

Stig Stenholm

* 26.2.1939 † 30.9.2017



PROFESSOR STIG Torsten Stenholm died of a serious illness in Espoo on 30th September 2017. He was an internationally acknowledged researcher in quantum optics, a respected teacher and an influential participant in both the national and international scientific community.

Stig Stenholm was born in Oulu on 26th February 1939, but he then lived in Jepua and later in Vaasa, where he graduated from high school in 1957. After studies at Helsinki University of Technology he received an M.Sc. (Tech) in Technical Physics in 1964, and also an M.Sc. in Mathematics from the University of Helsinki.

The cornerstone of his research career was the application of mathematically demanding theoretical tools to experimentally relevant physical problems. Stig Stenholm carried out his postgraduate studies at the University of Oxford, supervised by Dirk ter Haar, and received a D.Phil. in 1967 with a dissertation on quantum liquids. As a postdoctoral researcher with Willis E. Lamb at Yale University in 1967-1968 he moved into the field of laser spectroscopy. Laser physics had developed rapidly in the early 1960s and the possibilities offered by lasers in atomic and molecular physics were quickly understood.

Stenholm developed his research into laser spectroscopy still further after his return to Finland, concentrating especially on high intensities, the related saturation of absorption and collisional effects. Although working closely with researchers at the Helsinki University of Technology, he was next appointed as an associate professor at the University of Helsinki in 1974. In many ways his work on laser spectroscopy is summarized in his textbook *The Foundations of Laser Spectroscopy*.

The next and perhaps most important step in Stig Stenholm's career was his appointment as scientific director of the Research Institute for Theoretical Physics (TFT) at the University of Helsinki. Through personal experience, he understood the need for young people to spend longer research periods abroad and to receive support at crucial points, either between graduating as a PhD and going abroad, or when coming back and waiting for their next appointment. Many future Finnish professors working in various fields benefitted one way or another from the support provided by TFT. For those in Finland, the frequent international visitors coming to TFT provided another win-

dow on the latest and most exciting research. Stig Stenholm was appointed to membership of the Finnish Academy of Science and Letters in 1981.

Scientifically, Stenholm's major advance in the 1980s was his involvement in the laser cooling and trapping of ions and neutral atoms. The aim of such research was to improve the accuracy with which atomic properties could be measured and atomic clocks set. Naturally, he was especially interested in the conceptual question of single atoms and their dynamics, as this posed a challenge for conventional quantum mechanics and its statistical interpretations. Much of his work at that period is summarized in his paper *The semiclassical theory of laser cooling*.

At that time laser cooling and trapping was being studied independently on both sides of the Iron Curtain, and thanks to Finland's special position between East and West, Stenholm was able to bring the two communities together for discussions. This did much to help the development of this field, and when William D. Phillips was awarded the Nobel Prize in Physics for his work on laser cooling and trapping in 1997 he especially thanked Stig Stenholm in his Nobel lecture.

The first observations of quantum gases and atomic Bose-Einstein condensates, reported in the 1990s, brought quantum optics, the laser cooling and trapping of atoms and the theory of quantum liquids together. The varying properties of atomic elements, the controllability of the motion and interactions of atoms, and the numerous high-precision measurement tools that became available made quantum gases a popular new research field. Stenholm was also quick to enter this field, supported by his broad scientific ex-

perience, including his postgraduate studies.

In 1992-1997 Stenholm was an Academy of Finland research professor in Helsinki and also received an appointment as an Alexander von Humboldt fellow in Germany. Then, in 1997, he became professor at the Royal Institute of Technology (KTH) in Stockholm, continuing his research there while still maintaining connections with researchers in Finland. When he retired in 2004 he became a very active professor emeritus.

In Sweden he was also active in the Royal Swedish Academy of Sciences, and in 2005, for instance, he had the honour of delivering the presentation speech at the Nobel Prize ceremony when the Physics Prize was awarded to the pioneers of quantum optics and high-precision laser spectroscopy.

The field of quantum information developed greatly following the introduction of the concept of quantum computing in the 1990s, and its basics are summarized in the textbook *Quantum Approach to Informatics* which Stenholm wrote together with K.-A. Suominen. Stenholm was always willing to discuss and interpret the fundamental aspects of quantum mechanics, as was also the case with the philosophy of science. Experiments with single atoms and photons, like quantum information, have now brought these topics into mainstream physics, to his satisfaction. Stenholm also wrote a book *The Quest for Reality*, comparing the philosophical ideas of Niels Bohr and Ludwig Wittgenstein.

Stig Stenholm had a broad and powerful impact on theoretical physics in Finland and Sweden. He supervised 17 PhD students altogether, of whom at least 9 are professors or professors emeriti either in

Finland or abroad. As a teacher he was open and exhilarating, encouraging students and young researchers to indulge in independent and critical thinking. He will

be missed by many former students and colleagues, as well as by his wife Viola and their children Camilla and Carl with their families.

Obituary by Kalle-Antti Suominen