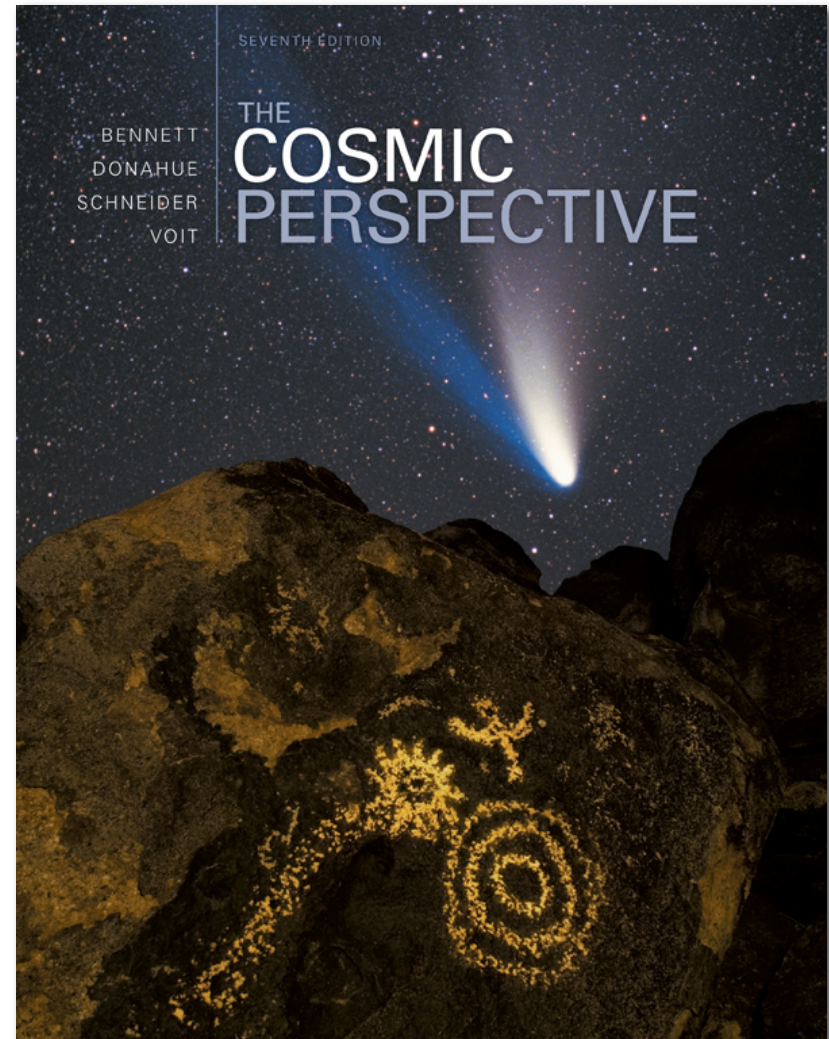# The Cosmic Perspective

Seventh Edition

The Science of Astronomy

3.1 The Ancient Roots of Science

- In what ways do all humans use scientific thinking?
- How is modern science rooted in ancient astronomy?

Scientific thinking is

a) making predictions about future events based on past observations and experiences.

b) a gradual process of learning how the world works.

c) a willingness to give up preconceived notions if those ideas are inconsistent with an experiment or observation.

d) all of the above

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Which of the following is not an example of measurements of ancient astronomers?

a) marking the day of summer solstice

b) measuring the 18.6 year cycle of lunar phases due to precession of its orbit

c) measuring the orientation of the crescent Moon

d) measuring the time for eclipse seasons to repeat

e) All of the above were measurements made by ancient astronomers.

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e) **All of the above were measurements made by ancient astronomers.**

Which is longer, a solar year or a lunar year?

a) A lunar year, because it is based on 13 months that are 29–30 days long, which is longer than 365 days.

b) A lunar year, because it is based on the time between total lunar eclipses, which is longer than 365 days.

c) A solar year, because a lunar year is 12 lunar months that are 29–30 days long each, for a total of 354–355 days.

d) A solar year, because a lunar year is based on 13 months that are 28 days long, which is 364 days.

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What does the 19-year Metonic cycle describe?

a) the time it takes for phases of the Moon to repeat on the same dates

b) the time it takes for eclipses to occur on the same dates

c) the time it takes for Earth's axis to precess

d) the time it takes for a series of lunar and solar eclipses to repeat, but not on exactly on the same dates

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3.2 Ancient Greek Science

- Why does modern science trace its roots to the Greeks?

