

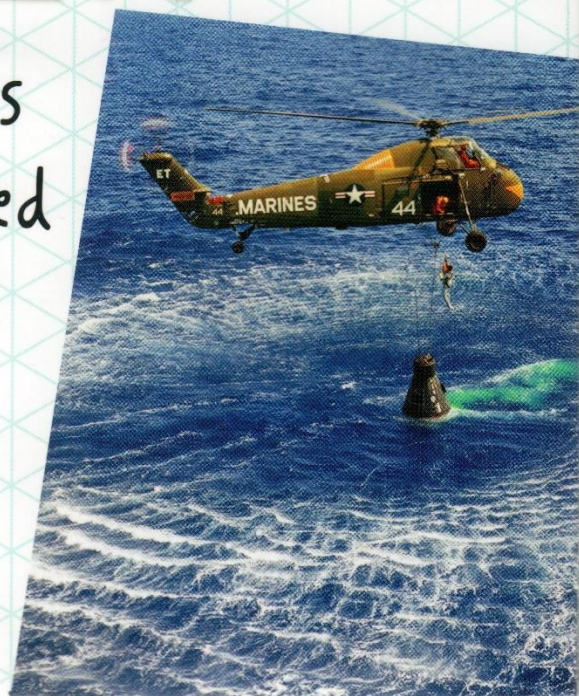


# SUPER WOMEN



Six Scientists  
Who Changed  
the World

LaURie  
LAWLOR





## CHAPTER FOUR

### Marie Tharp

No one knew exactly what was hidden beneath the Atlantic Ocean until Marie Tharp went to work in the summer of 1952 plotting a detailed map of underwater mountains, valleys, ridges, and plains. Using sonar recordings of sea floor depths gathered by Lamont Geological Observatory scientists on research ships, she painstakingly created an image of what the ocean bottom might look like if someone pulled a giant plug and drained out all the water.

Marie noticed something strange as she moved her finger down her drawing of the mountain range that sprawled along the mid-Atlantic sea floor like the ridged spine and long tail of an alligator with its nose pointing to the north. A kind of crack seemed to run along the middle of the range. Excitedly, she checked and rechecked the sonar readings. Yes, it appeared to be a deep valley that followed the crest of the mountains.

