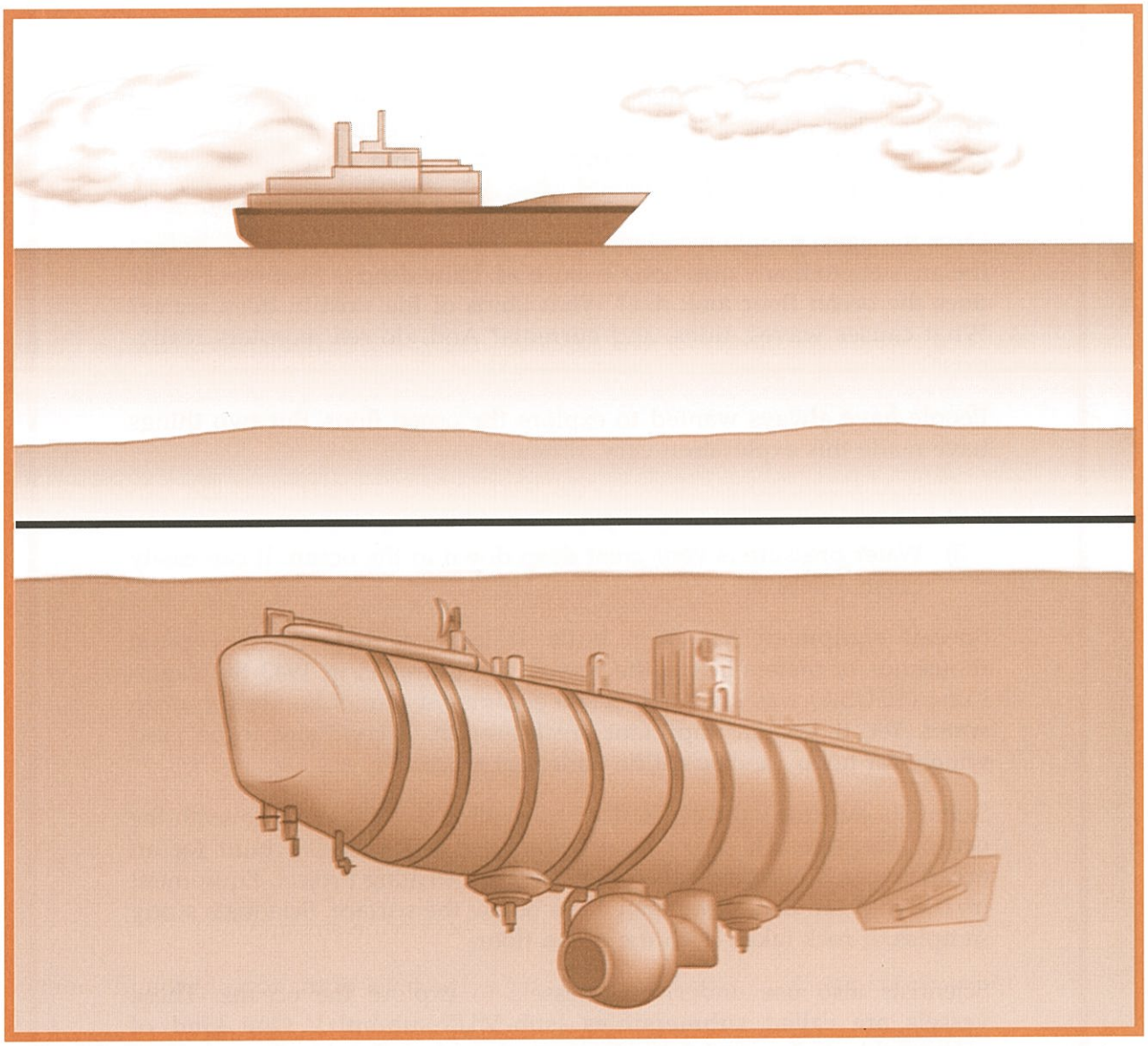
Lesson 3

How do scientists explore the ocean?



