

CHRISTIAN LIBERTY NATURE READER

Book Five

Fourth Edition



WENDY KRAMER

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Fourth Edition

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Preface

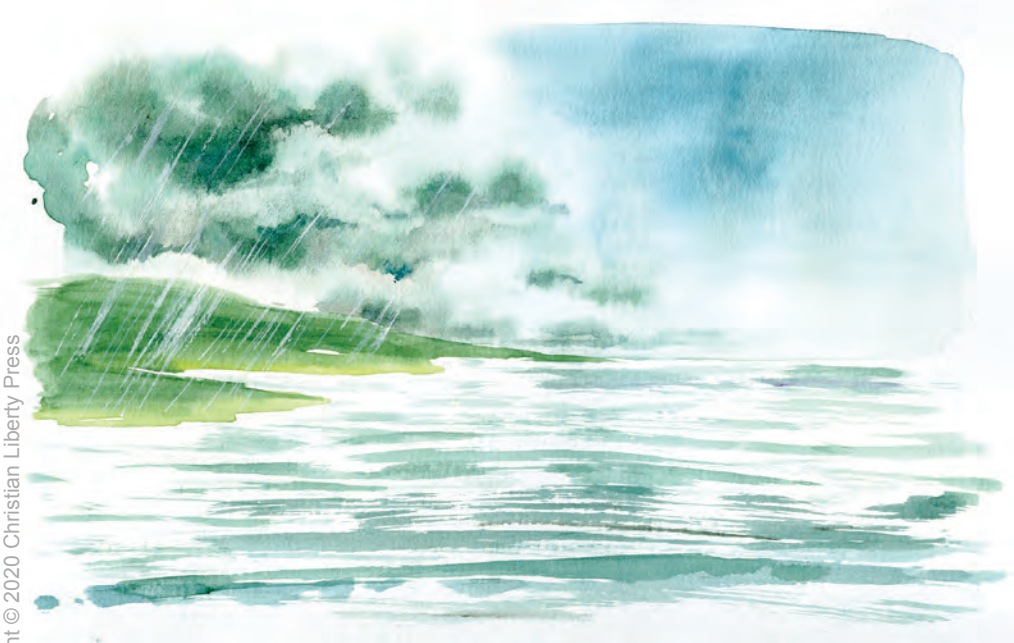
This particular textbook is designed not only to improve a student's reading skills and comprehension, but also to increase the student's understanding of and interest in God's wonderful creation.

The Bible says we are to do "all to the glory of God" (1 Corinthians 10:31). Reading for God's glory necessitates reading material that draws attention to Him and His truth, that reflects His majesty, and that meets the standards of Holy Scripture. What this means is that we should compare any reading selection to the standard in Philippians 4:8 and ask these simple questions: Is it true? Is it noble? Is it right? Is it pure? Is it lovely? Is it admirable? Is it excellent? Is it praiseworthy?

The *Christian Liberty Nature Reader* series seeks to follow these standards set forth in the Scriptures. Since we believe that the student can gain an enhanced appreciation for God by studying His creation (Psalm 19:1; Romans 1:20), this textbook has been designed to present the majestic splendor of His handiwork, seen in both the animal and the human realm.

It is our prayer that this series will give to the reader the joy that is to be associated with "good reading," and that the knowledge imparted will help make "wise the simple" (Psalm 19:7).

*Staff of Christian Liberty Press
Arlington Heights, Illinois*



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The water cycle (Hydrosphere)

Unit 1

Earth's Hydrosphere

The Ocean

What is the **ocean**? It is a huge body of salt water that covers more than 70 percent of the earth. The ocean is connected all around the world, but different areas have their own names. The main areas are called the Pacific, Atlantic, Indian, Arctic, and Southern oceans. *Pacific* is the name of the ocean that lies west of the continents of North and South America, and east of the continents of Asia and Australia. The Atlantic Ocean lies east of the Americas and west of Europe and Africa. The Indian Ocean lies south of the Indian subcontinent and east of Africa. The Arctic Ocean is located at the most northern region of our planet within the Arctic Circle. In the year 2000, scientists began to refer to the ocean at the southern end of the world—which is south of 60 degrees latitude and surrounding Antarctica—as the Southern Ocean. Sometimes, it is called the Antarctic Ocean or even the Austral Ocean.

