Astr 1020K * Spring 2020
TR 9:30-10:45 am, ULB 170
TR 2:15-3:30 pm, LH 300
Stellar and Galactic Astronomy

- Your instructor: Douglas Gies
- Astronomy at Georgia State University
- Syllabus
- Introduction to night sky

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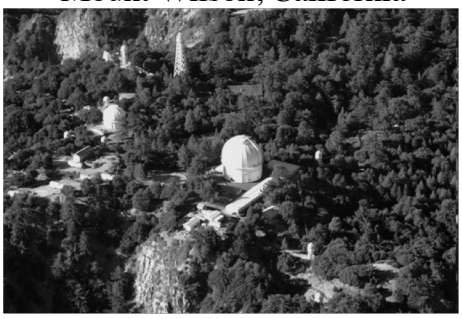
Hard Labor Creek Observatory
HLC State Park, Rutledge, GA

2

Apache Point Observatory
Sunspot, New Mexico

3

GSU CHARA Array
Mount Wilson, California



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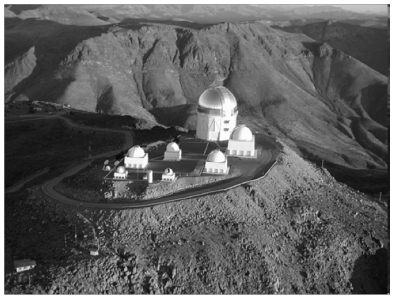
0.9 m Telescope
Cerro Tololo Interamerican Obs., Chile



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**Instructor:** Dr. Douglas R. Gies
25 Park Place NE, Room 606
Telephone: (404) 413-6021
E-mail: gies@chara.gsu.edu
WWW Site: http://www.astro.gsu.edu/~gies/ASTR1020/

**Office Hours:** M 4:00 pm – 6:00 pm or by appointment (ask after class, call, or e-mail me).

**Prerequisites:** Completion of ASTR 1010K or equivalent.

**Course Objectives:** This is a survey course designed for non-specialists that completes the topics in astronomy begun in ASTR 1010K. Students will learn through lectures and reading about the processes that have the formed the current universe and develop a perspective about our place and time in the universe.

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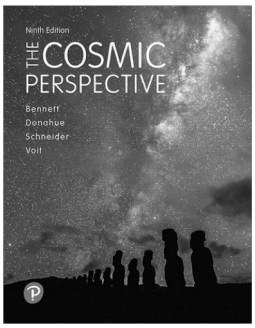


https://www.pearson.com/store/p/cosmic-perspective-the/P100001120237

**Textbook:** *The Cosmic Perspective* (9th ed.) by Bennett, Donahue, Schneider, & Voit (2019; ISBN-13: 9780134874364; Pearson Education, Inc.).

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**Grades:**
- Laboratory ..... 25%
- Best 3 of 4 tests ..... 75%
- Attendance bonus (5 days) ..... [+10%]

Grading scheme:
A+:97-100%, A:93-96%, A-:90-92%, B+:87-89%, B:83-86%, B-:80-82%, C+:77-79%, C:73-76%, C-:70-72%, D:60-69%, F:0-59%.

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## Labs for TR 9:30 am

**Laboratory:**
- Labs for this class are:

#16387 Monday ..... 10:00 am – 11:50 am
#16390 Tuesday ..... 02:00 pm – 03:50 pm
#16389 Wednesday ..... 10:00 am – 11:50 am
#16388 Thursday ..... 02:00 pm – 03:50 pm
#16386 Friday ..... 10:00 am – 11:50 am

- See the lab syllabus at http://www.astro.gsu.edu/lab/
- Labs begin the week of January 27 and are held in Langdale Hall 721.
- You are required to attend the same laboratory section each week.
- The lab will include one evening session for observing with telescopes.
- **A passing lab grade is required in order to pass the course.**

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## Labs for TR 2:15 pm

**Laboratory:**
- Labs for this class are:

#16398 Monday ..... 12:00 pm – 01:50 pm
#16401 Monday ..... 04:00 pm – 05:50 pm
#16402 Wednesday ..... 02:00 pm – 03:50 pm
#16397 Thursday ..... 12:00 pm – 01:50 pm
#16400 Thursday ..... 04:00 pm – 05:50 pm

- See the lab syllabus at http://www.astro.gsu.edu/lab/
- Labs begin the week of January 27 and are held in Langdale Hall 721.
- You are required to attend the same laboratory section each week.
- The lab will include one evening session for observing with telescopes.
- **A passing lab grade is required in order to pass the course.**

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**Tests:** Because only 3 of 4 tests will be counted, there will be **no** make-up tests. All tests and the exam will be multiple choice or true/false style questions. Scan forms will be provided on the day of the exam, and please bring a pencil to enter your answers. Students are expected to do their own work and to abide by the Policy on Academic Honesty discussed in the GSU *Code of Conduct*: `https://deanofstudents.gsu.edu/files/2019/07/Academic-Honesty-Policy.pdf`
Cheating on any test or exam will yield a zero on that work.

