

ROBERT C. BARBER

Henri Edmison Duckworth
1915-2008



Harry Duckworth, charter member and past president of CAP, professor and university administrator, died on December 18, 2008 in Winnipeg at the age of 93 after a short illness.

Harry was born in Brandon MB, November 1, 1915, the only child of Rev. Henry B. Duckworth and Ann Edmison, and grew up in Winnipeg where he attended Wesley College (B.A. 1935; now part of the University of Winnipeg) and the University of Manitoba (B.Sc. 1936). After teaching in Stonewall, Manitoba, and at United College in Winnipeg, he obtained the Ph.D. in physics at the University of Chicago (1942) working with Arthur Dempster, the pioneer mass spectroscopist.

Upon graduation, he was commissioned a Second Lieutenant in the Royal Canadian Corps of Signals, but was soon assigned to scientific war research on radar at the National Research Council in Ottawa. In the summer of 1944 he was given the opportunity to join Harry Thode's group at McMaster University, an outpost of the "Montreal Laboratory" which was engaged in the design of a pilot plant for the production of plutonium. His task was the construction of a mass spectrograph for the analysis of solid fission products, a project only just completed by the following summer.

He returned to the University of Manitoba in 1945 as an assistant professor of physics, taking with him the mass spectrograph with which he and a senior student, Ben Hogg, determined the abundances of the copper isotopes. It quickly became clear that a heavy teaching load would prevent progress in research. In the following year, on the recommendation of Dempster, he was lured to Wesleyan University, in Middletown, Connecticut, with the offer of an Associate Professorship, and, more importantly, a grant of \$10,000 to build a high resolution mass spectrograph to replace the first instrument that had been returned to McMaster. During the testing of the new instrument he searched for some hypothetical stable isotopes and discovered the last stable isotope of any element to be observed, namely, ^{190}Pt , which has an abundance of about 1 part in 10,000. To his surprise, this result was reported on the front page of *The New York Times*.

The research program was directed, however, at the study of nuclear binding energies by the determination of atomic masses. In 1949 Maria Goeppert-Meyer proposed, on the basis of experimental data, that there were nuclear shells for 2, 8, 20, 28, 50, 82 and 126 protons and for 2, 8, 20, 28, 50, 82 and 126 neutrons. Harry was uniquely placed, having the only laboratory ready and able to observe the dramatic changes that occur as one moves through these "magic numbers". In the next four years, they reported the masses of practically all of the stable atoms above silicon in a series of papers in the *Physical Review* and in *Nature*.

The graduate program at Wesleyan did not go beyond the M.Sc. level. Accordingly, in 1951 he was attracted to McMaster University as a Professor, with the promise of the development of a Ph.D. program in physics. Arrangements were made to move the mass spectrograph so that the work might continue. Then in 1954, the slow construction of a large mass spectrometer, having electrical detection rather than photographic plates, and having a radius of 9 feet (2.74 m) was

begun. Operation at its designed resolution was achieved in 1961. This was the first, and most productive, of several large instruments worldwide then under construction. With it an improvement in precision of more than two orders of magnitude was achieved and the change in nuclear binding associated with the change in nuclear shape around 90 neutrons was delineated. In these years he not only became recognised as one of Canada's foremost scientists, but also established a reputation both as a favourite teacher of physics and as a prized after dinner speaker.

He moved to the University of Manitoba in 1965, with an appointment as Vice-President. He was accompanied by R.C. Barber, who had been his Ph.D. student and then his Post-Doctoral Fellow at McMaster, and was now appointed Assistant Professor of Physics. The large mass spectrometer came to Manitoba a year later, and was incorporated into the collaborative research program of Duckworth and Barber. Prior to the move, the components of a new, second generation high resolution mass spectrometer (called "Manitoba II") had been under construction at several locations in Ontario. This instrument was assembled for the first time in Winnipeg and began full operation two years later.

He was appointed President of the University of Winnipeg in 1971, but continued to attract a significant part of the group's funding and to supervise graduate students and post-doctoral fellows until the late 1970s. As President, he oversaw a period of rapid development of the University of Winnipeg that he greatly enjoyed. In tribute to his interest in sport, the University's new sport facility bears his name. Following his retirement in 1981, he was active in academic and community affairs and, in 1986, was elected Chancellor of the University of Manitoba, serving until 1992.

During his career, he served on all the major scientific councils in Canada – the National Research Council, the Science Council, the Defense Research Board, and the Natural Sciences and Engineering Research Council. A charter member of the Canadian Association of Physicists (CAP, 1945), he served as President in 1960-1. In 1954 he became a Fellow of the American Physical Society and a Fellow of the Royal Society of Canada, later serving as its President (1971-2). He received the CAP's Medal of Achievement in 1964, and the Tory Medal of the RSC in 1965. He was appointed an Officer of the Order of Canada in 1976 and has been awarded ten honorary degrees.

He was a central figure in the small international community of physicists studying atomic masses. It was he who proposed in 1958 that the International Union of Pure and Applied Physics (IUPAP) form a Commission on Atomic Masses and that international conferences on the subject be held. He organised two of these conferences (1960 Hamilton and 1967 Winnipeg) at a time when such international conferences in Canada were rare. This developed into a series of conferences held every three or four years until the present. He was also instrumental in negotiating the coordinated change in the atomic mass scale from the chemical scale where $O = 16$ amu and the physical scale where $^{16}O = 16$ amu to the scale $^{12}C = 12$ u. The change was

approved by IUPAC in 1959 and by IUPAP in 1960. In recognition of his contributions he was awarded the SUN-AMCO medal of IUPAP in 1992.

He was predeceased by his first wife, Katherine Jane McPherson, whom he had married in 1942 and who died in 1991. In 1995 he married Shirley Craik, and acquired a second family of daughters and grandchildren. He is survived by wife Shirley; children Harry (Mary Lynn) and Jane (Andrew Maksymiuk); Shirley's daughters Judy (Pat Anglesey), Polly (David Rattray), and Donna (Thor Thorleifson); grandchildren Daniel (Minerva Hernandez Iraheta), Michael, Catherine, Hannah, Jake, Jesse, Claudia, Will, Paul and Olivia; great-granddaughters Catalina and Jane.

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(Author's title given as of the time of writing)