**Solving the Puzzle Under the Sea: Marie Tharp Maps the Ocean Floor**

Written by Robert Burleigh and Illustrated by Raùl Colón

 Maps. I ***love*** them!

 I love the flow of colors and lines. I love the way I can ***trace*** a path with my finger across mountains or valleys until my finger has traveled thousands of miles-from here to there-on just one page.

 I sometimes feel a map is talking to me. “Marie,” it says. “Have an adventure. Explore. Discover something new.”

 And once-I did.

 I’m Marie Tharp, and my love of maps began way back in the 1930s, when I was a girl. My father’s job was to make maps that helped farmers understand different kinds of soil and what they could be used for. I liked to watch as Dad drew his maps. Sometimes I held his pads and pencils as he worked.

 Dad traveled from state to state to make his maps-from Michigan, to Iowa, to Alabama, and beyond-and the whole family moved along with him. I had attended seventeen schools by the time I graduated high school. Trying topping that!

 Sometimes in class I’d gaze at a large map that hung on the wall. There was France, there was South Africa, there was China-and always the ***vast*** oceans. I had never seen a real ocean. What would it be like to look out at nothing but dark blue as far as the eye could see?

 When I was in college, a teacher pointed out that though the oceans covered more than half the earth’s surface, scientists knew very little about the bottom of the seas. And what did the seafloor really look like? No one seemed to know for sure.

 At last I was a young scientist, graduated from college and eager to work. But was science ready for me? In those days it wasn’t easy being both a woman and a scientist. Once I applied for a scientific job. They told me, “We don’t need any more file clerks.” Because I was a woman, they assumed the only thing I was capable of was taking care of their files!

 Even at the ocean-studies lab at Columbia University in New York, my first boss-Doc Ewing-told me a woman couldn’t go out on the research ships. “Having a woman on a ship is bad luck,” he said. I was amazed. It was 1948. Wasn’t science supposed to be free of silly superstitions?

 But I bit my tongue. That wasn’t going to stop me. I was ***determined***. I took on every little task I could, helping here, assisting there. Yes, I was bored sometimes (once I even thought of quitting), but I kept on. I was looking for something that really excited me, something that might lead to a new idea in the world of science.

 At the lab I worked hard and made lots of friends. One of those friends was Bruce Heezen, a ***colleague*** who worked with me on several projects. Both of us were interested in breaking new ground. How deep were the oceans? Were there mountains beneath the sea? Or was the bottom mostly flat?

 One day we had an exciting idea. Could the seafloor really be mapped? I thought so-and I wanted to give it a try!

 People had long attempted to measure the depth of the oceans. Sailors once lowered weighted ropes to make such measurements. More recently, scientists had begun using machines that sent sound waves from a ship to the seafloor and back again. Using the time it took for the echoes to go and come bouncing back, it was possible to figure out the depth at various points.

 These measurements are called “***soundings***.” As time passed, more soundings were made, including some by my friend Bruce. And these soundings gave me my starting point.

 ***You have to think big***, I told myself. I ***hauled*** a large table into my workroom and covered it with a huge sheet of paper. To me it was a blank canvas filled with possibilities. I couldn’t wait to get started.

 I began by drawing the coastlines-first of the ***Americas***, then of Africa. Between these coasts lay my ***target***: the wide Atlantic Ocean. Next I slowly collected all the soundings available and placed their numbers carefully where they belonged on my map.

 Each sounding told the ocean’s depth at one point. If the sounding number was, say, 16,000 feet, it meant the ocean was 16,000 feet deep right there. And if at a nearby point the depth was, say, only 8,000 feet deep, the sudden difference between the two numbers meant there was probably a mountain-like peak rising upward. And yes, there ***are*** mountains beneath the ocean, just as there are on land.

 It was like piecing together an ***immense*** jigsaw puzzle. I felt like a detective solving a great mystery.

 I was a scientist at last. ***Pinpointing*** the soundings helped me slowly understand the shape of the Atlantic’s floor: from its shallow shores, to its gradual drop-offs where the water deepened, to a long underwater mountain chain-called the Mid-Atlantic Ridge-that ran deep below the surface, north to south.

 I was a kind of artist, too. I used colors to show similar depths-shades of brown, blue, and green. Did all this take time? Yes. Even so, making a scientific discovery is worth it. I couldn’t see it with my eyes, yet a “***portrait***” of the ocean floor was coming into view. But there was even more. Listen.

 I noticed something else, something new and important. The depth numbers on my map suggested that a deeper narrow valley divided the seafloor of the mid-Atlantic into two parts.

 At that time, most scientists believed the earth’s surface never moved. The earth, of course, moved around the sun. Yet the earth’s surface, so these scientists assumed, was fixed, unmoving.

 Other scientists, though, thought differently. They had no idea, or ***hypothesis***, that the earth’s entire surface was divided into several gigantic parts, or “plates.” They thought these plates were being forced apart by deep-sea earthquakes and volcanoes that occurred along the plate edges. And because the continents rested on these plates and moved as they moved, the new theory was called “plate tectonics” or “***continental drift.”***

 Was the new theory true? I believed it was! My map, showing the deep crack, or rift, running between the mountain peaks of the Mid-Atlantic Ridge, was telling me so.

 As I continued working, others wandered in and out of my room, arguing about continental drift. Was it true? Yes, no, yes, no. (Scientists are like that. They question everything. Nothing is for sure-until it’s really for sure.)

 Even my friend Bruce refused to believe the new theory at first. But I ran my finger down the map, following the narrow path of the north-south rift at the center of the Atlantic Ocean’s mountain chain. I smiled to myself, remembering that a picture is worth a thousand words.

 Bruce at last nodded and agreed.

 It felt good. I knew we were changing the way people looked at the earth.

 We asked a landscape painter from Austria to help us with our map’s final printed version. I still remember the first time I saw it-with its rich colors, many markings, plains, and peaks. I felt like an explorer ***gazing*** at a newly discovered part of the world. Other people agreed, I guess because when the map was published, it appeared in museums, in schools, and even on the walls of many homes.

 Was I proud of myself? You bet. I had a fascinating job that led me to map a once unknown part of the earth and to discover things as I went along. That’s about as big as it gets!

 And, yes, my map helped prove that the earth’s surface is moving, too. But don’t worry. You won’t lose your balance. We’re only moving about an inch or two each year!