Have you ever seen the ocean? If you live near or have visited it, you have some idea of how big it is. You cannot see across it. Huge ships sail for days or even weeks without reaching land. The ocean is also very deep. Most of it is 12,500 feet or 3,810 meters deep (that is, 2.4 miles or 3.9 kilometers straight down). The bottom of the ocean has hills and mountains and valleys just like on land above sea level. Scientists have explored and studied some parts of

the ocean, and they have begun to learn more about this mysterious and fascinating world.

You might think that the waters of the ocean are just a huge, empty space, but actually they are full of life. From the warm waters near the equator, to the frozen world of the Arctic, to the deep trenches in the Pacific Ocean, animal and plant life is abundant! You can look at books or online, or visit an aquarium, to learn more about many of these wonderful, amazing creations. The more we learn, the more we realize how wise and powerful God is.

The ocean is the largest part of our world's **hydrosphere** (hī'•drō•sfēr'). The hydrosphere is all of the water found on, under, and above the surface of planet Earth. This includes water in oceans, lakes, streams, and groundwater; it also includes the various forms of water as well. Do you know the three forms of water? They are solid (ice), liquid, and gas (vapor). The oceans are just one part of Earth's hydrosphere. Most of the earth's water is saltwater; less than 3 percent of the earth's water is fresh water. Nearly 70 percent of fresh water is ice and snow, which is found in the Arctic, Antarctic, and mountain glaciers (glā'•shərs; slowly moving rivers of ice). The rest of the fresh water is found in lakes, rivers, and groundwater. Groundwater is water found under the surface of the earth and is found in small spaces in the soil and in the cracks of rock formations.

Review

1. What are the names given to the five oceans?
2. Where is each one located?
3. Describe the hydrosphere.

God Made All Things

We can learn a lot by studying the ocean. It shows us God's power and wisdom. God tells us that He controls the waves and winds (Psalm 89:9; cf. Matthew 8:27, Luke 8:22–25). We know that all of the creatures, from those so tiny we cannot see them, to enormous squids and whales, were created by Him (Genesis 1:20–25). Many of the plants and animals in the ocean have very special needs. God put each one in just the right place.

The Bible tells us that God made the earth and all that is in it in six days. He created the ocean on the second day. On the third day, God made the plants; on the fifth and sixth days, He made all the creatures that live in the water, fly in the air, and roam on the land. This book will give you just a small look at some of the creatures in the oceans and the special places where they can survive. As you learn more about God's world, be thankful for His love and care for all of His creation!

Review

1. When did God make the ocean?
2. When did He make the plants and animals that live there?

Seas, Bays, and Waterways

The parts of the ocean that surround the continents and islands are especially important to human beings. Some people use the terms “ocean” and “sea” interchangeably, but most of the areas of the ocean that are called **seas** are found near land and are at least partially bordered or even enclosed by land. Rounded out areas formed along these coastlines are called bays or gulfs, such as Chesapeake Bay or the Gulf of Mexico. A **bay** is usually smaller with a wider opening than a **gulf**, but there are many examples of just the opposite being true. Look at Hudson Bay and the Gulf of California on a map or globe! Hudson Bay is 650 miles (1,050 km) wide, but the Gulf of California is only 150 miles (241 km) at its greatest width. Many people live near large bodies of water because the oceans, seas, bays, and gulfs are an important source of food and means of transporting goods and people all around the world.



Some bays, such as those in Northern Europe, have been formed by glaciers. These bays are deep cut inlets—almost as if someone sliced dramatic canyon edges into the mountains. These narrow bays are called **fjords** (fē'•ôrdz) along

the west coast of Europe and the northeast coast of North America. These fjords are filled with ocean water. Elsewhere in the world, they may be called bays, inlets, sounds, or channels.

Along a coast, an area that is sheltered from the open ocean, yet is deep enough to allow large ships to enter, is known as a **harbor**. These protect ships from rough seas and also keep the coastline from eroding too quickly.