**Attendance:** Regular class attendance is highly recommended; it is usually the key to success. Attendance will be taken on five random dates during the semester, and students will be awarded two bonus points for attendance at each class for a cumulative total of a maximum of 10 bonus points that will be applied to the final grade out of 100%.
⋆ **Laboratory attendance is required each week.** ⋆

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**Important Dates to Remember:**
January 27 – Laboratory meetings begin.
February 4 – Test #1.
February 25 – Test #2.
March 3 – Last day to withdraw and receive a grade of W.
March 24 – Test #3.
April 14 – Test #4.

**Key Web Sites:**
GSU Hard Labor Creek Observatory: http://phy-astr.gsu.edu/connections/outreach/hlco/
Fernbank Science Center and Observatory: http://www.fernbank.edu/
Astronomy Picture of the Day: https://apod.nasa.gov/apod/
Sky and Telescope Magazine: https://www.skyandtelescope.com/
The Evening Sky Map: http://skymaps.com/downloads.html

**Notes:**
- The table attached gives a projected schedule of topics to be covered in each class (including the relevant chapters in the textbook). Please read the text before classes.
- The course syllabus provides a general plan for the course; deviations may be necessary.
- Your constructive assessment of this course plays an indispensable role in shaping education at Georgia State. Upon completing the course, please take time to fill out the online course evaluation.
- Students who wish to request accommodation for a disability may do so by registering with the Office of Disability Services. Students may only be accommodated upon issuance by the Office of Disability Services of a signed Accommodation Plan and are responsible for providing a copy of that plan to instructors of all classes in which accommodations are sought.

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| Dates | Lecture Topics |
|---|---|
| Jan. 14<br>Jan. 16 | Introduction: scales and motion in the Universe (1, 4)<br>Gravity, atoms, and light (4,5) |
| Jan. 21<br>Jan. 23 | Sun: interior (14)<br>Sun: outer layers (14) |
| Jan. 28<br>Jan. 30 | Stars: properties (15)<br>Stars: H-R diagram (15) |
| Feb. 4<br>Feb. 6 | Binary stars (15); **Test 1** (4, 5, 14, 15)<br>Star clusters (15) |
| Feb. 11<br>Feb. 13 | Interstellar medium (16)<br>Star formation (16) |
| Feb. 18<br>Feb. 20 | Evolution: low mass stars (17)<br>Evolution: high mass stars (17) |
| Feb. 25<br>Feb. 27 | Supernovae (17); **Test 2** (15, 16, 17)<br>White dwarf stars (18) |

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| | |
|---|---|
| Mar. 3<br>Mar. 5 | Neutron stars and black holes (18)<br>Milky Way Galaxy components (19) |
| Mar. 10<br>Mar. 12 | Milky Way Galaxy processes (19)<br>Galaxies (20) |
| Mar. 17<br>Mar. 19 | Spring break – no class<br>Spring break – no class |
| Mar. 24<br>Mar. 26 | Hubble's Law (20); **Test 3** (18, 19, 20)<br>Evolution of galaxies (21) |
| Mar. 31<br>Apr. 2 | Active galactic nuclei (21)<br>Cosmology: Big Bang (22) |
| Apr. 7<br>Apr. 9 | Epochs of the early Universe (22)<br>Dark matter (23) |
| Apr. 14<br>Apr. 16 | Dark energy (23); **Test 4** (21, 22, 23)<br>Life in the Universe (24) |
| Apr. 21<br>Apr. 23 | *Life Beyond Earth 1* (24)<br>*Life Beyond Earth 2* (24) |

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- Please exchange names and contact information with students sitting near you.

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# Chapter 1
# Our Place in the Universe

- What is our place in the universe?
- What units do we use for distance?
- How is distance related to history?
- What's up in the sky?

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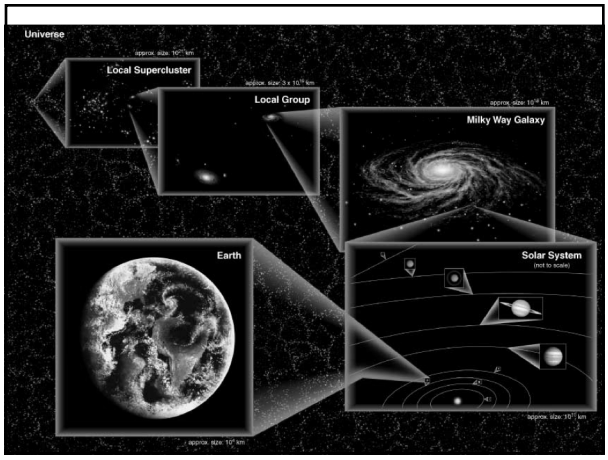


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## Distances in Astronomy

- **Astronomical Unit** = the average distance between the Earth and Sun ($1.5 \times 10^8$ km)
- **Parsec** = the typical distance between stars as defined by the angular wobble caused by Earth's orbit ($3.1 \times 10^{13}$ km)
- **Light-year** = the **distance** light can travel in one year ($9.5 \times 10^{12}$ km)

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How big is Earth compared to our solar system?

