SOVIET PHYSICS

JETP

SOVIET PHYSICS JETP VOLUME 2, NUMBER 2 MARCH, 1956

Academician Nikolai Nikolaevich Andreev

(On his 75th Birthday)

J. Exper. Theoret. Phys. USSR 28, 137-139 (August, 1955)

A PROMINENT place among the Soviet scientists working in the field of acoustics belongs to Academician Nikolai Nikolaevich Andreev, whose fruitful activity is distinguished both for great scientific accomplishments and for active participation in the national-economic life of our country. Nikolai Nikolaevich's name is continuously associated with solutions to many vital problems in technical and architectural acoustics and with the application of these solutions to industrial and civilian construction.

Nikolai Nikolaevich Andreev was born on July 28, 1880, in Moscow. After completing the Moscow higher technical school (1900) he entered the Moscow University as a non-matriculated student, and from 1904 through 1909 he continued his education in universities abroad, first in Goettingen and then in Basel.

From 1909 through 1917 Andreev taught in the Moscow middle schools and in 1912 he became, in addition, a laboratory assistant in the Moscow University. In 1914 Andreev was appointed lecturer. During these years Andreev carried out scientific work in optics, molecular physics, and electrical oscillations. One of the works by Andreev, "Grating, Prism, Resonator", was published in 1915 (J. Russian Phys. Chem Sci. **47**, No. 5) and has not lost its value for many years, exerting an influence on further spectrum analysis investigations made in the Soviet Union. Andreev's work of that period was by way of transition to subsequent work in the field of acoustics.

Andreev's 1917 Master's thesis was devoted to "Electrical Oscillations and their Spectra". In 1918-1920 he was professor of physics at the Omsk Polytechnic and Omsk Agricultural Institutes.

Andreev's work in the field of acoustics began in 1920, when he returned to Moscow and organized the Acoustic Laboratory in the All-union Electrotechnical Institute (VEI). In 1926 Andreev moved to Leningrad, where he directed the acoustic laboratory of the Leningrad Electrophysical Institute (LEFI).

Notable among the projects handled by Andreev in the Leningrad Laboratory is the development of acoustic measurement methods and the design of new measuring apparatus. Andreev suggested many original and yet simple methods for precise acoustic measurement, among them an elegant method for the absolute measurement of amplitudes of mechanical vibrations, namely, the fine-sand method, an extension of which (the small-hammer method) is particularly valuable for the study of surface distribution of vibration amplitudes by determining the equal-amplitude lines; he suggested methods of measuring acoustic impedances and of investigating acoustic filters. He also proposed several new instruments for acoustic measurements: a precise wide-range technical amplitude meter; and a widely-used automatic frequency analyzer for electric currents and for sounds. The production of Russian noise and reverberation meters is due to Andreev's initiative.

All these investigations at Andreev's laboratory provided a solid foundation for further development of Soviet acoustics. It must be noted that all the measurement methods and instruments developed by him incorporated the most modern accomplishments of electro-acoustics and electronics of our time.

The new instruments were used with success for a vigorous development of many very important problems in acoustics, such as the study of the vibrations of telephone membranes and of sound

recorders, study of the carbon microphone, investigations of the radiation and directivity of loud speakers, the development of loud-speaker horns, mesaurement of acoustic impedances, the study of engine noise, measurement of noise absorption and noise insulation and investigation of sound production by musical instruments and by air propellers. Important work was performed in non-linear acoustics and in acoustical and electroacoustical properties of solids (quartz, Rochelle salt and wood for musical instruments).

This list alone shows the wide scope and extent of Andreev's interests in modern acoustic problems. These investigations by Andreev and his students have been important steps, the value of many of which was not recognized by foreign science until the most recent years.