Rivers run down and flow into the ocean in various places along the coast, as part of God's miraculous **water cycle**. Water from the ocean evaporates, travels through the air, and then rains down on the land. Here it fills lakes, flows into streams and rivers, and, of course, provides the fresh water that plants and animals require. Eventually, the water flows to rivers that connect back to the ocean!

A place where the river enters into the sea is called an **estuary** (ěs'•chə•wěr•ē), which is a partially enclosed coastal body of **brackish** (that is, somewhat salty) water that connects to the open ocean. Where a river enters an ocean, sea, estuary, lake, or reservoir, a delta may form. A river **delta** is a landform that is created when sediment in the water collects near the mouth of a river as it enters a larger body of slower-moving or standing water. It is called a delta because of the shape the landform makes (Δ). See the Nile River Delta on a map or globe.

Since ocean travel is so important to trade and transportation, having access to the ocean is important. Waterways provide an important way for people who are not right on the coast to be able to reach the ocean. The St. Lawrence Seaway allows huge ships to go all the way from the Great Lakes in central North America to the Atlantic Ocean. The connections were not complete, however, and some of them

were not deep enough for freighters. Civil engineers dug out, or dredged, areas that needed to be enlarged.

Travel between the Great Lakes also required connections because the lakes are not the same level, forming dangerous rapids. People solved this problem by digging a channel and putting in a lock. No, not a padlock. This kind of **lock** is a channel that has gates on either end. A ship on Lake Superior can approach this gate, and the water level inside the lock is raised to the same level as the ship. The gate on that side is opened, and the ship moves into the lock. Then the gate is closed, and the water is lowered, along with the ship. Finally, the gate on the other side is opened, and the ship sails out onto Lake Huron! Of course, ships can travel in the other direction, as well. Without the locks, the lakes could only be made accessible to each other through a series of steep rapids, impossible for a large vessel to navigate.

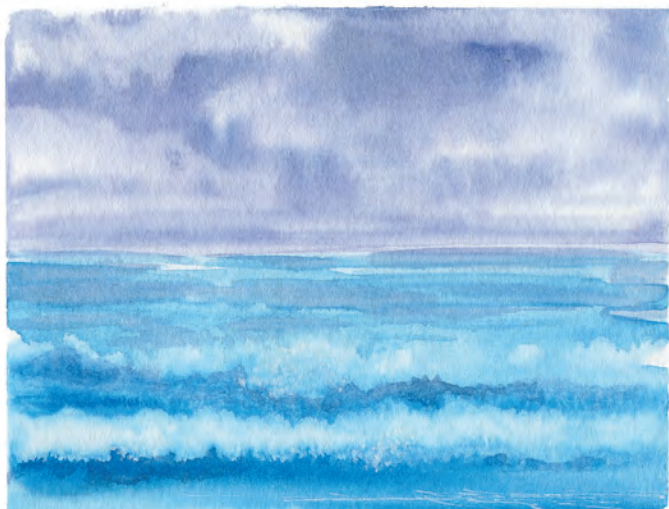
Another way that people have improved ocean travel is by digging canals. A **canal** is a natural or man-made waterway through which ships can move between two large bodies of water. Two famous canals are the Suez Canal and the Panama Canal. The Suez Canal connects the Mediterranean Sea and the Red Sea, and shortened the journey from the United Kingdom to India by thousands of miles. The Panama Canal connects the Atlantic and Pacific oceans, and is located between North and South America. Before this canal was opened, a ship going from one of these oceans to the other had to sail all the way down around Cape Horn, which is at the southern tip of South America, nearly in the Antarctic Circle!

God has given us great gifts, including the oceans and all they contain. He has also given us great abilities to make use of these marine resources more efficiently.

Review

1. What is a fjord? What other names are these formations called?
2. Describe the water cycle.
3. What is the difference between an estuary and a delta?
4. What is a canal used for?

Waves and Tides



The surface of the ocean does not usually just lie still. Like any liquid, it moves when it is disturbed. In the ocean, the main disturbance is a **wave**, which is caused by wind, which is largely caused by the heat of the sun. Each wave has a high peak and a low trough; one wave pushes the water near it, causing it to rise into a peak and then pushing it down into a trough as it moves away. At the shore, these waves wash up onto the beach or rocky coastline.