KEY TERMS

oceanography: study of the oceans

submersibles: underwater research vessels

LESSON 3 | How do scientists explore the ocean?

Powerful! Mysterious! Frightening! Awesome! Beautiful! Fascinating! These are but a few of the terms used to describe the ocean. Were you ever on the ocean? Did you ever watch — and hear ocean waves crashing onto shore? How would you describe the ocean

Over the ages, people wondered about the ocean. They wanted to find the answers to many questions — such as: How deep is the ocean? What does the ocean floor look like? What kinds of life exist in deep water? What causes waves, tides, and currents? And, do sea monsters really exist?

People have always wanted to explore the ocean floor. But two things have made this exploration very difficult:

1) People cannot breathe in water.

2) Water pressure is very great deep down in the ocean. It can easily crush a person.

Special equipment has been built. It lets scientists safely explore thousands of meters below the waves. For example, in 1943 the Aqua-Lung (SCUBA) was invented. Scuba equipment cannot be used in deep water. Yet, it was an important breakthrough. It continues to be used widely for hobby and scientific underwater activity.

Scientists can study the ocean floor by drilling into the crust beneath the ocean. The research ship *Glomar Challenger* was specially built for an ocean research program called the Deep Sea Drilling Project. Equipment on the ship can drill more than 4 km below the surface. Scientists study samples of rock taken from the ocean floor.

Scientists also use underwater vessels to explore the oceans. These vessels are called **submersibles** [sub-MUR-suh-bulz]. One kind of submersible is lowered into the ocean on a steel cable from a ship. Another kind is a small submarine. Scientists have discovered many unusual living things deep in the ocean while in submersibles.

OCEAN STUDY

Ocean study is called **oceanography** [oh-shun-OG-ruh-fee]. The first ocean-going research expedition was made by the *H.M.S. Challenger*. This British vessel cast off from Portsmouth, England on December 21, 1872.

It cruised for 727 days, and covered nearly 70 thousand miles. During that time, scientists recorded numerous observations, and carried out many experiments. They also collected sea floor sediment and nearly 5,000 kinds of plants and animals never seen before.

The *Challenger's* voyage marked the birth of oceanography.

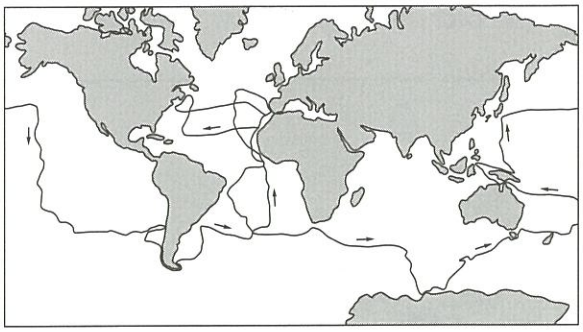


Figure A *The route of the H.M.S. Challenger.*

MORE ABOUT SUBMERSIBLES

The most advanced and useful submersible is the *Alvin*. The U.S. Navy owns Alvin. But it is operated by a private ocean-research organization.

