

# Welcome Scottsdale Teachers!

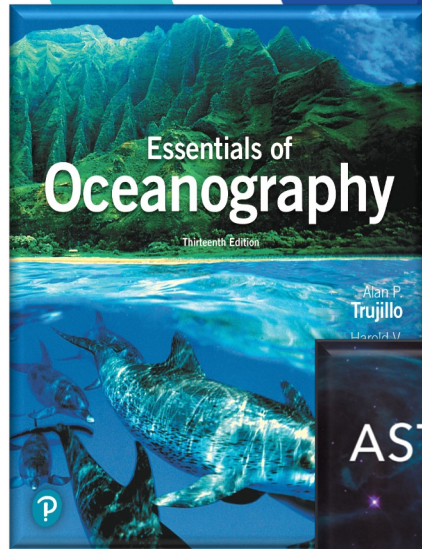


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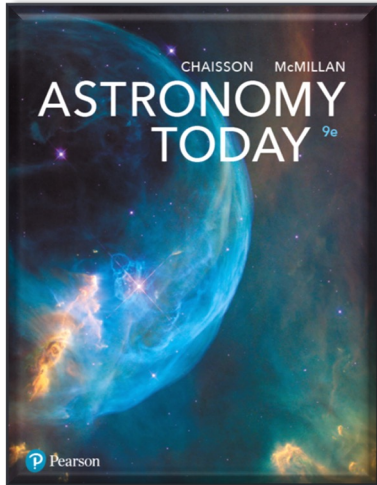
 **Pearson | MyLab | Mastering**



# Astronomy Today

## Chaisson 9e 2018

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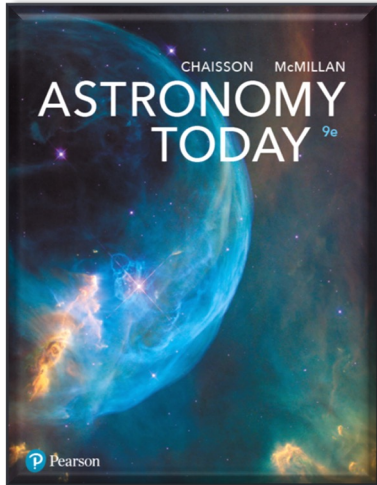


- Emphasizes Critical Thinking and visualization
- Process of Science Check Questions
- Big Picture Emphasis
- Concept Checks
- Discovery Boxes

# Astronomy Today

## Chaisson 9e 2018

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### 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

# 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)



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# New Big Picture Emphasis

## Mars 10

### A Near Miss for Life?

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### 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.

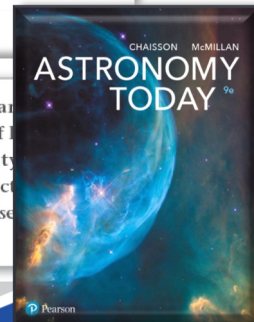
Problems labeled **POS** explore the process of science. **VIS** problems focus on reading and interpreting visual information.

**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? Through careful observation, this intriguing world has yielded no hint of intelligent or otherwise—not even bugs hiding beneath the dusty surface. Future robots will find archeological evidence for life now extinct, but 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

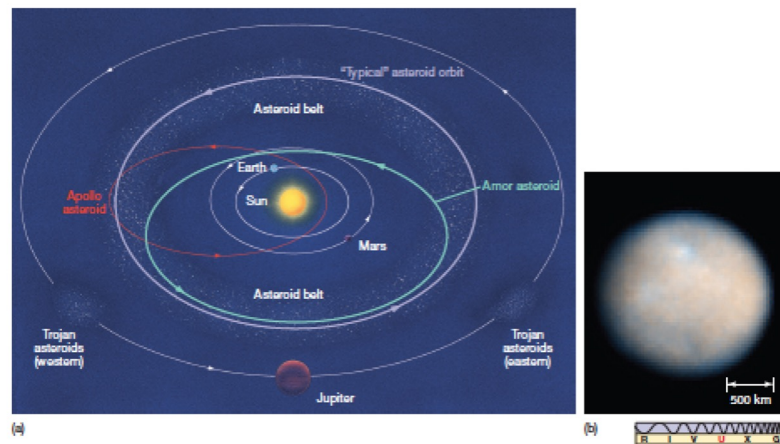
- 1 Describe the orbital properties of the major groups of asteroids.
- 2 Summarize the composition and physical properties of a typical asteroid.
- 3 Detail the composition and structure of a typical comet, and explain the formation and appearance of its tail.
- 4 List the key characteristics of cometary 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.”

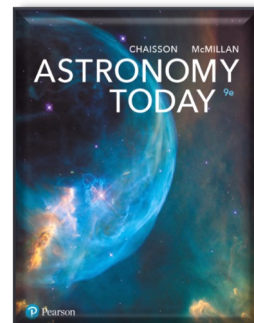
Asteroids differ from planets in both their orbits and their size. As illustrated in Figure 14.1, they generally move

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

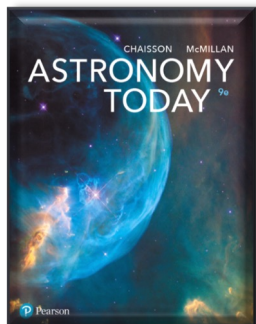


**FIGURE 15.14** *Whole New Worlds* This artist's illustration depicts the variety of planets detected by the Kepler spacecraft—some mostly gaseous, others perhaps with rocky or wet surfaces. Additional observations will be needed to pin down the nature of these alien worlds. (C. Pfuller and D. Aguilar, 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. [∞ \(secs. 7.2, 9.3\)](#) 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. [∞ \(secs. 11.5, 12.5\)](#)

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.

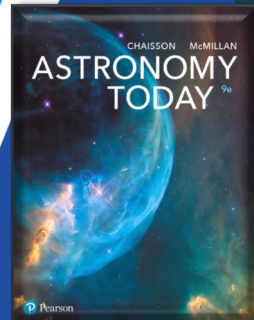
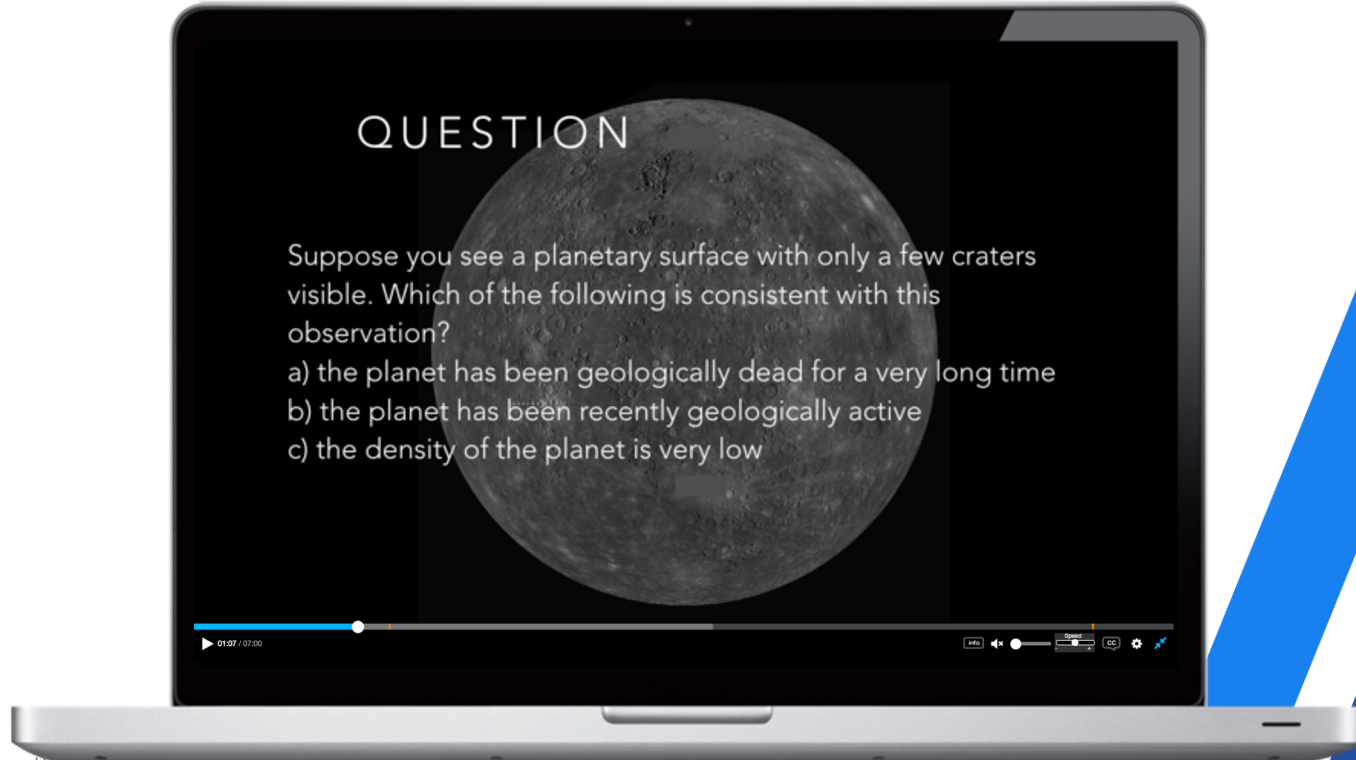
## PROCESS OF SCIENCE Check