The shores along the ocean experience something called **tides**, which are the rising and falling of the surface of the ocean. This occurs because the earth is rotating, and the ocean is affected differently by the gravitational pull of the sun and even more of the moon. When the pull is stronger, there is a larger rise in the ocean, and a larger fall. This moves as a wave toward the shore. When the gravitational pull is weaker, the waves are less. Twice a day there is a high tide, and the water goes higher up along the coast than at any other time. There is also a low tide twice a day, when the

ocean waters retreat. In some places, the ocean leaves behind water in little depressions, and these become tide pools. You can explore them to see interesting sea plants and creatures! Hurry! The ocean will soon cover this pool again.

Ocean tides flow into rivers at estuaries. At high tide, this is called a **flood current**. At low tide, it is called an **ebb current**. The shape of rivers, bays, and shores has an effect on the way that tides occur. Ships' captains need to know about these tides in order to sail their ships safely—the depth of water and the direction of the currents at various times in harbors or estuaries are important for being able to dock a ship or take it out to sea.

Sometimes, the ocean's surface is affected by something more drastic, such as a hurricane or typhoon, or an underwater earthquake or eruption. This can cause a drastic rise or drop in the ocean, setting up extremely dangerous tsunami or seismic ocean waves. This powerful force moves a huge volume of water across the ocean as fast as 450 miles per hour! Out in the deep water, it may only be a foot or two high, but when it approaches the shallower water near land, it is pushed upward, higher and higher; and when it peaks and is halted by the ocean bottom, it may be ten to thirty feet high. Sometimes, killer waves develop because of the violence of the incident, and waves of fifty or even 100 feet hit the shore, smashing things and quickly dragging them back out to sea.

Review

1. What causes waves?
2. What causes tides?
3. What can hurricanes and underwater earthquakes cause?

Paths of the Sea

In Psalm 8:8, God tells us that He has placed human beings in charge of creation, including “The birds of the air, and the fish of the sea that pass through the paths of the seas.” David, the psalmist, knew about these paths a long time before Christ was born, but in later millennia, we lost this knowledge. In the middle of the nineteenth century, a man named Matthew Maury decided to study and discover more about these **ocean currents** or “paths.” Because of his work, we began again to understand some of this amazing truth. The Gulf Stream—an important ocean current flowing between North America and Europe—became a passageway for ships and made the journey much faster.

Since the time of Maury, scientists have discovered a lot more about the “paths” spoken of in the Bible. Currents flow not only in the atmosphere but also in the ocean. In the ocean, there are currents near the surface caused mainly by wind and influenced by the rotation of the earth. The earth rotates from west to east, moving more rapidly at the equator than at the poles. This movement is one of the influences that cause air and water to move counterclockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere. There are many of these surface currents all around the world.

The water does not only move in one set of surface patterns. There are currents flowing in different depths of the ocean, in directed paths with a variety of causes. One type of current is called a **thermohaline** (thər•mō•hă•līn) **current**. Some surface water near the poles evaporates or turns to ice. The surface water left behind thus contains more salt, so it is denser and colder than the water below the surface; it then sinks down, pushing up some of the water from the

very bottom. This is part of a very slow current that moves the water from bottom to top, bringing nutrients with it. This type of current is part of a worldwide journey, moving water from ocean to ocean over a very long period of time.

Fish and other animals have God-given knowledge and ability to use the currents of the ocean and air to their advantage. As we study the earth and its oceans, we will learn more about God's amazing, complex plans, including the paths of the sea.

