

A. I. BERG, B. A. VVEDENSKIĬ, D. V. ZERNOV, Yu. B. KOBZAREV, and A. A. PISTOL'KORS

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DOCTOR of Technical Sciences, Professor, Academician V. A. Kotel'nikov, one of the founders of the theory of radio engineering and creator of the theory of potential (maximum attainable) interference immunity, which had served as the foundation for the subsequently developed modern theory of the optimal transmission of information in the presence of noise, has reached the age of 60.

His first work, dating from the 1930s (and earlier years), was devoted to practical inventions and research into the theory of processes occurring in a number of the radio devices already used at that time, with the object of enhancing their effectiveness. That period was associated with the studies: "Theory of the Nonlinear Filter with Frequency Division" (*Tekhnika svyazi* (Communications Engineering), no. 8, 1932); "Radio-Operated Multiple Printing Device" (*ibid.*, no. 11, 1932); "Quantitative Assessment of Various Fading Control Techniques" (*Nauchno-tehnicheskii sbornik LETIS* (Scientific and Technical Anthology of the Leningrad Electrotechnical Institute of Communications Engineers), no. 11, 1936); "Effect of a Sum of Sine-wave Voltages on Nonlinear Resistance" (*ibid.*, no. 14, 1936); "High-Power Short-wave Transmitters with Automatic Control" (*Tekhnika svyazi*, no. 6, 1938), and others.

The generation of radio engineers of the late 1930s and 1940s was greatly influenced by Kotel'nikov's work "O propusknoi sposobnosti éfira i provoloki v elektrichestve" (Carrying Capacity of Ether and Wire in Electricity) which, in particular, had formulated the now widely known theorem on sampling (instantaneous values of oscillations) which, when performed sufficiently often, determine the behavior of oscillations at all points. This theorem is of tremendous engineering and philosophic significance considering that, when pondered deeply, it can be seen as governing, up to a point, any process and even human behavior.

A most important stage in Kotel'nikov's activity during the subsequent years was the publication and defense in 1946, in the capacity of a doctoral dissertation, of one of the most fundamental works in the field of radio engineering: "Teoriya potentsial'noi pomekhostoichivosti pri fluktuatsionnykh pomekhakh (Theory of Potential Interference Immunity in the Presence of Random Noise). The marked advances made at that time (particularly during the wartime years) by communications engineering (and especially the development of highly sensitive radio receivers) have raised the problems of combatting noise, and primarily random noise, arising in the receiver itself. The contemporary basic research studies were of a highly particular and limited nature and, in fact, no theory of noiseproof feature had existed at the time.

The "Theory of Potential Interference Immunity" was a major work of the theory of radio reception, carried out at a mathematical level that was extremely high for that time, yet without neglecting in any way the applied



problems. Only later did its relationship to the mathematical theory of parametric estimation and hypothesis testing manifest itself. It was this work that had first formulated and solved the problem of the optimal (maximum attainable for given signals and noise) interference immunity, and it was also this work that had introduced the concept of the optimal receiver and specified its structure for a number of cases; introduced an explicit classification of noise and signals, which has now been universally accepted; found the best signals for use in a number of cases; investigated the interference immunity of certain known methods of radio reception, compared these methods and demonstrated the advantages of using various methods of information transmission, as well as considered a number of other problems.

The fundamental manner in which this problem was stated, the clarity of its formulation and the elegance of the statistical methods developed, and particularly the widely used graphic geometrical interpretation of the results, have subsequently led to widespread popularity of this theory in the USSR and abroad. The methods of the theory of potential interference immunity have been elaborated with respect to the transmission of signals along more complex communication channels, particularly those containing random parameters. In

the late 1950s and during the 1960s there arose the now rapidly developing general theory of optimal radio reception, the theory of signals, the theory of coding, and the theory of the synthesis of integral radio systems.

"The Theory of Potential Interference Immunity" has been translated and published in the United States and other countries.

Kotel'nikov's contributions to the development of printer communication systems and singleband multiplex telegraphy and telephony are widely known.

For his work on developing new communication systems Kotel'nikov was awarded the State Prize in 1943 and 1946.

His ideas are being used in the development of spacecraft control and monitoring systems. He personally and as a project director had designed and built the first models of equipment of this kind during his tenure at the Special Design Bureau.

In recent years his name has been associated with the rise and development of a new scientific discipline—planetary radar ranging. Using the ideas of theory and the achievements of applied reception of weak signals, a team of his co-workers, with his participation and under his direction, in 1961 had succeeded in the radar ranging of the planet Venus, which made it possible to determine more precisely the basic astronomical unit, whose accuracy of knowledge is decisive to the accuracy of the knowledge of distances in the solar system. The radar ranging of Venus was repeated in 1962 and 1964 and it provided data on the surface and rotational period of that planet. This was followed by radar studies of Mars, Mercury, and Jupiter. The cycle of these studies was published in *Doklady Akad. Nauk SSSR* (no. 6, 1962; nos. 3, 4, 1963; no. 5, 1964; no. 1, 1965) as well as in a number of other domestic and foreign journals. Kotel'nikov's work on planetary radar ranging was awarded the 1964 Lenin Prize.

Kotel'nikov continually combines his scientific work with the training of cadres of engineers and scientists in his capacity as the longtime head of the Department of the Theory of Radio Engineering at the Moscow Energetics Institute. His capital two-volume work "Osnovy radiotekhniki" (Principles of Radio Engineering) has now served as a textbook for several generations of students and it is used as a handy reference work by young specialists graduated from higher schools. This

textbook has been translated into Polish, Hungarian, and Chinese.

Kotel'nikov has taught a number of graduate students who have become leading scientific workers in various domains of radio engineering.

He is surrounded by students and co-workers who are drawn to him by his outstanding erudition, fundamentality of approach, lucidity and simplicity of thinking, and an enviable ability to remain up-to-date and to perceive the implications of new scientific discoveries.

His great capacity for work enables him to remain a versatile scientist: his field of scientific activity includes electronic oscillation processes, classical radio engineering, the motions of the planets, and even communication with extraterrestrial civilizations.

V. A. Kotel'nikov is not only an eminent scientist and a talented organizer but also an active public man. He is widely known as not only a professor and academician but also as member of the Presidium of the USSR Academy of Sciences, Deputy Academician-Secretary of the Division of General Physics and Astronomy, Chairman of the Scientific Council on the Interdisciplinary Problem of Radioastronomy, director of a division and laboratory at the Institute of Radio Engineering and Electronics, USSR Academy of Sciences, Editor-in-Chief of the scientific journal *Radiotekhnika i elektronika* (Radio Engineering and Electronics), member of the Presidium of the Supreme Accreditation Commission as well as of the Committee for Lenin and State Prizes, and also member of a number of other committees, councils and commissions. One can only be amazed by the fact that he not only is a member of these numerous organizations, but also takes an active part in their work and makes a major contribution to their varied activity.

He is now in the prime of his creative activity and there is no doubt whatsoever that he shall still accomplish a great deal for science, for technical progress, for the construction of the communist society in this country.

We wish the birthday celebrant vigorous health and new successes in his activity, so necessary and important to the Soviet nation.

Translated by E. Bergman