Boris Nikolaevich Klyarfel'd (obituary)

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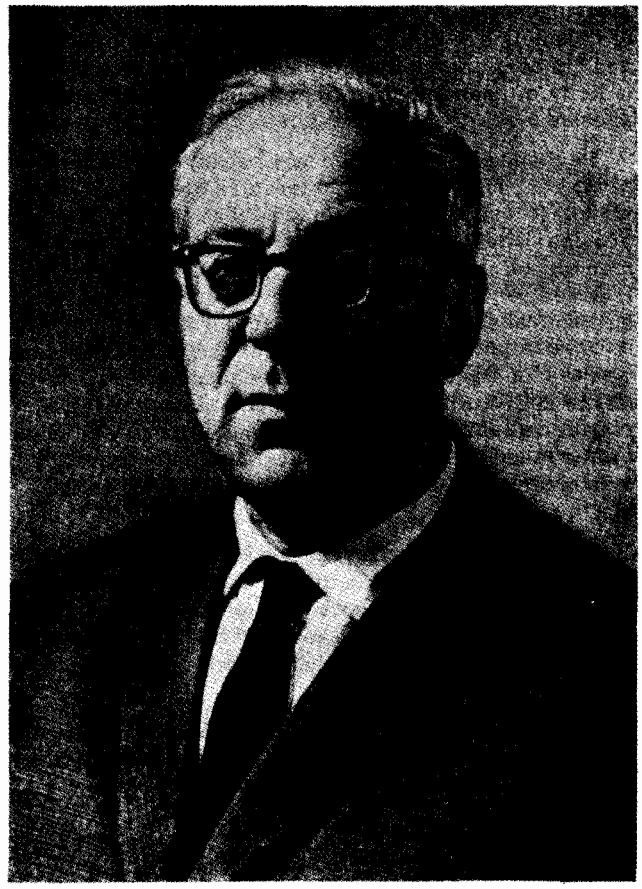
Professor Boris Nikolaevich Klyarfel'd, a prominent Soviet physicist and a Doctor of Physical and Mathematical Sciences who worked at the V. I. Lenin All-Union Electrical Engineering Institute (VEI) for more than 50 years, passed away one year ago, on March 22, 1973, at the age of 68.



Entering the Physical and Mathematical Department of Moscow State University in 1920, Klyarfel'd completed the entire course of study in three years. In 1922, not yet having graduated from the university, he embarked upon his scientific career at the VEI as a laboratory assistant. In 1938, the degree of Candidate of Physical and Mathematical Sciences was conferred upon this talented young scientific worker with defense of dissertation waived; in the next year, 1939, he defended his doctoral dissertation, and in 1940 he was made a Professor. He had directed a laboratory since 1932.

Over his many years of research in the physics of the gas discharge, Klyarfel'd wrote numerous scientific research papers, more than 100 of which were published in scientific periodicals. They are cited extensively in monographs, textbooks, and articles by Soviet and foreign authors. Klyarfel'd was among the Soviet Union's pioneers in study of processes in the gas-discharge plasma. His first paper, which was published in 1926, was devoted to electrical discharges in gases.

Klyarfel'd trained a large group of highly qualified specialists in the field of gas-discharge physics. The authority of his scientific school is held in high esteem both in the USSR and abroad.

During the prewar years, most of Klyarfeld's work was devoted to fundamental study of physical processes in the low-temperature plasma. He was the first to make extensive and systematic use of the probe method in plasma diagnostics. The originators of the method, Langmuir and Tonks, stressed the value of Klyarfel'd's contribution in this field.

Klyarfel'd's investigations of emission in a positive column are reflected in a whole series of papers dating from the early years of his scientific career. They compose a fundamental treatise on the energy budget in the positive column at various pressures and current densities. The power-budget diagrams that were obtained take account of all possible radiative losses from the gas-discharge plasma: thermal losses at the walls, emission of resonant and non-resonant lines, and thermal losses in the volume. Klyarfel'd's diagrams have been reproduced in most monographs and textbooks on the physics and technique of the gas discharge.

Many years of painstaking experimental verification of the quantitative conclusions of the Langmuir-Tonks theory for the positive column enabled Klyarfel'd to expand and develop his theory for high pressures and current densities and to compare theoretical and experimental conclusions.

Klyarfel'd made detailed studies of the anodic region in the gas discharge at low pressures and pointed out the inconsistency of the Langmuir theory for this region. To explain the mechanism of the anodic drop, Klyarfel'd suggested that the formation and disappearance of positive ions in the region next to the anode might be a decisive factor.

The work that Klyarfel'd began in 1932 on discharge ignition potentials belongs to the next phase of his activity. These problems were the subject of a whole series of investigations that Klyarfel'd carried out in the VEI and in one of the electronics-industry scientific-research institutes. Discharge initiation in inert and molecular gases was studied under the conditions of the left branch of the Paschen curve. The characteristics of the discharge itself were investigated in wide current and voltage ranges. The possible existence of three varieties of the glow discharge was indicated. Later studies of the pulse discharge made with a hollow cathode demonstrated the possible existence of a fourth variety: a glow discharge with current density on the order of few amperes per square centimeter. The later years of Klyarfel'd's life were devoted to a comprehensive investigation of elementary, normal, dense, and ultradense glow discharge.

Klyarfel'd's scientific career was many-faceted and

broad-ranging. All of his works, major or minor, are exemplary in the depth and care with which they were prepared, and became the foundation on which many branches of science and engineering have developed.

The numerous results of these investigations were embodied in the designs of the various gas-discharge devices developed both by Klyarfel'd himself and by his students at various times during his life. Thus, in 1938 he designed a gas-discharge light source of high luminous efficiency—the sodium arc lamp with helium or neon filler gas. During the Second World War, Klyarfel'd designed special discharge devices with defense applications and aided in setting up their production at the plant. Many gas-discharge devices were successfully developed at other institutes as a result of extensive consultation with Klyarfel'd. His results found important applications in the development of a whole series of high-voltage mercury rectifiers. His research made it possible to explain many physical aspects of the behavior of mercury rectifiers and to analyze their complex interactions, and provided designers with new ideas for solution of problems involving high voltages, the passage of heavy currents, backfiring, and measurement of mercury-vapor density.

Klyarfel'd's papers are rightfully considered outstanding for the thoroughness of the investigations and the profundity of the approach to explanation of physical processes in low-temperature plasmas. He was a scientist of world renown.

The Party and government held Klyarfel'd's work in high esteem, honoring him with the Order of Lenin and the Order of the Red Banner of Labor.

Klyarfel'd combined the qualities of an exacting taskmaster with great personal kindliness and benevolence. He shared his extensive knowledge generously with those around him. He was himself a man of broad erudition who, though absorbed in and deeply committed to his work, was at the same time uncommonly modest and charming.

In the person of Boris Nikolaevich Klyarfel'd, Soviet science has lost a remarkable scholar who did pioneering work in a number of aspects of gas-discharge physics and contributed to the development of fundamentally new instruments and devices that have come into extensive use in the national economy and in engineering.

The memory of Boris Nikolaevich Klyarfel'd will forever be preserved in the hearts and work of his many students, friends, everyone who worked and associated with him, and, indeed, all who knew him.

Translated by R. W. Bowers