

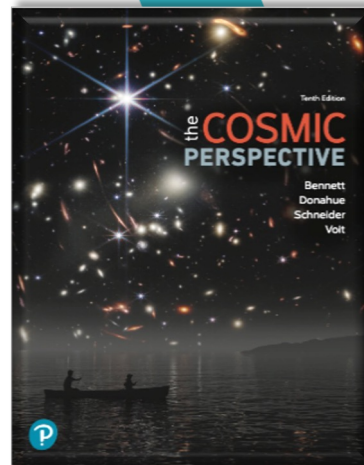
Welcome Scottsdale Community



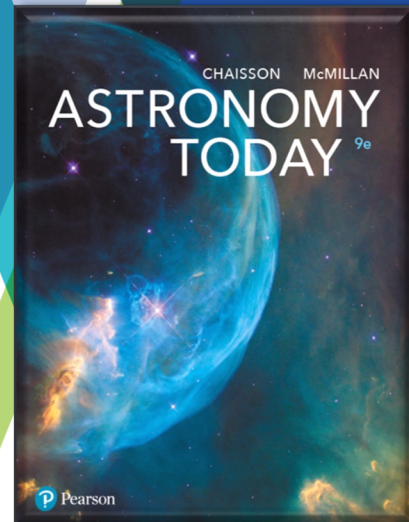
Julie Wesling
Science Curriculum Specialist



Jayne Feuerbacher
Account Manager

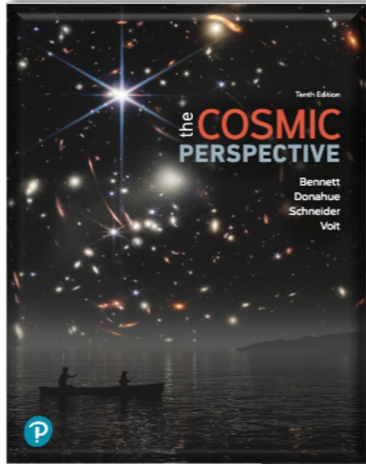


Bennett 2024
10th Edition



Chaisson 2018
9th Edition

Both Programs

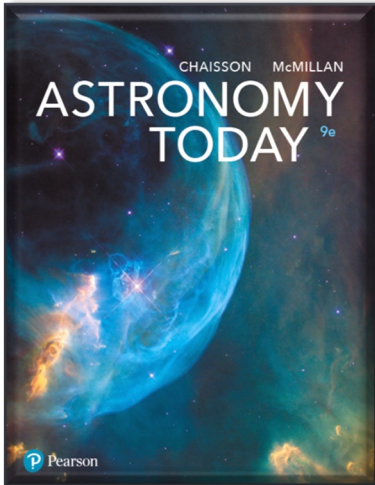


Components

- Print Student Edition
- Interactive eText
- Pre-Lecture Videos
- Astronomy Tutorials
- Virtual Astronomy Labs
- Dynamic Study Modules
- Learning Catalytics
- Advanced Assessment System
- Digital Access provided on Mastering Platform

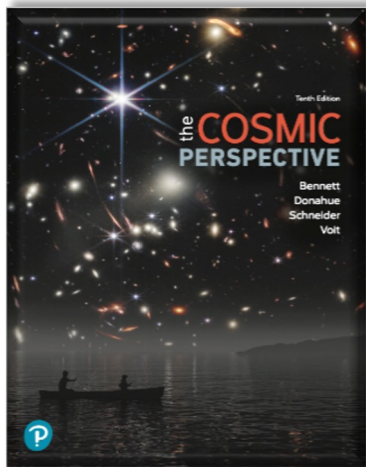
Astronomy Today

Chaisson 9e 2018

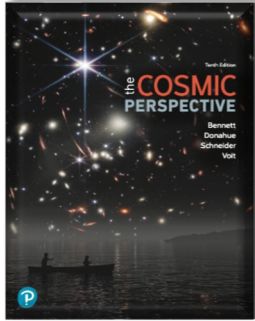


- Planet-by-planet approach focusing on “how we know what we know.”
- Emphasizes Critical Thinking and visualization
- Process of Science Check Questions
- Big Picture Emphasis
- Lexile 1320

The Cosmic Perspective Bennett 10e 2024



- Engaging, current introduction to Astronomy
- New discussion of center of Milky Way Galaxy and supermassive black holes.
- Insights from new telescopes like James Webb Space Telescope
- Features wide range of scientific updates
- Lexile 1270



The Cosmic Perspective

Topic Organization

- Perspective – how we fit into the Universe
- Physics concepts in Astronomy (motion, energy, gravity, etc.)
- Planetary systems, asteroids, comets, exoplanets, stars, galaxies
- Dark matter, other life

Astronomy Today



Topic Organization

- "How we know what we know..."
- History of Astronomy
- Radiation, Spectroscopy
- Planetary systems (planet by planet)
- Stars
- Galaxy/Cosmology
- Life in the Universe

Significantly Revised to Reflect Cutting Edge Scientific Content

Mars 10

A Near Miss for Life?

