clear weapons center known by its code name Arzamas-16 and a patriarch of Russian nuclear physicists.

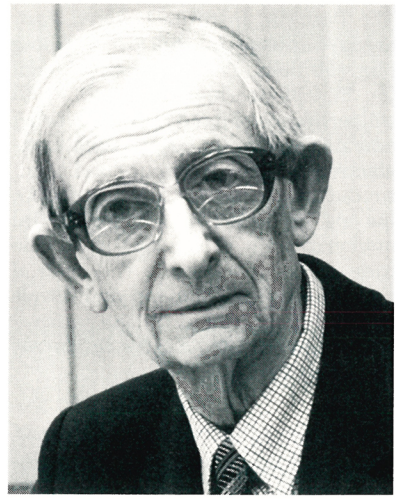
Yuli B. Khariton was born in St. Petersburg (later Leningrad), where he earned the degree of engineer–physicist in 1925 from the Leningrad Polytechnical Institute. Starting in 1921, he took part in research under Abram F. Ioffe and Nicolai N. Semenov. From 1926 through 1928, he advanced his scientific education by working at Cavendish Laboratory in Cambridge, England, under the guidance of Ernest Rutherford and James Chadwick, receiving a Cambridge PhD in 1928 for his work on "scintillation produced by alpha-particles."

For a decade (1928 through 1938), Khariton both taught at Leningrad Polytechnical Institute and engaged in research at the Leningrad Physics and Technology Institute, and later at the Institute of Chemical Physics in Leningrad, where he headed the explosives laboratory he had set up in 1931. His first important scientific paper, written in 1926 together with Zinaida F. Val'ta, became the basis for the theory of branching-chain chemical reactions developed later by Semenov.

The most important outcome of Khariton's studies of explosives was the discovery of the explosive charge failure diameter and the explanation given for its existence.

With the discovery of uranium nuclear fission, Khariton switched his research to the fission chain reactions of heavy nuclei. Between 1939 and 1941, together with Yakov B. Zel'dovich, he published a series of articles dedicated to uranium fission proceeding by the branching-chain reaction pattern. They discussed the factors governing nuclear reactor stability. In particular, they pointed to the role played by delayed neutrons in the control of chain reactions. With the help of I. Gurevich, they explored the conditions necessary for making a nuclear explosion.

Khariton was recruited in 1945 by Igor V. Kurchatov, the leader of the Soviet atomic project, to head activities aimed at developing Soviet nuclear weapons. Initially, these efforts were housed in Moscow in Laboratory No. 2 of the USSR Academy of Sciences (this lab is now the Russian Scientific Center—Kurchatov Institute). They gained a high priority and were placed on a broad footing after a new and supersecret atomic research center was set up at Sarov, about 400 km east of Moscow, in 1946. First known simply as Design Bureau 11 (KB-11), the center quickly developed into the Soviet counterpart of Los Alamos National Laboratory in the US, and later evolved into what is now known formally as the Russian Federal Nuclear Center—All-Russian Scientific-Research Institute of Experimental Physics (RFYaTs–VNIIÉF), but better known simply as Arzamas-16.



YULI BORISOVICH KHARITON

The history of Arzamas-16 is inseparably linked with Khariton. He not only helped establish Arzamas-16 but served as its scientific director for almost half a century (1946–92). And from 1946 through 1959 he was also the center's chief weapons designer. Under his guidance, the center found efficient ways of solving the most complicated scientific and technical problem of developing high-performance models of nuclear and thermonuclear weapons.

Khariton was noted for his direct personal contacts with a wide circle of Arzamas-16 employees. He combined a refined character, modesty, goodwill and cordiality with a willingness to be severe if required. He always insisted on the importance of knowing many times more than was necessary for solving the specific technical problem. Under his leadership, Arzamas-16 grew from a small design bureau into one of the top physics research centers in the USSR (later Russia). The center carries out studies in a wide range of topics.