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

## The Big Question

People from all walks of life—not just astronomers—eagerly await the discovery of a true Earth-like planet orbiting another star. When will Earth's twin be found, and will it have solid surface, water oceans, and a hospitable atmosphere? Most intriguing of all, will it be inhabited? We live at a remarkable time when we are

# Interactive Pre-Lecture Videos



# 20 Additional Tutorials

The laptop screen displays two browser windows from the MasteringAstronomy platform.

**Left Window: The Surface of Mercury**

Page Title: The Terrestrial Planets: A Study... The Surface of Mercury

Item Type: Tutorial | Difficulty: 4 | Time: 4m | [Contact the Publisher](#)

**Part A**

Though Mercury is a planet orbiting the Sun and the Moon is a natural satellite orbiting Earth, Mercury and the Moon have numerous similarities in appearance. Scientists have identified and defined numerous types of surface features. Sort the surface feature terms according to whether they describe features on Mercury, the Moon, or both.

Drag the appropriate items to their respective bins.

Reset Help

Four empty bins are shown at the top. Below them are three image bins labeled "Mercury", "Moon", and "Both". The "Mercury" bin contains an image of a crater labeled "crater". The "Moon" bin contains an image of a crater labeled "intercrater plains".

**Right Window: MasteringAstronomy: The Surface of Mercury**

URL: <https://session.masteringastronomy.com/myct/itemView?assignmentProblemID...>

**Hint 1. What are the definitions of maria, scarps, intercrater plains, and craters?**

Match the words in the left-hand column to the appropriate blanks in the sentences on the right.

Left column:

- maria
- intercrater plains
- craters
- scarps

Right column:

1.  are bowl-shaped depressions on the surface of the Moon that are the result of collision with interplanetary debris.
2.  are features believed to be the result of cooling and contraction of the surface.
3.  are relatively dark-colored and smooth regions on the surface of the Moon.
4.  are regions on the surface of Mercury that are relatively smooth.

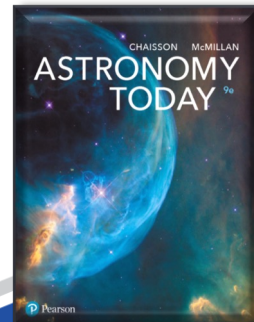
**Submit** My Answers Give Up

**Hint 2. Comparison of intercrater plains and maria**

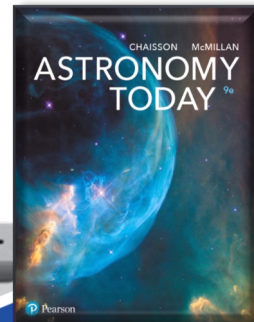
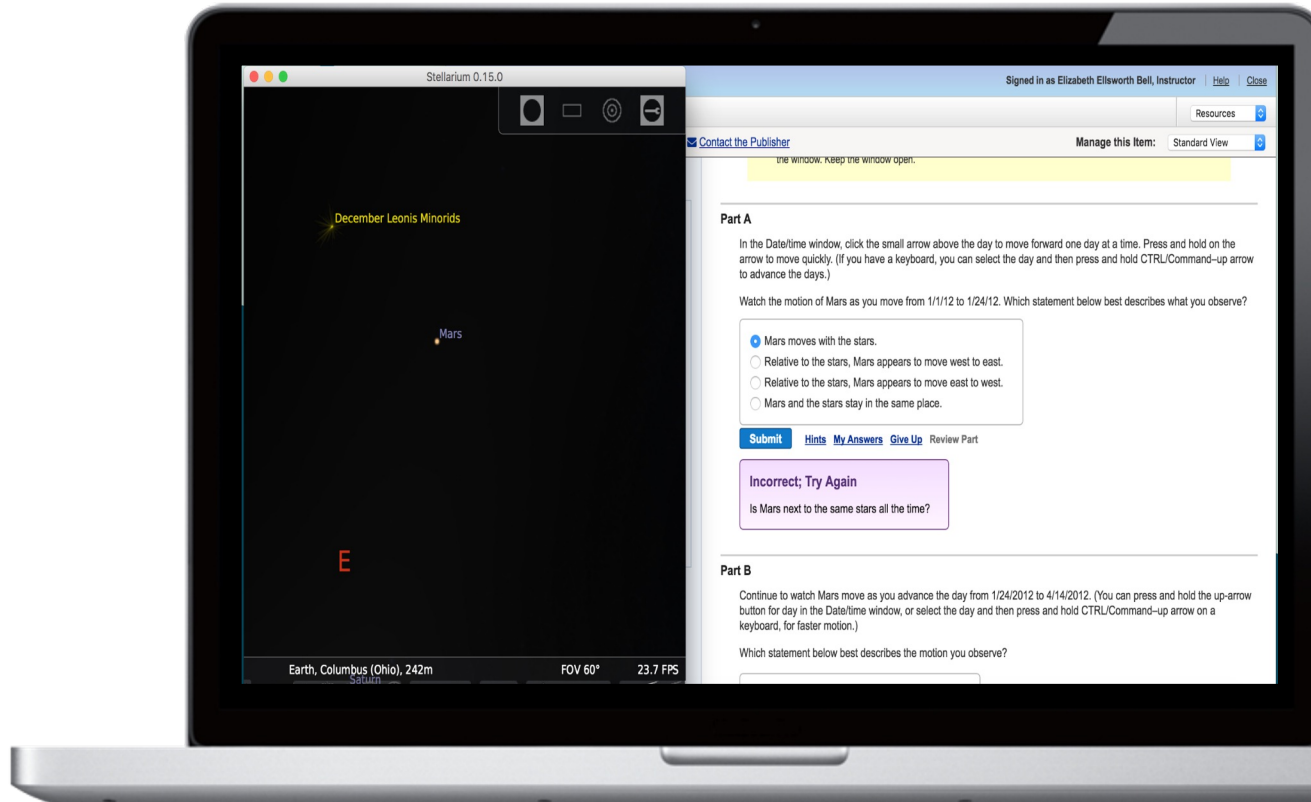
Both the intercrater plains and maria have relatively smooth terrain. Maria are dark, smooth plains found on the Moon. Their dark color contrasts sharply with the light-colored lunar highlands. Mercury's intercrater plains, on the other hand, have a similar overall color to the more cratered regions of Mercury.

