Boris Dolgoshein 1930–2010

Boris Dolgoshein, one of the most imaginative of experimental particle physicists, passed away in his office at the Moscow Engineering and Physics Institute (MEPhI) on 14 December.

Born in 1930 in Kazan, Boris studied at the Moscow Engineering and Physics University, where he graduated in 1954. He later became professor of the MEPhI and head of the particle-physics department.

In 1962 Boris and his colleagues invented the streamer chamber and went on to develop this novel technology to perfection. Unlike the bubble chamber, the streamer chamber could be triggered externally and was suited to the study of rare and complex events. In 1968 Boris and his team constructed the largest streamer chamber ever built, with a volume of $8 \times 2 \times 1 \text{ m}^3$, which operated for many years in Protvino at the 70 GeV synchrotron. It was used to search for the W boson in an experiment that identified prompt muons for the first time and measured their spectrum and polarization.

In 1977 Boris proposed the detection of high-energy neutrinos by measuring the acoustic signals from hadron showers created by neutrinos in water. This method was realized in prototypes in the US and in Lake Baikal, and it is currently being explored in the context of the ANTARES and IceCube neutrino telescopes (p28).

Boris also proposed measuring the density distribution of the Earth using high-energy neutrino scattering.

Boris developed and pioneered transition radiation detectors (TRDs) for particle tracking and particle identification. His experience and expertise with this sophisticated detector date back to the early 1970s and there is hardly a TRD in the world to which Boris has not significantly contributed. Among them are the TRDs of the HELIOS spectrometer at the Super Proton Synchrotron, the ZEUS and HERA-B experiments at HERA, the AMS spectrometer that will fly in space and the huge Transition Radiation Tracker (TRT) of the ATLAS experiment at the LHC.

Most TRDs, whether at accelerator-based experiments or in space, were built following one or other of these examples and profited from the intensive and careful R&D programmes that Boris and his collaborators carried out.

As spokesperson of the RD6 collaboration at CERN, for many years – and through troubled waters – Boris led the design and performance studies of a TRT for the LHC based on drift tubes, also known as “straws”. His unmatched experience, brilliant ideas and the painstaking care that he continuously put into understanding fully the complex behaviour of the straws at high occupancies and in an extremely harsh radiation environment were invaluable in many aspects of this daunting project. Thanks in great part to Boris, the ATLAS TRT today provides excellent measurements of charged-particle trajectories and beautiful views of the tracks in the collisions at the LHC.

Parallel to the construction of the ATLAS TRT, Boris continued to develop ideas for new detectors. In 1993, in collaboration with DESY, he started to develop a new type of silicon photodetector with high gain, which he called the silicon photomultiplier (SiPM). Consisting of an array of miniaturized silicon Geiger–Müller counters on a silicon wafer, the SiPM is sensitive to single photons but insensitive to magnetic fields.

Boris immediately realized the enormous potential of this technology and put his creativity and energy into its development. It is to his merit that SiPMs today have a vast number of applications ranging from the read-out of highly segmented calorimeters and photodetectors for astroparticle physics to medical applications, such as positron-emission tomography.

From the late 1970s, Boris was a frequent visitor to CERN and DESY, where he not only worked on his experiments and detector developments but was also active in science policy. As a member of the CERN–Russia Committee in 1991–1996, he contributed to an agreement for scientific and technological co-operation, which enabled Russian research institutes with the assistance of sectors of Russian industry to provide major contributions to the construction and utilization of the LHC.

Boris's creative and innovative work was recognized with numerous honours, including Academician of the Russian Academy of Natural Sciences, the Lenin Prize, the Kapitza Gold Medal and the Alexander-von-Humboldt Award. His advice was sought by many committees and he was member of the Advisory Editorial Board of Nuclear Instruments and Methods in Physics Research Section A, and member of the editorial board of the Journal of Instrumentation.

Boris’s creativity, knowledge and enthusiasm have been an inspiration and motivation for many scientists. Working with him has been an unforgettable experience. Georges Charpak in 1995 said: “I have a long-standing history of scientific contacts on particle detectors with Boris Dolgoshein’s team. I have great esteem for its ideas and achievements. Boris Dolgoshein is one of the most creative specialists in particle detectors science in the world.”

- His friends and colleagues.