

TIMELINES in Science

EXPLORING THE OCEAN

People have been studying ocean waves and currents at least since Egyptians sailed in the Mediterranean Sea more than 5000 years ago. Almost 3000 years ago, Phoenicians in the Mediterranean and Polynesians in the South Pacific understood enough to sail the open sea with confidence. More than 2000 years ago, people developed special gear to provide divers with oxygen so that they could explore the undersea world.

The timeline shows some historical events in the study of the ocean. The boxes below the timeline show how technology has made this study possible and useful.

345 B.C.

Alexander Goes Undersea?

According to legend, Macedonia's powerful ruler Alexander the Great has himself lowered into the ocean in a glass ball so that he can explore what lies underwater.



Events

360 B.C.

320 B.C.

APPLICATIONS AND TECHNOLOGY

APPLICATION

Measuring Ocean Depth

Around 85 B.C., the Greek philosopher Posidonius used a simple method to answer a simple question. He wanted to know the depth of the Mediterranean Sea. So he and a crew sailed out into the sea near Italy. There, they dropped a weight tied to a very long rope into the water. When the weight struck bottom, they measured how much rope they had let out. It was almost 2 kilometers (about 1 mi). This was the standard method for measuring depth for almost 2000 years. Today, instruments on ships emit sound waves that bounce off the sea floor. The instruments then calculate depth according to how long the sound waves take to return to the surface.

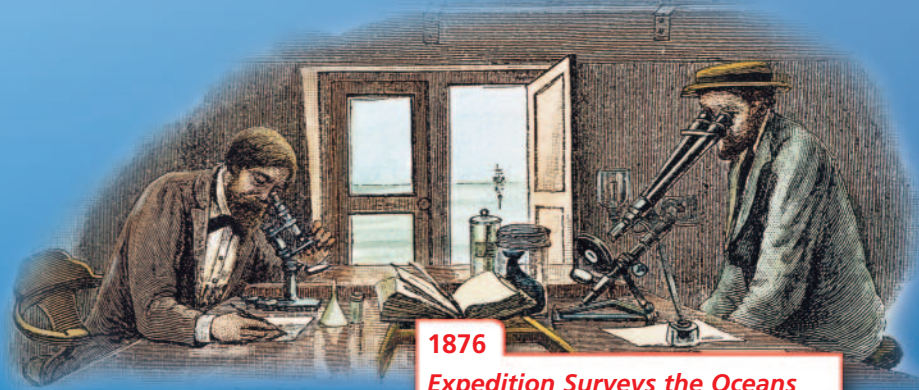
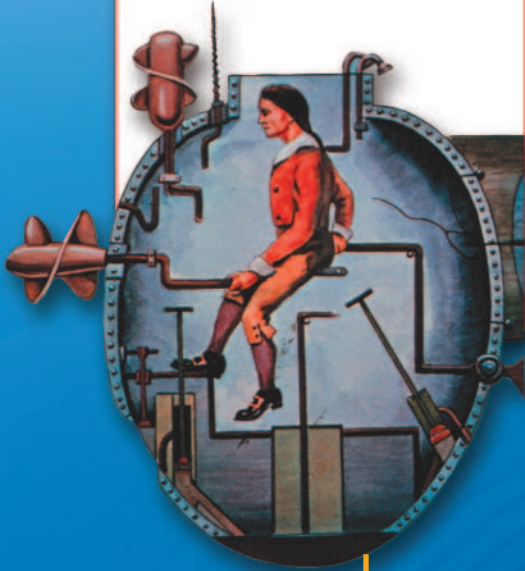


A sailor in 1916 prepares to lower a weight on a rope to measure the ocean's depth.

1775

Submarines Allow Undersea Travel

Connecticut inventor David Bushnell designs and builds a wooden submarine. It holds enough air for a person to stay underwater for 30 minutes. The *Turtle*, as his vessel is known, is among the first to allow people to travel underwater.



1876

Expedition Surveys the Oceans

The sailing ship *Challenger* completes one of the great scientific research efforts of the 1800s, and returns home to Great Britain. In 362 locations around the world, the crew recorded data on ocean depth, currents, temperature, and water chemistry. They identified more than 4000 previously unknown species of plants and animals.

