Robert Vivian Pound

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obituaries

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Indrek Martinson

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Indrek Martinson, an internationally recognized expert on accelerator-based atomic physics, died unexpectedly but peacefully in Södra Sandby, Sweden, on 14 November 2009. Indrek was an emeritus professor at the University of Lund in Sweden and director of the university's department of atomic spectroscopy; he also was a former chair of the physics section of the Royal Swedish Academy of Sciences, which oversees the awarding of the Nobel Prize in Physics.

Indrek was born on 26 December 1937 in Tartu, Estonia. Although it had been independent since 1918, during World War II Estonia was occupied by the Soviet Union, then by Germany, and then again by the Soviet Union. With the second Soviet occupation in 1944, Indrek and his family were forced to leave their home and become refugees in Germany. Two years later the Martinsons immigrated to Sweden, where Indrek obtained citizenship.

Indrek's first research studies began in 1961 and were in beta- and gamma-ray spectroscopy, carried out under Manne Siegbahn at the Nobel Institute for Physics in Stockholm. In 1964 Indrek, Torsten Alväger, and Hans Ryde performed a measurement that set a lower limit for the lifetime of the proton. The measurement subsequently provided a test of weak-interaction theories. In 1968, at the suggestion of institute director Ingmar Bergström, Indrek began studies in time-resolved fast-ion-beam spectroscopy. Those methods were being developed at the University of Arizona by Stanley Bashkin and William Bickel, and Indrek spent one year as a visiting scientist there.

After a productive year abroad, Indrek returned to Stockholm, and together with Jan Bromander and Gordon Berry arranged the Second International Conference on Beam-Foil Spectroscopy, held in June 1970 in Lysekil on the west coast of Sweden. The conference marked a great expansion of the field of accelerator-based atomic physics, with many active laboratories reporting new results. By then, lifetime studies were complemented by fine- and hyperfine-structure measurements using coherent-excitation and quantum-beat methods. Siegbahn, retired but still active at the Nobel Institute, was intrigued by the possibilities of atomic structure studies using accelerators, and each month Indrek and Siegbahn met to discuss the latest results. In 1971 Indrek completed his *filosofie doktor* thesis titled "Investigations of Atomic Spectra and Transition Probabilities Using Beam-Foil Excitation."

In 1976 Bengt Edlén's retirement from the University of Lund left vacant the professorship once held by Janne Rydberg. In a highly selective competition, Indrek was chosen to occupy that chair and lead the university's department of atomic spectroscopy. Rather than completely reorganizing the department, Indrek established a synergy between the high-wavelength-resolution spectroscopy of Edlén and his own time-resolved measurements. He also introduced laser- and tokamak-produced plasma light sources, synchrotron-radiation measurements, and Fourier transform spectroscopy. He pioneered the measurement of lifetimes of multiply excited states, developed a method that combines quantum-beat and lifetime measurements to obtain unprecedented accuracies in half-lives and fine-structure splittings, and devised an ingenious method for measuring forbidden transition rates through differential lifetime measurements. Many of his half-life measurements have altered accepted elemental solar and stellar abundances.

Indrek created an atmosphere of international collaboration that brought together many individuals and techniques. He opened exchanges between scientists in the West and those in Estonia, Lithuania, Russia, China, and Japan. A touching moment occurred in 1991, when Indrek returned to the city of his birth to receive an honorary doctorate from the University of Tartu. He was awarded Estonia's Order of the White Star in 2001 for service to the country.

Indrek's life was rich and varied. In addition to his abilities as a physicist, he had a great love for classical music and sports and a vast knowledge of both. A top-ranked chess player in Stockholm, Indrek often entertained visiting international chess masters and was able to hold Bobby Fischer to a draw.

Indrek was a gifted and imaginative scientist, a great humanitarian, and one of the kindest and most personable people that I have known.

Lorenzo J. Curtis
University of Toledo
Toledo, Ohio

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William E. Engeler
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20 February 1930 – 15 February 2010
Leonard Oscar Roellig
17 May 1927 – 12 February 2010
Richard Yamamoto
29 June 1935 – 16 October 2009
Harry Edmund Gove
22 May 1922 – 18 February 2009

Robert Vivian Pound

On the death of Robert Vivian Pound, one colleague remarked, "A great tree has fallen." Pound died on 12 April 2010 in Belmont, Massachusetts, following a series of strokes. He was instrumental in several discoveries that have had immense consequences for science and our everyday lives. A man of broad interests, he had a humanitarian concern for the beneficial uses of science.

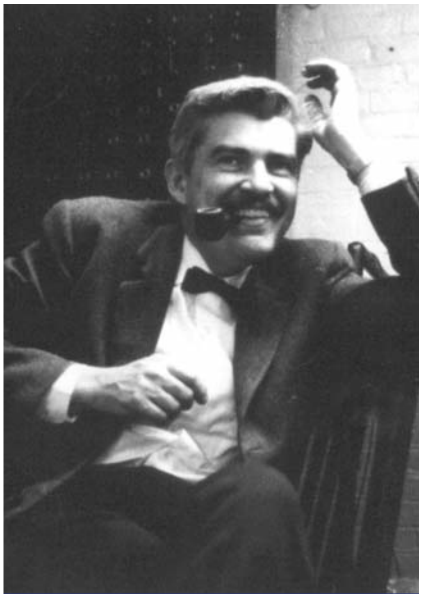
Pound was born in Ridgeway, Ontario, Canada, on 16 May 1919. His ancestors had lived in Ontario since the Revolutionary War, when the family—Crown loyalists and Quakers—had crossed the Niagara River into Canada. When he was four, the family moved to Buffalo, New York, where his father taught mathematics and where Pound derived joy from ham radio, mathematics, automobiles, and tinkering with electronics. He attended the University of Buffalo and received a bachelor's degree in physics in 1941.

