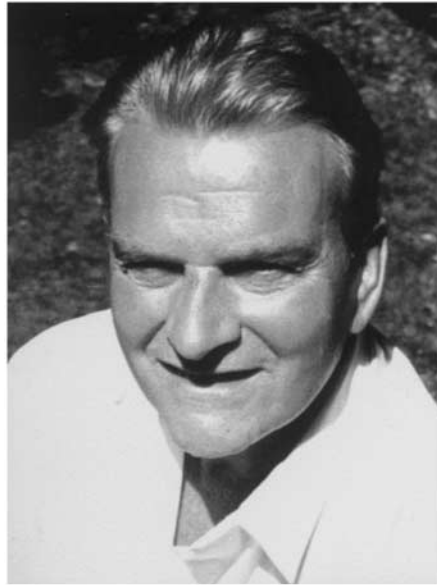




Professor Börje Larsson, 1931–1998: A Multidisciplinary Scientist

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It is with great sadness that we mark the death after a period of illness of Professor Börje Larsson, aged 67. Börje was Assistant Professor between 1966 and 1979 and Professor of Physical Biology between 1979 and 1991 at Uppsala. From then until 1998 he was Professor of Medical Radiation Biology at Zürich University.

Larsson was born on June 3rd 1931 in Stockholm and seven years later he moved with his parents to Norrköping, where he received his schooling. His subsequent education led to a BSc at Stockholm University in 1955 and a MSc in electrical engineering at the Royal Institute of Technology in 1958.

During his university studies, Larsson developed a great interest in interdisciplinary scientific issues. While still a student, he was invited to come to Uppsala by the Nobel prize winner, Theodor Svedberg, to work with biomedical applications on the accelerator that had been donated by the textile manufacturer, Gustaf Werner. The accelerator, a synchrocyclotron, was at the hub of the internationally renowned Gustaf Werner Institute, which in 1986 was incorporated into the Department for Radiation Sciences and the The Svedberg Laboratory. Larsson's research left an indelible mark on these activities in Uppsala.

Following the careful experimental preparation conducted by Larsson, the world's first proton irradiation of a tumour patient was carried out in 1957 in Uppsala. The

subsequent research led to a highly acclaimed doctoral dissertation on the proton irradiation of tumours, presented in 1962. Larsson was the driving force in the ensuing work on the irradiation of tumour patients with protons, and these treatments took place either in collaboration with doctors at Uppsala Academic Hospital or at the Karolinska Hospital in Stockholm. Together with colleagues, Larsson developed new dosimetric methods, which are still in use today, and he carried out experiments in which the biological effects of protons were analysed. Largely through Larsson's work, proton therapy has become a well-known procedure within cancer treatment. In different ways he participated in new and planned accelerator centres for cancer treatment in the USA, Europe and Japan.

Larsson's pioneering work in tumour treatment was followed by a unique contribution to the development of radiation surgery, an area in which he is considered to be one of the most eminent pioneers. His contribution included both the physical and biological aspects of radiation surgery, and in collaboration with pathologists and neurosurgeons, he studied the physiology of radiation-induced damage. In the clinic, radiation surgery treatments of different brain diseases were carried out, including Parkinson's disease and arterial-venous blood vessel malformations. This technical development under Larsson's

leadership led to the production of radiation surgical equipment, which in today's terminology is known as 'the gamma knife', a product that was the foundation of the activity of the company ELEKTA, which successfully sells such equipment throughout the world.

Larsson placed part of his research at the Department of Zoo-physiology in Uppsala. In 1962, he became an associate professor in the subject 'radiation biology' and was responsible for a number of research students in that area. Successful research contributed to his becoming Assistant Professor in 1966 and Professor in 1979 in the newly established subject, physical biology. He also occasionally worked as a research supervisor at the Swedish University of Agricultural Sciences in Uppsala. In his role as supervisor and examiner, Larsson assisted 29 researchers in attaining their doctoral degrees before he was offered a professorship in medical radiation biology at Zurich University.

During his years in Switzerland he succeeded in conducting basic radiation biology research in Zürich combined with applied research at the Swiss national accelerator centre, the PSI in Villigen, near Zurich. He led a research group that spanned the sciences, just as his group in Uppsala had done, and gave assistance to more researchers in obtaining their doctoral degrees.

Larsson took an early interest in so-called boron neutron therapy, in which tumour tissue is 'loaded' with the element boron. Following neutron irradiation, the boron atoms capture neutrons, which then produce a treatment effect; namely, the boron atoms break up and destroy the cancer cells. The method is still under development and may in a number of years become a clinically established treatment method. Börje actively pursued this development in both Switzerland and Sweden and, particularly in recent years, contributed to the prospect that the research reactor in Studsvik could be reconstructed to facilitate clinical treatment programmes.

Börje initiated different research projects in which radionuclides are used in medicine and was, for example, the mastermind behind the setting up of the PET Centre at Uppsala University. This technique enables the study of detailed element metabolism in the human body, without surgery, and the path of chosen biomolecules in the body can be followed. The PET technique has become very successful. One sphere of activity pursued at Uppsala University is the development of substances for selective binding of tumour cells, to carry cell-killing radionuclides as a means of treatment.

Larsson had many international collaborators. He was adviser to many large international accelerator centres, which were developed for radiation therapy and radiation surgery and was guest researcher at many foreign universities. For a couple of years, he was guest researcher at the Institut Laue-Langevin in Grenoble. He organized many international meetings; for instance, the Seventh International Symposium on Boron Neutron Therapy held in Zürich in 1996.

Larsson was a frequent participant in public debate and was greatly interested in making scientific findings more widely known. Together with Sven Kullander, he wrote two popular scientific books. *Mikrokosmos* was published in 1984 by Studieförlaget and *Out of Sight—from Quarks to Living Cells* was published in 1994 by Cambridge University Press.

For his contribution to science, Larsson was awarded several national and international prizes over the years. The 'Guldkuggen' for technical development of the gamma knife should be mentioned here, as well as the prestigious Fairchild prize, presented in Boston for development work within radiation surgery.

Shortly before his death, Larsson was active in the development of an analysis method for tissue samples from patients. The aim of this new cultivation method was to obtain knowledge about cell properties, quickly and effectively. This method may have importance in cancer treatment in the future. Larsson's colleagues in Switzerland and Sweden will continue to develop this work.

Börje Larsson is mourned by his wife, two children and their families, relatives, friends and colleagues. With his death the research community has lost a unique creator of ideas and inspiration, whose scientific contribution will make its mark in many research disciplines for many years to come. Börje Larsson was a creative researcher, who through his generosity and friendliness enabled many to share his ideas and to benefit from his achievements. For all this, we express our appreciation and sincere gratitude.

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