**Incorrect: Try Again**

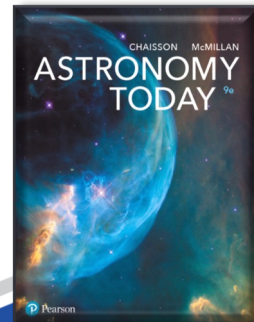
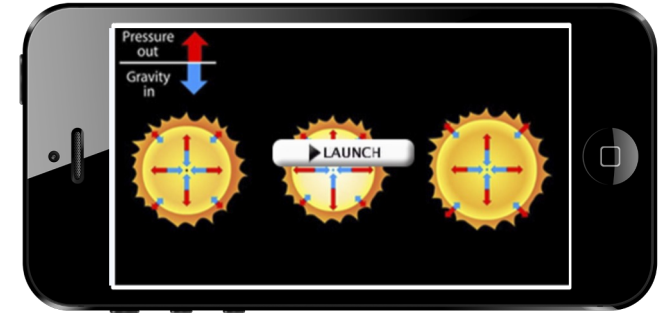
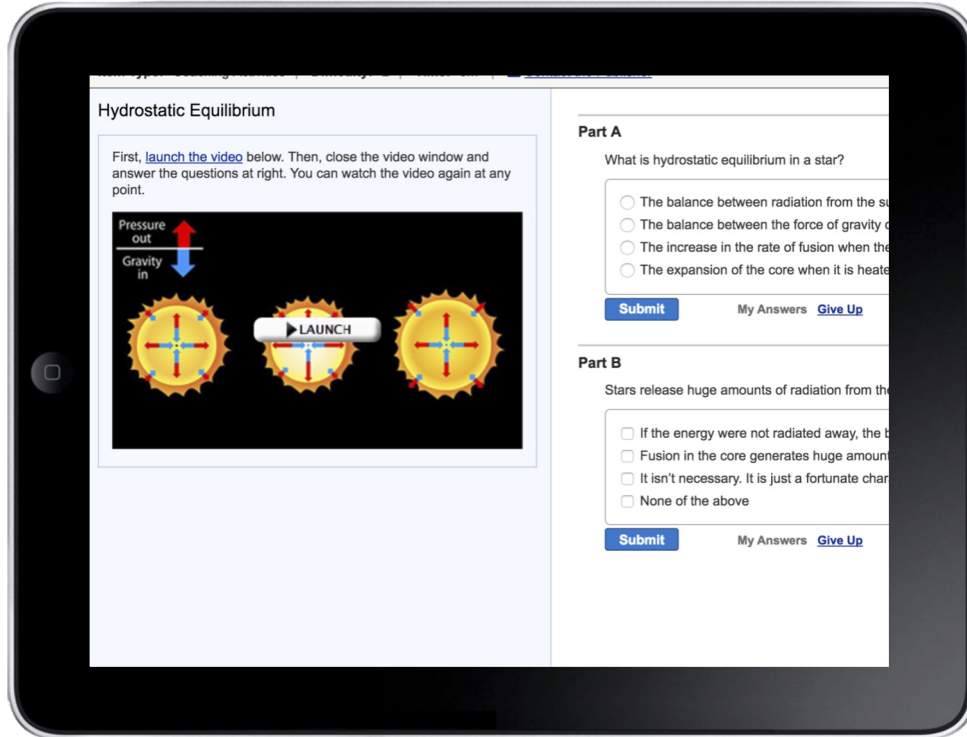
You sorted 3 out of 4 items incorrectly. Mercury's surface is thought to have cooled dramatically at some point in the past. This cooling produced elongated ridges or wrinkles on its surface. These were thought to be unique to Mercury, but recent discoveries with advanced imaging have shown these features are all over the surface of the Moon as well.



# NEW! Virtual Astronomy Labs



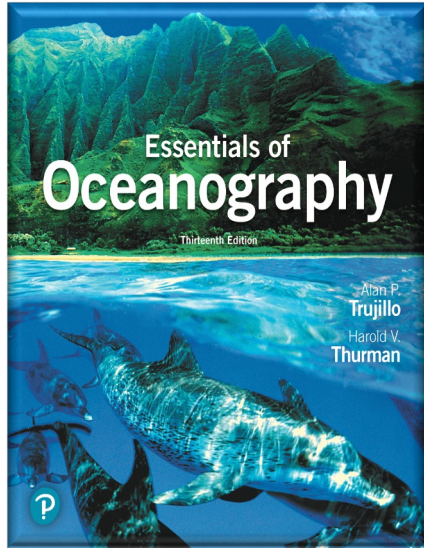
# NEW! and Enhanced Interactive Figures



# Essentials of Oceanography

## Trujillo 13e 2020

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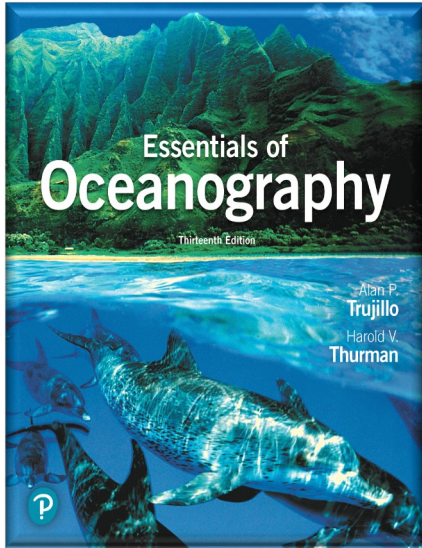


- Combines dynamic visuals and student friendly narrative
- Focus on interdisciplinary nature of oceanography
- New active learning pedagogy that divides chapter material into chunks
- Showcases new photos, satellite images and figures
- Emphasizes process of Science

# Essentials of Oceanography

## Trujillo 13e 2020

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### Components

- Print Student Edition
- Interactive eText
- Oceanography Animations
- Smart Figures/Smart Tables
- Dynamic Study Modules
- Learning Catalytics
- Advanced Assessment System
- Digital Access provided on Mastering Platform

# Three Reasons to Use Essentials

## 1

### Process of Science

This new feature gives students an understanding of **how scientists think and work**. This feature highlights an area of oceanographic inquiry and explicitly points out the associated background, method, and conclusion of the inquiry. Each Process of Science feature includes an assignable Mastering Oceanography coaching activity.

## 2

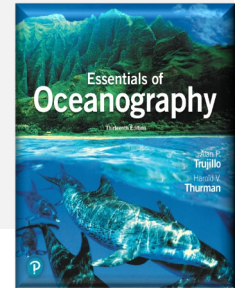
### Exploring Data

This feature **embeds data interpretation questions** directly within the figure captions of data-rich figures such as graphs and maps. An associated Exploring Data Mastering Oceanography activity is available for each chapter of the text.

## 3

### New SmartFigures

New and revised **SmartFigures** increase the total of the popular 3- to 4-minute video lessons in which oceanography experts explain difficult concepts and data.



# Process of Science

## PROCESS OF SCIENCE 4.1: When The Dinosaurs Died: The Cretaceous–Tertiary (K–T) Event

### BACKGROUND

The extinction of the dinosaurs—and about 75% of all plant and animal species on Earth, including many marine species—occurred about 66 million years ago. This extinction marks the boundary between the Cretaceous (K) and Tertiary (T) Periods of geologic time and is known as the K–T event or, because of recent changes in the geologic time scale, the *Cretaceous–Paleogene (K–Pg) event*. Did slow climate change lead to the extinction of these organisms, or was it a catastrophic event? Was their demise related to disease, diet, predation, or volcanic activity? Earth scientists have long sought clues to this mystery.

### FORMING A HYPOTHESIS

In 1980, geologist Walter Alvarez, his father, Nobel Physics Laureate Luis Alvarez, and two nuclear chemists, Frank Asaro and Helen Michel, reported that marine deposits collected in northern Italy from the K–T boundary contained an unusual clay layer with high proportions of the metallic element iridium (Ir), an element rare in Earth rocks but much more abundant in meteorites. The high concentrations of iridium suggested minerals in the clay had an extraterrestrial origin. In addition, the clay layer contained shocked quartz grains, indicating an event had occurred with enough force to fracture and partially melt pieces of quartz. Other deposits from the K–T boundary revealed similar features, supporting the hypothesis that Earth experienced an extraterrestrial impact at the same time that the dinosaurs died.