Then she noticed something else. Some-

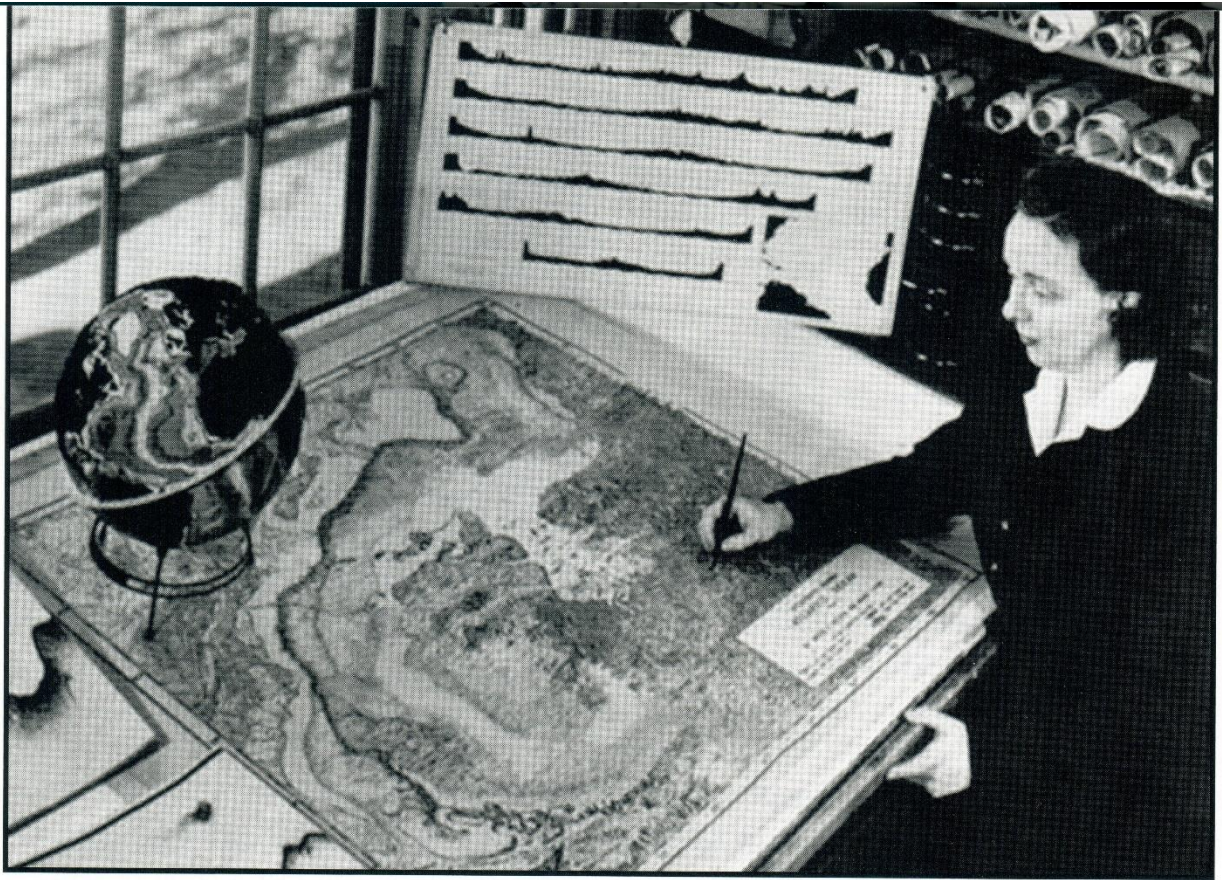
thing even more disturbing. Using another map that charted historical earthquake records, she discovered that a chain of seismic disturbances rocked this deep valley. The crack and the earthquake distribution matched.

Could this be evidence for continental drift—the controversial theory that massive landforms moved and shifted over time?

This notion was scientific heresy in the 1950s. “It was comparable to Copernicus saying that the sun, and not the Earth, was the center of the planetary system,” Marie said. Scientists in the United States were convinced that the Earth’s surface was static or unmoving.

When Marie showed the maps of the deep valley and earthquake records to her coworker Bruce Heezen, the geologist and oceanographer who had helped gather the sonar recordings on Atlantic research expeditions, he was “absolutely horrified.” They





Marie Tharp at work in 1959. The sonar recordings she used to create stunning maps of the ocean floor are shown in rolls behind her and on the drawing table. The prototype of the globe she and Bruce Heezen created is by the window.

might both lose their jobs. Angrily, he called her wacky ideas nothing but “girl talk.” It took hotheaded Marie a year to convince Heezen that she was right.

Marie’s precise drafting showed new clues that seemed to indicate that perhaps there was a dynamic seam in the planet’s crust, a kind of boundary where giant, continent-size plates shifted and shoved. This rift acted like a conveyor belt that caused continents to drift and move. Marie was among the first scientists to notice evidence for “plate tectonics,” as this movement was later called.

For the next three decades she and Bruce worked as collaborators. He collected data at sea; she drew the maps, since women were

not allowed to work on research ships until the late 1960s. The stunning charts they created have been called “the most remarkable achievements in modern cartography.” In their own era, however, their views of the ocean floor ignited controversy that would turn geophysics upside down.

Mapmaking was in Marie’s blood, she always liked to say. She was born July 30, 1920, in Ypsilanti, Michigan. Her father, William Edgar Tharp, who had finished only one year of high school, worked as a soil surveyor for the U.S. Department of Agriculture. “Papa,” as she called him all her life, moved where his work took him from the Midwest to the East Coast, from the Appalachians to the Deep



South. He'd make borings of soils and chart contours of the land—hard, physical work.

