

*NIKOLAĬ NIKOLAEVICH ANDREEV (on his 90th Birthday)*L. M. BREKHOVSKIKH, K. A. NAUGOL'NYKH, and G. A. OSTROUMOV
Usp. Fiz. Nauk. 101, 773-776 (August, 1970)

THE outstanding Soviet scientist and acoustics expert, Academician Nikolaĭ Nikolaevich Andreev, celebrated his 90th birthday on 28 June 1970. Andreev's name is inseparably linked with the organization and vigorous development of Soviet acoustics. His works, spanning half a century, cover a large number of fundamental problems of oscillations and acoustics, and the solutions of many practical problems of great national-economic and defense significance. Andreev is an organizer of a number of research institutions and laboratories specializing in acoustics. He trained a whole generation of students.

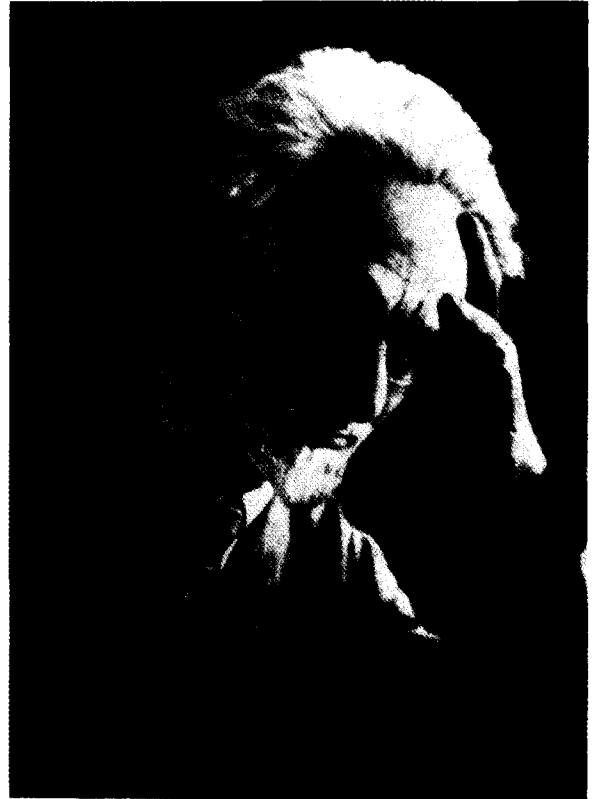
Andreev was born on 28 July 1880 in the village Kurmany of the Poltava province. In 1890, he entered a secondary school in Moscow, where he studied for three years and was then transferred to the fourth year of the Cadet Corps, also in Moscow. The Corps supplied Andreev with fair knowledge of the principles of natural sciences—mathematics, physics, botanics, zoology, good knowledge of German and particularly French, and also developed his mobility and agility and provided good physical buildup.

Andreev was a good student and invariably was among the first in his class up to his graduation in 1898. Choral singing, violin and flute playing, study of textbooks of harmony, and participation in the school orchestra contributed to Andreev's initial musical development. Being very musical, he conducted the orchestra of his class.

In the last years of the Cadet Corps and later, already a university student, Andreev became friendly with his distant relative, the philologist L. P. Bel'skiĭ, instructor at the Moscow University, and translator of the "Kalevala." Under this influence, Andreev became interested in Russian literature and fell in love with it for life. He remained attracted, in particular, to Russian poetry; he frequently turned to his favorite poets during his periods of rest and periods of meditation.

After graduating from the Cadet Corps in 1898, Andreev entered the Moscow Technical School (now the Moscow Higher Technical School). However, for participation in "students' disorders" in the spring of 1899 he was exiled to the hamlet Khoprík of the Saratov province. In the fall of the same year, he returned without permission to Moscow and continued to study in the second year of the Technical School. He became interested in mathematics and wanted to enter the University. To this, end, however, it was necessary to pass examinations in Latin and Greek, which were not taught in the Cadet Corps. Therefore Andreev did not succeed in becoming a regular student of the university, and enrolled as an auditor. He earned his living by giving private lessons and by serving as a draftsman for the Kiev-Voronezh Railway, and then as an inventory clerk in the evaluation of the real estate of the Moscow City Administration.

