

# Obituaries

KENNETH MacKENZIE

## Physicist helped find elusive element

Worked on Manhattan Project, investigated nuclear fusion as source of clean energy

BY TOM HAWTHORN, VICTORIA

Before he was 30, Ken MacKenzie had helped discover one of the last remaining elements of the periodic table. His next task was to solve one of the mysteries that unlocked the power of the atomic bomb.

Dr. MacKenzie, who has died in Los Angeles, aged 90, was a brilliant physicist who spent the last half of his life studying thermonuclear fusion as a source of clean energy. He also founded the Plasma Physics Laboratory at the University of California at Los Angeles.

In 1940, he was a doctoral student when he and two colleagues identified element 85 of the periodic table, which they named astatine. The discovery earned the quiet, modest and determined man a permanent place in scientific lore.

Kenneth Ross MacKenzie, who was born in Portland, Ore., moved with his family to Victoria in 1922 at age 10 after his father was hired by the provincial government.

Before radio had become a mass entertainment, young Ken built a crystal set in the basement of the family home with the proceeds from his paper route. Neighbours gathered to listen to the newfangled wonder, amazed that it snatched sounds from the air. "It was the only one in the neighbourhood, so it was quite a marvel," said his sister, Betty Nickull of Nanaimo, B.C.

He attended Victoria College for

two years before completing a bachelor's degree at the University of British Columbia in 1935. His precocious brilliance did not free him from the drudgery of labour, as he worked at a sawmill and sometimes had to sell his blood to buy food. His finances improved, however, after he concocted an ingenious cream separator from quarter-inch aluminum tubing he had found at the university's physics lab. He and his roommate, Franc Joubin, who would become a legendary prospector and millionaire, went door-to-door in Vancouver sweet-talking housewives into buying the contraption.

Ken MacKenzie earned a master's degree at UBC in 1937, the same year in which he married Lillian Stark, a nurse from Victoria. He then pursued his doctorate in nuclear physics at the University of California at Berkeley. His supervisor was Ernest O. Lawrence, the experimental physicist who in 1930 had built the world's first cyclotron, which has been described as a sort of nuclear pump, accelerating nuclear particles in a circular magnetic field.

"It was an exciting time," said Byron Wright, 84, a Texan who befriended Dr. MacKenzie when both were doctoral students in 1938. Dr. MacKenzie was teamed with post-doctoral student Dale R. Corson, the future president of Cornell University, and research associate Emilio Segrè, the Italian who was

**Kenneth MacKenzie: Among his early inventions was an ingenious cream separator that he sold door-to-door in 1930s Vancouver.**

renowned physicist Enrico Fermi's first doctoral candidate. (Segrè would share the 1959 Nobel Prize for physics with Owen Chamberlain for discovering the antiproton.)

In 1940, they bombarded bismuth with accelerated alpha particles in the cyclotron. The experiment yielded element 85, a predicted, but undiscovered, piece of the periodic table. The radioactive element was called eka-iodine and later renamed astatine, from *astatos*, the Greek for unstable.

The trio's discovery was announced during ceremonies for Prof. Lawrence when he was being presented with the Nobel Prize for physics. At the time, it was thought their creation of the synthetic ma-

terial had plugged one of two remaining holes in the periodic table.

In late 1941, Prof. Lawrence and others, including Dr. MacKenzie, constructed a new cyclotron with a 470-centimetre magnet. The monster atom smasher would soon be used in the race to develop the world's first atomic bomb.

Dr. MacKenzie and Dr. Wright were assigned to the giant wartime complex hurriedly under construction at Oak Ridge, Tenn. Some of the scientists thought they were working on a fuel for aircraft, others for submarines. Over time, they were told, or figured out, the true nature of their endeavours.

Their role in the top-secret Manhattan Project was to produce

enough fissionable material for use in a bomb. "We didn't discover anything," Dr. Wright said afterward. "We produced some uranium for a bomb. A lot of things were done by trial-and-error. Fortunately, we were successful in producing the materials for the first practical bomb."

Immediately after the war, Dr. MacKenzie and his colleagues at Berkeley converted the 94-centimetre cyclotron into the world's first synchrocyclotron, opening the door to the field of particle physics.

Dr. MacKenzie returned to UBC in Vancouver for a year, but one of his children suffered rheumatic fever, and the family returned to

California for its drier climate. He joined the UCLA faculty in 1947. He would teach and conduct research on campus for more than four decades until slowed by ill health.

In 1958, Dr. MacKenzie and Dr. Wright went into business as owners of MEVA Corp., an acronym for million-electrical-volt accelerator. They built a small cyclotron for teaching purposes before selling the company to Hughes Aircraft. "It was probably the smallest amount of money paid from one corporation to another," said Dr. Wright, who is now a professor emeritus of physics at UCLA.

In the 1960s, Dr. MacKenzie turned his formidable intellect to studying plasma, the hot, turbulent, gas-like matter that is believed to comprise the vast majority of the solar system. It had been his hope that hidden in plasma was the secret to destroying toxic waste, to neutralizing chemical and biological weapons, and to generating clean energy through fusion.

His expertise in cyclotrons and radio-frequency techniques was called on during the construction of UBC's TRIUMF facility, Canada's national laboratory for particle and nuclear physics. Dr. MacKenzie was a paid consultant on the project from 1968 until the cyclotron became operational in 1974.

He was also fascinated by Albert Einstein's genius, and worked intermittently on a book explaining the theory of relativity for use by freshmen in disciplines other than science. The book was unfinished when he was made immobile by the last of a series of strokes. He died at his Los Angeles home on July 4 of complications from a stroke.

Dr. MacKenzie leaves his second wife, Verna, whom he married in 1981; three adult children from his first marriage; three stepsons; sister Betty Nickull of Nanaimo; brothers Robert of Tacoma, Wash., and Ronald of Oakland, Calif.; and a half-brother, Rod MacKenzie. He was predeceased by his first wife, from whom he had divorced.

A public memorial will be held this fall at UCLA.

Dr. MacKenzie was modest to a fault. His second wife only learned of his great achievement after a visitor invited her to check the entry for astatine in her copy of *The Encyclopedia Britannica*. She was stunned to find her husband's name.

■ **Kenneth MacKenzie**, nuclear physicist; born in Portland, Ore., on June 15, 1912; died in Los Angeles on July 4, 2002.

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