One problem with the impact hypothesis, however, is that dust spewing from volcanic eruptions on Earth could create similar clay deposits enriched in iridium and containing shocked quartz. In fact, at about the same time as the dinosaur

extinction, large outpourings of basaltic volcanic rock in India (called the Deccan Traps) and other locations had occurred. Also, if there was a catastrophic meteor impact, where was the crater?

In the early 1990s, the 190-kilometer (120-mile)-wide *Chicxulub* (pronounced “SCHICK-sue-lube”) Crater off the Yucatán coast in the Gulf of Mexico was identified as a likely candidate because of its structure, age, and size. To create a crater this large, a 10-kilometer (6-mile)-wide object composed of rock and/or ice traveling at speeds up to 72,000 kilometers (45,000 miles) per hour must have slammed into Earth (Figure 4B). Such an impact would have created huge waves—estimated to be more than 900 meters (3,000 feet) high—that traveled throughout the oceans. In addition, the dust and debris lifted into the atmosphere most likely limited photosynthesis, chilled Earth’s surface, and brought about the extinction of the dinosaurs and many other species. Finally, acid rains and global fires may have added to the environmental disaster.

### DEVISING AN EXPERIMENT

Supporting evidence for the meteor impact hypothesis was provided in 1997 by recovering cores of sediment from the sea floor. Previous drilling close to the impact site

did not reveal any K–T deposits. Evidently, the impact and resulting huge waves had stripped the ocean floor of its sediment. However, at 1600 kilometers (1000 miles) from the impact site, the telltale sediments from the catastrophe, such as the iridium-rich clay layer, were preserved in sea floor sediments.

### INTERPRETING THE RESULTS

Convincing evidence of the K–T impact from this and other cores collected in 2016 suggests that Earth has experienced many such extraterrestrial impacts over geologic time. Statistics show that an impact the size of the K–T event should occur on Earth about once every 100 million years, severely affecting life on Earth as it did the dinosaurs. This frequency is consistent with the fossil record, which indicates that in the last 500 million years, Earth has experienced five major extinction events.

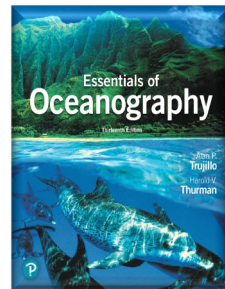
### THINKING LIKE A SCIENTIST: WHAT’S NEXT?

What kind of evidence would you expect to find in coastal rock sequences that were deposited during the time of the huge waves that were created by the meteor impact?



Figure 4B The K–T meteorite impact event.

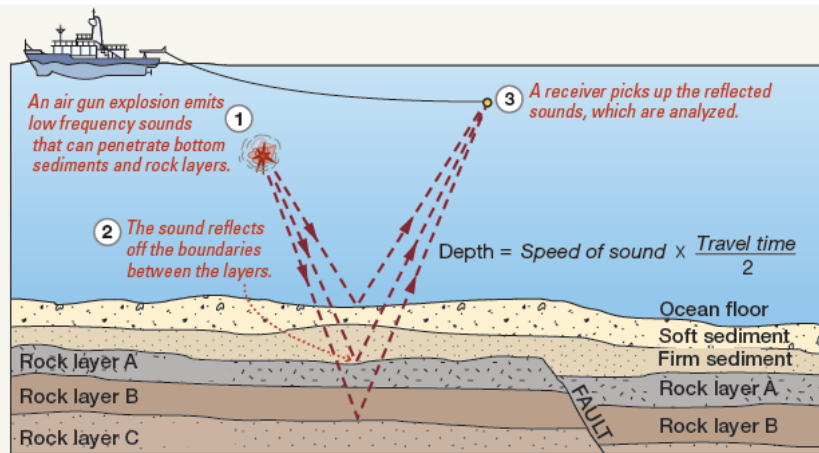
- Highlights oceanography inquiry and how scientists think and work
- Each process of science feature includes assignable coaching activities



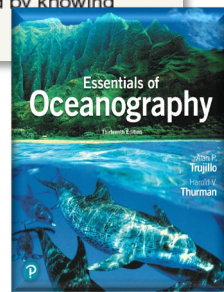
# Exploring Data

**EXPLORING DATA** ▶ Using the equation shown in Figure 3.7a, determine the time it takes sound to reach the deepest part of the ocean, the Challenger Deep in the Mariana Trench, which is 11,022 meters (36,161 feet) below sea level. Use the average speed of sound in seawater of 1507 meters (4945 feet) per second.

**NEW Exploring Data Activities** help students engage with graphs and other data-driven features to enable them to practice their data interpretation skills.



(a) A ship conducting seismic profiling. Note that depth can be determined by knowing the speed of sound in seawater and the travel time of the sound.



# Student-Centric Approach

## CONCEPT CHECK 8.6 ▶ Evaluate the advantages and disadvantages of harnessing waves as a source of energy.

- 1 Discuss some problems that might result from developing facilities for conversion of wave energy to electrical energy.
- 2 Describe the locations and power-generating capability of existing offshore wave power plants and wave farms.

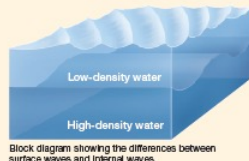
- 3 Worldwide, where are the best locations for new wave farms? Explain the oceanographic conditions that make these locations favorable.

**RECAP** Ocean waves produce large amounts of energy. Although significant problems exist in harnessing wave energy effectively, several types of devices are extracting wave energy today.

## ESSENTIAL CONCEPTS REVIEW

### 8.1 ▶ How are waves generated, and how do they move?

- All ocean waves begin as disturbances that release energy into the ocean. Energy sources include wind, the movement of fluids of different densities (which create internal waves), catastrophic releases of energy into the ocean by landslides and meteor impacts, underwater sea floor movements, the gravitational pull of the Moon and the Sun on Earth, and human activities in the ocean.
- Once initiated, waves transmit energy through matter by setting up patterns of oscillatory motion in the particles that make up the matter. Progressive waves are longitudinal, transverse, or orbital, depending on the pattern of particle oscillation. Particles in ocean waves move primarily in orbital paths.



#### Selected Key Terms

Use the glossary at the end of this book to discover the meanings of these Selected Key Terms: ocean wave, atmospheric wave, internal wave, orbital wave.

#### Critical Thinking Question

Compare and contrast the properties of the three types of progressive waves: longitudinal, transverse, and orbital waves.

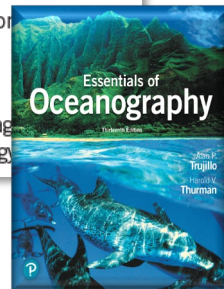
#### Active Learning Exercise

Working in groups of three, have each student in class pick one of the following types of progressive waves: (1) longitudinal wave, (2) transverse wave, and (3) orbital wave. For each type of wave, use your own words to explain how the wave moves and whether the wave can transmit through the three states of matter: (a) solid, (b) liquid, and (c) gas. Then recombine as a group and have each student take turns explaining their wave type.

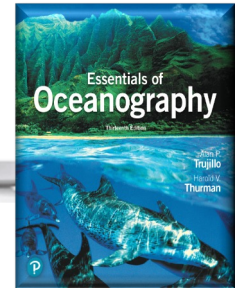
## ESSENTIAL LEARNING CONCEPTS

At the end of this chapter, you should be able to:

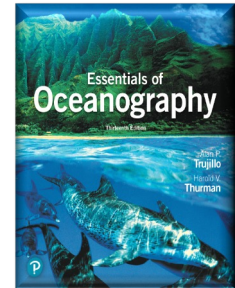
- 8.1 Demonstrate an understanding of how waves are generated and how they move.
- 8.2 Describe the characteristics of waves.
- 8.3 Discuss how wind-generated waves develop.
- 8.4 Explain how waves change in the surf zone.
- 8.5 Specify the origin and characteristics of tsunamis.
- 8.6 Evaluate the advantages and disadvantages of harnessing waves as a source of energy.