1797

Explorer Designs First Diving Suit

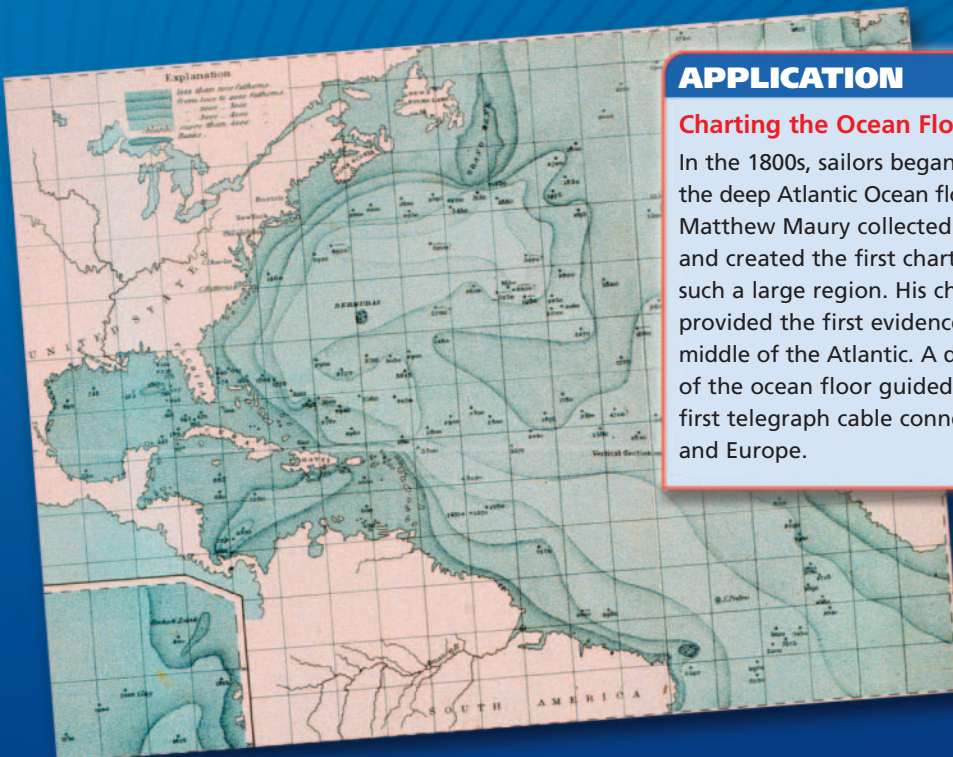
German mechanic Karl Heinrich Klingert combines waterproof clothes and a helmet with two tubes, one for inhaling and one for exhaling. He calls his outfit a diving machine. It allows people to stay underwater for longer periods than ever before.

A.D. 1760

1800

1840

1880



APPLICATION

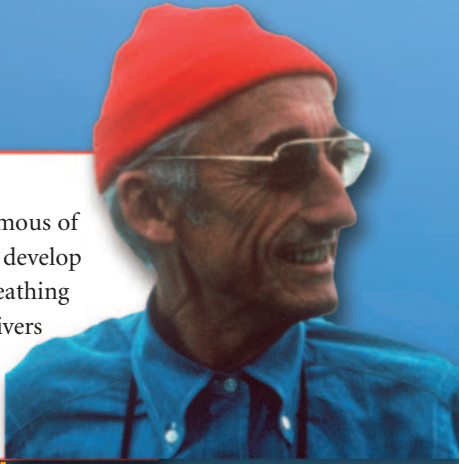
Charting the Ocean Floor

In the 1800s, sailors began recording measurements of the deep Atlantic Ocean floor. The U.S. Navy lieutenant Matthew Maury collected 200 of these measurements and created the first chart showing water depths in such a large region. His chart, completed in 1855, provided the first evidence of mountains in the middle of the Atlantic. A decade later, Maury's studies of the ocean floor guided those who were laying the first telegraph cable connecting the United States and Europe.

1943

Explorer Breathes Underwater

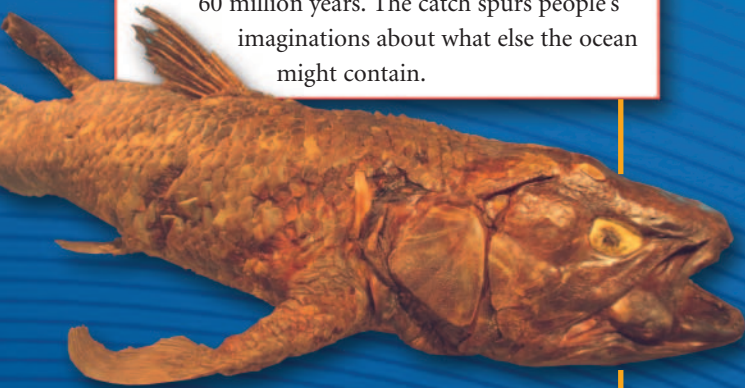
In 1943, Jacques Cousteau, the most famous of 20th-century undersea explorers, helps develop scuba—a self-contained *underwater breathing apparatus*. The breathing gear allows divers to explore depths of 30 meters and beyond without having to wear heavy suits and metal helmets.



1938

Fish with Elbows Caught

Among the day's catch of the South African fisherman Hendrick Goosen is an odd five-foot-long fish with joints in its fins, like elbows and knees. Surprised scientists identify it as a coelacanth, a creature they thought had been extinct for 60 million years. The catch spurs people's imaginations about what else the ocean might contain.



1951

Exploration as Entertainment

Improvements in underwater breathing gear in the 1940s make recreational scuba diving possible. Then, a 1951 movie about scuba-wearing soldiers, *The Frogmen*, spurs popular interest in the activity. The movie inspires more people than ever before to start exploring the underwater world for themselves.

1953

Robotic Probe Searches Ocean

POODLE, the first remote operated vehicle (ROV), is invented. Since ROVs carry no people, they allow more research to be done in deep areas that are difficult for people to travel to.