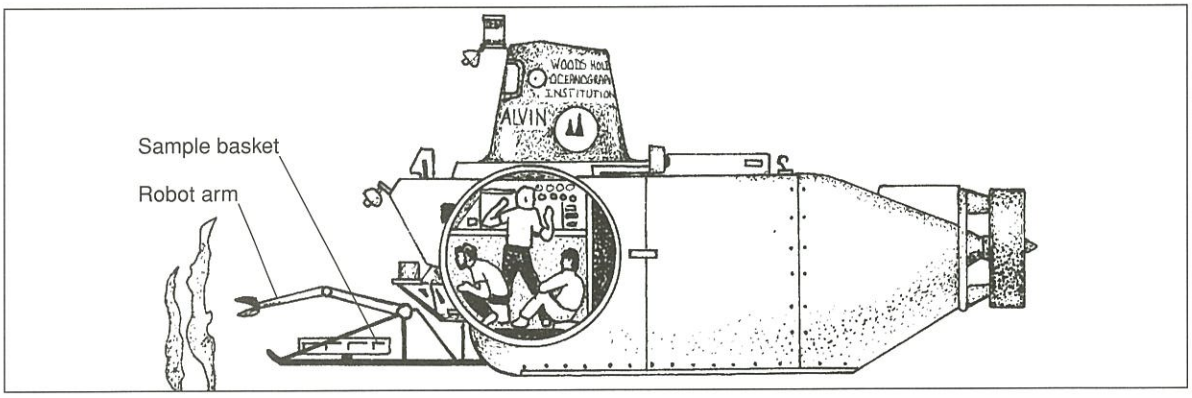


Figure B *Alvin*

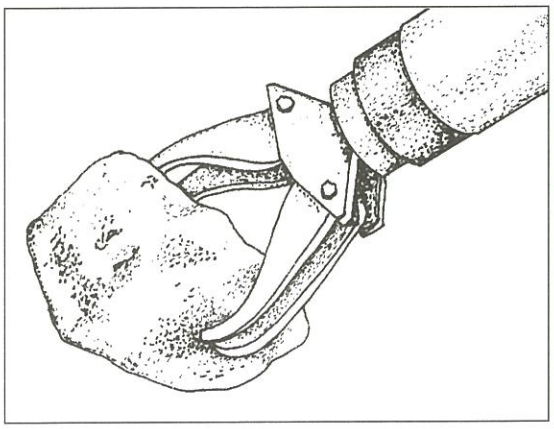


Figure C

Alvin is pressurized, and can move about freely near the ocean floor. It carries its own oxygen. *Alvin* has a robot arm. It can grab things and assist in experiments. *Alvin* can descend as far as 13,000 feet. That's more than two miles. *Alvin* is shown in Figure B with a "full house." How many persons can Alvin hold? _____

THE "TOOLS" OF OCEANOGRAPHY

The pictures below show many of the vessels and instruments used to study the ocean.