This 2015 "selfie" shows NASA's Curiosity rover atop a small hill in the floor of Gale crater on Mars. The region was probably once filled with water, making it a prime target for Curiosity's onboard chemistry lab. Who took the photograph? The rover's sampling arm contained the camera, which was removed from the photo. The white dust in the foreground marks one of several holes made in the Martian bedrock by Curiosity's drill. (NASA/JPL)

MasteringAstronomy®

Visit the MasteringAstronomy Study Area for quizzes, animations, videos, interactive figures, and self-guided tutorials.

Neutron Stars and Black Holes 22

Strange States of Matter

This striking image, a composite of individual X-ray (blue and green), infrared (yellow), and radio (pink) images, shows W49B, a violent supernova event that marked the death of a massive star in our Galaxy about 100,000 years ago. Its distorted, asymmetric shape and unusual composition suggest to many astronomers that W49B may actually be a rare example of a hypernova—the most energetic class of stellar explosion known—with a black hole at its center. (Palomar Observatory; NASA)

MasteringAstronomy®

Visit the MasteringAstronomy Study Area for quizzes, animations, videos, interactive figures, and self-guided tutorials.

New Big Picture Emphasis

Mars 10

A Near Miss for Life?

The 2015 'selfie' shows a NASA's Curiosity rover atop a small hill in the floor of Gale crater on Mars. The region was probably once filled with water, making it a prime target for Curiosity's onboard chemistry lab. Who took the photograph? The rover's sampling arm contained the camera, which was removed from the photo. The white dust in the foreground marks one of several holes made in the Martian bedrock by Curiosity's drill. (NASA/JPL)

MasteringAstronomy®
Visit the MasteringAstronomy Study Area for quizzes, animations, videos, interactive figures, and self-guided tutorials.

The Big Picture

Mars has been reconnoitered by humans more than any other cosmic object beyond Earth and the Moon. It intrigues us, frustrates us, and invites us to visit. Although the surface of Mars today is as dry as any desert on Earth, many scientists think it was much wetter billions of years ago, when its atmosphere was thicker and the climate was warmer. Mars remains high on most astronomers' list of likely sites for life in the solar system.



Discussion

MasteringAstronomy® For instructor-assigned homework go to MasteringAstronomy.com.

Problems labeled **POS** explore the process of science. **VIS** problems focus on reading and interpreting visual information.

LO connects to the Introduction's numbered Learning Outcomes. **BP** builds on concepts in the Big Picture.

1. **LO1** Why is opposition the best time to see Mars from Earth? Why are some Martian oppositions better than others for viewing Mars?
2. **LO1 LO2** Imagine that you will be visiting the southern hemisphere of Mars during its summer. Describe the atmospheric conditions you might face.
3. **LO2 LO3** Describe the two Martian polar caps, their seasonal and permanent composition, and the differences between them.
4. **LO3** Why is Mars red?
5. **LO3** Describe the major large-scale surface features of Mars.
6. **LO3** Why were Martian volcanoes able to grow so large?
7. **LO6 BP** Why couldn't you breathe on Mars? Could you have in the past?
8. **LO4 POS BP** What is the evidence that water once flowed on Mars? Is there liquid water on Mars today?
9. **LO4 BP** Is there water on Mars today, in any form?
10. **LO4 BP POS** Why do some scientists think Mars once had an extensive ocean? Where was it located?
11. **LO5 BP** Compare and contrast the evolution of the atmospheres of Mars, Venus, and Earth.
12. **LO6** What do measurements of Martian magnetism tell us about the planet's interior?
13. **LO5 BP POS** What is the evidence that Mars never melted as extensively as Earth?
14. **LO5 BP** Since Mars has an atmosphere, and it is composed mostly of a greenhouse gas, why isn't there a significant greenhouse effect to warm its surface?
15. **LO7** How were the masses of Mars's moons measured, and what did these measurements tell us about their origin?

The Big Question

For well over a century, people have wondered, Is there life on Mars? After years of careful observation, this intriguing world has yielded no hint of living creatures, intelligent or otherwise—not even bugs hiding beneath the dusty rocks. Perhaps future robots will find archeological evidence for life now extinct, or maybe they will find no organisms at all—dead or alive. Either way, the consequences for our place in the cosmos could be profound.

