James Ransom Heirtzler: A Tribute

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Abstract James Ransom Heirtzler passed away in Silver Spring, Maryland, on 15 July 2022, at age 96. He was born in Baton Rouge, Louisiana, on 16 September 1925. James served in the U.S. Navy in the tropical and western Pacific during 1944–1946. He graduated from New York University obtaining a Ph.D. in Physics in 1953 and taught at the American University of Beirut 1953–1956. Dr. Heirtzler was at Columbia University 1960–1969, at Woods Hole Oceanographic Institution 1969–1985, and then at NASA Goddard Space Flight Center until retiring in 2004. He authored or coauthored 168 scientific articles, edited numerous books and participated in the production of the documentary movie “Where the Earth Turns Inside Out.” James was a fellow of the American Geophysical Union, the Geological Society of America, and the American Physical Society. He led scientific cruises in all the oceans of the world and had expeditions in both Polar Regions. Dr. Heirtzler has two Antarctic geological features and a microfossil named for him: the Heirtzler Ice Piedmont (72°34′S and 61°25′W), the Heirtzler Fracture Zone (63°30′S and 162°30′E), and the microfossil “Pithonella heirtzleri.”

Plain Language Summary James Ransom Heirtzler passed away in Silver Spring, Maryland on 15 July 2022 at age 96. Dr. Heirtzler studied magnetic anomalies over the sea floor. Magnetic study performed by Dr. Heirtzler and his group over Reykjanes Ridge showed that European and American Plates are separating from each other at a rate of about 1 cm per year. That was the first clear evidence for what is now called Plate Tectonics.

James Ransom Heirtzler was born in Baton Rouge, Louisiana, on 16 September 1925. During World War II James served in the U.S. Navy in the Pacific (1944–1946) (Figure 1). With this experience James developed a love to the oceans and an interest in marine geophysics. He received his M.S. from Louisiana State University in 1948 and his Ph.D. in Physics from the New York University in 1953. That year he was appointed Assistant Professor of Physics at the American University in Beirut, Lebanon, where he stayed until 1956.

In the late fifties (1956–1960), James became a senior physicist at General Dynamics Corporation studying geomagnetic field fluctuations. While working on a classified U.S. Navy project James discovered that submarines produces a unique magnetic signal of a given strength and pattern. It was the time of the Cold War between the U.S. and the Soviet Union, with submarines in all the ocean basins, and the fact that the locations of these submarines could be defined by their magnetic signals was invaluable. Later on, this discovery would help James to locate the remains of Navy nuclear submarine Thresher, the first nuclear submarine lost at sea.

In 1960, James went to the Lamont Doherty Geological Observatory at Columbia University where he served as Senior Research Associate until 1967. At that time, Lamont was under the directorship of Maurice “Doc” Ewing, who strongly supported research in marine geomagnetism. Observations were made by towing a proton precession magnetometer behind research ships and accurately measuring the strength of the earth's magnetic field. These data, when combined with other types of measurements, yielded important information about the geological structures beneath the sea floor (Heirtzler, 2016).

Vine and Matthews (1963), following the sea floor spreading model, suggested that the massive body of volcanic rocks created at the axis of mid-oceanic ridges separated into two oceanic plates and become magnetized in the direction of the Earth's ambient magnetic field as they cooled. They assumed that the magnetic field had been reversed in the past, still a contentious idea in 1963. However, in 1964, largely due to the findings of Cox et al. (1964) and Opdyke et al. (1966), paleomagnetic reversals of Earth's magnetic field became widely accepted and a chronology of geomagnetic field reversals for the last 3 million years became defined. At the same time, a detailed aeromagnetic survey was performed over southern part of Reykjanes Ridge (Heirtzler...
et al., 1966) and beautiful profiles of lineated magnetic anomalies have been observed (Heirtzler, 2016). Geomagnetic data supported the ideas of Vine and Matthews (1963) and justified the hypothesis that the North American and European plates are separating from each other at a rate of about one cm per year. This was the first clear evidence for what is now called plate tectonics. Moreover, due to this research, the paleomagnetic reversal time scale was extended back to 10 million years and the theory of Plate Tectonics soon became widely accepted.

In addition to being involved in this groundbreaking geomagnetic research, James spent a good deal of time aboard ships (especially the R/V Vema) carrying out an array of research experiments and occasionally putting this research to practical use. An early use of the magnetometer was in 1963 when the U.S. naval submarine Thresher, one of the early adopters of nuclear energy for propulsion, sank with 120 men off the coast of Boston. A proton precession magnetometer was altered to allow it to function underwater near the sea floor (Heirtzler, 1964), and the specific magnetic signal of the submarine was recorded. The Thresher was found due to efforts of many institutions and an account of the event was published in Science in 1964 in (Spiess & Maxwell, 1964). James participated in several other searches over the course of his time at Lamont before being transferred to Columbia’s Hudson Laboratories, where he served as director during 1967–1969.