Yuli Borisovich will be forever engraved on the memories of Russian nuclear scientists not only as a great scientist but also as a patriot and as a humanitarian, who greatly worried about the fortunes of mankind in the atomic age. They will never forget the words he wrote in 1995 to the memorial committee of J. Robert Oppenheimer: "Conscious of my participation in remarkable scientific and engineering achievements, which led to mankind's possession of a practically inexhaustible source of energy, today, at a more than mature age, I am no longer sure whether mankind has matured enough to possess this energy. I realize our participation in the terrible death of people and in the dreadful damage inflicted upon the nature of our home, the Earth. Words of repentance can certainly change nothing. Please God, those who come after us will find the ways, find in themselves the firmness of spirit and determination, in striving for the best, not to do the worst."

**VIKTOR N. MIKHAILOV**
**RADY I. ILKAEV**
**GERMAN A. GONCHAROV**
**YURI A. TRUTNEV**
*RFYaTs–VNIIÉF*
*Sarov, Russia*

## Georges Maxime Temmer

Georges Maxime Temmer, a professor of physics emeritus at Rutgers University, died on 12 January 1997 in Princeton at the age of 74. He spent his professional life as an experimental nuclear physicist and will be remembered for several major contributions.

Temmer was born in Vienna, where he received his early education. With the rise of Nazism, he emigrated to France and then the US. He earned a BS (1943) from Queens College, and an MA (1944) and PhD (1949) from the University of California, Berkeley, under the guidance of Emilio Segrè.

After two years as a research associate at the University of Rochester, he worked at the National Bureau of Standards, in Washington, DC, where he carried out seminal experiments on nuclear orientation of rare earth nuclei with Ernest Ambler and Ralph Hudson. He joined the staff of the Department of Terrestrial Magnetism of the Carnegie Institution in Washington, DC, in 1953. Over the next decade, Temmer and Norman Heydenburg explored nuclear structure and shapes with experiments on Coulomb excitation of nuclei with low-energy alpha beams. These experiments, described in a landmark review article in *Reviews of Modern Physics* on the shapes of atomic nuclei, resulted in a vital confirmation of the theories of Niels Bohr and Ben Mottelson.

As experimental nuclear physics blossomed at university laboratories with the spread of tandem Van de Graaff accelerators, Temmer accepted an appointment as professor and director of the Nuclear Physics Laboratory at Florida State University in 1960, and then at Rutgers University in 1963.

At Florida State, he wrote a paper on the possibility of resonant transfer in nuclear reactions, a process that was very speculative at the time but became experimentally verified several years later. He also began work on

the statistical behavior of fluctuating cross sections, which had been predicted by Torlief Ericson. In his early data from Rutgers, he found the first firm confirmation of the theory for many degrees of freedom. Among nuclear physicists, however, he is probably best known for his work on isobaric analog resonances. These studies led to the Barshay–Temmer theorem, a fundamental symmetry relation in nuclear reactions.

Temmer was a strong advocate of cross-disciplinary collaboration between scientists, clearly manifest in the fruitful cooperation between Rutgers University and AT&T Bell Laboratories. Together with Bell Labs scientists, Temmer initiated some of the first experiments in the channeling of nuclei through crystals. These experiments led to the measurement of lifetimes of compound nuclei around $10^{-18}$ s.

Toward the end of his career, Temmer became an active participant in activities opposing the nuclear arms race, nuclear testing and the Strategic Defense Initiative. He served as vice chairman of education for the Coalition for Peace Action in Princeton, New Jersey. He lectured widely in the US, USSR and Western Europe.

Temmer was a "universal" physicist. He consistently supported developments on the interface between nuclear physics and atomic and condensed matter physics and always was a strong advocate for inclusion of theorists in experimental groups. He cultivated relationships with scientists from all over the world. His laboratory was always a beehive of activity, where long-standing collaborations were formed, all languages were spoken and many aspects of physics beyond nuclear physics were explored. He was one of the first official scientific visitors from the US to the USSR, and also to China, where he spent a sabbatical leave in 1972.

Georges Temmer's broad knowledge, his flair for physics and his immense curiosity provided intellectual stimulation to all around him. His enjoyment of life as a physicist was contagious. His friends and colleagues will miss him.

**Noemie Benczer-Koller**
**Charles Glashausser**
*Rutgers University*
*New Brunswick, New Jersey*

## Viktor Yakovlevich Frenkel

Viktor Yakovlevich Frenkel, one of the most prolific historians of Russian and Soviet science and technology, died suddenly of a stroke on 8 February 1997 in St. Petersburg, Russia. He was the author, coauthor, editor and compiler of 40 books and some 300 papers concerning the history of physics.

