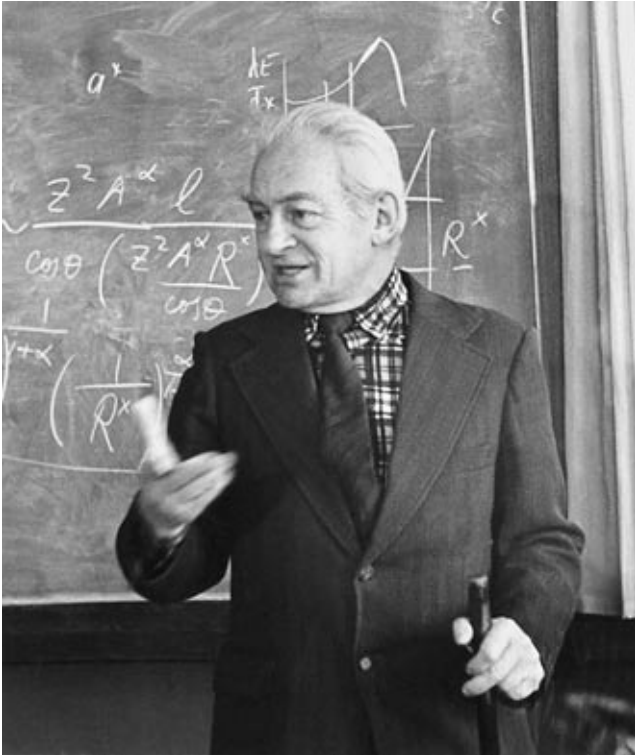


Naum Leonidovich Grigorov (1915–2005): Obituary

PACS numbers: 01.60.+g

DOI: 10.1134/S0010952506020018



Naum Leonidovich Grigorov passed away on November 14, 2005. Not only we, his collaborators at the Skobeltsyn Nuclear Physics Institute of Moscow University, have suffered deprivation, the entire community of researchers in the field of astrophysics of high-energy particles has also suffered a loss.

Naum Grigorov was a unique scientist who amazingly combined the talents of a physicist-theoretician and an outstanding experimentalist. Space experiments headed by Grigorov were often preceded by operating prototypes of future instruments that were manufactured by him literally by hand from anything available. Only after this did he recruit designers and electronic engineers to implement his ideas.

We always admired his ability to look immediately into the very essence of every scientific problem, by his tremendous intuition that allowed him in advance to know answers for many scientific questions simply, as was his saying, by “looking at the ceiling.” There was a

joke among some of our American colleagues that they were ready to visit Russia specially in order to look at the ceiling in Grigorov’s room. During his long and bright life, Grigorov contributed so much to high-energy astrophysics that it is difficult to choose what was the most important and significant. He himself considered as the most fundamental those works in which he first measured the inelasticity coefficient for interactions of high-energy protons with air atomic nuclei, invented an instrument for measuring the energy of high-energy elementary particles (ionization calorimeter), discovered the rising effective cross section of inelastic interaction between protons and light nuclei with increasing energy of protons, studied the influence of this effect on propagation of cosmic rays in the Earth’s atmosphere, discovered the process of generation of high-energy pions, measured for the first time by direct methods the spectrum of primary cosmic rays in the energy range 3×10^{10} – 10^{15} eV, predicted the existence of the Earth’s radiation belt of electrons with energies of 100 MeV or higher, and discovered a radiation belt of the anomalous component of cosmic rays.

To the international scientific community, Grigorov was known primarily as an inventor of the ionization calorimeter—an instrument that made it possible to detect charged particles of superhigh energies and to measure their spectra.

Until the present time, the result obtained by Grigorov in 1965–1969 on board satellites of the *PROTON* series has remained a standard reference included in all rapporteur papers of the International Conferences on Cosmic Rays. This result, which indicates the existence of a break in the spectrum of protons of galactic cosmic rays (it has been known for a long time among astrophysicists as a “Grigorov’s knee”) in the energy range 1–10 TeV, still has no confirmation, but has not been disproved either. Naum Grigorov mounted a tremendous effort in order to finally prove this result, and we believe that this problem, which has an extreme importance for high-energy astrophysics, will at last be solved. Grigorov also suggested a theoretical explanation for the distinction between the spectra of protons and nuclei as caused by the difference in acceleration processes (protons, according to this theory, are accelerated at earlier stages of supernova explosions in com-

parison with nuclei). We also consider as extremely important and interesting the studies on the so-called anomalous component of cosmic rays that were carried out by a group of researchers (headed by Grigorov) from the Skobeltsyn Institute of Nuclear Physics in collaboration with American colleagues from the US Naval Research Laboratory and NASA. In a number of experiments on board satellites of the *Kosmos* series, a new radiation belt of the Earth was discovered, composed of ions of the anomalous cosmic rays. Basic parameters of this belt derived from these experimental data were later confirmed by detailed measurements on board the American satellite *SAMPLEX*.

Grigorov's extraordinary fitness for work was always a subject of our admiration. Having celebrated his 90th birthday (in March 2005), he continued working fruitfully in spite of very serious problems with his ears and almost complete loss of sight. For reading and writing, he used an instrument of his own invention in which positive images were transformed into negative (better apprehended by the human eye). To the last International Conference on Cosmic Rays at Pune (India), Grigorov submitted his papers on the problem of measuring the spectral index of protons and on specific problems of measuring galactic cosmic rays in the ATIC experiment.

One of his last papers "A Generalized Picture of the Back-Scattering Effect on the Measured Spectrum of Cosmic Ray Protons" was considered by Grigorov as especially important, since the problem of back-scattering remains topical in measurements of the proton spectrum.

The workbook of Naum L. Grigorov opens with an entry about graduation from a factory-and-workshop school of Moscow Power Supply Office (Mosenergo), and ends with a position of chief researcher of the Skobeltsyn Institute of Nuclear Physics and professor of Moscow State University. Naum Grigorov was a member of the editorial board of the *Cosmic Research* journal since the moment of its foundation.

For us, collaborators of Naum Leonidovich, it was not easy to work with him due to his high standards of research work and fidelity to principles, and intolerance to any kind of negligence and incompetence. However, it will be even more difficult to work without him, without his intuition, talent, clear and crisp logic, bright scientific ideas, and fantastic capacity for work.

We shall remember Naum Leonidovich Grigorov forever, not only as an outstanding scientist, but also as a wise and charming person with a good sense of humor, brilliant storyteller and good company. And he had much to tell. There were in his life balloon flights, an around-the-world tour on board an oil tanker, and long work at high-mountain stations.

One can say without exaggeration that an entire epoch has ended together with Grigorov's retirement from the stage. The epoch of people who were personally involved in the very first space experiments and studies, people who laid the foundation of high-energy astrophysics of the present day.

Colleagues, friends, editorial board