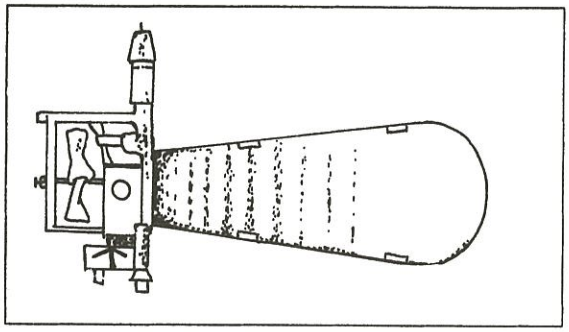


Figure D *Deep water current detector*

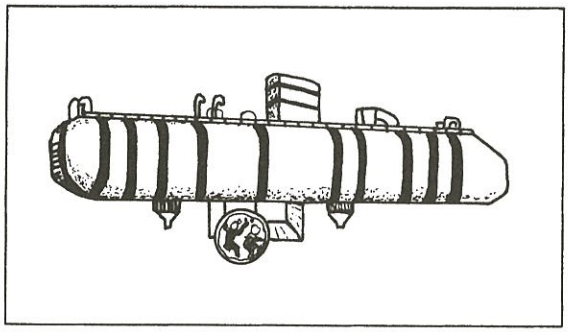


Figure E *Bathyscaphe*

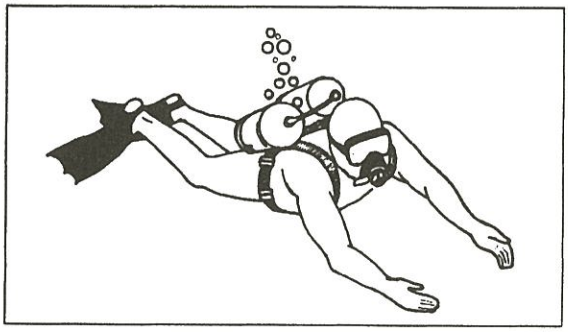


Figure F *SCUBA*

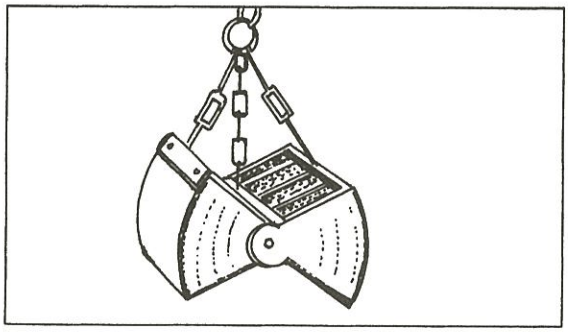


Figure G *Grab bucket*

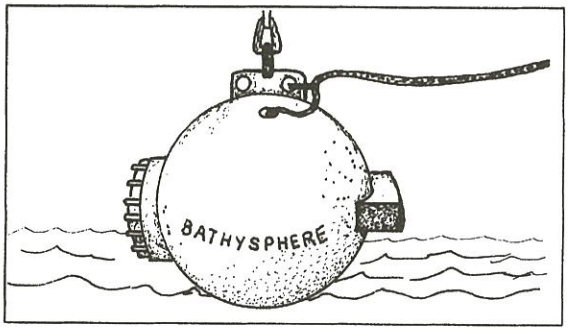


Figure H *Bathysphere*

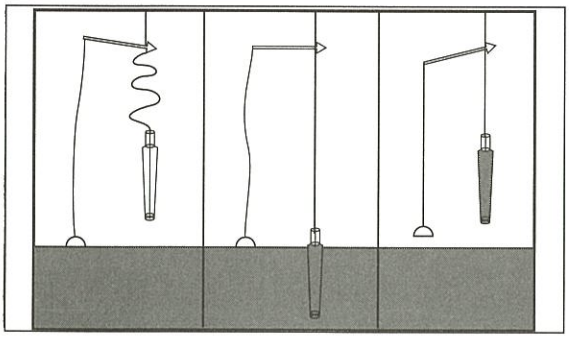


Figure I *Coring tube*

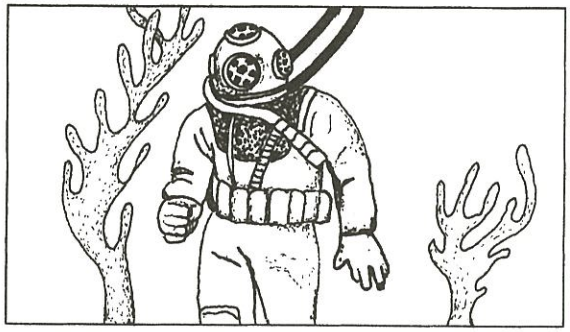


Figure J *Early diving suit*

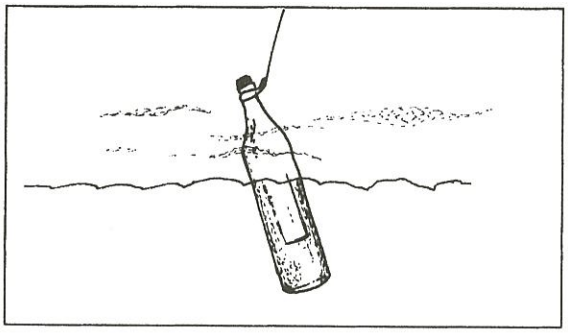


Figure K *Drift bottle*

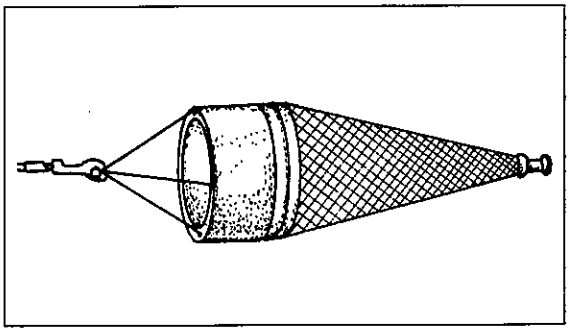


Figure L *Plankton townet*

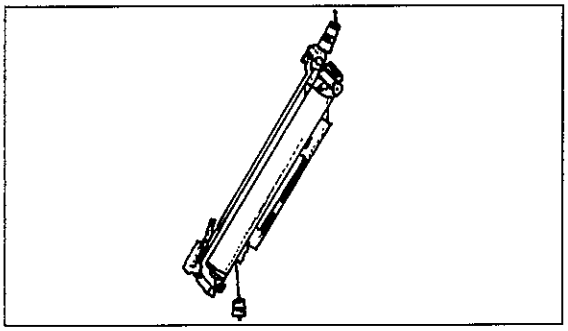


Figure M *Nansen bottle*

Study Figures D to M. Then match the "tools" with their descriptions. Write their names on the spaces provided.

_____ 1. Cone-shaped cloth bag held open by a metal ring. It catches tiny marine organisms as it is towed slowly behind a ship.

_____ 2. Just a closed waterproof container with a note in it. It is carried along by the ocean currents. The note asks that anyone who finds the bottle return it indicating where it was found. In this way, scientists trace ocean currents.

_____ 3. Shaped like an open clam. When it touches the bottom, the halves snap shut. As it shuts, it takes along sea floor samples.

_____ 4. Shaped like a bomb. It is lowered into the ocean, where it records currents far below the surface.

_____ 5. Long and slim; double-side-by-side tubes. Collects water at any depth and records its temperature.

_____ 6. A hollow tube that is forced into the ocean floor. The core fills with sea floor material.

