# PERSONALIA

## Aleksandr L'vovich Mints (obituary)

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Usp. Fiz. Nauk **116**, 165–167 (May 1975)

PACS numbers: 01.60.

Academician Aleksandr L'vovich Mints, the prominent Soviet radiophysicist, engineer, and scientific organizer, died in his 80th year on December 29, 1974 after a brief but grave illness.

His name is inseparably associated with the development of radio-engineering and especially that of high-power radio network construction and large charged-particle accelerators in our country.

Mints' scientific career began in 1916, when he entered P. P. Lazarev's laboratory while still a student at the Moscow State University. Here he did research work in the ionic theory of excitation and produced his first invention, in which frequency modulation was used for the first time.

Mints joined the ranks of the Worker's and Peasants' Red Army (RKKA) in 1920 and participated in military actions on the Caucasian, Crimean, and Polish fronts as a radio division leader in Budennyĭ's First Cavalry Army. In 1921, he was named chief of the radio faculty and director of the radio laboratory at the RKKA's Higher Military Communications School, and in 1923 he became the first director of the RKKA Scientific Research Institute of Communications (NIIS RKKA). During his work at the Communications School, Mints began research on the theory and design of antennas under the supervision of M. V. Shuleĭkin, obtaining results that served as a basis for later studies that he made in this field.

At the NIIS RKKA, Mints carried out a series of studies of modulation systems for radiotelephone stations that culminated in publication of his books "Basics of Plate Modulation Calculations" (1927) and "Basics of Grid-Modulation Calculations" (1929). These books became ready references for specialists in radio.

Also at the Institute, Mints completed a broad program of studies of the propagation of short waves. The results obtained here demonstrated the possibility and advantages of using short waves for long-distance radio communications.

His research and development work on radiotelephone transmitters at the NIIS RKKA laid the foundations for an engineering approach to the design of radio broadcasting stations. It was therefore natural that when the decision was taken in 1927 on the initiative of G. K. Ordzhonikidze to proceed with the development of a high-wattage radio network in the Soviet Union, Mints was made responsible for implementation of the project.

At Leningrad in 1928, Mints set up the Office of High-Power Radio Construction, which soon grew into the large Branch Radio Laboratory for Transmitting Facilities (ORPU) of the Comintern High-Power Radio Construction Combine, which unified various scientific laboratories, factories, and planning and installing organizations. Mints took over the scientific supervision of the ORPU and, in 1936, that of the Combine.

The broadcasting stations built during this period under the direct supervision of Mints embodied a number of his scientific ideas and inventions. These ideas included the use of a modular system in the design of the output stages of high-power oscillators, which ensured reliability and was subsequently adopted all over the world; the use of circuits tuned to odd harmonics to improve the efficiency of the stations, which has also been recognized worldwide; construction of broad band shortwave antennas around large-diameter cylindrical vibrators mounted on metal towers, and many others. In 1928, while working at the Office of High-Power Radio Construction, Mints organized a Division of Radio Telescopy, the name by which television was then known, at the Central Radio Laboratory of the Electrical Engineering Trust of Small Appliance Plants. Here his inventions include the 1929 "Device for Interlaced Image Transmission." The principle advanced in this invention formed the basis for the alternate-line scanning system that is now used in all of the world's television centers.


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The radio broadcasting stations built under Mints' supervision–the 100-kilowatt All-Union Central Trade-Union Council (VTsSPS) station in 1929, the 500-kilowatt Comintern station in 1933, the 150-kilowatt Kosior station in 1937, the 120-kilowatt RV-96 short-wave station in 1938, and the 1200-kilowatt station of 1943–advanced Soviet radio broadcasting to first place in the world.

The year 1946 marked a turning point in Mints' scientific and engineering activity. From that date, he brought his enormous accumulated experience in high-power radio construction to bear on the development of one-of-a-kind charged-particle accelerators.

The first of these accelerators was the 680-MeV synchrocyclotron, which was built in three and a half years and formed a basis for the Accelerator Center of the Joint Institutes for Nuclear Research at Dubna. Mints supervised the overall design and development of a number of systems used in the synchrocyclotron. When placed in operation (December 1949), it was the largest accelerator of this type in the world–with respect to both the energy of the accelerated particles and the intensity of the particle beams.