In 1969, James accepted a position as the Chair of the Department of Geology and Geophysics at the Woods Hole Oceanographic Institution (WHOI). His first cruise was down the east coast of Africa, where a geophysical study of the Indian Ocean was performed. As a result of this experiment, James edited, with John Sclater, the geophysical portion of a groundbreaking book on “Indian Ocean Geology and Biostratigraphy” (Heirtzler et al., 1977).

At WHOI, one of the James’s prominent projects was the French-American Mid-Ocean Undersea Study (FAMOUS) where, with Xavier Le Pichon, he explored the axis of the Mid-Atlantic Ridge south of the Azores using the deep submersible ALVIN (Heirtzler, 1975a). Due to the importance of the joint study, the New York Times science reporter and National Geographic photographer and documentary filmmaker Walter Sullivan came along. As a result, the documentary “Where the Earth Turns Inside Out” was created and distributed by WGBH Boston (Heirtzler, 1975b).

Later on, James Heirtzler became more involved in research activities on the drill ship “Glomar Challenger” and served as the Chairman of the Planning Committee to decide which research activities would be pursued. James also served as the Chief Scientist on two drilling cruises (Figure 2). The first cruise, in late 1972, departed from Perth Australia and circled around western Australia (Figure 3) (Heirtzler, 2016).

While James was working at WHOI, the Soviet Union became the first non-US member of the project called the Deep Sea Drilling Project. As part of this collaboration, a Russian research ship “Academician Kurchatov” visited WHOI in 1975. One of the scientists introduced herself to James as “Katherine Nazarova,” who was at that time a postdoc in rock magnetism and paleomagnetism. Throughout the years, Drs. Nazarova’s and Heirtzler’s paths kept crossing in different scientific meetings and in 1991 Katherine and James got married (Heirtzler, 2016).

From 1986 to 1991 James was head of the Geology and Geomagnetic Branch at the NASA Goddard Space Flight Center, from which he retired in 2004. Although James Heirtzler had many discoveries during his long and illustrious career, he is probably best known as an author of the classic series of papers describing fascinating results of magnetic surveys in different parts of the world’s ocean, published in the Journal of Geophysical Research in 1968 (Davidson & Heirtzler, 1968; Dickson et al., 1968; Le Pichon & Heirtzler, 1968; Pitman et al., 1968). In 2011, James encouraged his colleagues to submit a brief account of their experiences during the early days of Lamont Doherty Earth Observatory, and 39 stories have been received, with the collection published at a website of the American Institute of Physics in Niels Bohr Library and Archives: https://repository.aip.org/islandora/object/nbla:6273#page/22/mode/2up (Early Lamont, 2002).
Figure 2. Photo taken aboard “Glomar Challenger” 15 February 1976.

Figure 3. James Heirtzler and John Veevers in front of Glomar Challenger, Perth, Australia, 1972.
James has two geological features named after him: the Heirtzler Ice Piedmont (72°34′S and 61°25′W; Wikipedia. https://en.wikipedia.org/wiki/Heirtzler_Ice_Piedmont) can be found on the black coast od Palmer Land, Antarctica, and the Heirtzler Fracture Zone (63°30′S and 162°30′E; Wikipedia. https://en.wikipedia.org/wiki/Heirtzler_Fracture_Zone) is located south of New Zealand. In addition, James has a microfossil named after him: “Pithonella heirtzleri.”

Author of more than 150 scientific articles, 15 popular articles, 11 technical reports, two atlases, and one documentary movie, James was a fellow of the American Geophysical Union, the Geological Society of America, and the American Physical Society. He was also President elect of the AGU Geomagnetism and Paleomagnetism section (1980–1984) and received many awards at home and abroad (e.g., the Otto Schmidt Medal, Institute of Physics of the Earth, Moscow, 1994). James Heirtzler’s importance in the development of plate tectonics was underscored in 1995 when a special session was held at the AGU Spring Meeting to honor him in anticipation of his seventieth birthday. The session was entitled “Spanning the Plate Tectonic Revolution: The career of James R Heirtzler.”

James was a man of integrity, and many friends and colleagues admired his kind, warm, and modest personality. He was also an avid runner and participated in many marathons in the U.S. and abroad (Figure 4).

James Heirtzler is survived by his wife Katherine and three sons.

**Data Availability Statement**

Data were not used, nor created for this research.
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