LEARNING OUTCOMES

Studying this chapter will enable you to

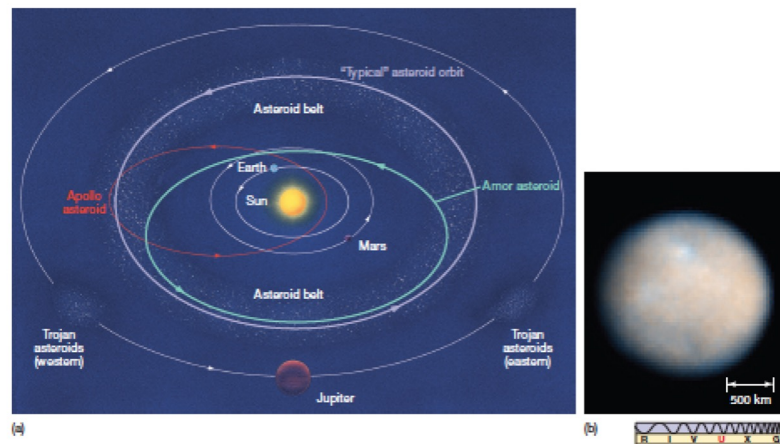
- 1 Describe the orbital properties of the major groups of asteroids.
- 2 Summarize the composition and physical properties of a typical asteroid.
- 3 Detail the composition and structure of a typical comet, and explain the formation and appearance of its tail.
- 4 List the key characteristics of cometary orbits, and explain what they tell us about the probable origin of comets.
- 5 Describe the solar system beyond Neptune, and explain why astronomers now consider Pluto a dwarf planet.
- 6 Distinguish among the terms meteor, meteoroid, and meteorite and describe the frequency and effects of impacts on Earth.
- 7 Summarize the orbital and physical properties of meteoroids, and explain what these properties suggest about the probable origin of meteoroids.

14.1 Asteroids

Asteroids are relatively small, predominantly rocky objects that revolve around the Sun. Their name literally means “starlike” but asteroids are definitely not stars. They are too small even to be classified as planets. Astronomers often refer to them as “minor planets” or, sometimes, “planetoids.”

Asteroids differ from planets in both their orbits and their size. As illustrated in Figure 14.1, they generally move

on somewhat eccentric trajectories between Mars and Jupiter, unlike the almost circular paths of the major planets. Few asteroids are larger than 300 km in diameter, our cutoff for a “midsize” moon, and most are far smaller—as small as a tenth of a kilometer across. The largest known asteroid, Ceres (Figure 14.1b), is just 1/10,000 the mass of Earth and measures only 940 km across. Taken together, the known asteroids amount to less than the mass of the Moon, so they do not contribute significantly to the total mass of the solar system.



NARRATED FIGURE 14.1 Inner Solar System (a) The main asteroid belt, along with the orbits of Earth, Mars, and Jupiter (drawn obliquely, that is, neither face-on nor edge-on). Note the Trojan asteroids at two locations in Jupiter's orbit. Some Apollo (Earth-crossing) and Amor (Mars-crossing) orbits are shown. (b) From Earth's distance, little surface detail is evident on even the largest asteroid, the dwarf planet Ceres. This processed Hubble image, one

Tightened Learning Outcomes

End-of chapter material



FIGURE 15.14 Whole New Worlds This artist's illustration depicts the variety of planets detected by the Kepler spacecraft—some mostly gaseous, others perhaps with rocky or wet surfaces. Additional observations will be needed to pin down the nature of these alien worlds. (C. Pallam and D. Aguilar, CFA)

life as we know it is the existence of liquid water on (or under) a planet's surface, implying a surface temperature roughly in the 0–100° C range. ∞ (Sec. 10.5) The planet's temperature depends both on its distance from its parent star and on the star's intrinsic brightness. Figure 15.13 illustrates how a **habitable zone** (really, a three-dimensional shell) surrounds any given star. Within that zone, liquid water can exist on the planet, making it a possible abode for life.* Notice how, for low-mass, faint stars, the habitable zone is small and lies close to the star, while for more massive, brighter stars it lies much farther out and can be 1 AU or more wide. Three terrestrial planets—Venus, Earth, and Mars—lie in or near the Sun's habitable zone. As we saw in Chapter 10, any or all of them might have seen the development of life, given the right circumstances. ∞ (Sec. 10.6)

* Of course, planetary atmospheres can greatly affect surface conditions. The greenhouse effect can warm planets that would otherwise be frozen, whereas the runaway greenhouse effect may transform an apparently habitable planet into an inferno. ∞ (secs. 7.2, 9.5) Our choice of planets in Figure 15.13 tries to take these effects into account. In addition, there are ways in which liquid water might exist at other locations—under the surface of a Jovian moon, for example—but the habitable zone still provides a handy rule of thumb to indicate where planets like Earth might reside. ∞ (secs. 11.5, 12.5)

At the time of writing, more than 50 confirmed super-Earths and seven exo-Earths are known to orbit in or near the habitable zones of their parent stars. They are indicated as labeled points on Figure 15.13. A few of these planets with measured radii also have estimated masses, implying densities consistent with rocky/metallic terrestrial composition. The other planets in Figure 15.13 are of unknown density and hence composition. More of the planets in the figure orbit near the “hot” edge of the habitable zone than on the “cool” side, but this is just another aspect of the observational bias described earlier—planets in close orbits are the most likely to be detected. Figure 15.14 places some of the new findings into perspective, again with a considerable amount of artistic license.