1900

1920

1940

1960

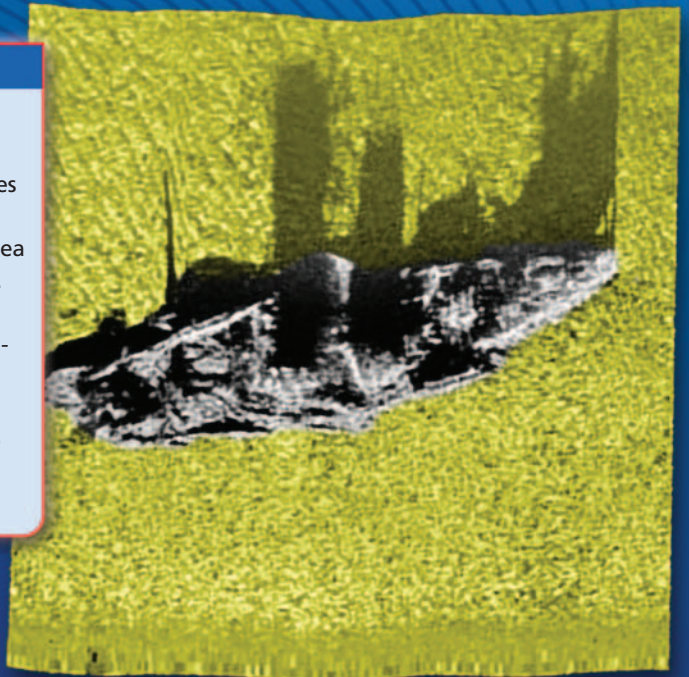
1980

TECHNOLOGY

Sonar

In 1914, Reginald Fessenden developed the first practical instrument for using the echo of a sound to measure distances underwater. This technique, later named sonar, for "sound navigation and ranging," allows scientists to study the undersea world without the expense and danger of going underwater. Sonar has been a valuable tool for measuring the depth of the ocean and the landforms along the bottom. Because temperature and salt concentration affect how sound travels, oceanographers can use sonar to measure these properties as well. One of sonar's most important early uses was to help sailors spot icebergs. Today, industry uses sonar to identify schools of fish, places likely to have oil, and other features.

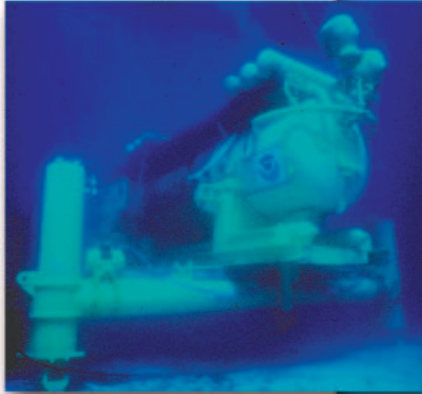
This sonar image, recorded in October 1999, shows a shipwreck at the bottom of Delaware Bay.



1998

Aquarius Keeps Researching

After renovation, the 12-year-old *Aquarius* lab settles on the ocean floor in the Florida Keys. Its crew is investigating a nearby coral reef. They have studied the impact of sewage, the effects of ultraviolet radiation, and chemicals produced by organisms in the reef.



1994

Life Thrives Under Ocean

The discovery of microorganisms thriving in rock pulled up from 500 meters (1600 ft) below the ocean floor raises new questions for scientists. How did the bacteria get there? How do they survive? How many are there? Scientists call the region the deep biosphere.



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2000

TECHNOLOGY

Ocean Buoys

Starting in 2000, scientists scattered in the ocean 3000 buoys equipped with the latest developments in floating technology. These Argo floats then started collecting information on water temperature and salinity. They transmitted data by satellite every 15 days. With this more detailed information about ocean water, scientists may be able to make weather predictions more accurate than ever before.



INTO THE FUTURE

Over the past 5000 years, people have learned more and more about the ocean. This knowledge has helped scientists understand how ocean systems work, how Earth has changed, and what factors influence the weather. Continuing research is expanding knowledge in these areas. New findings could be just as surprising as the previous discovery of a fish considered extinct or of microorganisms deep under the ocean floor.

People will probably continue to catch fish and to drill for oil in the ocean for many decades. In addition, people might find it profitable to use other ocean resources. For example, they might mine gold or manganese. Or they might use the tremendous energy in ocean tides or waves—or in the winds that blow over the ocean—to generate electricity. The ocean is so large that many possibilities for using its resources remain.

ACTIVITIES

Mapping the Sea Floor

Suppose you are in a boat that is traveling in a straight line. You take a sonar reading every one-half minute. Your readings, which show how long sound waves take to reach bottom and return to the surface, are as follows:

- | | |
|---------------|--------------|
| 1. 2 seconds | 3. 3 seconds |
| 2. 0.5 second | 4. 3 seconds |

Sound travels at about 1500 meters per second (4900 ft/s) in seawater.

From this information, draw what the sea floor looks like under the path of your boat.

Writing About Science

Technology has been used for centuries to study the ocean. Trace the history of one piece of technology, such as a submarine, diving gear, sonar, or a depth gauge. Write a short history of that device.