ASTR 111 Introduction to Modern Astronomy

- Dr. Peter A. Becker
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- Office Hours: 1-2pm MW (please make appointment!)
- The syllabus contains all scheduling information for lecture and exams
- ASTR 112 Astronomy Lab is recommended but not required

Introduction to Modern Astronomy

- Course Content:
  - Solar System
  - Properties of Planets
  - Evolution of Planets
  - The Sun
  - Comets
  - Asteroids
  - Development of Life

Class Resources

- Course Website:
  mason.gmu.edu/~pbecker/astr111.html
- Website includes:
  - Exam review materials
  - Links to publisher’s website
  - General astronomy/science links
  - Lecture list
Grading Plan

• EXAM 1 (lecture 9)
• EXAM 2 (lecture 18)
• EXAM 3 (lecture 28)
• Comprehensive Final Exam (December 13)
• The exams count with equal weight
• I drop the lowest exam score out of all 4 exams
• Makeup exams will be allowed only with signed medical note from doctor or in the event of documented family emergency
• ASTR 112 Astronomy Lab is a separately graded class

Grading Scale

• A = 90 - 100
• A- = 85 - 90
• B+ = 80 - 85
• B = 75 - 80
• B- = 70 - 75
• C+ = 65 - 70
• C = 60 - 65
• D = 50 - 60
• F = 0 - 50
• No extra credit projects are allowed

How to Succeed in ASTR 111

• Download class notes for each lecture
• Attend lectures
• Ask questions
• Read book chapters
• Do review problems in book
• Do online practice exams
• Attend class before each exam for review
Astronomy News

• Cassini continues mission at Saturn
• Discovery of a nearby Earth-type planet
• First photo of extrasolar planet
• Messenger Mission launches for Mercury
• Results from the Mars Rovers
• Discovery of 10th planet around Sun
• New Results from the Mars Rovers

Astronomy Today

• The “rate of discovery” is at an all-time high!

Astronomy has Roots in Astrology

• Astrology allowed mankind to place their lives in a cosmic context

• By relating their lives to the “unchanging” (and therefore universal) stars, mankind satisfied his unending search for meaning
Scientific Method

- Transformed the search for meaning into a quest for objective truth
- This led to conflicts with religious doctrines

Scientific Method

- Our search for meaning is driven by our evolutionary need to explore and understand
- This tendency has survival value for the human race
- Isaac Newton was the first theoretical physicist

Multiwavelength Astronomy

- Using Newton’s techniques, combined with our knowledge of atomic structure, we can use light to study distant objects...

- X-ray
- optical

- composition of matter
- temperature of matter
• In a revolutionary state, as it was in the time of Galileo, and for the same reasons!
• The scientific method originated in the renaissance, and is still used today:

\[ \text{truth} \rightarrow \text{prediction} \rightarrow \text{hypothesis} \rightarrow \text{theory} \rightarrow \text{test} \rightarrow \text{observation} \]

**Phases of the Moon**

**Lunar Tides**
Hurricanes and Cyclones

- The Earth rotates as a solid object
- The rotation of the Earth has a higher velocity at the equator than at the poles:
  - Solar heating causes the air at the equator to be the hottest
  - This forms a convection cell
  - Warm air from the equator travels towards the poles
  - The warm air moves eastward faster than the surrounding air

Hurricanes Isabel and Katrina

Surface Heating

- Not all of the re-radiated energy gets out!
- Much of it gets blocked by CO₂ molecules
  - The amount blocked depends sensitively on the concentration of CO₂ in the atmosphere
  - Stronger hurricanes likely powered by Global Warming
Nearby Earth-Type Planet

- 50 light-years away
- 14 times the mass of Earth
- Rocky composition
- Very close to star - 10 day orbit
- Very hot - 1,000 F
- Surface gravity 2.4 times Earth's - dieting popular there

Atmospheric Blurring

Hubble Space Telescope
Ground-Based Astronomy

The Solar System

Each planet is unique...