Many planet hunters are confident that within the next decade (or sooner), observational techniques will reach the level of sophistication at which Jovian and even terrestrial planets similar to those in our solar system should be readily detectable—if they exist. Advances during the next decade will either bring numerous detections of extrasolar planets in “solar system” orbits or allow astronomers to conclude that systems like our own really are a small minority. Either way, the consequences are profound.

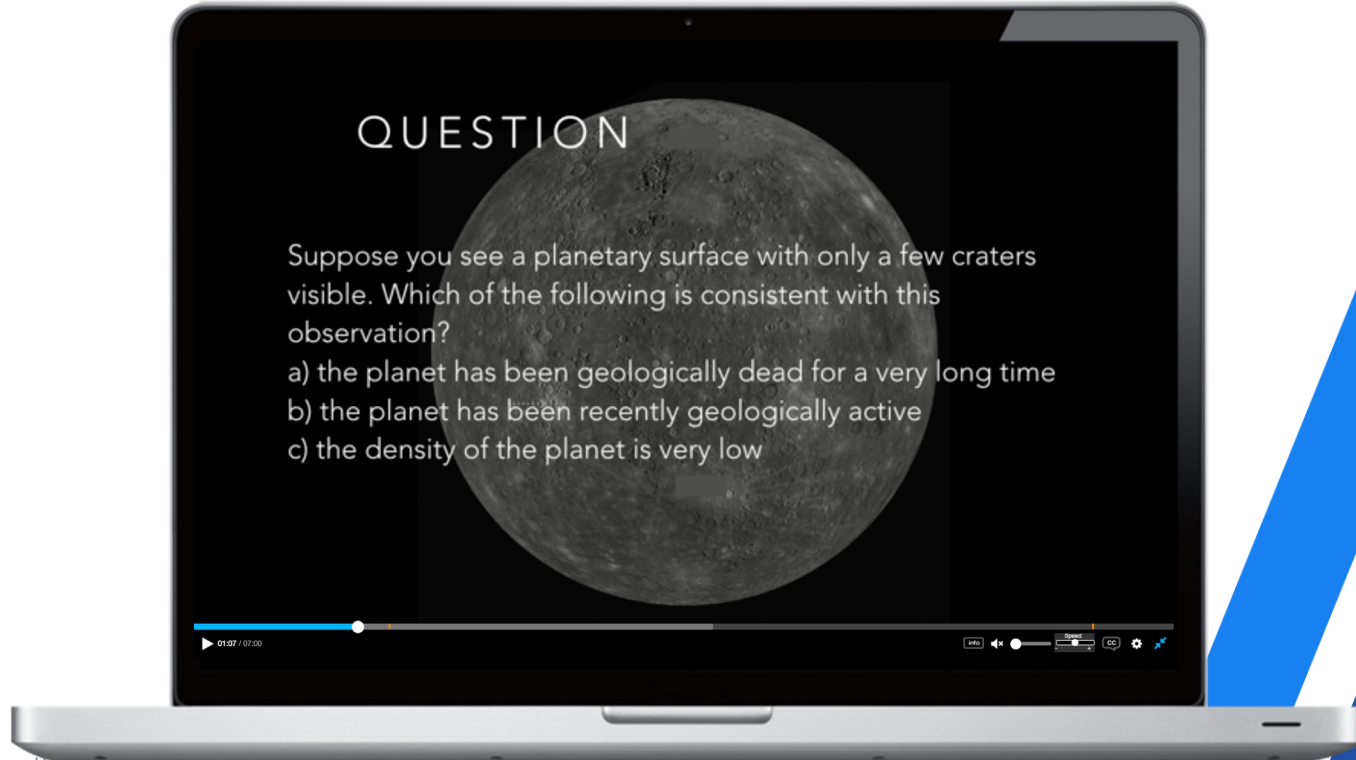
PROCESS OF SCIENCE Check

- ▶ How does the condensation theory accommodate the dissimilarities between the properties of planets in our solar system and those of the known extrasolar planets?

