Natural Science I: Cosmos and the Earth V55.0202
Summer 2004 Meyer 122

Monday through Thursday
9:55 – 11:30 a.m.
Dr. Andre Adler
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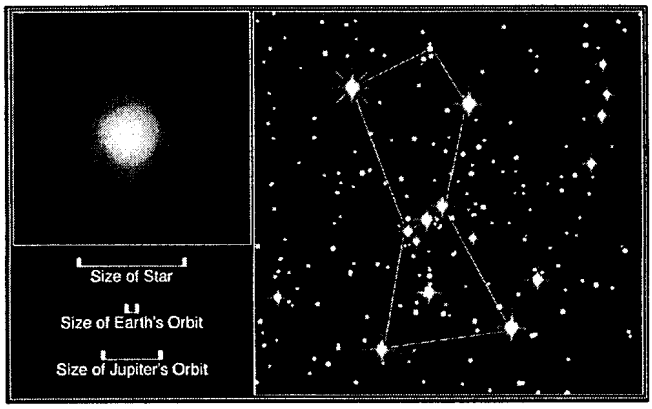
Office hours: By appointment



The winter constellation Orion on the right, a Hubble Space Telescope photograph of the star Betelgeuse on the left, and a comparison of the size of Betelgeuse (the bright star in the upper left), to the orbit of Earth and Jupiter.

Laboratory Instructor
Igor Kamenetsky (igor.kamenetsky@physics.nyu.edu)
Department of Physics
Meyer Hall, 4 Washington Place
Room 322

Course Description

This course is an introduction to modern astronomy. Current research in astronomy deals with many questions like: how do galaxies evolve, what is the Universe made of, what is the fate of the Universe, what does the Universe look like on the largest distance scales, and are Earth-like planets common? All of these questions will be discussed. Stars, white dwarfs, neutrons stars, black holes, galaxies and quasars populate the universe. They inhabit a space that is altered by the presence of mass and energy. In the evolution of the stars we find the forge of the elements needed to make planets and life. Supernova explosions of stars make the heavier elements and spread them into space to mix and build systems of stars, planets, and perhaps life. More than one hundred planets orbiting other stars have been discovered. Some stars evolve into bodies that can distort space to such a degree that it gets cut off from the rest of the universe. The basis of modern cosmology is the Big Bang theory of creation, in which space and time were created sometime in the distant past. The evidence for this theory will form an important part of the course.

The course makes use of mathematics such as powers, square roots, ratios, proportions, and high school algebra and geometry. Part of the laboratory sessions will review the mathematics you need for the course. Part of the role of the laboratory sessions is to help understand the lecture material and to work on and review homework.

Course Objectives

- Understand how we try to understand the natural world through observation, experimentation, and theory.
- Connect observations on earth to observations made of stars and other astronomical phenomena.
- Show how light is a messenger carrying information about the cosmos.
- Understand how the sun generates energy.
- Tell the story of how the universe started out with mostly hydrogen and helium and evolved stars to forge the heavier elements necessary for life.
- See how stars evolve into white dwarfs, neutron stars and black holes.
- Look at the evidence for the big bang theory of creation.
- Look at the role of relativity in interpreting the big bang theory and the properties of black holes.

Course texts

1. *Astronomy, A Self-Teaching Guide*, 6th edition, Dinah L. Moche.
2. *On the Cosmic Horizon: Ten Great Mysteries for Third Millennium Astronomy*, 2001, Jeffrey Bennett. (A copy of this book is on reserve at Bobst Library.)
3. *Lecture-Tutorials for Introductory Astronomy*, preliminary edition, 2002, Jeffrey Adams, Edward Prather, Timothy Slater.
4. *Cosmos and Earth: Laboratory Manual.*

Course Examinations

The examinations will be based on

(a) the lecture questions,
(b) exercises contained in *Lecture-Tutorials for Introductory Astronomy* that you will work on in groups in some laboratory sessions.
(c) questions from *Astronomy, A Self-Teaching Guide* that are found at the end of each assigned section and each chapter.
(d) homework problems that are handed out in lecture.

