Reading a Textbook

Quickly & Easily

by

SOAR® Study Skills

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SOAR® Study Skills

Practice the Power Strategy...

Read the pictures:

1. Look at each picture, graph, and visual.
2. Read the caption.
3. Ask yourself, “Why do I think this picture is here?”

Guide for Reading

Focus on this question as you read.

- *What tools are used by scientists to study the Earth's oceans, crust, and atmosphere?*

3–3 Exploring the Earth

We have learned about a few of the tools scientists use to study the microscopic world and the world of outer space. Now you will spend some time learning about the ways in which scientists explore the planet Earth. **In simple terms, we can think of the Earth as being divided into three main parts—water, land, and air.**

Exploring Earth's Oceans

More than 70 percent of the Earth is covered by water, and most of that water is found in the oceans. It's no wonder, then, that Earth is often referred to as the water planet.

Scientists use research vessels called submersibles to explore the oceans. Some submersibles carry only scientific instruments; others carry people as well. One kind of submersible is called a **bathysphere** (BATH-ih-sfeer). A bathysphere is a small, sphere-shaped diving vessel. It is lowered into the water from a ship by a steel cable. Because it remains attached to the ship, the bathysphere has limited movement.

A **bathyscaph** (BATH-ih-skaf) is a more useful submersible. It is a self-propelled submarine observatory that can move about in the ocean. Bathyscaphs have reached depths of more than 10,000 meters while exploring some of the deepest parts of the ocean.

The bathyscaph *Alvin* has made thousands of dives into the ocean depths. Some of *Alvin's* discoveries have helped scientists learn more about life on the ocean floor. During one dive, scientists aboard

ACTIVITY

DISCOVERING

Food From the Ocean

Visit a supermarket or fish market. List the different seafoods available.

- Develop a classification system to distinguish the types of seafood sold in your local market.

Figure 3–20 *A*
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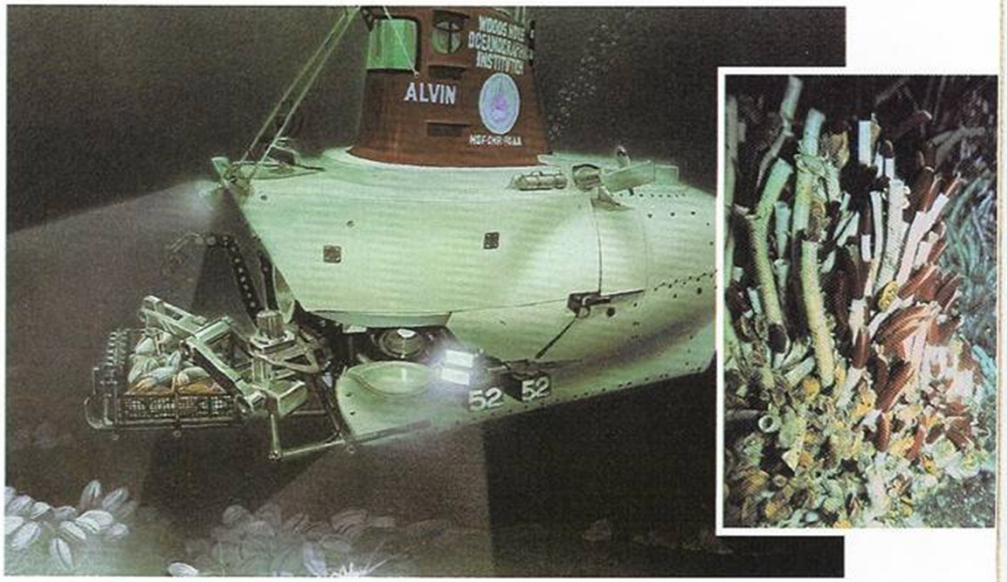
the submersible
form of life called tube worms.



Among the many unusual organisms discovered by the **submersible Alvin** was a new form of life called tube worms.

Notice the **robot craft** as it is about to explore the wreck of the Titanic.

ACTIVITY READING

Dangerous Depths

Do you love an action-packed adventure story? If so, you will want to read *Twenty Thousand Leagues Under the Sea*, by Jules Verne.

Alvin found several communities of unusual ocean life near vents, or natural chimneys, in the ocean floor. The vents discharge poisonous hydrogen sulfide into the water. Water temperatures near the vents reach 350°C. The combination of high temperatures and deadly hydrogen sulfide should make the existence of life forms near the vents impossible. But as the scientists discovered, giant tube worms, clams, mussels, and other strange life forms make their homes near the vents. These life forms exist without any sunlight. Some scientists suggest that conditions near the vents may be similar to conditions on distant planets. So the discoveries made by *Alvin* may help astronomers study the possibility of life on other worlds.

In September 1985, another submersible made a remarkable discovery. This submersible is a robot craft that can be guided along the ocean floor from a ship on the surface. The robot craft discovered the remains of the famous steamship *Titanic*. The ship was lying on the ocean floor in very deep water off the coast of Newfoundland, Canada. In 1912, on its maiden voyage, the *Titanic* struck an iceberg and quickly sank.

