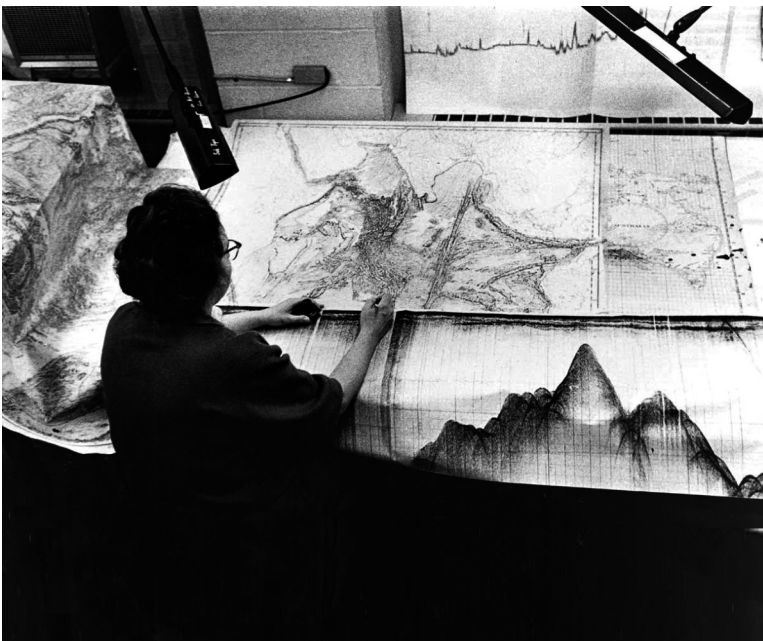


A Revolution Revival: Ridges

"Modern" measurements of ocean depths greatly increased in the 19th century, when deep-sea line soundings (*bathymetric* surveys) were routinely made in the Atlantic and Caribbean. Basically, this involved lowering down a line with a weight (sounding lead) to the bottom of the ocean, and measuring the length of the line.

Simplified maps, called bathymetric chart published by U.S. Navy Lieutenant Matthew Maury revealed the first evidence of underwater mountains in the central Atlantic (which he called "Middle Ground"). This was later confirmed by survey ships laying the trans-Atlantic telegraph cable. Our picture of the ocean floor greatly sharpened after World War I (1914-18), when echo-sounding devices -- primitive sonar systems -- began to measure ocean depth by recording the time it took for a sound signal (commonly an electrically generated "ping") from the ship to bounce off the ocean floor and return. Time graphs of the returned signals revealed that the ocean floor was much more rugged than previously thought. Such echo-sounding measurements clearly demonstrated the continuity and roughness of the submarine mountain chain in the central Atlantic (later called the *Mid-Atlantic Ridge*) suggested by the earlier bathymetric measurements.



Marie working on her 1964 physiographic diagram of the Indian Ocean in Lamont's Oceanography Building. Sounding records are visible beneath her elbows and propped on a ledge in front of her.

Photo courtesy of the Lamont-Doherty Earth Observatory.

This technology improved after World War II, and the first effort to map the entire ocean floor was taken on by Marie Tharp of Columbia University's Lamont Geological Observatory in 1952. Working alongside Bruce Heezen and the artist Heinrich Berann, she created the first map of the North Atlantic in 1957, followed by a world map in 1977.

Marie's work led to the discovery of a rift valley running down the center of the Atlantic Ocean. It was also discovered other "underwater mountains", later named ridges.

