

obituary

Bruce C. Heezen

PROFESSOR Bruce C. Heezen of the Lamont-Doherty Geological Observatory, New York, died on 21 June 1977 at the age of 53 of a heart attack while working on board the U.S. nuclear research submarine NR-1 studying the Reykjanes Ridge south of Iceland.

With his late colleague, Professor Maurice Ewing who was founder and director of the Lamont (later Lamont-Doherty) Geological Observatory, Bruce Heezen played a major part in the rapid post-war expansion of our understanding of the morphology and geology of the deep ocean floor, on which the now widely accepted theory of plate tectonics is based.

During the war the techniques for studying the deep ocean improved immensely so that in the early 1950s all sorts of new geological and geophysical data were being collected from the increasing number of research cruises. With Maurice Ewing, Bruce Heezen saw the enormous potential in the thorough compilation and analysis of these data, especially the morphology, on a world-wide scale. Because of the restrictive attitudes of the U.S. Navy on the publication of contour charts, he was forced to develop, with the cartographic skills of Marie Tharp, the physiographic diagram style of presentation of seabed morphology. These charts, several of which were published by the National Geographic Magazine, have been widely used by those interested in the oceans and have contributed significantly to an appreciation of what lies beneath the sea surface. His analysis of ocean floor morphology, initially of the North Atlantic and published as a Special Paper of the Geological Society of America in 1959 but later extended world-wide, became the basis of a physiographic classification used now by oceanographers, geologists and even by lawyers.

During these morphological studies in the late 1950s he made what I believe to be his greatest contribution to the earth sciences. He recognised that the major ridge systems which lay roughly in the centre of many oceans were in fact linked into one continuous, although sinuous, mountain range 40,000 miles long and covering an area equal to that of all the continents combined. He found that the axis of this mid-ocean ridge system was associated with shallow seismicity and was able to predict the existence of hitherto unknown ridges southeast

of Africa and across the Arctic ocean. Along the axis Heezen, and his colleagues Tharp and Ewing, noted a more or less continuous valley which was morphologically similar to and actually linked to the Red Sea and the East African rifts, and also to the tension cracks in the central Icelandic graben. It was clear that along this 40,000 mile axis the crust of the earth was under tension and splitting apart. Heezen saw this initially as evidence for an expanding earth but dropped this idea when the subduction mechanism was discovered to absorb the excess crust and global plate tectonic theory developed.

Although Heezen was able to view the oceans on a global scale, he was concerned with all scales of deep-sea geological processes. He recognised that far from being quiet passive regions, the abyssal deeps were disturbed by fierce and destructive turbidity currents which contributed to the cutting of submarine canyons, transported sediment great distances along the sea floor and which gave rise to abyssal plains. He was interested in all modes of sedimentation and pioneered the study of deep-sea bedforms, such as sand waves and dunes, and their relation to near-bottom ocean water movement. In his search for details of bottom processes he exploited the use of bottom photography to the full, superbly and readably presented to the general public in his book with Hollister, *The Face of the Deep* (1971) nominated for a U.S. National Book Award, and in the last decade he made numerous dives in research submersibles to observe the bottom directly.

Heezen was much concerned with the practical problems presented by the deep ocean. For years he advised the cable industry on the potential hazards to deep-sea cables from geological causes and much of his submersible work was directly related to naval requirements. He was an ardent supporter of international collaboration, especially the GEBCO bathymetric chart project, and pioneered the cartographic presentation of geological and tectonic data for the Commission for the Geological Map of the World.

Born in Iowa, Bruce Heezen obtained his bachelor's degree from the University of Iowa in 1948 and his Ph.D. from Columbia University in 1957. He joined Maurice Ewing in the formative stages of the Lamont Geological Observatory and spent his work-

ing life there, becoming assistant professor in 1960 and associate professor in 1964. He was an enthusiastic and hard-driving seagoing scientist dedicated to using ship-time to its fullest extent. In the same way he used his time ashore to the full, often hard at work until the small hours in his rambling and paper-filled house on the Hudson River and yet never too busy to devote time to his students. Neither did he stint himself in some of the pleasures of life. He was always good for a party, beaming, boyish in appearance and heavy in build. He had a strong and provocative personality, not mincing his words when he felt strongly about an issue, and it was tragic, but perhaps inevitable, that his early collaboration with the equally strong personality of Maurice Ewing should have changed into a bitter quarrel in which both parties as well as the science suffered.

Heezen's contributions to science have been recognised by the award of the Cullum Geographical Medal and the Francis Shepard Medal for excellence in marine geology, and in June this year by the award by the American Geophysical Union of the prestigious Walter H. Bucher Medal for his life's work of "original contributions to the basic knowledge of the earth's crust."

His loss will be keenly felt by his life-long collaborator, Marie Tharp, his many colleagues, friends and students, and by the whole marine geological community who owe so much to his energetic research, his insight into the deep oceans of the world and his inspiration of his students.

A. S. Laughton

Howard Hinton

PROFESSOR Howard Everest Hinton FRS died on 2 August 1977, aged 64. He was one of the few remaining polymaths in the field of biology, having wide interests in many branches of the subject. However, he had a remarkable ability to become expert in any topic within a remarkably short time, so that few of his acquaintances, meeting him in connection with one facet of his interests, realised that this was not his major subject of study. Even his friends were often surprised by discovering his involvement in new fields of interest in science and the arts, as well as by his political naivety.

Hinton was born in Mexico, and his