# Oceanography Animations



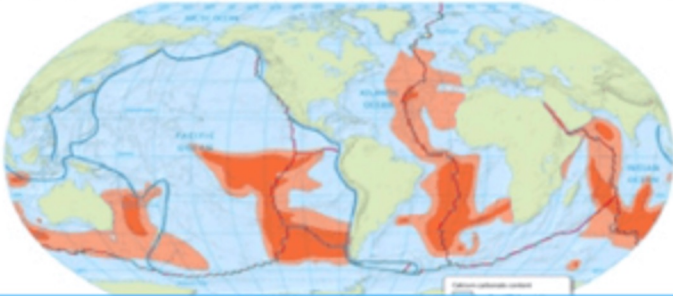
# Smart Figures



# Smart Tables

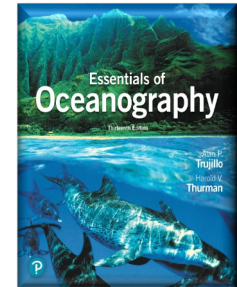
**SMARTTABLE 4.3** COMPARISON OF ENVIRONMENTS INTERPRETED FROM DEPOSITS OF SILICEOUS AND CALCAREOUS OOZE IN SURFACE SEDIMENTS

|                                                    | Siliceous ooze                                                    | Calcareous ooze                                                                 |
|----------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Surface water temperature above sea floor deposits | Cool                                                              | Warm                                                                            |
| Main location found                                | Sea floor beneath cool surface water in high latitudes            | Sea floor beneath warm surface water in low latitudes                           |
| Other factors                                      | Upwelling brings deep, cold, nutrient-rich water to the surface   | Calcareous ooze dissolves below the CCD                                         |
| Other locations found                              | Sea floor beneath areas of upwelling, including along the equator | Sea floor beneath warm surface water in low latitudes along the mid-ocean ridge |



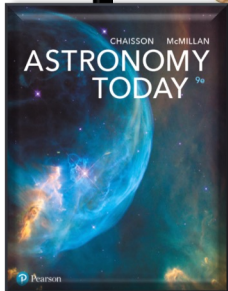
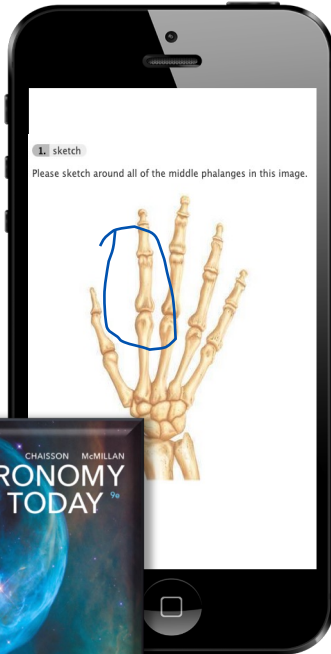
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Engaging lecture videos clearly explain relevance of data sets



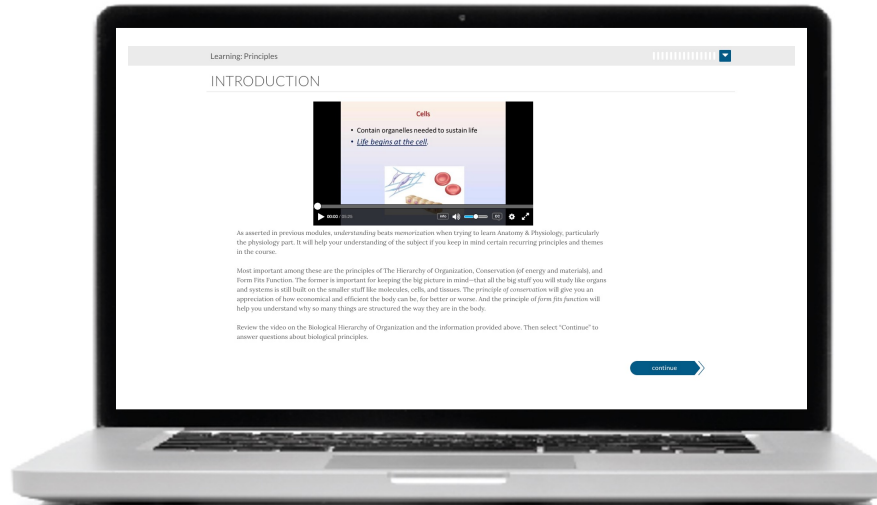
# What's available in Mastering?

## Learning Catalytics

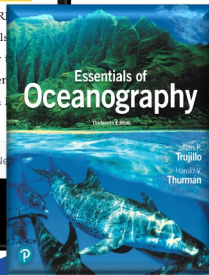
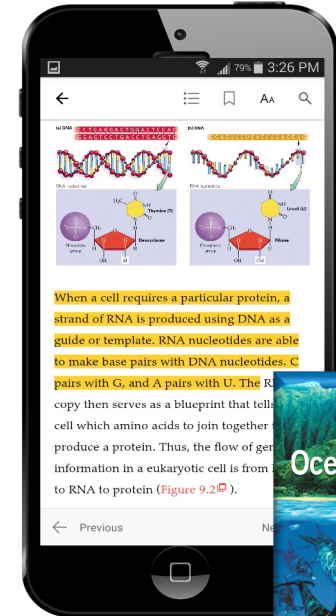


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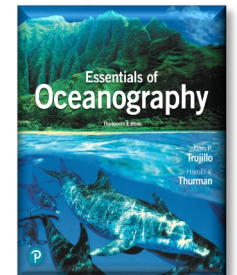
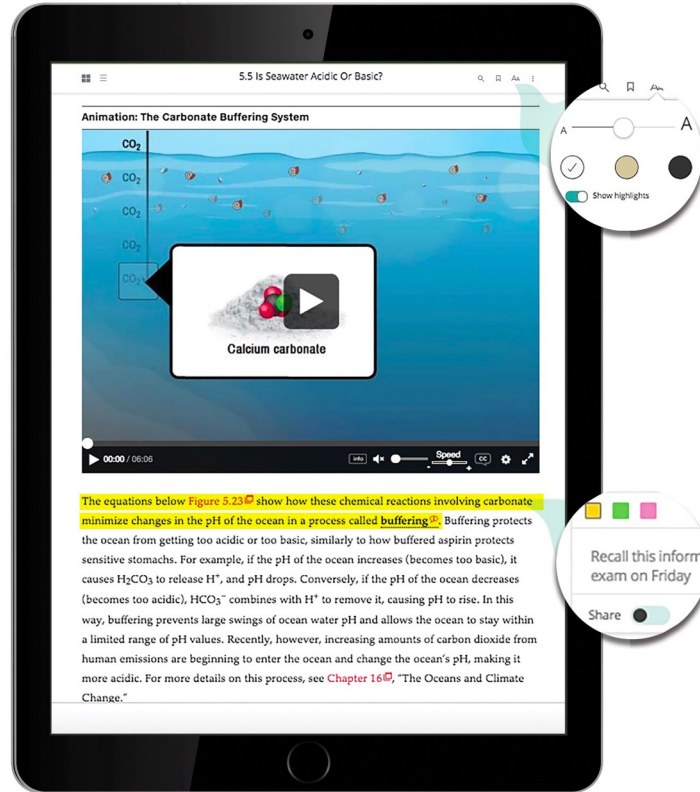
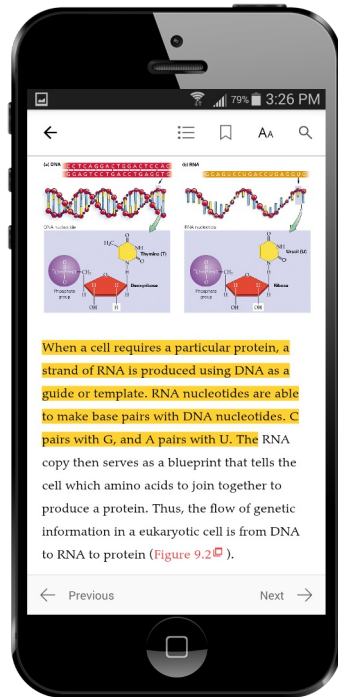
## Dynamic Study Modules