You will need to bring a calculator to all exams. The exams will be in the multiple-choice format. There will be two exams: one during the semester (see below for the dates) and the final examination on the last day of class. The first exam will be based on material we will cover in the first 3 weeks of the class and the second exam will be based on material we will cover in the last 3 weeks of the class. The final exam will also have material from lectures tested by the first exam.

After the first exam I will put a list of problems on the blackboard that had the greatest number of incorrect responses. The cumulative nature of the final exam will be reflected in concepts from the first exam that were the subject of those questions that had the most incorrect responses. The final exam will be cumulative with a design to testing you on concepts from the first exam that the most students had trouble with.

Course Grade

Mid-term Examination	30%	June 7, 9:55 to 11:30 a.m.
Laboratory/Homework	30%	
Final examination (cumulative)	40%	June 24, 9:55 to 11:30 a.m.

Laboratory Sessions

These twice-weekly sessions are an important part of the course. You must be registered for one lab section. You will have to submit a lab report for each experiment performed. The lab report has to include answers to all questions and any data you may have collected. The lab report will be due in the next lab after the experiment has been performed. **The laboratory sessions will be held in Main 202 and will begin on Wednesday, May 19.**

The laboratory sessions will be devoted to

1. Doing experiments described in your laboratory manual.
2. Doing exercises from the *Lecture-Tutorials for Introductory Astronomy* volume.
3. Discussing the homework problems.
4. Discussing the lecture questions.

Section	Day	Time
2	Monday and Wednesday	12:00 – 2:00 p.m.
3	Monday and Wednesday	2:20 – 4:20 p.m.

The laboratory grade will be based on the following assignments:

Lab experiment and report	50%
Attendance/Participation during the Lecture Tutorial/Lecture Questions Sessions	50%
Total Lab Grade	100%

Attendance

If you arrive late for the lab session you will lose some of the attendance credit.

Absence Policy

Excused absences will only be given in the case of illness (with a doctor's note) or observation of a religious holiday. You must notify your lab instructor in advance in writing if you miss a lab due to religious reasons. All other absences will be considered unexcused and will result in a lab grade of zero.

Late Assignments

Late assignments will be penalized five points for each day late (excluding weekends).

Homework

Homework problems will be handed out in lecture. The homework will be reviewed in the laboratory sections. Some assignments will be handed in and graded. The problems contained in them will serve, in part, as practice for the midterm and final examinations.

Lecture Questions

Science is a process of asking questions, answerable by observations, experiments and theory. A sheet of questions will be handed out in each lecture. I will structure the lecture around these questions. They will form the core of the examinations, along with the homework assignments.

Missed Exams

There is no make-up exam for the course midterm examination. If you miss the midterm examination, for a valid reason (illness or injury), your grade will be based on the following allocation:

Laboratory	30%
Final examination (cumulative)	70%

Final Exam

A make-up for the final examination will be given under exceptional circumstances, which must be discussed with Dr. Adler before the examination. In this case a grade of incomplete will be assigned and the make-up will be scheduled for sometime during the Fall 2004 semester. Please avoid making travel plans before the date of the final exam. No alternative date for the final examination will be offered before the end of the Summer 2004 semester.

Internet Sites on Astronomy

1. Astronomy Picture of the Day: http://antwrp.gsfc.nasa.gov/apod/astropix.html
2. Space.com: http://www.space.com/
3. Astronomical Society of the Pacific: http://www.aspsky.org/, This organization is a link between professional astronomers, amateur astronomers, teachers, and the general public.
4. Hubble Space Telescope Pictures: http://oposite.stsci.edu/pubinfo/Pictures.html. The more general address of the Space Telescope Science Institute is http://oposite.stsci.edu/.
5. The "Astronomy Cafe": http://www.astronomycafe.net/, Astronomer Sten Odenwald answers questions.
6. Search for extra-solar planets: http://www.exoplanets.org
7. The Nine Planets: http://www.seds.org/nineplanets/nineplanets/
8. NASA's Planetary Photojournal: http://photojournal.jpl.nasa.gov/, See also Welcome to the Planets: http://pds.jpl.nasa.gov/planets/
9. Solar Eclipses: http://sunearth.gsfc.nasa.gov/eclipse/eclipse.html
10. Planetary Society: http://www.planetary.org/index.html
11. Imagine Mars: http://imaginemars.jpl.nasa.gov/index1.html and http://mmp.planetary.org/
12. Space Day: http://www.spaceday.com/
13. Popular Magazines about astronomy: Astronomy magazine: http://www.astronomy.com/, Sky & Telescope magazine: http://www.skypub.com/, Mercury magazine: http://www.aspsky.org/