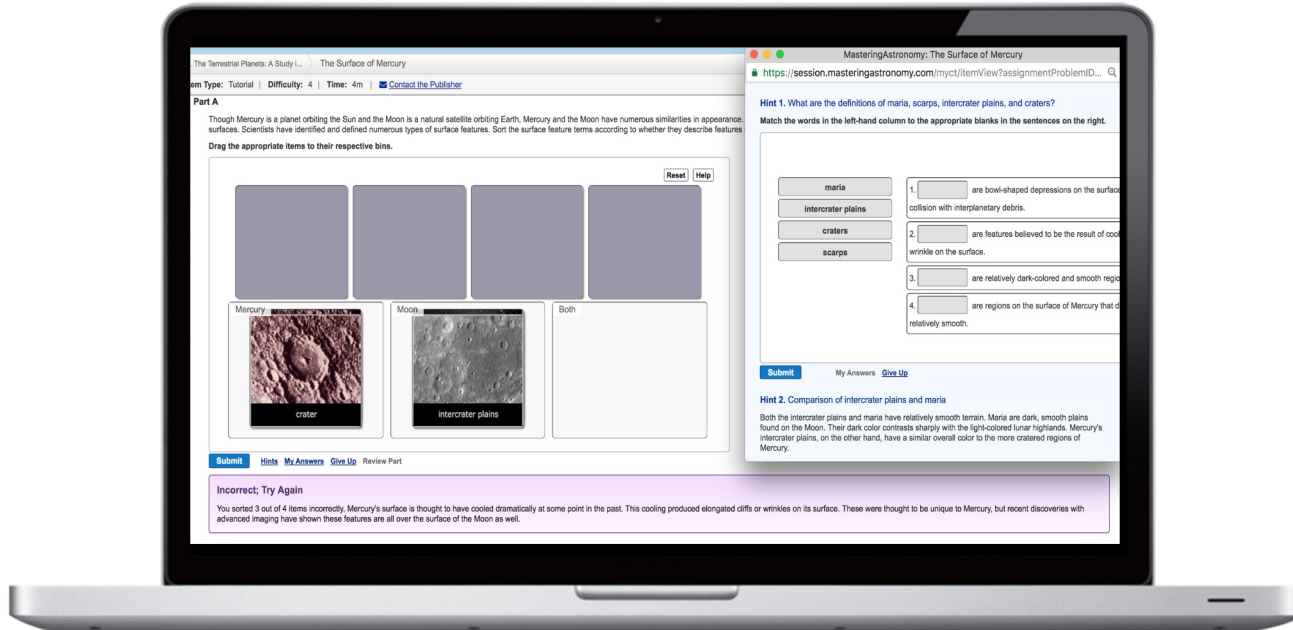


**New to this Edition -
MasteringAstronomy™**

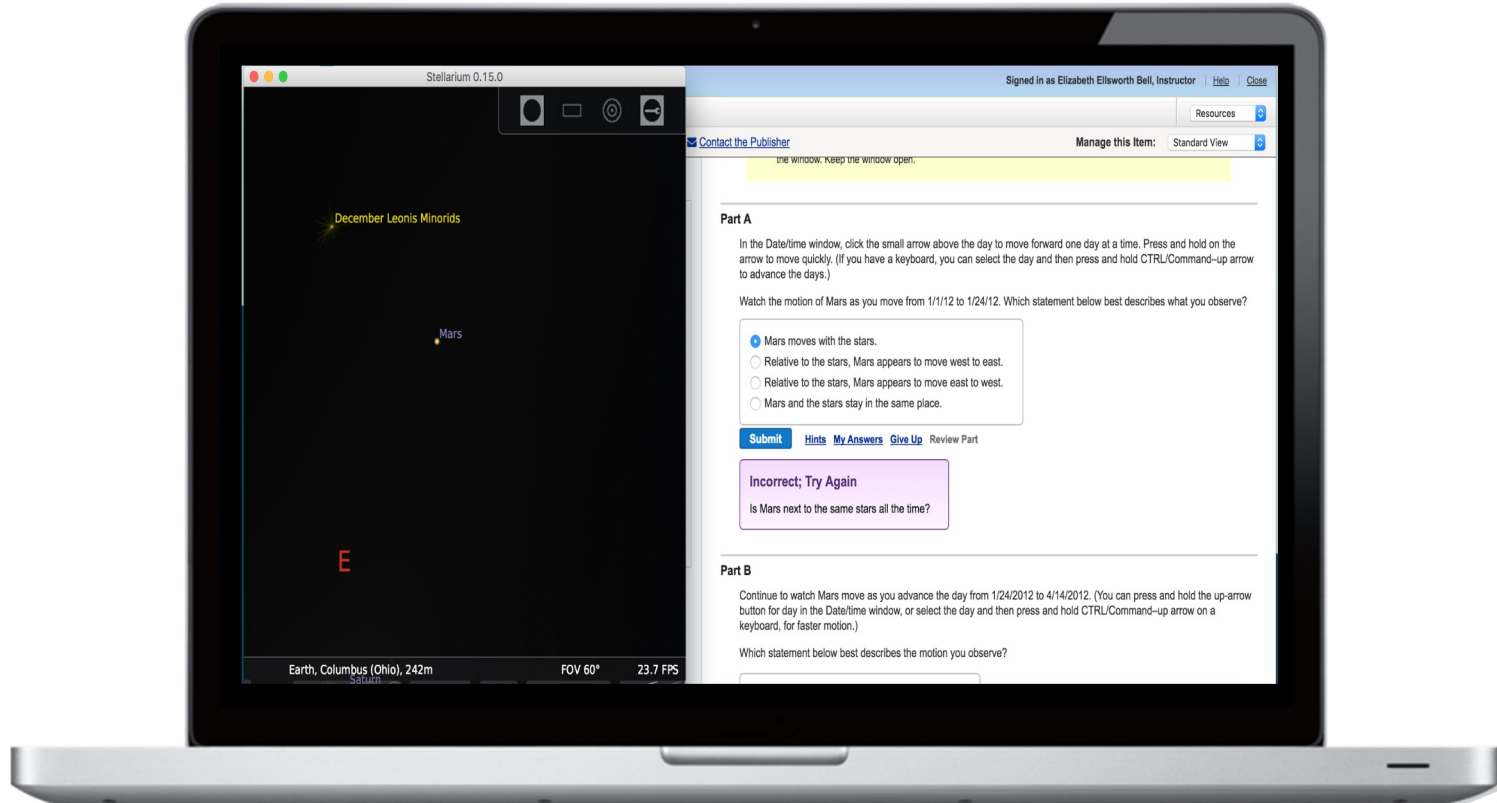
