

**A Sense of Place and A Historical Perspective: The Emergence of a Science**

**1. 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?

**2. 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**

The Astronomical Unit	Planet	Star
The light-year	Parsec	Galaxy
Universe	Constellation	Ecliptic
The celestial sphere	Equinox	Geocentric
North/South celestial pole	Solstice	Circumpolar
Celestial equator	Right ascension	Declination
Retrograde motion	Ptolemaic model	Synodic period
Planetary alignments	Lunar phases	Sidereal period
Precession		

**Reading Assignments**

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

Ferris, *Coming of Age in the Milky Way*, chapters 1 and 2

Comins, *Discovering the Essential Universe*, chapter 1 and 2

## Going Through the Motions: It's all Relative

### 1. The Copernican Revolution

- How did Copernicus, Tycho, and Kepler challenge the Earth-centered idea?
- 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. The Nature of Science

- How can we distinguish science from nonscience?
- What is a scientific theory?

### 3. Describing Motion: Examples from Daily Life

- How do we describe motion?
- How is mass different from weight?
- What is free fall and acceleration due to gravity?

### 4. Newton's Laws

- How did Newton change our view of the universe?
- Newton's three laws of motion
- The Law of Universal Gravitation
- What determines the strength of gravity?
- How does Newton's law of gravity extend Kepler's laws?

### 5. Conservation Laws in Astronomy

- What is linear momentum?
- What is angular momentum and how does it relate to Kepler's discoveries?
- What is conservation of momentum?

## Key Definitions and Terms

Copernican model	Planetary alignments	Sidereal period
Inertia	Mass	Semi-major axis
Velocity	Acceleration	Weight
Angular momentum	Simultaneity	Hypothesis
Theory	Scientific Model	

## 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 3