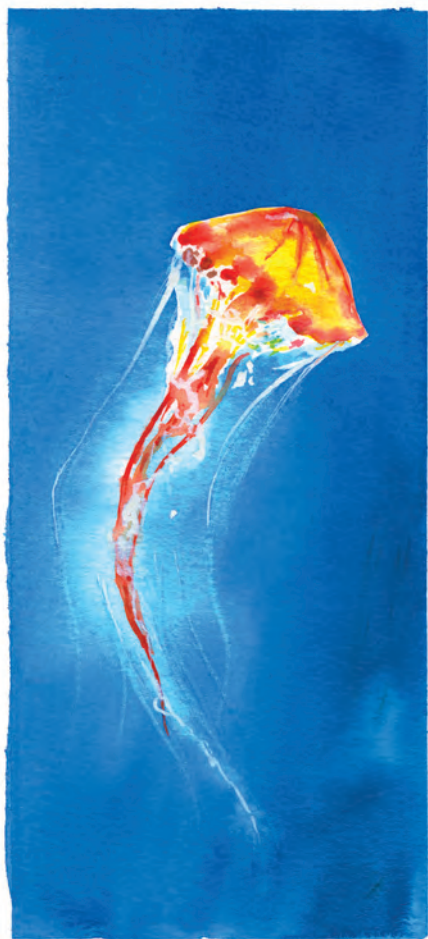
Review

1. What causes surface currents?
2. What is a thermohaline current?

Habitats

All animals and plants need to live in places that are right for them. Some need a lot of water, while some need rocks or sand. Some need trees, or dark spaces, or open skies. God has made animals to fill the earth, each in its own special place, or habitat. A **habitat** is the place where a plant or an animal naturally lives and grows.

The best place for some animals is in the ocean. Most crea-



tures even have to be in a special part of the ocean. Crabs crawl on the bottom of the seas, finding their food. Eels live in rocky areas. They can hide in holes among the rocks or coral and dash out to catch fish. Seahorses live among the seagrasses. They hold on to the grass with their tails. Some sea creatures make their own light. They live deep in the ocean, where it is very dark. Their lights attract other creatures. This ability of a living organism to create and emit light is called

Jellyfish

bioluminescence (bī•ō•lū•mā•nē'sən(t)s). This occurs in many animals, including fish, jellyfish, comb jellies, crustaceans, and cephalopod mollusks. Over 75 percent of the deep-sea animals produce light using bioluminescence.

Our God made every plant and animal for its place. Do not forget to thank Him as you learn about some of the living things He put in the ocean.

Review

1. What is a habitat?
2. Name some animal habitats.
3. What is bioluminescence?

The Sargasso Sea

There are many different habitats in the ocean. A coral reef is one kind of place; another is the ocean floor. The **Sargasso Sea** is another amazing habitat in the ocean. It is the only “sea” that does not have land on any of its borders. Instead, it is surrounded by ocean currents on all four sides. It lies in the middle of the North Atlantic Ocean, with the continent of North America to the west and the continent of Europe to the east. Four specific ocean currents keep the Sargasso Sea separate from the rest of the waters and bring all kinds of plants, and even animals, to find a home in this sea. Strong currents flow all around this sea, which sits in the middle like a huge pool of water that just slowly turns. You would expect it to be impossible for plants to grow in the middle of the ocean. **Sargassum** (sâr•gă’səm) weed, an amazing exception, is what gives the sea its name. This looks like plain brown and yellow seaweed (that is, algae) until you examine it more closely. The plants have little, round bladders, or air sacs, that act like balloons, keeping the sargassum weed afloat.

Many creatures live among the seaweed in the Sargasso Sea. Tube worms, barnacles, and other small creatures attach themselves to the plants. Shrimp, crabs, and even turtles crawl around on the sargassum carpet. Fish live in the water, and these smaller creatures attract larger fish, as well as birds, that come to find a meal.

The creatures that live among the sargassum weeds are not able to swim far from their home, or to hide anywhere but among the weeds. Many of them depend on camouflage to protect them from their enemies. The color and shape of many of the creatures in the Sargasso Sea give them excellent camouflage. There is a Sargasso shrimp and a Sargasso

fish. Each one blends in with the brown and yellow of the weeds. They have irregular edges and little, feathery bits similar to the plants where they live.

When Christopher Columbus was sailing from Europe, looking for a way to the Far East, he was tricked by the Sargasso Sea. He and his crew saw a bit of seaweed floating by with a crab clinging to it. They were sure that this meant that there was land nearby. Actually, it was a bit of seaweed from the Sargasso Sea, and they were far from land.

Learning about God's world can help us to understand history and help us to travel and explore safely.

Review

1. What forms the borders of the Sargasso Sea?
2. How can sargassum weed stay afloat?
3. What kinds of animals live in the Sargasso Sea?