In 1957, Mints completed the planning and development of various basic systems of the 10-GeV protron synchrotron, which was then the world's largest, and placed them in operation. This accelerator was the first to incorporate Mints' suggestion that the accelerating electrodes be mounted in two of the four linear gaps between 90° sectors of a ring elecgromagnet. This separation of the accelerating systems made it possible to reduce by half the average power requirement of the high-frequency generators. Later, separation of the accelerating systems became standard practice in all ring-type accelerators.

Mints was directly involved in the development and construction of new types of ring accelerators with strong focusing. A 7-GeV proton synchrotron was commissioned in 1961 at the Institute of Theoretical and Experimental Physics (ITÉF), and a 76-GeV protron synchrotron in 1967 at the Serpukhov Institute of High-Energy Physics (IFVÉ).

The USSR Academy of Sciences Radioengineering Institute, which was founded by Mints and directed by him for 24 years, was responsible for the development of the electronic and vacuum devices used in all of these accelerators.

Mints also supervised the construction of a series of linear electron accelerators with energies from 15 to 60 MeV and protron accelerators from 25 to 100 MeV.

Mints made a substantial contribution to the science and engineering of accelerators when, with a group of his collegues, he suggested automatic control of the acceleration regime with the aid of electronic computers that process information obtained from the charged-particle beam. This proposal permitted substantial reduction of the vacuum-chamber cross section, and, consequently, of the mass of the electromagnet. In 1963, Mints appeared at the International Conference on Accelerators at Dubna with a paper on a design for a 100-GeV cybernetic proton synchrotron. Studies of a model 1-GeV cybernetic accelerator built at the Radioengineering Institute of the USSR Academy of Sciences fully confirmed the correctness of the principles on which the project was based.

In 1969, Mints and his co-workers argued for the feasibility of building a 4000–5000-GeV proton synchrotron using superconductive electromagnets.

Mints attached great importance to increased concentration of the energy fluxes, and in 1967 he proposed a new method for the shaping of rotating relativistic electron rings in a vacuum and put a group of his collegues to work on the problem, which is still under study.

In his last years, Mints devoted a great deal of attention to the use of accelerators in medicine. In 1973, he participated in the organization of a Conference on the treatment of Malignant Tumors at Dubna.

In his wide-ranging activity as Chairman of the USSR Academy of Sciences Scientific Council on Problems of Charged-Particle Acceleration, and as a Member of the Board of the USSR Academy of Sciences Division of General Physics and Astronomy, the Committee on Science and Engineering of the USSR Council of Ministers, the Committee on Lenin and State Prizes, the A. S. Popov Central Administration of the All-Union Scientific and Technical Society for Radioengineering, Electronics, and Communications, the editorial staff of "Doklady Akademii Nauk SSSR," and the Council of the Moscow House of Scientists, Mints was always an effective and principled force. He performed all of his duties with a deep sense of responsibility.

Most of the facilities built under Mints' supervision were so unprecedented and monumental of scale, like solutions proposed for them, as to make them appear unrealistic to many of his collegues. But they were always successful.

The concrete results that grew out of Mints' nearly sixty years of work were no doubt made possible by the unusual combination, in a single individual, of the gifts of a great scientist, a talented engineer, and a brilliant organizer who possessed a subtle feeling for that which is new, the ability to accept technical risks, and a knack for rallying individuals with a wide range of specialties and qualifications to unite in pursuit of a common objective.

In 1946, Mints was elected a Corresponding Member of the USSR Academy of Sciences; the Academy's Presidium awarded him the A. S. Popov Gold Medal in 1950, and in 1955 he was elected an honorary member of the A.S. Popov Scientific and Technical Society for Radio Engineering and Electrical Communications. He became a full member of the USSR Academy of Sciences in 1958.

Twice (in 1946 and 1951), Mints was honored with USSR State Prizes; in 1956, he was named a Hero of Socialist Labor, and he received a Lenin Prize in 1959. Mints held four Orders of Lenin, two Orders of the Red Banner of Labor, two Orders of the Red Star, and many medals.

With all of his perfectionism–which he applied primarily to himself–Mints possessed remarkable traits of character. His great benovolence, sense of justice, tact, comradely attitude and sense of humor invariably endeared him to his colleagues.

Mints served Soviet science to the point of self-denial to the last days of his life. The glowing memory of Aleksandr L'vovich Mints, a remarkable human being and a true son of Russia, will be preserved forever in our hearts.

Translated by R. W. Bowers.