As a child Marie loved to travel with him in his big green government truck. (She learned to drive when she was 11.) Her fondest memories were of tramping across the fields looking for arrowheads, “making mud pies and being a general nuisance.” Her mother, Bertha Tharp, was a proper former schoolteacher—a much more shadowy figure in Marie Tharp's recollections.

The family moved so often that Marie never had much time to make friends. She always considered herself something of an outsider—an independent only child accustomed to spending time by herself. Early photographs show her red hair cut in a simple bowl cut; she wears sturdy overalls. Science did not interest her much in her early years, she said. Her mother tried to “civilize” her tomboy daughter with Sunday school and art lessons. When they lived in Washington, D.C., at various times, Marie enjoyed visiting the National Gallery and the Museum of Natural History.

By the time she reached high school, she had attended 18 different schools. The advantage of their constant movement meant that she had a chance to see many different landscapes. She first set eyes on the Atlantic Ocean when she was five or six. This was the time her father did mapping in Mobile County, Alabama. The beach and the constant movement of the waves amazed her.

Science did not intrigue Marie until she attended school in Florence, Alabama.

A teacher seemed to spark her talent. A few years later, her father retired and bought a run-down farm he intended to improve in rural Ohio. Before they had lived there a year, Bertha Tharp died. Marie was only 15. Later, she seldom spoke of her mother, her illness, or her own grief.

Marie decided to go to college at Ohio University. By the time she graduated in 1943, she said she had changed her major every semester. She had a hard time fitting into the college social scene. As she later explained, most people seemed to baffle her. Awkward and opinionated by turn, she struggled to fit in during the early 1940s when co-ed dress mandated conformity. Female students were expected to wear skirts of a certain length, anklets, saddle shoes, and high-neck sweaters with pearls. “Terrible” was the way she remembered the experience of having to look like someone she wasn't.

One thing Marie knew for sure. She did not want to graduate and take on the jobs available to women: secretary or nurse. “I couldn't type and I couldn't stand the sight of blood,” she said. It seemed a relief when she finally discovered that she was good at drafting and geology. By the time she graduated, World War II had begun and she discovered from a notice on a bulletin board that if she completed a certain degree, she could get a job in a scientific area newly open to women: petroleum geology.

Marie attended classes at the University of Michigan to get her degree, and in 1945 traveled to Tulsa, Oklahoma, for a job as



an assistant geologist with an oil company for the astronomical sum of two hundred dollars a month, twice what a teacher made. She was able to take advantage of science jobs that opened up because of the war. She worked at the oil company for three years and meanwhile earned another master's degree. However, she hated the work. "Not too challenging," she wrote of her experience. "Nothing to do. Hot."

In 1946, Marie married a violinist named David Flanagan, whom she'd met in Ohio. He had served in the U.S. Air Force during World War II. Before divorcing in 1952, they moved to New York City. Although she'd earned a bachelor's degree with a double major in English and music (with four minors) at Ohio University in 1943 and a master's degree in geology from the University of Michigan in 1944, and another in mathematics from the

University of Tulsa in 1948, the best job she could find in New York City was working as a lowly research assistant to a group of male graduate students at Columbia University's Lamont Geological Observatory.

Beginning in 1949, Marie spent three years drafting simple maps and occasional diagrams and worked as a number cruncher, punching a primitive adding machine in the cramped geophysical lab. The data that she and the handful of other "human calculator" women in the department used included everything from underwater gravity and acoustics to seafloor depths and topography.

Although Marie had completed more academic training than most of her superiors, her job was strictly arithmetical—nothing theoretical, creative, or intellectually challenging. She became the frazzled go-to person in the department, the one depended



At Lamont's Oceanography building in the mid-1960s, Marie Tharp creates a physiographic diagram of the Indian Ocean. Sonar recordings are shown near her right elbow.