

NIKOLAĪ NIKOLAEVICH ANDREEV

(on his eightieth birthday)

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JUNE 28, 1960 marked the 80th birthday of the great Soviet scientist and acoustician, Academician Nikolai Nikolaevich Andreev. The works of N. N. in the region of physical and technical acoustics have played a great role in the development of the theoretical foundations of acoustical science, in the national economy, and in the defense of the nation. More than one hundred scientific and scientific-popular papers have come from his pen.

In 1898, Andreev was graduated from the Cadet Corps and entered Moscow upper technical school, but within a year he was sent to the Saratov province for participation in "student disorders." After returning to Moscow and spending the 1899-1900 school year at the technical college, N. N. enrolled as an auditor in Moscow University, where he worked after the first year for Professor of Mathematics N. V. Bugaev and was his assistant. After two years' residence in the university, N. N. went to Germany in 1904, where he entered Göttingen University, and in 1906 enrolled at Basel University in Switzerland.

"The Theoretical and Experimental Investigation of the Effect of Temperature on the Dispersion of Light" was the first scientific paper of N. N., after which, in 1909, Basel University awarded him the degree of "Doctor of Philosophy and Master of Liberal Arts" with distinction.

Returning to his native land at the completion of his university studies, Andreev taught physics for some time in Moscow Secondary schools.

In 1912, he began his scientific-pedagogical activity at Moscow University. In 1914, N. N. Andreev received the title of Lecturer of Moscow University. Here he delivered lectures on the most important problems of physics of that time: statistical mechanics, electron theory, relativity theory, and tensor analysis; this gives an idea of the breadth of his scientific interest.

Problems of vibration theory became the fundamental core of Andreev's scientific work in the period 1909-1919. Of the researches of this period one should specially note, as exceptional in clarity of presentation and depth of analysis, the paper "Grating, Prism, Resonator," in which the spectra of damped waves were considered, and also the effect on such waves of a diffraction grating, a refracting prism, and a resonator. In this work, the problems of the analysis of spectra were first set forth correctly, the importance of which



was properly recognized only many years later. The research has remained of value to the present day.

The master's dissertation of Andreev was devoted to spectral analysis — "Electric Vibrations and Spectra," defended in 1917.

The fundamental region of scientific interest of N. N. Andreev was determined in the period 1920-1926. In these years he organized the acoustical laboratory in the All-Union Electrotechnical Institute in Moscow, which he directed until his moving to Leningrad.

A still wider field of activity opened before N. N. Andreev in 1926 when he went to Leningrad. The research carried on by him in the acoustical laboratory of the Leningrad Electrophysics Institute was distinguished by its great breadth and productivity. Important theoretical researches were carried on there, in large measure completed by N. N. Andreev himself: problems of reciprocity and reversibility in acoustics, nonlinear acoustics, the acoustics of a moving medium, aerodynamic sound generation, investigations in the region of acoustical measurements, (in particular, setting up the hammer-and-sand classical methods),

investigations of the piezoelectric properties of quartz and Rochelle salts, (in which the idea of a bimorphic element belongs to N. N. Andreev), researches on reverberation and soundproofing, acoustic investigations of the atmosphere, and probing of the stratosphere in the polar regions.

The activity of N. N. Andreev in the Leningrad period (1926-1940) was not limited to the acoustical laboratory of the Leningrad Electrophysics Institute. In 1931, at the instigation and under the direct control of N. N. Andreev, a scientific-research institute was created for the music industry. Gathering a strong group of young acousticians, N. N. Andreev created a new school of the acoustics of musical instruments, enriching the science and technology by valuable investigations and substituting exact knowledge for complicated and groundless notions cultivated in this field by craftsmen and musicians. Andreev himself performed a great deal of work on the establishment of criteria for the selection of wood for the sounding boards of musical instruments. The approach to wood as an anisotropic homogeneous material proved to be very fruitful.

A practical result of this important research was the cessation of the wood imports for musical instruments and the adoption of domestic materials by the musical industry.

In Leningrad, as before, the scientific activity of Nikolai Nikolaevich was tightly connected with his teaching activity. Here he emerged as a teacher of the special disciplines of acoustics and hydrodynamics. Making his appearance as a professor and then holding the chair of acoustics of the Leningrad Polytechnic Institute, he devoted much effort to the preparation of a corps of Soviet engineer-acousticians. Nikolai Nikolaevich was also the head of the Chair and Acoustics Laboratory organized by him in the Buddenyĭ Military Electrotechnical Academy. After the end of his work in the Academy of Communication, the acoustics laboratory was named "The N. N. Andreev Electroacoustics Laboratory."

In 1940, Nikolai Nikolaevich went to work at the Academy of Sciences and became the director of the acoustical laboratory of the P. N. Lebedev Physics Institute of the U.S.S.R. Academy of Sciences (FIAN) in Moscow. N. N. Andreev succeeded in gathering about him in the acoustics laboratory of FIAN a still more vigorous group of scientists and acousticians than in Leningrad, and organized work in widely differing directions: the propagation of sound in inhomogeneous media, correlation-statistical methods in acoustics, architectural acoustics, ultrasonics, new piezoelectric and magnetostrictive materials, and other sections of acoustics. At the present time it is acknowledged that Soviet acoustics takes a leading position in world science in some of these fields.

