Print

Irminger Sea: Oct 27
Bottom Effect by Dallas Murphy

As a kid obsessed with the ocean, I dreamed that I could descend to the depths where the reds and yellows of the dry-land world disappeared and only ocean-blue remained. Breathing comfortably without artificial aid , seeing clearly, I could float in suspension with the currents and watch wondrous creatures—sailfish, schools of bluefin tuna, giant barracuda, sharks, giant squid, whales—that no one, certainly no adult, had ever seen close up at such depths. The ocean inhabitants didn't pay particular attention to me; I wasn't looking for new friends. I wanted to observe, not alter, their natural behavior. Since I grew up in southeast Florida, I drifted in the Gulf Stream, in its mysterious, unmatchable blue, and these expeditions affirmed my childhood belief that the ocean was a better, far more exciting place to live than Florida.

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At some point, while not much older, I heard about the bottom, I think from Jacques Cousteau, not the near bottom of sand and rock and coral I'd seen through a dive mask, but the deep, really deep, bottom. I was amazed that there were mountains and mountain ranges down there and unimaginably deep gorges and vast flat plains you couldn't drive across in a week. I redirected my imaginary expeditions to the bottom.

"Have you seen the Grand Canyon? It's three miles deep?"

"No, but I've seen the Mariana Trench. It's seven miles deep."

Then I heard about the Mid-Atlantic Ridge.

In 1872, Charles W. Thomson and a team of scientists on the HMS Challenger Expedition, the first-ever dedicated oceanographic cruise, discovered a large rise in the North Atlantic midway between North America and Europe while investigating a possible route for a submerged telegraph cable. But the Challenger scientists were basically measuring the depth of the water, not the shape of the bottom, with the age-old method of dropping a weight, a cannon ball in this case, tied to a long line, and then when weight hit the bottom, they pulled it up and measured the length of the line. Nonetheless, they found "shallow" water, indicating something rising above the bottom, but that's about all they could conclude with this no-tech method.

Sound waves travel very effectively through seawater; whales have been communicating by that method for millions of years. Our version, perhaps clumsy by comparison, is called sonar, but there was no such thing until World War I. In 1930, the existence of the rise was confirmed by sonar, and it gained the name Mid-Atlantic Ridge. As the years passed and another, bigger world war came and went, other investigators using better sonar devices found evidence of similar "rises" in other parts of the North Atlantic and in the South Atlantic. (The "two" Atlantics are artificially separated by the equator.)

Intrigued, scientists, using still more sophisticated acoustic (sound) equipment, began a dedicated study of these curious bottom features. The U.S. Navy, more interested in submarines than science, led the way, running mow-the-lawn-patterns back and forth across the North and South Atlantic. A library of data had been collected, but no one had put it all together until the early 1950s. Bruce Heezen, an oceanographer, Maurice Ewing, a geologist, both from Lamont-Doherty Earth Observatory in New York, decided to have a closer look at this so-called rise. Heezen asked his student, Marie Tharp to compile and plot the data to see if it added up to anything. What Tharp found in her meticulous work turned out to one of the most extraordinary discoveries in both oceanography and geology.

These rises are not merely a series of neighboring mountains spattered across the Atlantic. Instead, it was a single, continuous mountain range originating northeast of Greenland, running through the center of Iceland, then weaving sinuously down the North Atlantic, across the Equator and deep into southern reaches of the South Atlantic, almost to the doorstep of Antarctica. Some of the highest peaks along the ridge soar over 20,000 feet—nearly as high as Mt. Everest—above the surrounding ocean. The North Atlantic Ridge is the largest single geographic feature on the face of the Earth.

There is a great deal more to this story. A related discovery by Tharp and Heezen—that the Ridge is a series of active volcanoes—resulted in one of the great, explain-it-all discoveries in geology, called "plate tectonics." But that story is beyond our scope here.

There is a school of oceanography concerned with the geology of the bottom of the ocean. They would just as soon all the water go away, since it interferes with their study. Dr. Bob, however, is a physical oceanographer, concerned with the water itself, its behavior and flow. But Dr. Bob cannot ignore the bottom features. Many of the deep currents he studies and some of the "surface" currents are directed by the mountains and valleys on the bottom. Iceland, for instance, lies directly on a segment of the Mid-Atlantic Ridge called the Reykjanes Ridge. This and other bottom features including the Greenland "continental" shelf in the vicinity of the Denmark Strait create a very complex, confusing submarine topography that contribute directly to the complexity of the inflow and outflow through the strait.

Remember that giant “waterfall” plunging into the Irminger Sea? There would be no waterfall if the bottom itself didn’t plunge. Water would still flow southward—it must if it first flows north—but everything would be different. The final destination of the water might be different, and as a result our climate might even be different. And that’s only one example of the “bottom effect” in this region, and there are others almost everywhere in the world ocean.

Island by Nick M?ller

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