

Alpo Kallio

* 21.2.1935 † 29.10.2020



PROFESSOR EMERITUS Alpo Kallio passed away in Oulu on 29th October 2020 at the age of 85, broken by a sudden illness. He had a remarkable career of over 30 years as a professor of theoretical physics at the University of Oulu. He was invited to join the Finnish Academy of Sciences in 1975.

Kallio was born in the small village of Eskola in Kannus on 21st February 1935. His father was a driver on a local log transporter train, and his mother looked after the home. The logging enterprise offered villagers job opportunities, in which Kallio also actively participated in his youth. Seedlings were planted, trees were stamped for harvesting and the railway had to be repaired. Berry picking also brought opportunities for hardworking young boys to earn some money. Kallio moved from the village school to the high school in Kannus and graduated in 1954. He was particularly interested in mathematical subjects and went to study theoretical physics at the University of Turku. He graduated with master of philosophy degree in 1959 and gained a licentiate degree in 1961.

As a talented student, Kallio received a scholarship to the Nordita Institute in Copenhagen for the years 1962–1964. Nordita

was at that time a research centre for theoretical physics jointly financed by the Nordic countries, and was located partly on the same premises as the Niels Bohr Institute, which guaranteed a continuous stream of distinguished visitors from all over the world. Nuclear physics was very well financed at that time because of energy interests and the armaments industry. Kallio prepared his doctoral thesis on *Effective Interaction on the Fermi-Surface of Finite Nuclei*, at Nordita under the supervision of Professor Gerry Brown, with contributing papers published in collaboration with Kristofer Kolltveit. The model they developed attracted international attention and was named the Kallio-Kolltveit potential.

After this scholarship period Kallio returned to Finland, where his doctoral dissertation was approved at the Institute of Theoretical Physics. Soon after that he moved to a postdoctoral position at the University of Minnesota, continuing his work on nuclear models there and a year later at the Argonne National Laboratory. As the models evolved they required the use of computers to solve them, and the national laboratory had excellent resources available for that. Kallio and his collaborators developed the software required

for the necessary solutions, and Kallio brought these with him when he moved to Oulu in 1967, although computer resources in Oulu were not yet sufficiently well developed at that time to make the software immediately useful.

An associate professorship in theoretical physics had been founded at the University of Oulu in autumn 1967, and Kallio applied for and received the position. He was then appointed to a full professorship on 1st February 1969, when he was still only 33 years old. He held the chair for more than 30 years, until his retirement on 29th February 2000. Theoretical physics was a new discipline in the Finnish universities, and Nordita had created an excellent environment for young researchers. As a result, many of the first university positions in theoretical physics were filled by former Nordita fellows.

As a teacher, Kallio was very clear and inspiring. For example, before his time courses in quantum mechanics were called *Mysticism I* and *II*, but Kallio began to teach them systematically, highlighting the Copenhagen interpretation he had learned at Nordita. Quantum mechanics, or more broadly quantum physics, is an amazingly accurate theory for describing micro-world phenomena. In the 1970s it was still possible to organize public seminars and discussions concerning its interpretations, and Kallio participated actively in these. Those problems have now been solved and small-scale quantum computers have already been built.

Kallio's research work in the early days in Oulu was concentrated on applications of nuclear physics, even though advanced numerical computing was not possible in Oulu at that time. International cooperation and visitors to Oulu offered some

help, however. The University of Oulu, as the northernmost university in the world, was an exotic place to visit, and Kallio himself also acted as a visiting researcher and lecturer elsewhere, e.g. at the International Centre for Theoretical Physics (ICTP) in Trieste, Italy, in 1971.

Kallio then moved to the development of equations modelling more generally other many-particle systems such as charged gases and helium fluids. The interaction between particles is simpler in these, than it is between protons and neutrons, but the challenge lies in the high density of helium fluid and in the long range of the interaction between charged particles. This focus on modelling became possible while he was a visiting professor at New York State University at Stony Brook in 1976-1977. Several doctoral dissertations were then completed on these topics in Oulu.

In his final years in office Kallio was inspired to study high-temperature superconductors, a peculiar phenomenon for which no generally accepted model existed. Kallio approached the problem as involving a mixture of charged gases in which the lighter component transforms to a superconducting state at a surprisingly high temperature. In his retirement years Kallio took up stem cell research as a hobby, in collaboration with medical doctors.

As a result of his years spent abroad, Kallio had many friends and colleagues who were invited to visit Oulu. He was a member of the Nordita executive board from 1973 to 1990 and was its chairman in 1985-1987. Nordita's programme involved sending its own researchers on short visits to various Nordic universities and Oulu received a fair share of these visits. For more than 20 years he was also a

member of the board of the Helsinki Research Institute of Theoretical Physics. Kallio strongly encouraged his students to go abroad and also arranged positions for them in foreign research institutes.

Kallio became known for the strong opinions he expressed in the administrative bodies of the University of Oulu. When he came to Oulu he had already learned to use computers in his research, and he had a clear view of how that field should evolve. As a member of the board of the university IT Centre in 1969-1987, he tirelessly sought to influence the development of personal workstations and information networks in their current form. His proposals did not always meet with understanding from the central management, however, and so Kallio himself sometimes became involved in running cables to new sites when he considered this necessary. Programming and numerical solutions to mathematical models also became integral parts of the curriculum for a physicist.

Fishing was a favourite hobby for Kallio, ice fishing in winter and trolling in

summer. Kallio and his wife Kirsti lived in Toivoniemi at the mouth of the Oulu river, where all the fish that rise into the river gather, so that he could follow the fishermen's activities from his window and join them sometimes. The renovation of the fish ladders to Merikoski and spawning areas in the Oulu river had already become one of Kallio's dreams in the 1970s, and he wrote to the local newspapers and held discussions strongly advocating this. In the end, a new fish ladder was built, and now thousands of salmon rise into the Oulu river each year. Gardening at their summer house in Kannus was also an important way to relax. We in the coffee room of the Department of Theoretical Physics learned all about the growing of raspberries, and it seemed that sometimes the whole neighbourhood in Kannus was called in to help pick the berries.

The status of theoretical physics as a new university subject was very important to Kallio. In Oulu it was largely his creation, and he defended it vigorously on all occasions.

*Obituary by Mikko Saarela,
Pekka Pietiläinen and Matti Alatalo*