Figure 3–21 *Notice the robot craft as it is about to explore the wreck of the* Titanic.

Figure 3–2
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Exploring Earth's Crust

We often tend to take the land we walk on for granted. "Solid as the Earth," is a common phrase. And most of the time, it makes sense. But in the 1980s, residents of Mexico, Armenia, and California (to name just a few places) felt the Earth move beneath their feet. What they felt, in case you haven't guessed, was an earthquake.

Detecting and measuring the strength of earthquakes is an important task for scientists who explore the Earth's crust. One day their studies may enable them to predict earthquakes so that people in the affected area can be warned before the earthquake strikes. Today, unfortunately, our ability to predict earthquakes is limited. But we are well able to detect and measure them using a tool called the **seismograph** (SIGHZ-muh-grahf).

A seismograph is a fairly simple instrument. It consists of a weight attached to a spring or wire. Because the weight is not attached directly to the Earth, it will remain nearly still even when the Earth moves. A pen is attached to the weight. Beside the pen is a rotating drum wrapped with paper.

This collapsed California highway is evidence of the tremendous energy unleashed during an **earthquake**.

ACTIVITY

CALCULATING

Earthquake Waves

Earthquake waves, or seismic waves, travel at a speed 24 times the speed of sound. The speed of sound is 1250 km/hr. How fast do seismic waves travel?

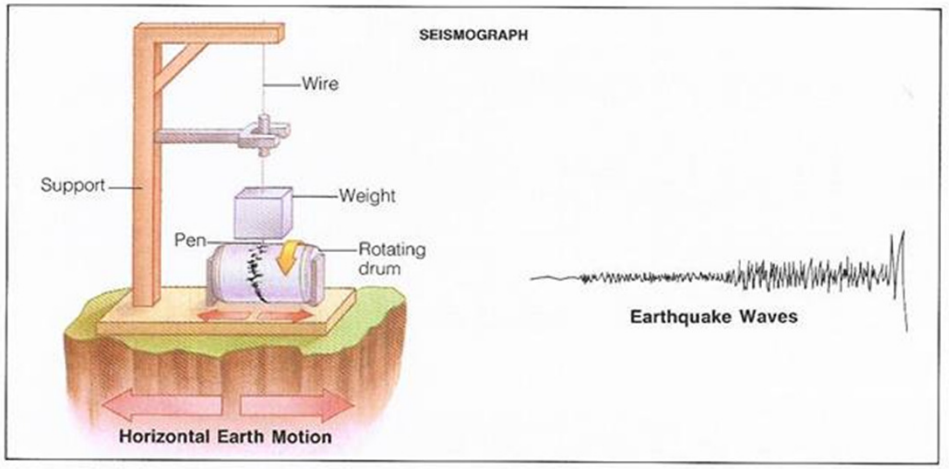


Figure 3–23 *A seismograph (left) detects and records earthquake waves, or seismic waves. A typical pattern of seismic waves is shown (right).*

Because the pen is attached to the weight, it also remains nearly still when the Earth moves. But not so for the drum, which is attached to the Earth and moves with the Earth. When the Earth is still, the pen records an almost straight line on the rotating drum. However, when an earthquake occurs, the pen records a wavy line as the drum moves with the Earth. What kind of line would be recorded during a violent earthquake?

Scientists can determine the strength of an earthquake by studying the height of the wavy lines recorded on the drum. The higher the wavy lines, the stronger the earthquake. Using the seismograph, scientists can detect an earthquake at almost the instant it occurs—anywhere on Earth!

Exploring Earth's Atmosphere

Scientists use many tools to study the Earth's atmosphere. Weather balloons and satellites transmit data to weather tracking stations around the world, enabling scientists to predict the weather far better than they could in the past. Wind vanes measure the speed and direction of the wind, an important thing to know if you are trying to determine if a nearby

A **seismograph** detects and records **earthquake waves**, or seismic waves. A typical pattern of seismic waves is shown (right).

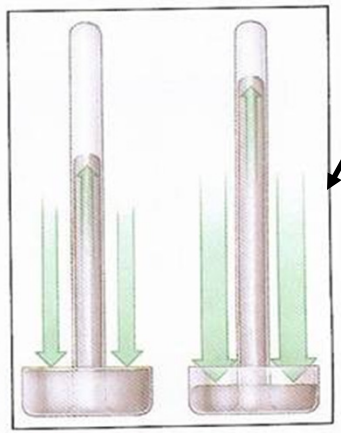
Figure 3–24 *Among the most modern scientific tools are weather satellites which, among other things, can be used to track potentially dangerous hurricanes.*

storm is coming your way. Other instruments measure the humidity (amount of moisture in the atmosphere) and air temperature. The list of instruments to study the atmosphere goes on and on. In this section, we will learn about one instrument you may already be familiar with—the **barometer.**

A barometer is a device that measures air pressure. Although you probably don't often think about it, air is a form of matter and therefore has mass. And as you learned in Chapter 1, the Earth's gravity pulls matter toward the Earth. In simple terms, air pressure is a measure of the force of the atmosphere pushing down on every point on the Earth due to gravity.