Additional information adapted from:

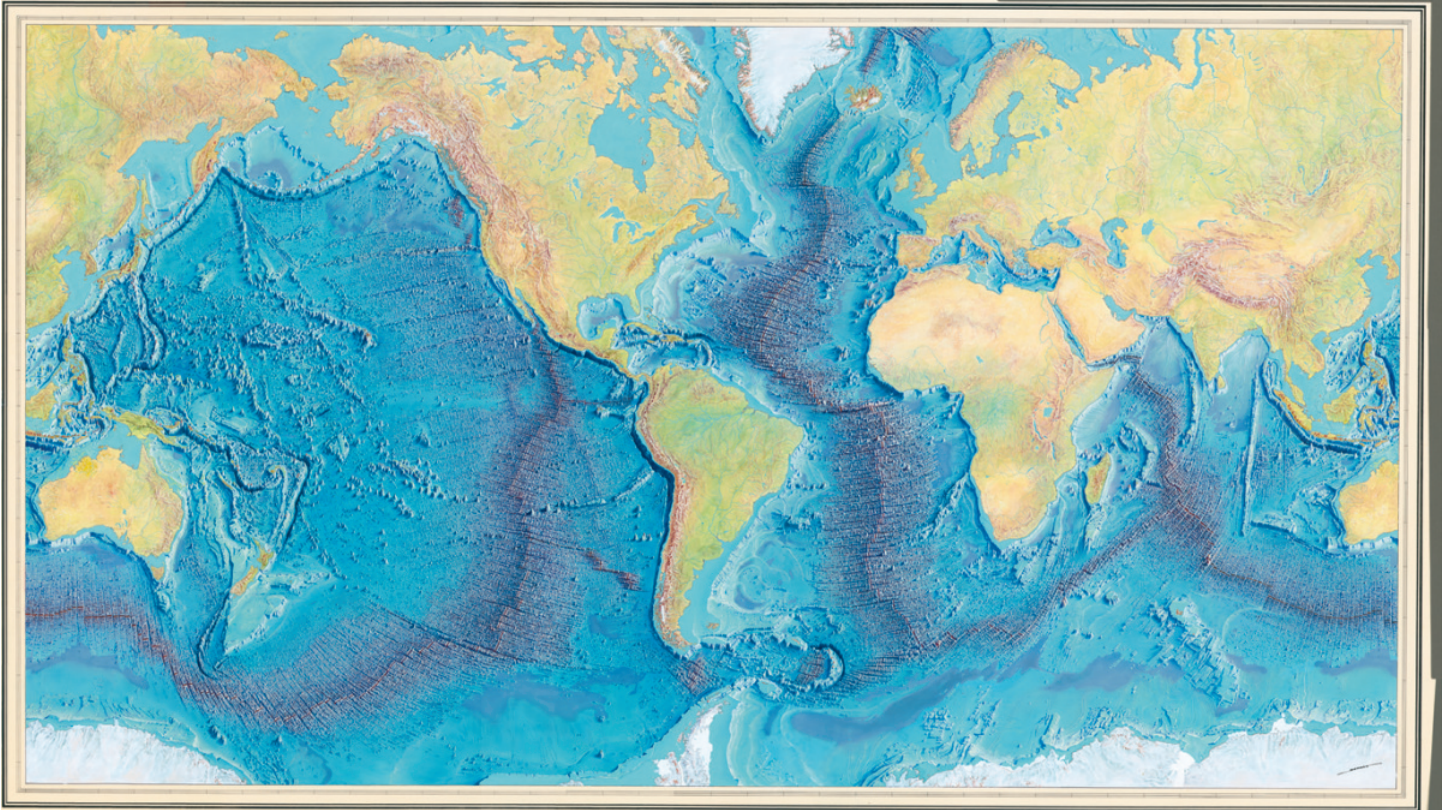
http://www.huffingtonpost.com/hali-felt/marie-tharp-map-ocean_b_1826410.html

Historic narrative adapted from <http://pubs.usgs.gov/gip/dynamic/developing.html>

Emoji from <http://emojipedia.org/smiling-face-with-sunglasses/>

CA NGSS Roll Out #3: Tool E to 6-8 Learning Sequence

A Revolution Revival: Ridges



The 1977 World Ocean Floor Panorama. It was painted by Berann and based on the previous 25 years of Marie and Bruce's work. *Image courtesy of Marie Tharp Maps.*



Examine the map closely and record your observations. Identify the three **MOST IMPORTANT things you learned that will help your team revise and support your claim about how the Earth has changed over time.**