Frenkel was born in Leningrad on 22 February 1930, the son of Yakov Ilich Frenkel, the long-time head of the theoretical physics department at the A. F. Ioffe Leningrad Physical-Technical Institute. As a young boy, Viktor Frenkel experienced some of the most difficult trials of Soviet life: the ruthless purges ordered by Stalin in the 1930s, the German invasion of the USSR in June 1941, and the blockade of Leningrad.

The Frenkel family survived the war by moving to Kazan, on the Volga River, along with other members of the scientific elite. Upon returning to Leningrad, Viktor Frenkel completed high school and entered the Leningrad Polytechnical Institute, writing his senior thesis on meson theory. His excitement over his impending graduation in 1953 was tempered by the death of his father and a growing climate of ideological repression directed against Jews and of damaging attacks on genetics, relativity theory and quantum mechanics. After a year of unemployment, Frenkel began work at a radio tube factory, work that led to his candidate of science degree in 1960 from Leningrad Polytechnical Institute. In 1959, he transferred to the Ioffe Institute, where he remained until his death. There, he worked on mathematical and plasma physics through 1973, and then devoted himself to the history of physics. He became a senior scientist and the institute's deputy scientific secretary (1973–86).

As a historian of physics, Frenkel preferred to write biographies and based all of his works on extensive archival research. His last major work was a biography of his father: *Yakov Ilich Frenkel* (Basel, Birkhaüser Verlag, 1996), an extensive revision of the 1966 Russian version. He wrote or cowrote biographies of Paul Ehrenfest, Alexander Friedmann (with Artur Chemin and Eduard Tropp) and Igor Kurchatov (with A. P. Grinberg). He coauthored books about two of his father's colleagues, Matvei Petrovich Bronshtein (with Gennady Gorelik) (Moscow, Nauka, 1990; in English, Basel, Birkhaüser Verlag, 1994) and Vsevolod Konstantinovich Frederiks (with Anatolin Sonin) (Moscow, Nauka, 1995), both of whom had been among the dozens of his father's physics colleagues who perished in the purges or the gulag system.

Frenkel also assembled a series of books of documents, letters and previously published articles on leading physicists that serve as crucial primary sources for the study of Soviet science, for example the Ehrenfest–Ioffe correspondence and reminiscences of Abram Alikhanov and Boris Konstantinov. Recently, he published articles on George Gamow and Fritz Houtermans, who had been *personae non gratae* in the USSR for imaginary crimes against the state.

Frenkel believed that science was international. He wrote about the relationships that Wolfgang Pauli and Niels Bohr each had with Soviet scientists. His publication record clearly reveals a physicist and historian dedicated to opening the history of Soviet science to examination of its social, political and philosophical aspects, always grounded in a thorough mastery of the science itself.

His home was always open to foreign guests, no matter the period of Soviet history. Even before the breakup of the Soviet Union, he helped western scholars gain access to previously closed Soviet archives and generously secured photographs as book illustrations.

In his last years the economic hardships that beset Russia began to tell upon Frenkel's health, requiring him both to continue his writing at a feverish pace and to endure the sheer physical challenges of living in a large city whose transportation and consumer goods infrastructure had crumbled. But that did not interfere with his miraculous productivity or his hospitality.

**Paul R. Josephson**
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## Albert Moscowitz

Albert Moscowitz, an international authority on the spectra of chiral molecules, died of cancer in Minneapolis on 25 September 1996, at the age of 67.

Moscowitz was born in Manchester, New Hampshire. He did his undergraduate studies at the City College of New York and obtained his PhD in chemical physics from Harvard University in 1957. Following two years as a postdoctoral fellow at Washington University, he joined the University of Minnesota's chemistry faculty in 1959, where he remained for the rest of his career.

In his thesis, Moscowitz recognized that the Kronig–Kramers relations have their counterparts in relations between optical rotation and circular dichroism spectra. He used this insight to replace the direct calculation of rotational strengths from circular dichroism spectra, which were then