There are two different types of barometers. One type is a mercury barometer. A mercury barometer consists of a glass tube closed at one end and filled with mercury (a silvery liquid). The open end of the glass tube is placed in a container of mercury. At sea level, air pushing down on the mercury in the container supports the column of mercury in the glass tube at a certain height. As the air pressure decreases, the column of mercury drops. What will happen if the air pressure increases?

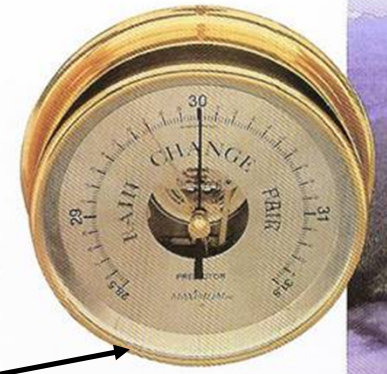
Figure 3–25 *When air pressure increases, the column of mercury rises in the barometer tube (right). What happens when air pressure decreases (left)?*



Among the most modern scientific tools are **weather satellites** which, among other things, can be used to track dangerous hurricanes.

When air pressure increases, the column of mercury rises in the **barometer tube** (right). What happens when air pressure decreases (left)?

An **aneroid barometer** (inset) is used to **measure air pressure** anywhere from your hometown to the foggy banks off Kruzof Island in Alaska.



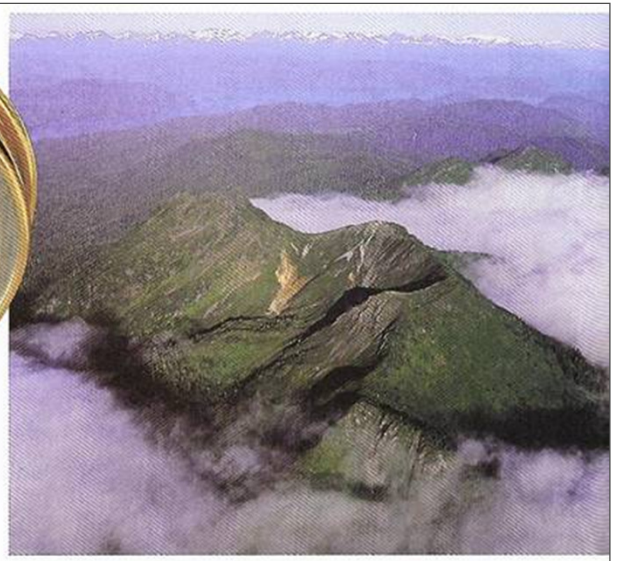


Figure 3–26 *An aneroid barometer (inset) is used to measure air pressure anywhere from your hometown to the foggy banks off Kruzof Island in Alaska.*

A more common type of barometer is called an aneroid (AN-er-oid) barometer. See Figure 3–26. An aneroid barometer consists of an airtight metal box from which most of the air has been removed. A change in air pressure causes a needle to move and indicate the new air pressure. Perhaps you have an aneroid barometer at home or in your school. If so, see if you can discover for yourself the relationship between rising and falling air pressure and the weather in your area.

CTIVITY

CALCULATING

A Water Barometer

Mercury has a density of 13.5 g/cm³. Water has a density of 1.0 g/cm³. If standard air pressure supports a column of mercury 76 cm high, how high would a column of water be supported at this pressure?

3–3 Section Review

1. What are some of the tools used to explore the Earth's oceans, crust, and atmosphere?
2. Can a seismograph be used to predict earthquakes? Explain your answer.

Critical Thinking—*Applying Concepts*

3. Using the term density, explain why air pressure is related to altitude (distance above sea level).

84 ■ A

3-3 Section Review

- What are some of the tools used to explore the Earth's oceans, crust, and atmosphere?
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Critical Thinking – *Applying Concepts*

3. Using the term density, explain why air pressure is related to altitude (distance above sea level).

SOAR® Study Skills

What Did You Think?

The information from the pictures ALONE gives you enough information to…

- Answer the first summary question at the end of this passage.
- Understand what the second question is asking and know where to find it.
- Determine the answer to question 3 by using clues from the picture of the barometer tube.

Your brain has now been "primed," meaning it has some baseline knowledge for the topic. Now, as you learn new information from the black-and-white text AND class lectures, that new information will "stick" to your brain much more efficiently.

HINT: You can get 30-80% of the information in a text-book from the visuals (including charts and graphs). The black-and-white text simply adds more details. Even if you do not have time to read the black-and-white text, at LEAST read the visuals...you will learn more, pay better attention in class, and begin earning better grades in less time.