Date	*Lecture Topic*	*Reading*
M May 17	Observational Astronomy I	Moche: chapter 1
T May 18	Observational Astronomy II	Moche: chapter 1
W May 19	Light – Messenger of the Stars	Moche: chapter 2
R May 20	Atoms and Light	Moche: chapter 2
M May 24	The Stars - Distant Suns	Moche: chapter 3
T May 25	Properties of Stars	Moche: chapter 3
W May 26	Binary Star Systems	Moche: chapter 3; Bennett: Mystery 9
R May 27	The Sun	Moche: chapter 4
M May 31	**Memorial Day**	
T June 1	Evolution of Stars	Moche: chapter 5
W June 2	Exploding Stars	Moche: chapter 5
R June 3	Corpses of Massive Stars	Moche: chapter 5
M June 7	**Midterm Examination**	
T June 8	Supernovae and the heavy elements	Moche: chapter 5
W Jun 9	Our Home: The Milky Way	Moche: chapter 6
R Jun 10	Galaxies – Sizes, Shapes and Colors	Moche: chapter 6; Bennett: Mystery 8
M Jun 14	Galaxies – Their Birth and Evolution	Moche: chapter 6; Bennett: Mystery 7
T Jun 15	Active Galaxies and Quasars	Moche: chapter 7
W Jun 16	The Big Bang I	Moche: chapter 7
R Jun 17	The Big Bang II	Bennett: Mystery 4
M Jun 21	The Age of the Universe	Bennett: Mystery 3
T Jun 22	The Fate of the Universe	Bennett: Mystery 3
W Jun 23	Dark Matter	Bennett: Mystery 2
R Jun 24	**Final Exam**	

Laboratory Schedule

Week	Date	Laboratory Experiment
1	May 17	No lab
	May 19	The Celestial Sphere on the Computer
2	May 24	Spectroscopy
	May 26	Young's Experiment
3	May 31	Memorial Day
	June 2	Lecture-Tutorials for Introductory Astronomy
4	June 7	Polarization
	June 9	Lecture-Tutorials for Introductory Astronomy
5	June 14	Observing the Cosmic Redshift
	June 16	Hubble's Law
6	June 21	Lecture-Tutorials for Introductory Astronomy
	June 23	Review for final exam

Astronomy Picture of the Day

Discover the cosmos! Each day a different image or photograph of our fascinating universe is featured, along with a brief explanation written by a professional astronomer.

December 12, 1996

The Milky Way Through the Summer Triangle
Credit and Copyright: Andy Steere

Explanation: There are more than a few stars in our Galaxy. The light from many of them combines to appear as a wisp of faint light across the night sky - the Milky Way. In the northern hemisphere, away from city lights and during the summer months, part of the Milky Way can be seen behind the Summer Triangle of stars - Deneb, Vega, and Altair. These are the brightest three stars in the above photograph, listed from left to right, respectively. If you could collect light in your eyes for 10 minutes at a time (instead of the usual 1/10th of a second), you might see something like the above photograph. Behind the Summer Triangle lies some of the vast star fields of our Milky Way Galaxy, containing literally billions of stars. The dark band across the middle that seems to divide the stars is actually interstellar dust, which absorbs more visible light than it emits and so appears dark.

Tomorrow's picture: Disorder in Stephan's Quintet

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Authors & editors: Robert Nemiroff (MTU) & Jerry Bonnell (USRA)
NASA Technical Rep.: Jay Norris.
A service of: LHEA at NASA/ GSFC

Academic Guidelines for Students
Morse Academic Plan, College of Arts and Science

To help foster common academic expectations among students and instructors, the following guidelines for MAP courses are offered to students. While these represent minimum expectations across the curriculum, individual faculty members may set additional course requirements. Students should therefore consult the course syllabus for details of policies in each class.