Interactive Pre-Lecture Videos



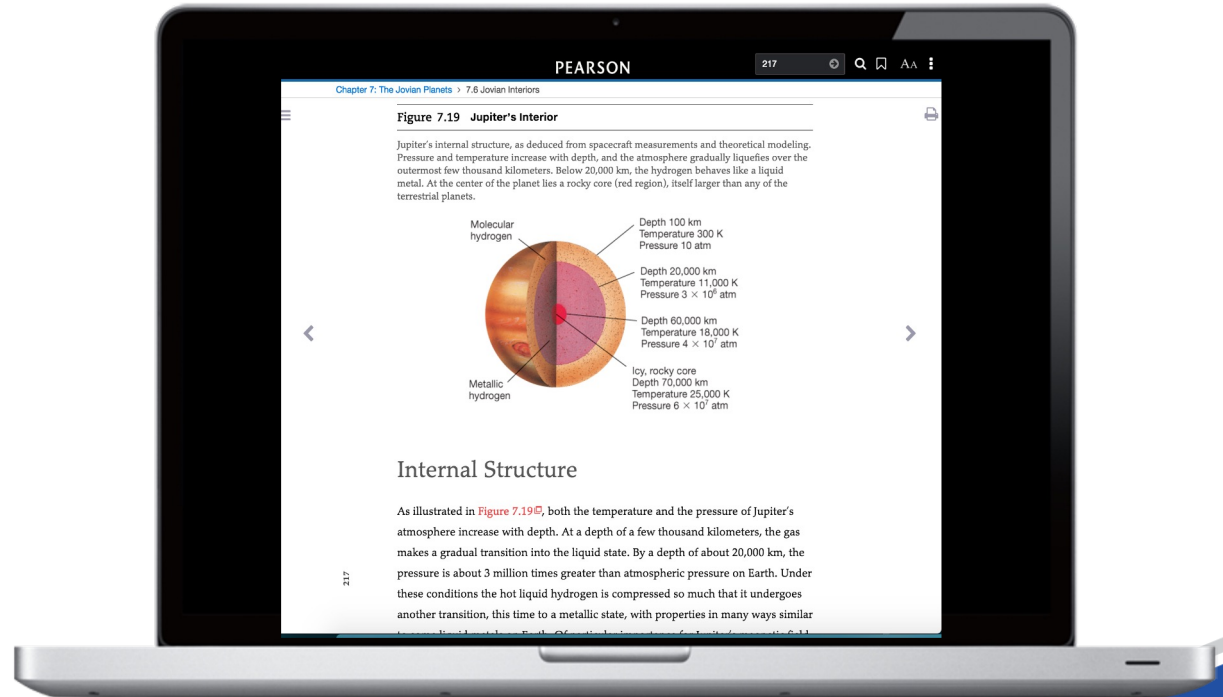
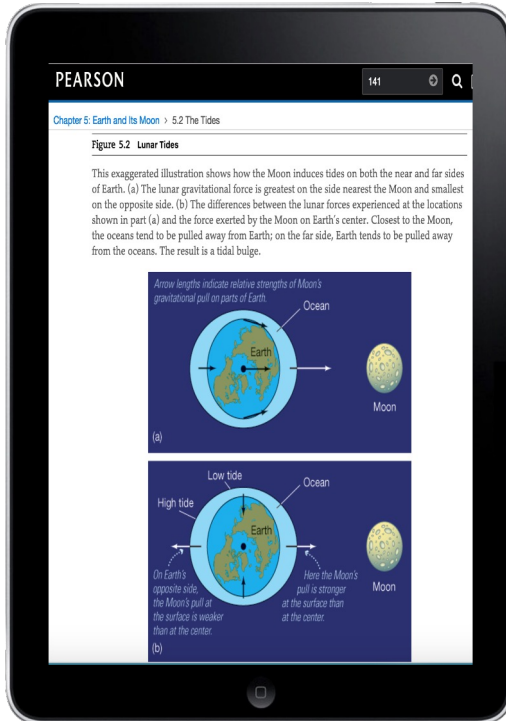
20 Additional Tutorials



