

Mid-Ocean Ridges: Mountains in the Middle of the Ocean



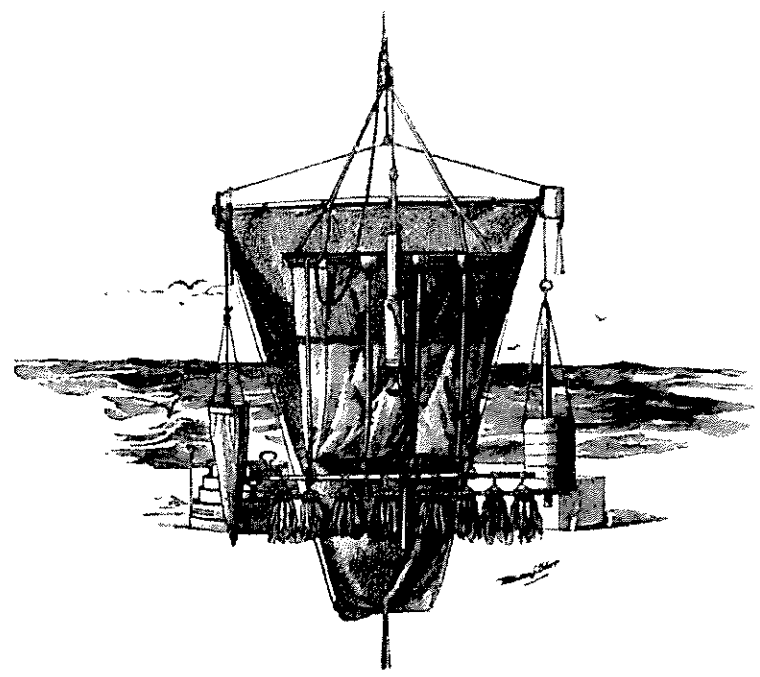
The Mid-Atlantic Ridge is the lighter-colored line that runs between two sets of continents: North America and South America to the left, and Europe and Africa to the right. The ridge is a chain of volcanoes that are formed as the seafloor below the ocean expands. (Image credit: NOAA)

Many questions that scientists ask are “why” questions. As people explore the world around them, they find puzzling discoveries that raise the question, “Why are things the way they are?” This is the story of how one discovery led scientists to ask a very big “why” that took many years to answer.

On December 7, 1872, a ship called the H.M.S. Challenger left England on a 3-year mission to study the world’s oceans. In those days, taking a voyage was a very challenging task. You had to bring your own food and fresh water, and power the voyage with sails, in addition to engines. *Challenger* was a ship of scientific exploration, so also on board the ship were scientific laboratories, equipment for capturing and preserving fish and other ocean animals, and 144 miles of rope.

144 miles of *rope*? How was rope important to scientific exploration? The rope was needed for a process called *sounding* (we'll read about that process in a moment) that would help the scientists achieve one of their most important goals: to make maps of the bottoms of the oceans. Scientists were curious about what the bottom of the ocean looked like--a mystery humans had been living with for centuries!--because there was no way to see the bottom of the ocean just by looking at the water. So the scientists needed another way to develop a picture of the ocean floor. That's where sounding came in.

Here's how sounding worked (it was really very clever). To find out how deep the ocean was at different places, ships would lower the rope with a 100-pound weight on its end. When they felt the rope stop, they knew that they had found the bottom of the ocean. The length of the rope that was *submerged* (under the water) would measure the distance from the surface of the water to the bottom of the ocean. So all they had to do was keep track of how much rope they had lowered into the water to measure the ocean's depth! A scientist would write that down, and that would be one point on the map. As more points were added, the map could be drawn.