Attendance
Inasmuch as students have voluntarily sought admission to the University, they are expected to attend all class meetings, including all lectures and all meetings of associated recitation, workshop, or laboratory sections. Students may be excused for documented medical or personal emergency and will receive reasonable accommodation for the observance of religious holidays. In these cases, they should contact their instructors in advance or, in cases of emergency, as soon as is practicable. Students are responsible for making up any material or assignments they miss.

Classroom Decorum
The classroom is a space for free and open inquiry and for the critical evaluation of ideas, and it should be free of personal prejudice. Students and instructors alike have an obligation to all members of the class to create an educational atmosphere of mutual trust and respect in which differences of opinion can be subjected to deliberate and reasonable examination without animus.

As a matter of courtesy to their fellow students and instructors, students should arrive at class promptly, prepared and ready to participate. Students are reminded particularly to shut off all cellular telephones and pagers and, except in cases of emergency, to remain in the classroom for the duration of the lecture or section meeting. If it is necessary to leave or enter a room once class has begun, students should do so quietly and with as little disruption as possible. Under University policy, disruptive classroom behavior may be subject to faculty review and disciplinary sanction.

Completion of Assignments
Students are expected to submit course work on time and to retain copies of their work until a final grade has been received for the course. Instructors are not obliged to accept late work and may assign a failing or reduced grade to such assignments.

Students who encounter sudden and incapacitating illness or other comparably grave circumstance that prevents them from completing the final examination or assignment in a course may request a temporary mark of Incomplete from the course instructor. To receive an Incomplete, students must have completed all other requirements for the course, including satisfactory attendance, and there must be a strong likelihood they will pass the course when all work is completed.

Questions and Concerns
Up-to-date course information is available on the MAP website: www.nyu.edu/cas/map. Questions, concerns, comments, and feedback may be directed to the following members of the MAP staff, located in 903 Silver Center, 212-998-8119. Complaints will remain confidential.

Foundations of Contemporary Culture:	Dr. Vincent Renzi	map.fcc@nyu.edu
Foundations of Scientific Inquiry:	Dr. Trace Jordan	map.fsi@nyu.edu
MAP Administration:	Mike Summers	morse.plan@nyu.edu

(over)

Statement on Academic Integrity

Morse Academic Plan, College of Arts and Science

As a student at New York University, you have been admitted to a community of scholars who value free and open inquiry. Our work depends on honest assessment of ideas and their sources; and we expect you, as a member of our community, likewise to maintain the highest integrity in your academic work. Because of the central importance of these values to our intellectual life together, those who fail to maintain them will be subject to severe sanction, which may include dismissal from the University.

Plagiarism consists in presenting ideas and words without acknowledging their source and is an offense against academic integrity. Any of the following acts constitutes a crime of plagiarism.

- Using a phrase, sentence, or passage from another person's work without quotation marks and attribution of the source.
- Paraphrasing words or ideas from another's work without attribution.
- Reporting as your own research or knowledge any data or facts gathered or reported by another person.
- Submitting in your own name papers or reports completed by another.
- Submitting your own original work toward requirements in more than one class without the prior permission of the instructors.

Other offenses against academic integrity include the following.

- Collaborating with other students on assignments without the express permission of the instructor.
- Giving your work to another student to submit as his or her own.
- Copying answers from other students during examinations.
- Using notes or other sources to answer exam questions without the instructor's permission.
- Secreting or destroying library or reference materials.
- Submitting as your own work a paper or results of research that you have purchased from a commercial firm or another person.

Particular emphasis is placed on the use of papers and other materials to be found on the World-Wide Web, whether purchased or freely available. In addition to having access to the same search engines as students, faculty also have at their disposal a number of special websites devoted to detecting plagiarism from the web.

Plagiarism and other cases of academic fraud are matters of fact, not intention. It is therefore crucial that you be diligent in assuring the integrity of your work.

- Use quotation marks to set off words not your own.
- Learn to use proper forms of attribution for source materials.
- Do your own original work in each class, without collaboration, unless otherwise instructed.
- Don't use published sources, the work of others, or material from the web without attribution.
- For further information, consult the Bulletin of the College of Arts and Science, the CAS Academic Handbook, and the Student's Guide to NYU.

revised 11/2003