Let's reduce the size of the solar system by a factor of 10 billion; the Sun is now the size of a large grapefruit (14 cm diameter).

How big is Earth on this scale?

A. an atom
B. a ball point
C. a marble
D. a golf ball

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Let's reduce the size of the solar system by a factor of 10 billion; the Sun is now the size of a large grapefruit (14 cm diameter).

How big is Earth on this scale?

A. an atom
**B. a ball point (100 times smaller than Sun)**
C. a marble
D. a golf ball

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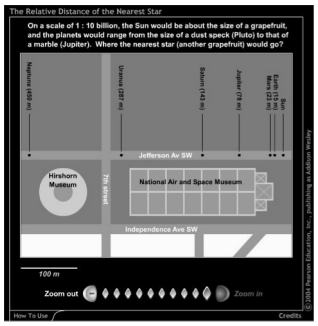
## The scale of the solar system

- On a 1-to-10 billion scale:
  - Sun is the size of a large grapefruit (14 cm)
  - Earth is the size of a ball point, 15 meters away.

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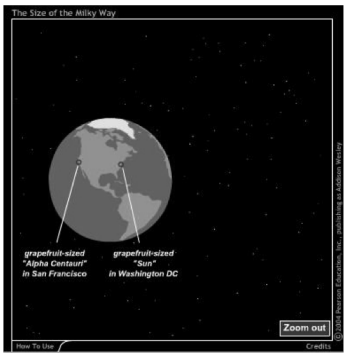
## How big is the Milky Way Galaxy?

The Milky Way has about 100 billion stars.

On the same ten billion-to-one scale….

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## How can we know what the universe was like in the past?

- Light travels at a finite speed (300,000 km/s).

| Destination | Light travel time |
|---|---|
| Moon | 1 second |
| Sun | 8 minutes |
| Vega (nearby star) | 25 years |
| Andromeda Galaxy | 2.5 million years |

- Thus, we see objects as they were in the past:

***The farther away we look in distance, the further back we look in time.***

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## Night Sky Tonight

- http://skymaps.com/downloads.html
- Orient map with direction you are facing at the bottom of page.

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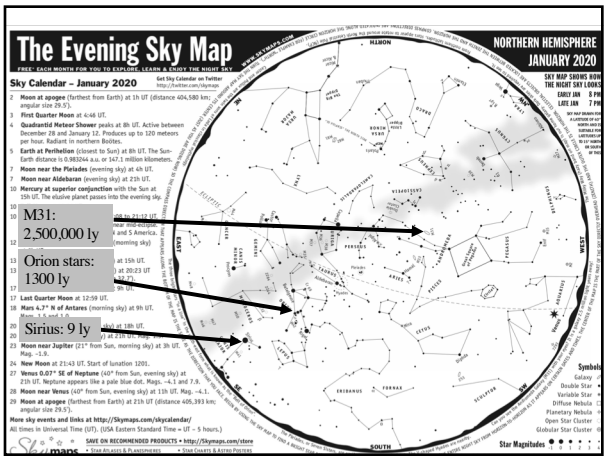
The Evening Sky Map
NORTHERN HEMISPHERE
JANUARY 2020
Sky Calendar – January 2020
M31:
2,500,000 ly
Orion stars:
1300 ly
Sirius: 9 ly

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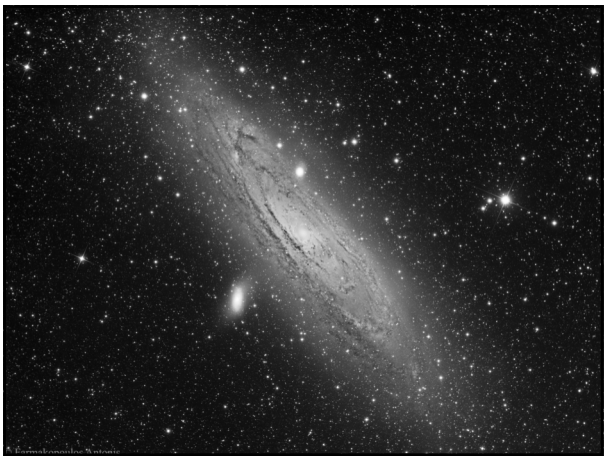

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