
In the early 20th century, the German polar meteorologist Alfred Wegener used fossil and glacial deposits to postulate the prior existence of a large supercontinent (Pangea), which then proceeded to split into pieces over geological time. His theory of continental drift was extremely controversial and rejected by most geologists, primarily because he was not able to provide a physical mechanism for his theory; he could not explain what was happening beneath the Earth’s surface to cause these huge land masses to move about. That mechanism was found in the latter half of the century, ironically in the oceans. By this time, the technology behind SONAR, marine gravity and marine magnetics had advanced to the point that the complexities of the ocean floor and beneath could be unraveled in unprecedented detail. And it took a young woman with a background and training unusual for the time in both geology and mathematics, coupled with art, to have the courage of her convictions and her intellect to posit one of the most fundamental proofs of continental drift: a rift valley caused by the faulting of seafloor spreading. But because she was a woman, her contributions were belittled or outright ignored.

The biographies of Rosalind Franklin and Mileva Maric Einstein may come to mind. Franklin was the chemist whose research was instrumental in Watson and Crick’s discovery of the structure of DNA, but she was largely unheralded and forgotten. Einstein was little more than a footnote in her husband’s biographical story until a 1987 release of his private letters revealed that she was a brilliant and ambitious physicist in her own right. Soundings, by Hali Felt, is yet another account of an amazing female scientist, initially not allowed to function as a scientist, and then once finally allowed to do so, was not given proper recognition for her accomplishments until decades later. The account is extremely well written, well researched, and thus compelling, engaging, celebratory, and, most importantly, instructive.

Interestingly enough, at the beginning of the book Felt interweaves her own story alongside the narrative of Tharp’s. This could have been quite distracting, but for this reviewer lent a level of personalism and authenticity that was attractive, drawing me even further into the Tharp narrative. Indeed, it is remarkable that Felt had never met Tharp, and did not start her work on this book in earnest until after Tharp’s death in 2006. Tharp had no immediate family left when she passed, only her faithful research assistants, affectionately...
dubbed “Tharpophiles.” Yet Felt recreated scenes from her life as if there as a witness, often describing in great and intimate detail what Tharp might have been thinking at many critical junctures. I normally do not pay much attention to the notes section of a book. But this is a work where I would highly recommend a close study of the notes available for each chapter. It is within these pages that Felt very carefully documents her sources, including how and why she felt justified in “interpolating” Tharp’s life and thoughts. As a seagoing mapper of the ocean floor who started working professionally just as Tharp was finally being recognized for her great scientific accomplishments, the pages of Soundings rang very true for this reviewer.

Part one consists of seven chapters chronicling Tharp’s early years, noting that “on one level, for most of the first twenty years of her life, Marie did not publicly display much interest in science. But on another level, it seems that she was, throughout her childhood and adolescence, quietly gathering bits of scientific knowledge like gossip, trying to deduce whether her private crush might be worthy of pursuit (p. 27).” Inspired by many treks into the field with her father, who was a professional soil surveyor for the government, and nourished by very close relationships with both parents, Tharp went on from Ohio University to an accelerated master degree program at the University of Michigan (encouragingly open to women at the time with, so many men off to war in the early 1940s). Those who could complete the degree, male or female, were guaranteed a job in the petroleum industry. Tharp followed suit, gaining a position as a geology assistant with Stanolind Oil in Oklahoma, while simultaneously earning a second bachelor degree in mathematics at the University of Tulsa. Dissatisfaction with her life and station in Oklahoma caused her to move to New York in search of a true research position at Columbia University, where she secured a post in the lab of the iconic Maurice “Doc” Ewing, founder of the Lamont Geological Observatory.

Part two extends through chapter thirteen, covering Tharp’s original days as a drafter for Doc Ewing to her pairing with Bruce Heezen, the most important association of her professional and personal life, and how the two of them began the first systematic, comprehensive attempt to map the entire ocean floor. Heezen collected the data at sea, which he brought back for Tharp to map. Tharp developed a truly unique process for translating millions of ocean-sounding records into a single drawing. During this process she discovered the rift valley of the Mid-Atlantic Ridge, which Heezen at first discounted, holding incorrectly to his expanding Earth theory. In the early 1950s, it was the overlay and correlations with earthquake data via a light-table-enabled process—heralding the world of GIS that was to come—that finally persuaded Heezen to believe in the rift valley. Tharp’s name was absent from the 1956 scientific paper that released this discovery to the world. However, her name was allowed to appear on the landmark 1959 Geological Society of America special paper, The Floors of the Oceans: 1. The North Atlantic. And in 1961, M. N. Hill, writing for
The Geographical Review, “recognized it as a ‘brilliant compilation of much of the information from the North Atlantic’ and said that the authors ‘presented a farsighted interpretation of its meaning (p. 124).”

Chapters fourteen to twenty-four of part three detail the expansion of Tharp’s work with Heezen to the Atlantic and Indian oceans. While their professional collaboration became closer, more fine tuned, and inclusive of opportunities for Tharp to travel abroad with Heezen to scientific meetings, a dangerous professional rift between Heezen and Ewing began to fester in 1965. “The Harassment,” as Heezen and Tharp dubbed it, was a most unfortunate and regrettable circumstance, lasting far too long, and resulting in the eventual dismissal of Tharp from Lamont in 1968. However, Heezen immediately secured funding for her via the Naval Oceanographic Office. It was during this year that she finally had the opportunity to go to sea, and to perform the first ever shipboard processing and plotting of bathymetric data. During this time, Tharp and Heezen also formed a successful partnership with Austrian landscape painter Heinrich Berann to produce several panoramas of the ocean floors, leading to the now famous World Ocean Panorama of 1977.

Part four (chapters twenty-five to twenty-seven) describes the circumstances surrounding the untimely death of Heezen in 1977 while in a submersible on the deep floor of the Atlantic, with Tharp directly above aboard a research vessel. This was just months after the printers had sent the final proofs of their World Ocean Panorama. Part five (chapter twenty-eight to the final chapter thirty-three) chronicles the untiring efforts of Tharp to continue their work and preserve Heezen’s legacy, as well as her own. Tharp was a great storyteller with her words, data, and of course with her maps. So the book ends appropriately with the “story” of the development of the Heezen-Tharp collection in the Library of Congress.

In addition to Tharp’s personal story, Soundings provides such a good overview of the 20th-century history of oceanography that I would recommend it as required reading for all oceanography students, particularly those in marine geology. There are very important insights to be had for students of cartography as well. As her first, long-time employer, Doc Ewing, invented the field of marine geophysics, Tharp invented the field of marine cartography. However, unlike marine geophysics, marine cartography is not formally taught as part of either an oceanography or geography degree. In fact, the UNESCO International Oceanographic Data Exchange (IODE) rightly points out that there isn’t even a formal, accredited academic degree or curricula in oceanographic data management. Hopefully these circumstances will quickly change given the ubiquity of mapping technologies and data, the emergence of neocartography and crowdsourcing, and the need for cartographers of both land and ocean to integrate sound theory and intuitive design with ever-evolving technology.