_____ 7. Completely self-contained. Diver moves freely without outside power.

_____ 8. Bulky and heavy. Supplied oxygen from the surface. Lowered and lifted by rope that also limits diver's movements.

_____ 9. Round vessel with heavy, thick steel walls. Lowered and raised by heavy steel cables. Pressurized.

_____ 10. Looks like a fat submarine with a sphere connected to its underside. Carries two scientists. Pressurized. Propellers permit horizontal movement only.

SONAR

In Lesson 5, you will learn about the ocean floor. You will find out what it looks like.

Scientists have learned a lot about the surface of the ocean floor using sonar. The word "sonar" comes from the letters in **So**und **N**avigation **A**nd **R**anging. Sonar is an echo-sounding system.

Sonar is used to figure out the depth of the ocean. Sound waves travel through water at a speed of 1,500 m/sec. A transmitter bounces a sound wave off the ocean floor. A receiver picks up the echo.

Scientists measure the time it takes for the echo to return. Let us say a sound wave makes it from the transmitter to the receiver in 10 seconds. The sound wave takes 5 seconds to reach the bottom and 5 seconds to return. Therefore, the depth of the ocean floor is 7,500 m (1,500 m/sec × 5 sec).

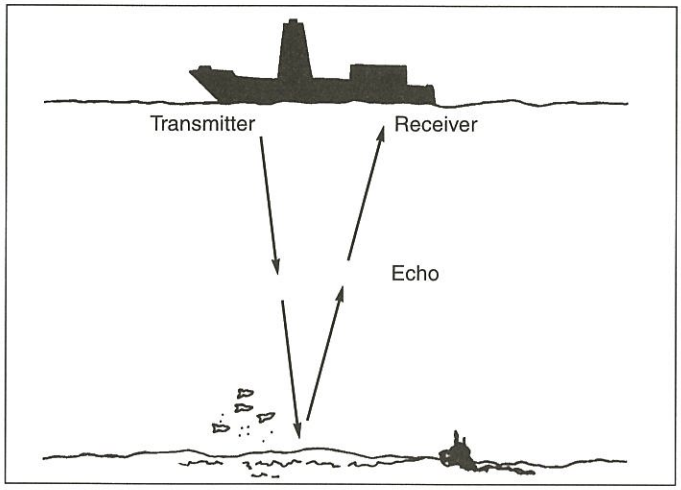


Figure N

REACHING OUT

Complete the chart below. The first column shows the amount of time it takes for a sound wave to make a round trip using SONAR. For each time, give the depth of the ocean floor in meters (m).

	Length of Time(s)	Depth (meters)
1.	2 sec	
2.	6 sec	
3.	12 sec	