Andreev's theoretical accomplishments were also considerable. Nikolai Nikolaevich and his students formulated and successfully solved many difficult problems in the theory of non-linear acoustic vibrations and the associated effects of sound pressure (radiation pressures) and sound wind, as well as problems in hydrodynamic sound formation. The principal premises of the acoustics of a moving medium were formulated and published in Andreev's monograph " Acoustics of a Moving Medium" (1934). He made the first formulation of the principal premises of the reciprocity theorem not only for mechanical but also for electromechanical sytsems. In the field of atmospheric acoustics Andreev developed the theory of sound propagation near the earth's surface and has subsequently (1932-1933) participated directly in the planning and performance of experiments with pilot balloons in the stratosphere at polar latitudes.

Another branch of Andreev's theoretical investigations was closely related to pressing practical problems of industry and construction. As early as 1933 he developed together with his collaborators, the theory of the sound from an air propeller.

Andreev's Leningrad activities include the founding in 1931 of the Scientific Research Institute of the Musical Industry (NIIMP). In this Institute N. N. Andreev was the principal scientific leader and inspirer of many interesting and original projects in the development of the physical theory, research and quality control of musical instruments. Belonging to this period are his investigations of the properties of resonant wood, of the construction and tempering of many various instruments, and of sound production in string and wind instruments.

In 1940 N. N. Andreev turned his efforts to the USSR Academy of Sciences. He assumed the leadership of the acoustic laboratory of the P. N. Lebedev Physics Institute of the USSR Academy of Sciences (FIAN). The Moscow period of Andreev's scientific activity was just as successful and fruitful as the Leningrad period. N. N. Andreev surrounded himself with a strong group of talented students and followers, carrying out investigations in a variety of fields. Important works were devoted to the propagation of sound in inhomogeneous media, to correlation-statistical methods in acoustics, to non-linear acoustics, to ultrasonics, to architectural acoustics and to many other branches. Andreev headed up a group of investigations on the theory of sound absorption in porous and perforated materials. In connection with the construction of the Palace of the Soviets, with Andreev in close collaboration , a special laboratory on architectural acoustics was formed in Moscow before the war. Under Andreev's leadership the FIAN laboratory has assumed and important place in Soviet science and was reorganized in 1954 into the Acoustic Institute of the Academy of Sciences.

At the present time Andreev carries on important scientific work. During the past five years he published works on non-linear acoustics, on electrostriction and on physiological acoustics.

N. N. Andreev is widely known as an author of many scientific-popular works on acoustics, relativity, wave mechanics, thermodynamics, and electrodynamics. He thoroughly revised Michelson's widely known physics textbook and wrote many sections of the physics textbook edited and compiled by Academician N. D. Papaleksi.

Andreev is just as well known as an editor or as a member of the editorial staff of physics journals (Journal of Technical Physics, Journal of Experimental and Theoretical Physics, Proceedings of the Commission on Acoustics of the USSR Academy of Sciences); recently added to this list is the Acoustic Journal, in the foundation of which Andreev participated most actively.

Andreev devoted considerable attention to pedagogical activity. He was professor of the M. I. Kalinin Leningrad Polytechnical Institute, S. M. Budenny Leningrad Military Electrotechnical Academy and Moscow Correspondence Electrotechnical Institute.

Academician Andreev's students and followers were always stimulated and inspired by the breadth of his scientific interests, by this thorough knowledge of mathematics and by the high theoretical level of his approach to the solution of problems and by his tendency of invariably relating the scientific accomplishments to practical problems of Russia's national economy. Andreev succeeded also in imparting these principal approaches to the representatives of the scientific school he founded.

Andreev has always been a central figure in the acoustic fraternity of the Soviet Union; he unified about him all the activities in the organization, planning, and coordination of the scientific and scientific-technical work performed. He has been in charge of periodic conferences on acoustics since 1931, and of extended conventions of the Commission on Acoustics of the USSR Academy of Science, since 1936.

The Soviet Government has highly valued Andreev's services and has awarded him three Orders of Lenin, the Order of the Labor Red Banner, and several medals. In 1933 N. N. Andreev was selected an associated member of the USSR Academy of Science, and became a full member in 1953.

All Soviet men of science wish this great jubilarian, Nikolai Nikolaevich Andreev, many years of activity just as fruitful as he has so far been carrying on.

Translated by J. G. Adashko
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