NEW! Virtual Astronomy Labs

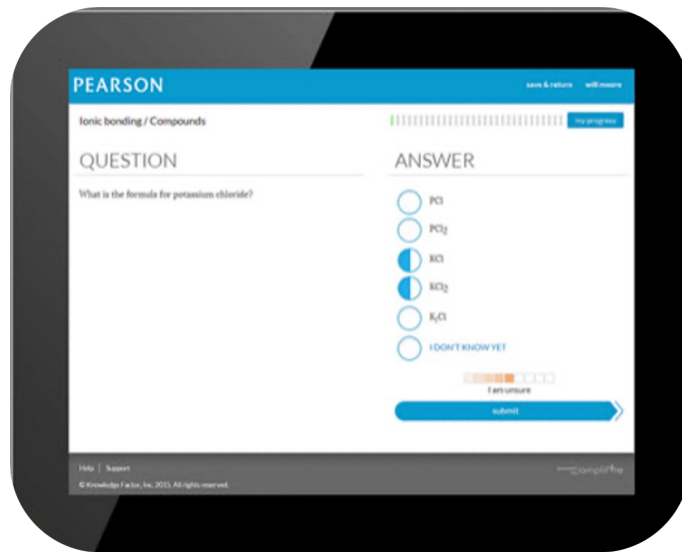


NEW! eText 2.0

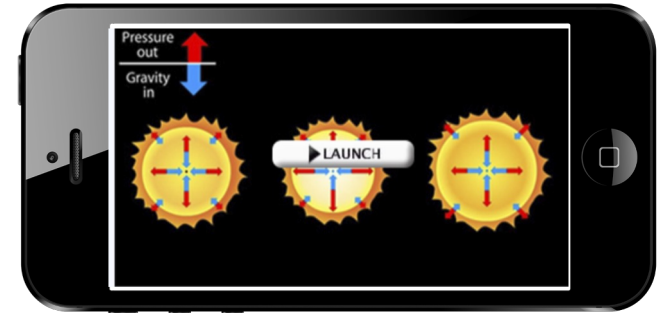
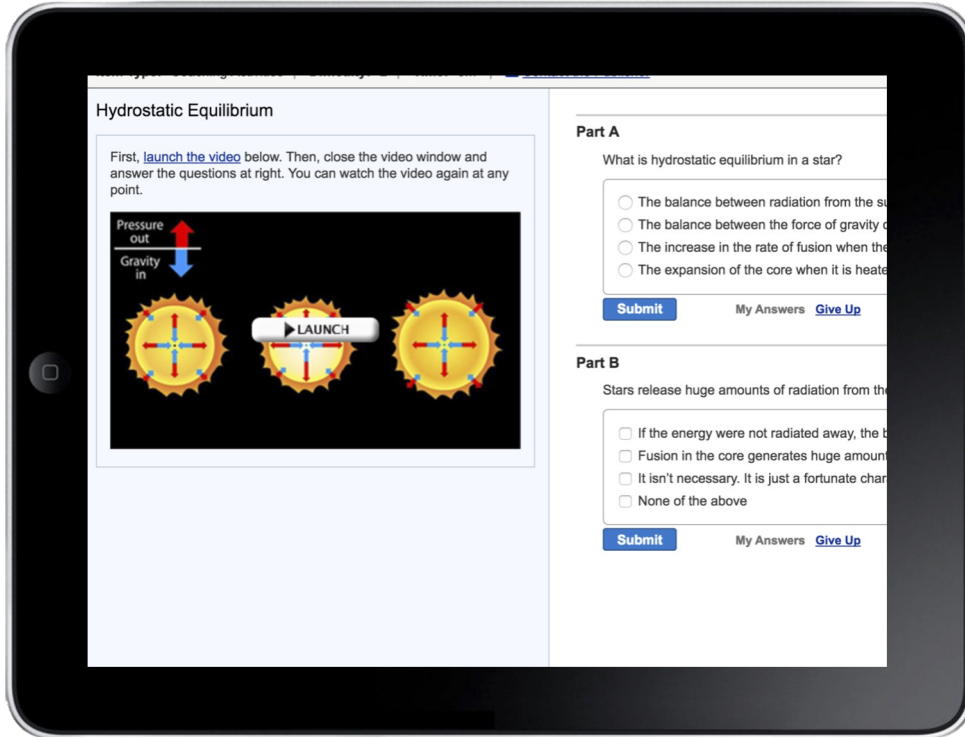


Dynamic Study Modules: Customizing Content through Adaptively

- **Dynamic Study Modules** help individual students consolidate what they know, and provide extra practice and remediation opportunities around items with which they are struggling.