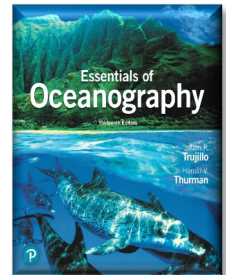
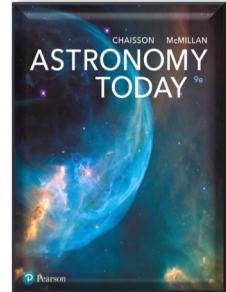
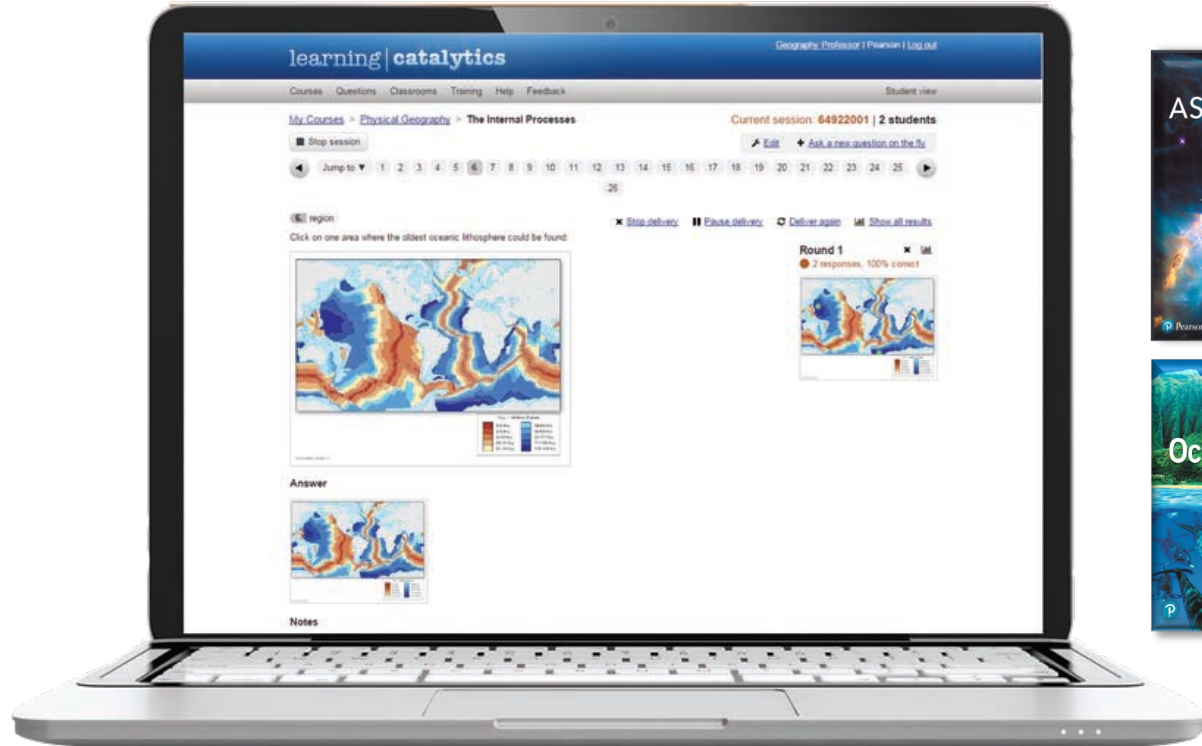
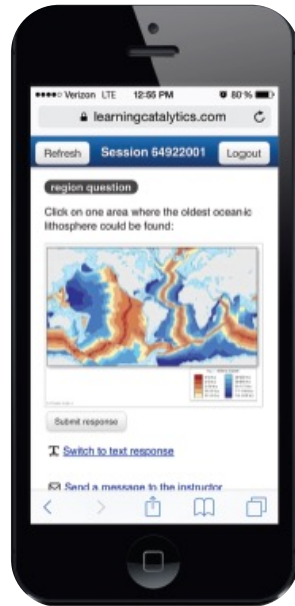
## Interactive eText



# The Pearson eText



# Learning Catalytics

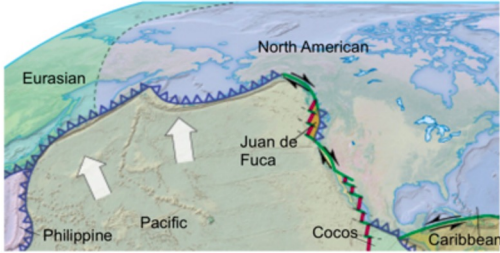


# Learning Catalytics

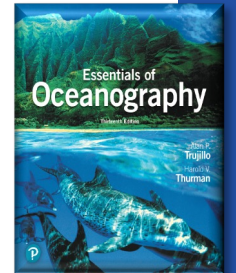
Oceanography (48179586)

0:19

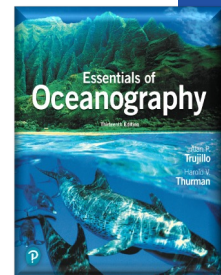
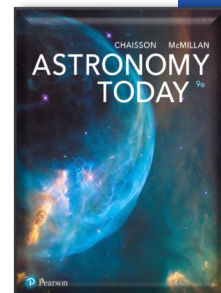
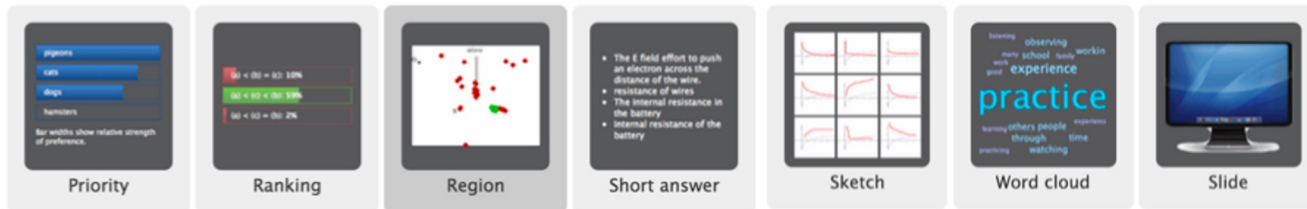
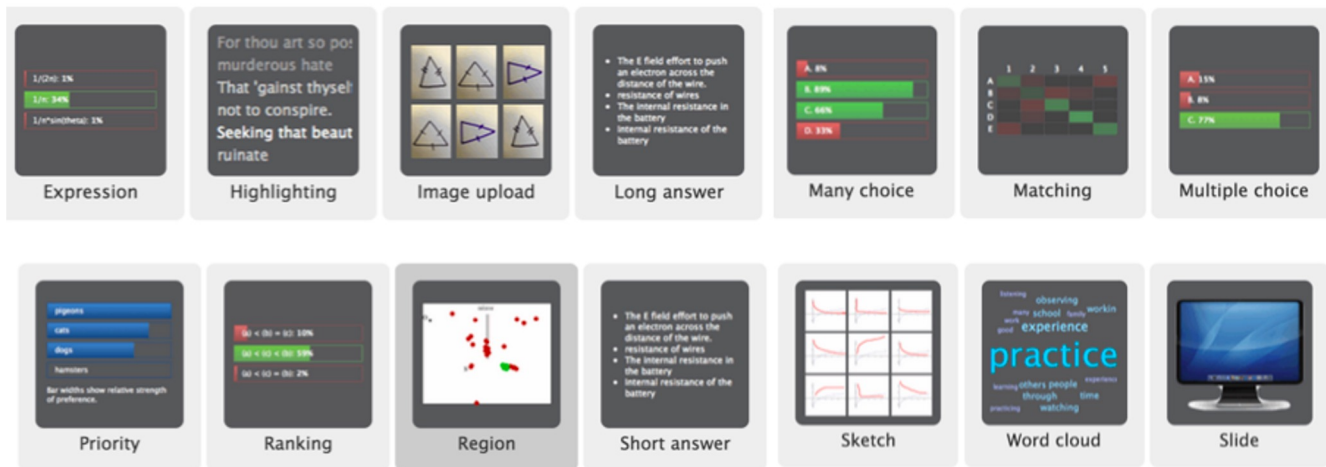
Examine the map of plate boundaries below. Indicate on the map where you would expect to find an active hydrothermal vent. Convergent boundaries are shown in blue, divergent in red, and transform in green.