Plants in the Ocean

Plants in the ocean are an important part of God's creation. They provide food, oxygen, and homes for animals. Without the plants on the land and under the water, there could be no life on earth!



How do plants grow in the ocean? A few grow near the shore, or at least in water shallow enough that sunshine can reach them through the water. Most kinds of plants that we know about cannot live without sunshine. Some ocean plants, such as kelp, can grow as tall as fifty feet, with their roots growing in an ocean bed!

However, most of the ocean is too deep even for plants such as kelp to grow. Does this mean that there are not any plants in the deep sea? Not at all. God designed

many ocean plants so they could survive in the deepest water. He did not do this by making the plants taller. He did it by making these plants so small, you cannot even see them! These plants are so small, they can easily float. They are called **plankton** (plăn(k)•tən)—organisms including bacteria, algae (plantlike organisms), protozoa (one-celled organisms), and even tiny, floating animals! If they sank to the bottom, they would not get any sunshine, and they would die.

God planned that these organisms would be part of the food chain for many animals. The **food chain** is how different living things feed on each other. Plants are at the bottom of the food chain; then smaller animals eat plankton and tiny animals; and people and large animals eat plants and smaller animals. Some of the largest animals on earth depend on plankton for food. How can these tiny organisms that we cannot even see help to feed animals as big as whales? These organisms are not big, but there are a vast number of them. There are so many plants and animals floating in some parts of the sea, they change the color of the water. Small animals eat these organisms. Larger animals eat the smaller animals. For example, a plant-eating animal called **krill** is very small; these small crustaceans are, in turn, the main food of many of the larger fish and whales in the ocean! God shows us His wisdom and planning in so many ways.

Review

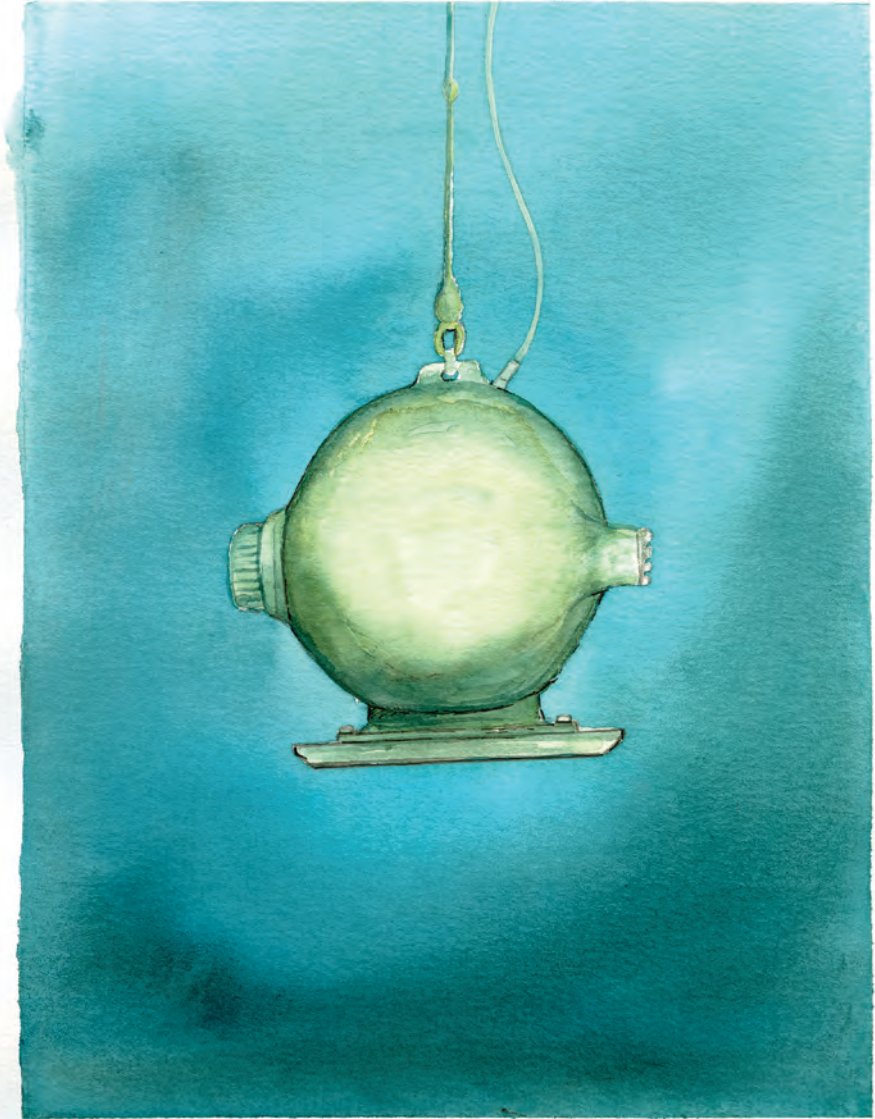
1. Are all of the plants in the ocean the same type?
2. Where do plants live in the ocean?
3. Describe how small organisms, such as plankton and krill, are part of the food chain.

