several paragraphs. In your paper, you will provide some background on the material covered in the article, discuss the importance of the Hubble discovery reported, and most importantly, evaluate the accuracy and reliability of the article based on what you have learned in this seminar. Please include a xerox copy of the article with your paper.

Course Outline

Sep. 22 *Introductions*

Sep. 24 *How Big is the Milky Way Galaxy?*

Read Z (Chap. 1-3), FGK (Chap. 1)

Sep. 27 *How Big is the Universe?*

Sep. 29 *Light*

Oct. 1 *Telescopes*

Read Z (Chap. 4-5), FGK (Chap. 5-6)

Oct. 4 *The Rationale for a Space Telescope*

Oct. 6 *The Capabilities of the Hubble Space Telescope*

Oct. 8 *Hubble Trouble* **(Paper #1 Due)**

Read Z (Chap. 6-8)

Oct. 11 *The Impact of Comet Shoemaker-Levy 9*

Oct. 13 *The Sagittarius Star Cloud*

Oct. 15 *The Globular Cluster M80*

Read FGK (pp. 170-174, 433-456, 497-511, 605-611)

<http://hubblesite.org/newscenter/archive/releases/1994/1994/34/image/a/>

<http://hubblesite.org/newscenter/archive/releases/1998/28/image/d/results/>

<http://hubblesite.org/newscenter/archive/releases/1999/26/image/a/>

- Oct. 18 *The Eagle Nebula*
Oct. 20 *The Carina Nebula*
Oct. 22 *The Cat's Eye Nebula*
Read FGK (pp. 471-488, 525-534)
<http://hubblesite.org/newscenter/archive/releases/1995/44/image/a/results/>
<http://hubblesite.org/newscenter/archive/releases/2007/16/image/a/>
<http://hubblesite.org/newscenter/archive/releases/2004/27/image/a/>
- Oct. 25 *The Expanding Light Echo of V838 Monocerotis*
Oct. 27 *The Remnant of Supernova 1987A*
Oct. 29 *The Crab Nebula* **(Paper #2 Due)**
Read FGK (pp. 533-548, 555-572)
<http://hubblesite.org/newscenter/archive/releases/star/2005/02/image/a/>
<http://hubblesite.org/newscenter/archive/releases/star/2007/10/image/a/>
<http://hubblesite.org/newscenter/archive/releases/2005/37/image/a/>
- Nov. 1 *The Fomalhaut Exoplanet*
Nov. 3 *The Sombrero Galaxy*
Nov. 5 *The Whirlpool Galaxy*
Read FGK (pp. 198-204, 621-625, 635-643)
<http://hubblesite.org/newscenter/archive/releases/star/2008/39/image/a/>
<http://hubblesite.org/newscenter/archive/releases/2003/28/image/a/>
<http://hubblesite.org/newscenter/archive/releases/2005/12/image/a/>
- Nov. 8 *The Coma Cluster of Galaxies*
Nov. 10 *The Cosmic Yardstick NGC 3370*
Nov. 12 *The M87 Cosmic Jet*
Read FGK (pp. 643-654, 669-687, 708-712)
<http://hubblesite.org/newscenter/archive/releases/galaxy/2008/24/image/a/>
<http://hubblesite.org/newscenter/archive/releases/galaxy/2003/24/image/a/>
<http://hubblesite.org/newscenter/archive/releases/2000/20/image/a/>
- Nov. 15 *The Colliding Antennae Galaxies*
Nov. 17 *The Massive Gravitational Lens Abell 2218*
Nov. 19 *The Hubble Ultra Deep Field* **(Paper #3 Due)**
Read FGK (pp. 616-621, 654-663, 691-705)
<http://hubblesite.org/newscenter/archive/releases/galaxy/2006/46/image/a/>
<http://hubblesite.org/newscenter/archive/releases/2000/07/image/b/results/>
<http://hubblesite.org/newscenter/archive/releases/2004/07/image/a/results/>
- Nov. 22 *Hubble's Legacy and Beyond*

Paper #4 Due in Prof. Meyer's Dearborn mailbox by 5 PM on Monday, December 6