The map shows the Pacific Ocean region with several tectonic plates labeled: Eurasian, North American, Pacific, Philippine, Juan de Fuca, Cocos, and Caribbean. Plate boundaries are color-coded: blue for convergent, red for divergent, and green for transform. A red line (divergent boundary) runs along the western edge of the Pacific Plate, passing through the Juan de Fuca and Cocos plates. A blue line (convergent boundary) runs along the northern edge of the Pacific Plate, where it meets the North American and Eurasian plates. A green line (transform boundary) runs along the eastern edge of the Pacific Plate, where it meets the Caribbean plate. White arrows indicate the direction of plate movement: the Pacific Plate is moving northward, the North American Plate is moving westward, and the Caribbean Plate is moving eastward.

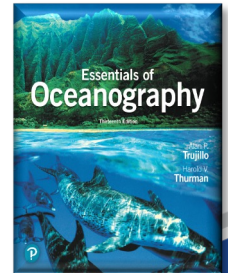
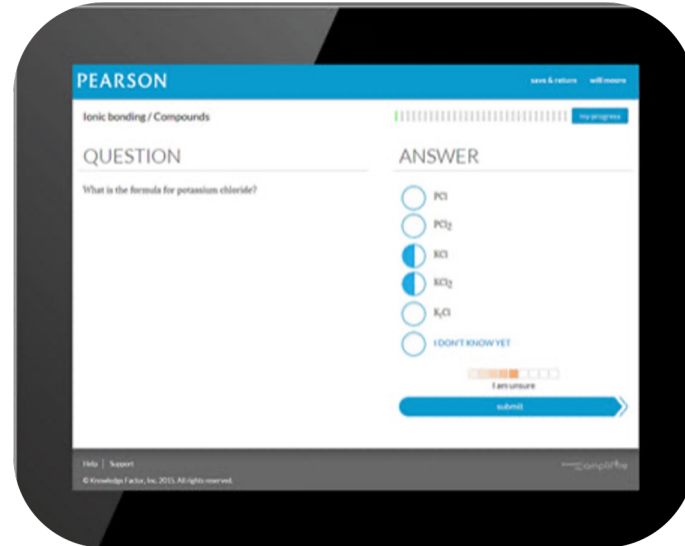


# Learning Catalytics



# Dynamic Study Modules: Customizing Content through Adaptively

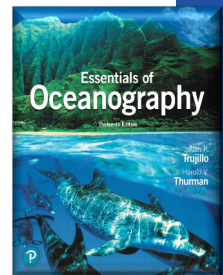
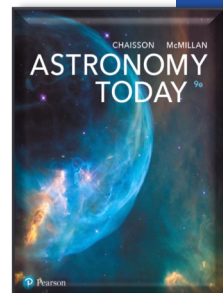
- **Dynamic Study Modules** help individual students consolidate what they know, and provide extra practice and remediation opportunities around items with which they are struggling.



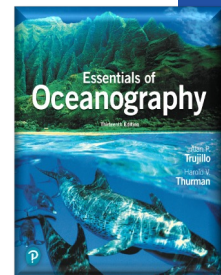
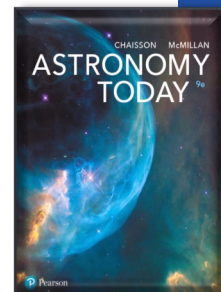
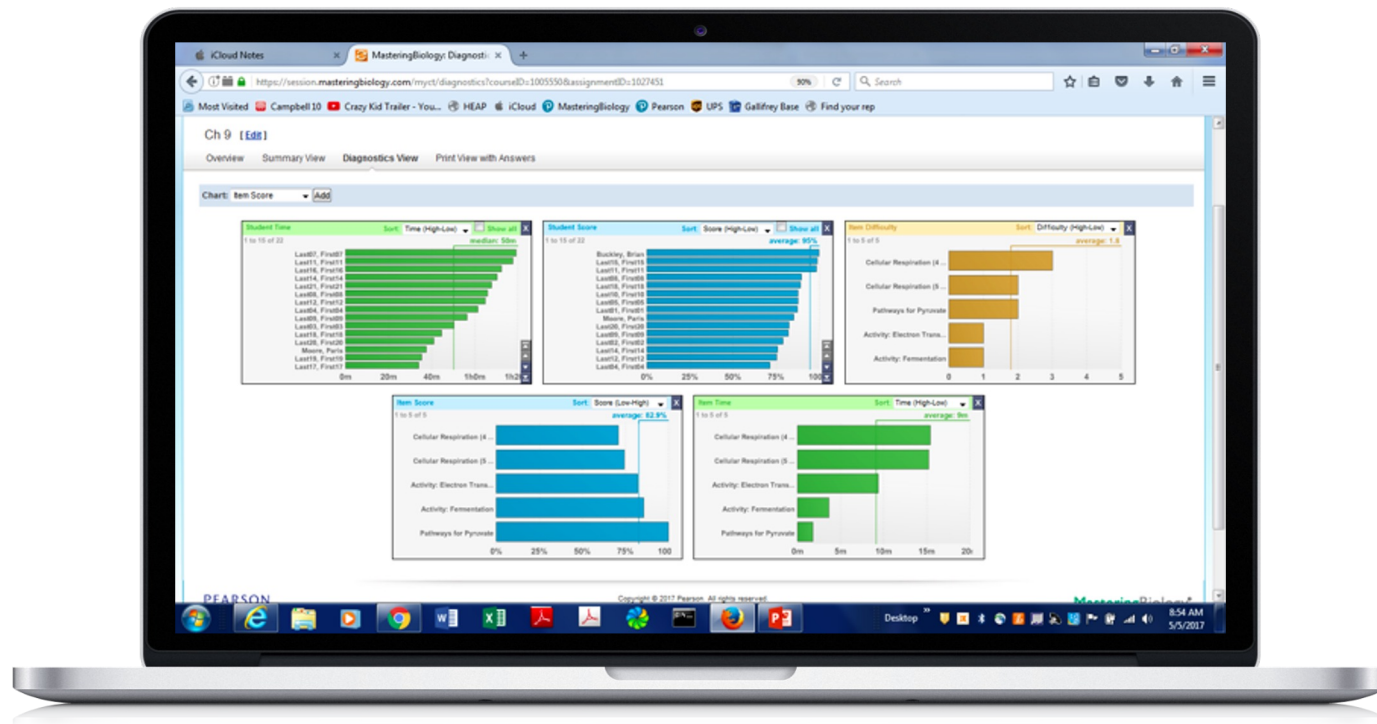
# Gradebook