With the close cooperation of Andreev, a laboratory of architectural acoustics was established in 1937, during the construction of the Palace of Soviets. This

laboratory completed a number of important researches and obtained some results whose value can be appreciated only now, in the light of similar researches published in recent years.

During World War II, the FIAN acoustics laboratory, under the direction of Andreev, completed a number of important researches for special purposes. N. N. himself, with a group of his co-workers, spent a great deal of time directly in the theatre of military action, solving on the spot problems of very great importance to the Navy.

In the postwar years the FIAN acoustics laboratory grew rapidly, and by the end of 1953 it attained, in the scale and significance of its researches, the status of an independent institute of the Academy. It was therefore reorganized as the Acoustics Institute of the U.S.S.R. Academy of Sciences. In the new institute, Andreev continued to work with undiminished energy, heading the laboratory bearing his name. One of the recent important researches of Nikolai Nikolaevich "Some Important Second-Order Quantities in Acoustics" served as the starting point of a series of theoretical and experimental investigations of his students on the propagation of waves of finite amplitude, with account of thermal conductivity and viscosity of the medium. N. N. Andreev and his students succeeded in clarifying the basic rules of the growth of discontinuities during propagation of sound waves of finite amplitude and of the nonlinear damping of such waves. Successful investigations are being carried on in Andreev's laboratory on the propagation of waves of finite amplitude in relaxing media.

The conversion of the acoustical (physical) process into physiological effect by the complicated auditory-analysis system of living things and of man represents one of the most complicated problems of the contemporary theory of hearing. N. N. Andreev, in the laboratory managed by him, has gathered a group of physiological acousticians who engage in the problem of pitch differentiation by using the methods of modeling of the mechanical part of the hearing organ and electrophysiological methods of investigation of the separate elements of the auditory channel. With the aid of models of the cochlea and use of a skin analyzer, a number of researches have been completed on the investigation of the mechanism of tone discrimination by the ear. Electrophysiological investigations (with applications of microelectrodes) have been carried out on the phylogeny of the hearing function and on the tonotopical localization in the cortex of the brain. Researches in these directions are being continued, and now the problem arises as to the expansion of similar investigations urgently dictated by life.

N. N. Andreev is the author of a survey of the literature on the problems of the hearing organs of insects.

Andreev is widely known as an outstanding popularizer of physics, having published a large number of papers and brochures not only on acoustics but also on the theory of relativity, thermodynamics, electrody-

namics, and wave mechanics. He took part in the composition or revision of a series of better textbooks on physics. Thus, for example, as one of the co-authors, he took part in the writing of the well-known college physics text under the editorship of N. D. Papaleksi and in the revision of the text of Michelson which was well known in its day.

Andreev took an active part in the publication of the Great Soviet Encyclopedia and the acoustics articles in the Physics Dictionary. He has continually taken part in editorial boards of outstanding physics journals. He is the founder and chief editor of the "Acoustics Journal," which has received widespread dissemination in the Soviet Union and abroad.

N. N. Andreev has led a great deal of social work. In 1936 he organized in the U.S.S.R. Academy of Sciences, the Commission on Acoustics, which to the present date has sponsored conferences and meetings on various scientific-technical problems that play a great role in the coordination of scientific investigations on acoustics in the Soviet Union. Prominent foreign scholars have taken part in the work of acoustical conferences of recent years.

For his services, N. N. Andreev has received high government awards: three Orders of Lenin, the Order of the Red Labor Banner, and medals. N. N. Andreev was elected a corresponding member of the U.S.S.R. Academy of Sciences in 1933 and became a full member in 1953.

N. N. Andreev has played a prominent role in strengthening international scientific bonds, establishing friendly relations with a number of leading acousticians of Poland, Czechoslovakia, Rumania, Hungary, and the German Democratic Republic. Recently, the Dresden Technische Hochschule awarded N. N. Andreev an honorary degree of doctor-engineer.

N. N. Andreev has taken part in the work of the Soviet delegations to the Second and Third International Acoustic Congresses, which were held in the USA and in West Germany. The Soviet acousticians at these conferences were represented by a number of papers by our scientists, among them N. N. Andreev himself. In the USA, N. N. Andreev presided over a working session of the Acoustics Congress and was elected to the International Commission on Acoustics. By this move, the activity of N. N. Andreev as a leading scholar with a world-wide reputation was recognized.

A lively interest and an extremely sympathetic view toward the scientific researches of his co-workers and students has been characteristic for N. N. Andreev. N. N. has always been ready to give useful advice, to make critical comments, to show the necessary direction of further research to a young scientific worker. His never changing good spirit, clearness of mind, and high principle assist Nikolaï Nikolaevich even now, on his 80th birthday, to bear on high the rank of an outstanding Soviet scholar.

We wish Nikolaï Nikolaevich health, long years of life and creative successes.

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