Directly from college Pound joined the World War II scientific effort at the MIT Radiation Laboratory; he contributed fundamental ideas and inventions essential to the development of radar, among them the broadband Pound stub coaxial support and the microwave cavity-locked Pound stabilizer. He wrote the book—literally—on microwave mixers (*Microwave Mixers*, MIT Radiation Laboratory Series, volume 16, McGraw-Hill, 1948).

After the war, Pound's election to the Society of Fellows at Harvard University served as a substitute for a formal PhD. He joined the Harvard faculty in 1948 and remained there for the rest of his career.

In 1946 Pound and collaborators Edward Purcell and Henry Torrey adapted the Rad Lab techniques—widely used to this day in radar and communications—to detect nuclear magnetic resonance in condensed matter. Soon NMR became a standard analytical tool in chemistry, biology, and physics, and the "Pound box" marginal oscillator became the standard NMR detector. For the NMR discovery at Harvard, and related work at Stanford University, respective team leaders Purcell and Felix Bloch were awarded the 1952 Nobel Prize in Physics. Further developments in NMR, to which several of Pound's graduate students contributed, have given medicine the remarkable diagnostic tool now called magnetic resonance imaging.

Pound and his collaborators followed their discovery of NMR with studies of nuclear relaxation; that work resulted in the 1950 demonstration of "negative temperature"—their term for an inversion of the Boltzmann energy level populations—in nuclear spin systems. That elegant research led directly to the invention of the maser and laser, for which Charles Townes received the Nobel Prize in Physics in 1964. Applications in information technology, communications, and medicine are now part of our culture. In his Nobel speech, Townes referred to the "striking demonstration of population inversion and stimulated emission" by Purcell and Pound.


Robert Vivian Pound

Pound may be most widely recognized for using the Mössbauer effect to make the first accurate terrestrial measurement of the gravitational redshift, in collaboration with his student Glen Rebka. Their experiment constituted the first test of Einstein's equivalence principle applied to gravity's effect on electromagnetic radiation near Earth's surface. It had been widely assumed that such a test was possible only over enormous differences in altitude—for example, from an orbiting satellite—given the magnitude of the effect: a fractional shift of just 1.09×10^{-16} per vertical meter.

Pound recognized that the unprecedented narrowness of the recently discovered Mössbauer resonance provided the tool that made such a measurement possible, though hardly easy: The 2.5×10^{-15} fractional shift over the 23-meter height of the Harvard Jefferson Laboratory's enclosed tower was less than one part in a thousand of the iron-57 resonance line width. (It amused Pound that the same tower had been used by Edwin Hall, of Hall effect fame, who dropped 948 balls for his 1903 *Physical Review* paper "Do Falling Bodies Move South?") The pioneering redshift experiment was performed with such elegance, ingenuity, inherent simplicity, and accuracy that it has become a landmark in modern physics. For his accomplishments, Pound received the 1990 National Medal of Science and the 1965 Eddington Medal of the Royal Astronomical Society.

Pound loved things that exemplified ingenuity and scientific design, particularly if they defied convention, such as his full-suspension Moulton bicycle and hovercraft Flymo lawnmower. He was passionate about automobiles, especially British ones that complemented his tweed jacket, bow tie, wool trousers, and trimmed moustache.

His many graduate students became Pound's extended family, mentored gently and dined hospitably. Many remember him as the most important influence in their lives and the finest scientist they've known. He was unflappable, amused and amusing, always in control, and always ready with a new idea. He loved puzzles, especially those involving mechanisms. I sought his advice when my car made a clicking sound but would not start. "Oh, you have a stuck ring gear in your starter mechanism," he said, and prescribed the cure: "It's easy, just grab onto the rear bumper and push the car back and forth. You'll hear a click when it slips back into place." We did, and it did.

Pound had no social pretense, no sense of station or class. He equally enjoyed conversing with a car mechanic or a colleague—with perhaps a slight preference for the former. In the seventh decade of his life, Pound's professional contributions shifted toward science and public policy. He was a vigorous trustee of Associated Universities Inc, the organization responsible for the National Radio Astronomy Observatory and, until 1997, Brookhaven National Laboratory.

Pound's hair became silvery white, and he grew a full beard to complement his ever-present moustache. Then one day he shaved the beard off because, while walking through Harvard Yard, someone tried to direct him to a senior citizens event. He reported that decision with a twinkle in his eye. The day after the beard's abrupt removal he came home, even more delighted, to report that only one person in the physics department had noticed its disappearance. That colleague had stopped him to say, "You look different." He had asked, "In what way?" His colleague peered at him intently for a few moments and then, smiling with discovery, said, "You grew a moustache!" Pound's eyes lit up every time he told that story.

I am grateful to John Pound, Robert's son, for his numerous contributions to this obituary.

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