- How did the Greeks explain planetary motion?

How did Ptolemy's model differ from Aristotle's model of the universe?

a) Ptolemy's model placed the Sun at the center rather than Earth.

b) Ptolemy's model involved spheres that were not perfectly circular.

c) Ptolemy's model had the planets moving in smaller circles attached to the larger spheres.

d) Ptolemy's model had a different ordering of spheres than Aristotle's.

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How was the great library of Alexandria destroyed?

a) It was destroyed deliberately by people in the 5th century A.D.

b) It was destroyed accidentally in a great fire in the 4th century A.D.

c) It was destroyed when the Nile flooded in the 5th century A.D.

d) It was abandoned after the death of Alexander the Great, and gradually fell into disrepair over a period of several centuries.

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3.3 The Copernican Revolution

- How did Copernicus, Tycho, and Kepler challenge the Earth-centered model?

- What are Kepler's three laws of planetary motion?

- How did Galileo solidify the Copernican revolution?

Why didn't scientific thinkers immediately accept the Copernican model of the solar system?

a) They had irrefutable evidence that the Earth-centered model was correct.

b) Copernicus's model did not make noticeably better predictions than the Earth-centered model.

c) Copernicus was not respected in the science community.

d) They were reluctant to throw out the Earth-centered model because it had been around for so many years.

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Who observed a nova in 1572, showing that there could be changes in the realm of the heavens?

a) Nicolas Copernicus
b) Galileo Galilei
c) Johannes Kepler
d) Tycho Brahe

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Which of the following is not a contribution made by Tycho Brahe to the Copernican Revolution?

a) He measured the parallax of a supernova and showed that it was further away than the Moon.

b) He measured the parallax of a comet and showed that it was further away than the Moon.

c) He measured the parallax of stars, showing that the Earth orbits the Sun.

d) He measured the positions of the planets with unprecedented accuracy, making it possible for Kepler to determine their orbits.

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Which of the following is not one of Kepler's laws of planetary motion?

a) The orbit of each planet around the Sun is an ellipse with the Sun at one focus.

b) As a planet orbits the Sun it sweeps out equal areas in equal times.

c) The rotation of a planet is always aligned with its orbital motion around the Sun.

d) Planets with larger orbits orbit the Sun at slower average speeds than planets with smaller orbits.

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a) the semi-major axis

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Which of the following was not an observation made by Galileo supporting the Sun-centered model?

a) He measured the parallax of a comet.

b) He observed objects orbiting Jupiter.

c) He observed the phases of Venus.

d) He observed mountains on the Moon.

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3.4 The Nature of Science

- How can we distinguish between science and nonscience?

- What is a scientific theory?

A scientific model

a) is a small physical representation of a real-world system.

b) uses math and logic to describe and predict the behavior of a real-world system.

c) is a scientist who is photographed for advertisements.

d) must be completely accurate or it is considered pseudoscience.

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The concept of a scientific model comes from

a) Greek philosophers.

b) Galileo Galilei.

c) Johannes Kepler.

d) the Mayans.

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If an experiment or observation contradicts a scientific theory, then

a) it must not have been a scientific theory, but pseudoscience.

b) the theory must be revised to account for the new data, or discarded.

c) the theory is still considered correct as long as the vast majority of experiments still agree with the theory.

d) the experiment or observation must be wrong, because a theory cannot be contradicted by any measurement.

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Which of the following is not a hallmark of science?

a) A scientific theory is built on logic and common sense to explain observed phenomena.

b) Science seeks explanations for observable phenomena using natural causes.

c) Science makes progress by testing models that explain observations as simply as possible.

d) A scientific model makes testable predictions about natural phenomena and is revised or abandoned if the predictions do not agree with observations.

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3.5 Astrology

- How is astrology different from astronomy?
- Does astrology have any scientific validity?

Which of the following is an *astrological* prediction?

a) Venus and Mars will be nearly aligned on a particular date.

b) The Moon will eclipse the Sun at a particular time.

c) When Saturn enters a particular constellation, the weather will improve.

d) all of the above

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Astrology is

a) a scientific study of human behavior.

b) a scientific study of the effects of the Sun and other celestial objects on the Earth and people.

c) not a scientific enterprise because scientists have overwhelmingly voted against it in favor of astronomy.

d) not a scientific enterprise because it does not make testable predictions.

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