

Cartographer Reveals Hidden 70 Percent of Earth's Surface

By Dr. Gary E. Weir, NGA Historian

"I had a blank canvas to fill with extraordinary possibilities, a fascinating jigsaw puzzle to piece together," said oceanographic cartographer Marie Tharp in an oral history interview conducted for the 50th anniversary of the Lamont-Doherty Earth Observatory in 1999 and as reported in their 2006 news release announcing her death.

"It was a once-in-a-lifetime — a once-in-the-history-of-the-world — opportunity for anyone, but especially for a woman in the 1940s," said Tharp of her oceanographic work.

In 2011 the National Geospatial-Intelligence Agency named a conference room at its new campus in Springfield, Va., for Tharp. The designation celebrates her knowledge of the Earth and her skill as a cartographer; few others knew as well as she did that part of the Earth the ocean hid.

I had the good fortune to know Marie. In her South Nyack, N.Y., home we talked for the best part of two days. She unrolled for me across two banquet tables, situated end-to-end, the brown-paper drafts of the comprehensive map of the ocean floor she composed with her partner, geophysicist Bruce Heezen.

The Office of Naval Research sponsored their work and then published the result in 1977, well before the digital revolution took over the process of making maps. I could see the data points they carefully placed on the paper over many months. She and Heezen also produced groundbreaking maps of the North Atlantic, South Atlantic and Indian Oceans.

Marine scientists and oceanographers who professionally came of age in the 1960s and 1970s universally experienced a revelation upon seeing the Tharp map of the world ocean. Allyn Vine of the Woods Hole Oceanographic Institution, father of the Alvin submersible (a deep-ocean research vehicle), noted that since the formation of the Earth no scientist could possibly form a near true mental image of the ocean floor.

Vine related to me that the Tharp-Heezen map stunned every scientist who viewed it. They could suddenly see the object of their lifelong curiosity in a way previously impossible. Apparently it felt somewhat akin to the experience my generation felt when Life Magazine published the first pictures of the Earth



Photo courtesy of Marie Tharp Maps LLC

Cartographer Marie Tharp appears here as she did when she collaborated with Dr. Bruce Heezen on the first comprehensive map of the world ocean floor.

taken from the Moon. There we were, and it was real! Marie Tharp made the ocean bottom truly real for geologists and physicists.

Born in Ypsilanti, Mich., in 1920, Tharp departed early from the study of English and music that occupied her undergraduate years. World War II took most of the male students off to war and opened graduate programs in the sciences to women as alternative students. Tharp took full advantage of the opportunity. She completed a master's degree in geology at the University of Michigan and another in mathematics at the University of Tulsa.

In 1948, looking for a true challenge, Tharp moved to New York City and found employment at the geology department of Columbia University. She worked initially as a secretary and then began plotting ocean depth soundings as an assistant to the department chairman, Professor William Maurice "Doc" Ewing, one of the founders of the discipline of geophysics in the United States. She followed Ewing to New York's Palisades' area when he established the Lamont Geological Observatory for Columbia University in 1949.



This is the World Ocean Floor Panorama, the first complete map of the world ocean bottom, created by Marie Tharp and Dr. Bruce Heezen at Lamont-Doherty Geological Observatory under U.S. Navy sponsorship in 1977.

In the process of plotting ocean depth soundings which revealed the bottom by echo return, she slowly traced and exposed the existence of a 40,000-mile long geological ridge, running in a curved circuit around the globe. That discovery formed the basis for her more comprehensive work both in the individual oceans and then in the larger 1977 map.

The intensity and regularity of Ewing's program of collecting terrestrial and oceanographic soundings and other data permitted Tharp to take an additional step, making a remarkable and groundbreaking discovery. She revealed the existence of a valley at the pinnacle and along the length of the mid-Atlantic segment of the ridge that she felt looked very much like a rift valley in east Africa. While the suggestion at the time struck many geologists as absurd, others who favored the new hypothesis of seafloor spreading felt it had promise. Time would reveal that Tharp had contributed a significant element to the emerging paradigm of plate tectonics. The seafloor did indeed move to the east and west from the rift valley along the mid-Atlantic ridge, opening up space for the interior of the Earth to extrude new crustal material to fill in the opening gap.

Like so many modern cartographers, Tharp received credit for her work beyond her immediate peers only late in life. The Library of Congress honored her and three other cartographers in 1997 for their contributions to the field during the centennial of their map and geography division. In 2000 the Office of Naval Research included her as one of the seminal personalities in a celebration of the birth of oceanography as a multi-disciplinary science in the United States. I had the opportunity to do an oral history with her at that time, as well as another in conjunction with my own work on the history of oceanography for the U.S. Navy.

A giant in her field, Tharp helped anyone who wished to know the Earth. She set a high standard for her fellows in a venerable, practical scientific endeavor that still serves today as one of the pillars of geospatial intelligence. ✨