Students per page: 25

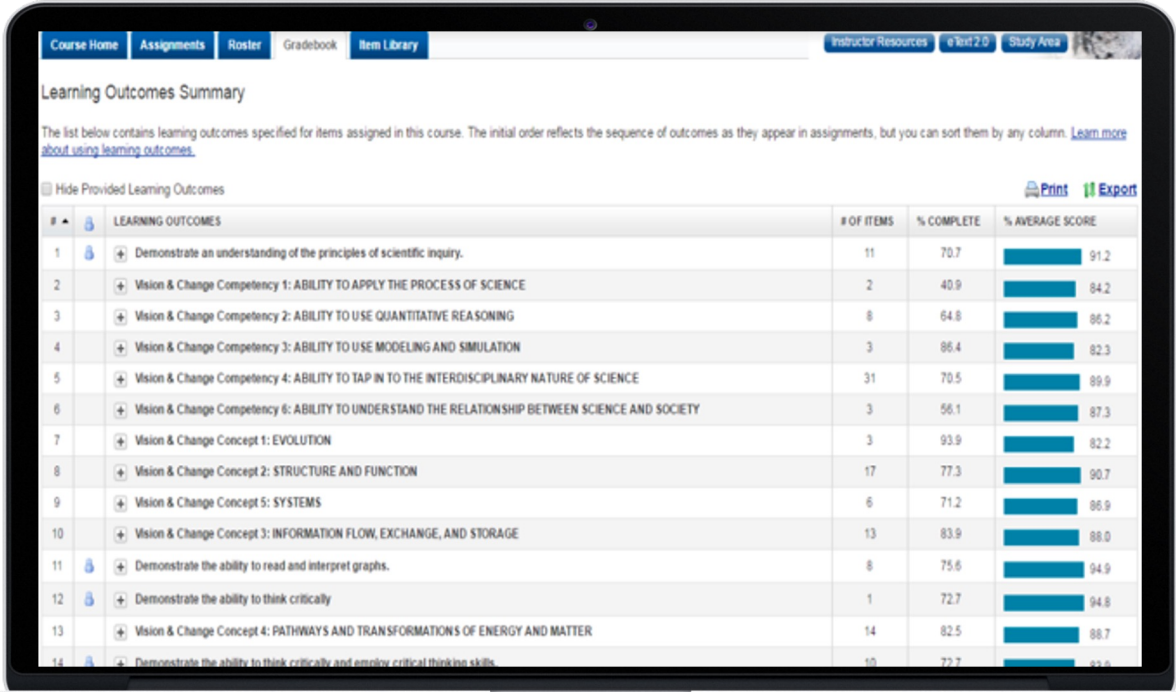
| NAME                | Ch 9  | Ch 24 | Evolution | Ch 30 | Ch 35 | Ch 36 | Ch 11 | Ch 2  | Ch 6 | Ch 4  | Chapter 7b | C |
|---------------------|-------|-------|-----------|-------|-------|-------|-------|-------|------|-------|------------|---|
| <b>Essays</b>       |       |       |           |       |       |       |       |       |      |       |            |   |
| Assigned Points     | 10.00 | 1.00  | 15.00     | 10.00 | 5.00  | 3.00  | 11.00 | 12.00 | 7.00 | 10.00 | 10.00      |   |
| Class Average       | 9.1   | 0.8   | 6.4       | 4.3   | 7.4   | 2.3   | 6.9   | 7.9   | 5.6  | 7.8   | 7.3        |   |
| Buckley, Brian      | 50.0  | 0.0   | 0.0       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  | 0.0   | 0.0        |   |
| Foley, Katie        | 0.0   | 0.0   | 0.0       | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  | 0.0   | 0.0        |   |
| Last101, First10... | 8.7   | 1.0   | 10.3      | 9.9   | 10.0  | 2.9   | 8.9   | 10.1  | 6.6  | 10.2  | 10.1       |   |
| Last102, First10... | 7.9   | 0.6   | 9.5       | 3.4   | 9.2   | 2.9   | 8.8   | 8.4   | 6.0  | 9.8   | 4.8        |   |
| Last103, First10... | 6.7   | 1.0   | 0.0       | 0.0   | 9.2   | 2.8   | 0.0   | 8.8   | 6.6  | 10.4  | 10.0       |   |
| Last104, First10... | 7.1   | 1.0   | 1.2       | 6.2   | 9.0   | 2.5   | 8.0   | 8.7   | 4.6  | 5.9   | 8.6        |   |
| Last105, First10... | 8.8   | 0.8   | 10.3      | 0.0   | 9.4   | 2.5   | 8.1   | 9.5   | 6.0  | 9.9   | 3.5        |   |
| Last107, First10... | 7.1   | 1.0   | 6.9       | 4.7   | 9.0   | 2.7   | 8.4   | 9.4   | 6.7  | 10.1  | 7.7        |   |
| Last108, First10... | 9.0   | 1.0   | 10.4      | 6.5   | 9.8   | 2.9   | 8.7   | 10.1  | 7.0  | 8.5   | 10.0       |   |
| Last109, First10... | 8.2   | 0.6   | 9.7       | 4.2   | 0.0   | 3.0   | 7.7   | 7.9   | 6.4  | 10.4  | 7.9        |   |
| Last110, First1...  | 8.8   | 0.9   | 9.9       | 0.0   | 9.8   | 2.8   | 8.6   | 9.1   | 6.6  | 10.5  | 9.2        |   |
| Last111, First1...  | 9.8   | 1.0   | 6.7       | 7.0   | 9.8   | 3.0   | 8.9   | 10.1  | 6.5  | 10.3  | 10.2       |   |



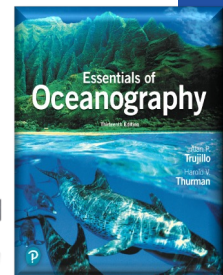
# Gradebook



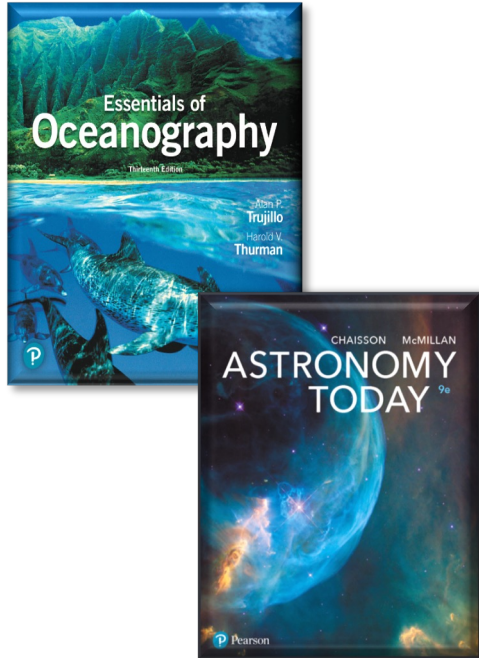
# Gradebook



| #  | LEARNING OUTCOMES                                                                                | # OF ITEMS | % COMPLETE | % AVERAGE SCORE |
|----|--------------------------------------------------------------------------------------------------|------------|------------|-----------------|
| 1  | Demonstrate an understanding of the principles of scientific inquiry.                            | 11         | 70.7       | 91.2            |
| 2  | Vision & Change Competency 1: ABILITY TO APPLY THE PROCESS OF SCIENCE                            | 2          | 40.9       | 84.2            |
| 3  | Vision & Change Competency 2: ABILITY TO USE QUANTITATIVE REASONING                              | 8          | 64.8       | 86.2            |
| 4  | Vision & Change Competency 3: ABILITY TO USE MODELING AND SIMULATION                             | 3          | 86.4       | 82.3            |
| 5  | Vision & Change Competency 4: ABILITY TO TAP IN TO THE INTERDISCIPLINARY NATURE OF SCIENCE       | 31         | 70.5       | 89.9            |
| 6  | Vision & Change Competency 6: ABILITY TO UNDERSTAND THE RELATIONSHIP BETWEEN SCIENCE AND SOCIETY | 3          | 56.1       | 87.3            |
| 7  | Vision & Change Concept 1: EVOLUTION                                                             | 3          | 93.9       | 82.2            |
| 8  | Vision & Change Concept 2: STRUCTURE AND FUNCTION                                                | 17         | 77.3       | 90.7            |
| 9  | Vision & Change Concept 5: SYSTEMS                                                               | 6          | 71.2       | 86.9            |
| 10 | Vision & Change Concept 3: INFORMATION FLOW, EXCHANGE, AND STORAGE                               | 13         | 83.9       | 88.0            |
| 11 | Demonstrate the ability to read and interpret graphs.                                            | 8          | 75.6       | 94.9            |
| 12 | Demonstrate the ability to think critically                                                      | 1          | 72.7       | 94.8            |
| 13 | Vision & Change Concept 4: PATHWAYS AND TRANSFORMATIONS OF ENERGY AND MATTER                     | 14         | 82.5       | 88.7            |
| 14 | Demonstrate the ability to think critically and employ critical thinking skills                  | 10         | 72.7       | 83.6            |



# Why Pearson Mastering?



- Powerful digital resources
- Extensive Study Area
- Advanced Assessments & tracking
- Learning Catalytics
- Dynamic Study Modules

# Thank You, Scottsdale Teachers!



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