The Deep Sea

Places in the ocean can be just as different from each other as places on the land. Would you expect to see the same plants and animals in a desert, as in a jungle, or on a mountaintop? In the ocean, there are warm shallow seas, coral reefs, wide open spaces, frozen bays, and also the ocean deeps.

Before 1900, people could only wonder about what might be at the bottom of the ocean. It was not until 1934, when William Beebe and Otis Barton invented the bathysphere, that any kind of deep-sea exploration was possible. A **bathysphere** is a solid steel diving sphere for deep-sea observation. Why was an ordinary submarine, which had been around for over a hundred years, not good enough? The deepest parts of the ocean are dark, but the real problem is the pressure. Water weighs a lot more than air; and the deeper you go under the surface of the ocean, the more water is weighing down and all around you. An ordinary submarine going thousands of feet under the water would be squashed, like someone crushing an aluminum pop can. It took very special equipment for people to begin to see and finally to go to the deepest places.

Until recently, a large part of the ocean had not been explored, especially the deep ocean floor. Now, however, we know that some of the strangest and wildest creatures live down there, from sea worms and sea cucumbers to anemones, shrimp, and fish. There are creatures with lights, called bioluminescent creatures, and creatures with enormous, needle-sharp teeth and see-through skin! Others look very scary!



Bathysphere

People expected the deep, dark, cold ocean to be lifeless. What could live with no sunlight? They were wrong! The ocean is full of life, even in the deepest place in the Pacific Ocean, which is called **Challenger Deep**. It is over 30,000 feet (5.7 miles or 9.15 kilometers) deep! It is the deepest known point in Earth's hydrosphere. Plants that receive sunlight can make food using a process called photosynthesis. Bacteria or other living things in the deep ocean can use a process called **chemosynthesis**, which is a process that turns inorganic (nonliving) material into food. Larger animals can eat the smaller ones; and a huge number of creatures have been discovered living on the ocean bottom, often near **hydrothermal vents** (cracks in the ocean floor), where water has been heated by underground lava (molten rock) or magma (a mixture of molten rock, water vapor, carbon dioxide, and solids). This water contains the material used for chemosynthesis. Other animals can live off nutrients that float down from above. There is nowhere on Earth that God did not think of when He created our planet!

Review

1. Why is it so hard to study the deep ocean?
2. Why did people think there would be no living things down there?
3. What is chemosynthesis?

Words You Should Know

A

Abalone—a snail that lives near the shores in warm oceans

Ambergris—a valuable substance found in the sperm whale; can be dried and used in expensive perfumes

American lobster—a type of crustacean; largest of the lobster species

Ampullae of Lorenzini—a shark's sensing organs

Anglerfishes—a type of fish that has a special spine that sticks out above its eyes to lure its prey

Antennae—pair of long, thin sensory appendages on the head of a creature

Arrow worms—marine creatures that are shaped like arrows and have fins

B

Baleen whales—whales that have baleen to filter out small creatures from the ocean

Barnacles—crustaceans that cement themselves headfirst onto any surface by producing a liquid that hardens into plates

Barracuda—vicious fish that grows up to six feet long

Basket star—a type of brittle star

Basking shark—a large fish that strains food with gill rakers