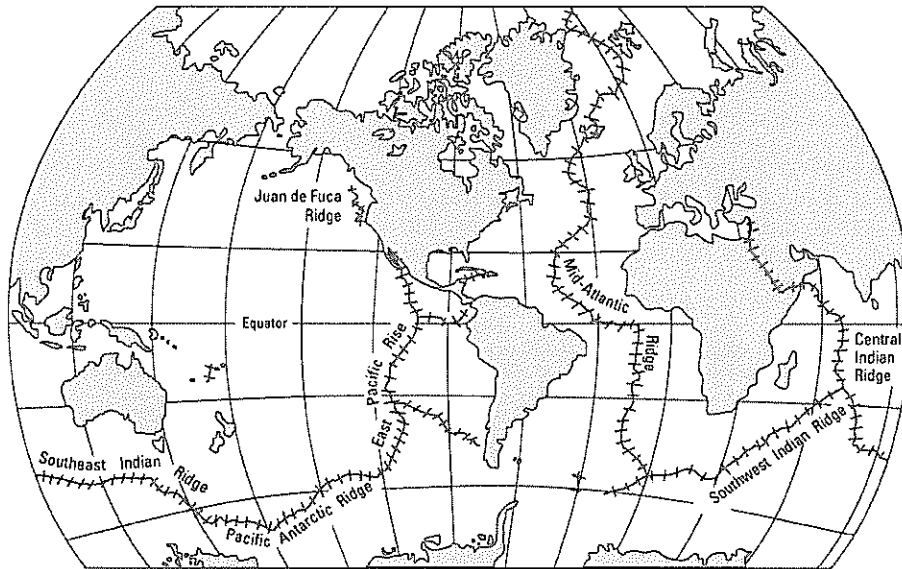


TRAWL, DREDGE, TOW-NET, WATER-BOTTLE, SOUNDING MACHINE, AND SIEVES.

The sounding equipment is the long pipe hanging in the middle. (NOAA/Steve Nicklas)

What did the scientists aboard the Challenger find? On the bottoms of the oceans, also known as *ocean floors*, there were long chains of mountains in the Atlantic, Indian, and Pacific Oceans. They had discovered that that mountain chains were found even under the sea. Once they had discovered that, they wanted to know “why,” but it took more exploration to finally answer that question.

Today, we know that these mountains are volcanoes! The volcanoes form under the oceans when pieces of earth's surface pull apart. All of the land on earth, both above and under the oceans, is divided into pieces that float on hot, molten rock underneath. The pieces are called *tectonic plates*, and they are very large, as you can see from the picture below. This map shows where the plates are pulling away from each other. These are the places where we find the mid-ocean ridges.



The Earth's mid-ocean ridges are connected (United States Geological Survey)

Why do volcanic mountains form at the plate margins? When two plates move away from each other, the hot rock under the surface rises up into the gap between the plates. Think about a slice of pizza with cheese on top. If you split apart the cheese, you'll be able to see the tomato sauce under the cheese. This is the same thing that happens at mid-ocean ridges--what is under the surface comes up when the ocean floor splits apart. Only unlike the tomato sauce, the hot rock continues to flow, so it creates huge spikes: that is, mountains!

Scientists think that 80% of Earth's volcanic eruptions occur under the world's oceans. Underwater volcanoes explain why there are mountains under the oceans, and they have also ended up helping geologists solve one of the biggest puzzles of how the Earth works. The hot rock pushing up *proves* that Earth's plates are moving, creating the mountains we find both under the water and on dry land.

The scientists on H.M.S. Challenger must have been surprised to find so many mountains under the ocean. We can only imagine how much more surprised they would have been to learn that the mountains are volcanoes formed by the movement of Earth's surface!

Check Your Understanding:

1. The *Challenger's* mission was mainly:
 - a. for scientific study of the oceans
 - b. to discover new continents
 - c. to find gold
 - d. to find new routes for trade

2. What is the purpose of sounding?

3. Explain how sounding works.

4. At the bottoms of all the oceans, the scientists on board the *Challenger* found:
 - a. deep valleys
 - b. sunken treasure
 - c. underwater chains of mountains
 - d. strange, glowing fish!

5. What are tectonic plates?

6. Why do volcanic mountains form where two plates pull apart from each other?