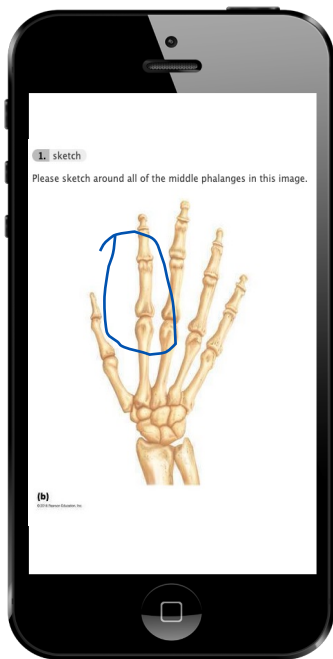


NEW! and Enhanced Interactive Figures

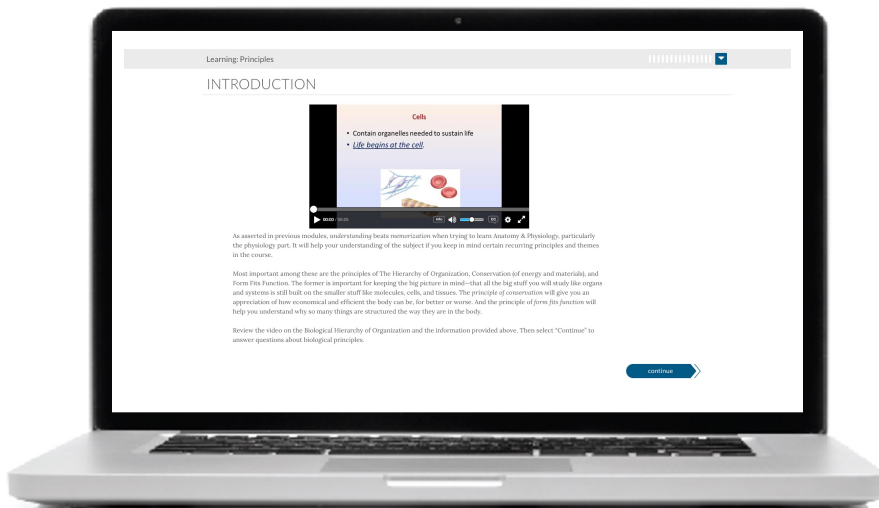


What else is available in Mastering?

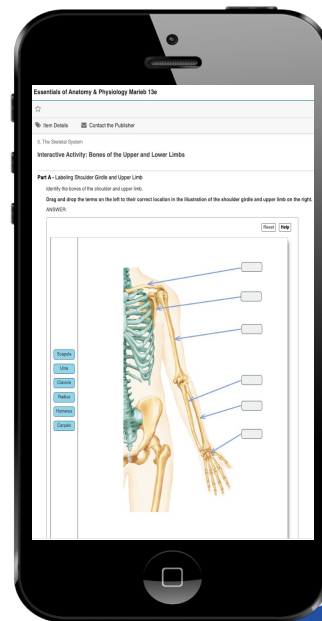
Learning Catalytics



Dynamic Study Modules



Tech-Enhanced Questions



Learning Catalytics in Action



Mastering Platform

Demo Account

mlm.pearson.com

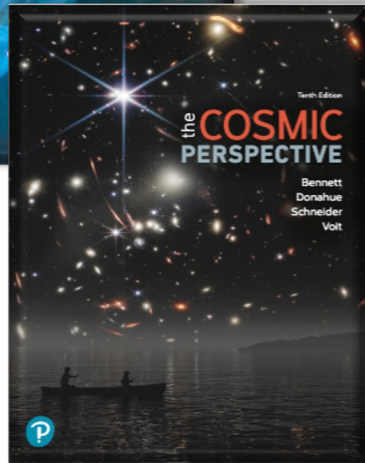
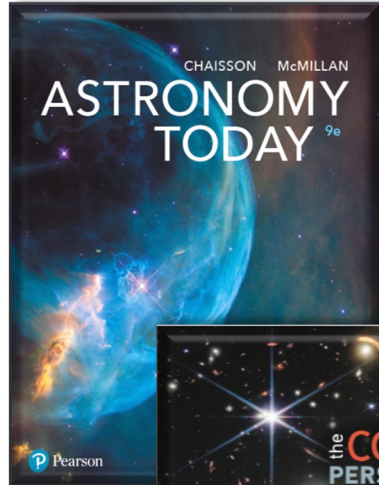
User: Pearson.Science

Password: TrySavvasNow2

Why Pearson Astronomy?

Astronomy Today Cosmic Perspective

- Emphasized Critical Thinking & Evaluation
- Big Picture Emphasis
- Pre-Lecture Videos
- Astronomy Tutorials
- Virtual Astronomy Labs



Mastering Platform

- Interactive eText
- Extensive Study Area
- Advanced Assessments
- Learning Catalytics
- Dynamic Study Modules

Thank you Scottsdale Community



Julie Wesling
Science Curriculum Specialist



Jayne Feuerbacher
Account Manager

