

A Sense of Place

1. Our Modern View of the Universe

- What is our place in the universe?
- How can we know what the universe was like in the past?
- Can we see the entire universe?

2. The Scale of the Universe

- How big is Earth compared to our Sun? Our solar system?
- How far away are the stars?
- How big is the Milky Way Galaxy?
- How big is the universe?

3. Spaceship Earth

- How is Earth moving in our solar system?
- How is our solar system moving in the Milky Way Galaxy?
- Are we ever sitting still?

Key Definitions and Terms

The Astronomical Unit
The light-year
The parsec

Planet
Star
Galaxy

Universe

Reading Assignments

Comins, *Discovering the Essential Universe*, chapter 1

Ferris, *Coming of Age in the Milky Way*, chapter 1

A Historical Perspective: The Emergence of a Science

1. Patterns in the Night Sky

- What are constellations?
- How do we locate objects in the sky?
- Why do stars rise and set?
- Why don't we see the same constellations throughout the year?

2. The Reason For Seasons

- What causes the seasons?
- How do we mark the progression of the seasons?
- Does the orientation of Earth's axis change with time?

3. The Ancient Mystery Of The Planets

- What was once so mysterious about the movement of planets in our sky?
- Why did the ancient Greeks reject the real explanation for planetary motion?

4. Ancient Greek Science

- Why does modern science trace its roots to the Greeks?
- How did the Greeks explain planetary motion?
- How did Islamic scientists preserve and extend Greek science?

Key Definitions and Terms

Constellation	Ecliptic	Precession
The celestial sphere	Equinox	Geocentric
North/South celestial pole	Solstice	Circumpolar
Celestial equator	Right ascension	Declination
Retrograde motion	Ptolemaic model	zodiac
Saving the phenomena	Lunar phases	Astronomical unit
Light-year	Equant	

Reading Assignments

Bartusiak, *Archives of the Universe*, chapters 1 – 6

Ferris, *Coming of Age in the Milky Way*, chapter 2

Comins, *Discovering the Essential Universe*, chapter 2

Going Through the Motions: The Birth of a Science

1. The Copernican Revolution

- How did Copernicus, Tycho, and Kepler challenge the Earth-centered idea?
- How did the Copernican model differ from the Ptolemaic model? How were they similar?
- Why is Kepler sometimes called the last scientific astrologer and the first astrophysicist?
- What are Kepler's three laws of planetary motion?
- What observations by Galileo cast doubt on the Aristotelian worldview?
- How did Galileo solidify the Copernican revolution?

2. Describing Motion: Examples from Daily Life

- How do we describe motion?
- What is linear momentum? Angular momentum?
- How is conservation of angular momentum related to Kepler's laws?

Key Definitions and Terms

Copernican model	Planetary alignments	Inferior planet
Superior planet	Inferior conjunction	Conjunction
Superior conjunction	Greatest elongation	Opposition
Quadrature	Sidereal period	Synodic period
Semi-major axis	Speed	Velocity
Acceleration	Linear momentum	Angular momentum

Reading Assignments

Bartusiak, *Archives of the Universe*, chapters 7 – 11

Ferris, *Coming of Age in the Milky Way*, chapters 3 – 7

Comins, *Discovering the Essential Universe*, chapter 2