In 1903 Andreev ran across the Henri Poincaré's book "Science and Hypothesis." This book exerted an



exceedingly strong influence on him, was translated by him into Russian, and he had approximately 600 copies printed at his own expense. The cover of the book reads: "Store of the Publishing House, Moscow, Irinin Street, Nikol'skii's House, N. Andreev" (not far from the Gnesin Music School). This book exerted a great influence on the formation of Andreev's scientific viewpoints.

At the Moscow University, Andreev attended lectures by Profs. N. E. Zhukovskii, N. V. Bugaev, and displaying mathematical abilities, was an unofficial assistant of the latter. Not having any hope for being graduated from the university in Russia, Andreev decided to continue his education abroad.

He went to Germany on 1 May 1905, entered the Göttingen University, where at that time the teachers were Klein, Minkowski, Karatheodory, and Vogt. Then, in 1906, Andreev moved to Switzerland and entered the Basle University as a doctoral candidate of Prof. Hagenbach.

After investigating the dispersion of electromagnetic waves in media, during the course of which Andreev, in particular, derived a certain generalization of the Lorenz-Lorentz formula, he defended with high grades a dissertation for the degree of Doctor of Philosophy. In 1909 he was chosen a member of the French Physics Society.

After returning to Moscow, Andreev engaged in teaching; at the same time he joined the Circle of Moscow Physicists, organized by P. N. Lebedev.

After passing his Master's degree examination, he was appointed in 1914 as an instructor at the Moscow University, where he delivered lectures on tensor calculus, relativity theory, statistical mechanics, electron theory, and others. Some of these courses were taught for the first time at the Moscow University. Among Andreev's students were B. A. Vvedenskii, K. F. Teodorchik, A. S. Predvoditelev, and others who subsequently became well known scientists.

In 1915 Andreev wrote the well known paper "Grating, Prism, Resonator," published in the journal "Voprosy fiziki"—the predecessor of "Uspekhi Fizicheskikh Nauk." This article did not contain any new material, but a lucid exposition of spectrum representations, which were particularly timely in connection with the then vigorous development of radio engineering.

Further investigations by Andreev in the field of oscillation theory culminated in a Master's Dissertation on the topic "Electric Oscillations and Their Spectra. Theoretical Investigation," defended by him in 1917.

At the same time, Andreev took part in research of military nature, was occupied in developing a dosimeter for poison gas, and also in the problem of acoustic direction finding for guns and airplanes.

After two years' work in Omsk (1918–1920), where Andreev was professor of physics and mechanics at the Agricultural and Polytechnic Institutes (positions offered to him after his defense of the Master's dissertation), he returned to Moscow. There he organized, in the All-Union Experimental and Electrotechnical Institute (VEEI) an acoustic laboratory, and since that time acoustics occupied the first place in his activity. At the same time, he refused to take part in the attacks on the progressive ideas of relativity theory. Andreev took part in public disputes, carried out at that time in the presence of large audiences, and translated into Russian Einstein's book "Principles of Relativity Theory," and organized the publication of the first Soviet scientific-popular physics journal "Iskra" (Star), of which he became the editor (1922–1927).

In 1926, Andreev accepted a suggestion by N. N. Semenov, of organizing an Acoustics Division as part of the Leningrad Physico-technical Laboratory. Andreev's scope of interests in the field of acoustics was quite wide. He carried out theoretical investigations of vibrations of strings, of the dynamics of the keyboard mechanism, problems of reciprocity in acoustics, the acoustics of moving media, nonlinear phenomena, and the principles of silencer design. Of fundamental significance is his work on the theory of vibrations of piezoelectric plates, which led to the invention of a bimorphous piezoelectric element. Andreev's experimental work was brilliantly simple. He developed original methods of measuring the amplitude of oscillations of plates. These include, in particular, the well known method of jumping sand grains.

Andreev's scientific-organization talent was apparent already at that time. He took part in the organization of the Research Institute for the Musical Industry

and was the scientific director of its operations (1932). An important result of this Institute was the replacement of imported wood for musical instruments by domestic woods. He exerted great influence on the work of the acoustic groups of the Central Radio Laboratory, of the V. I. Ul'yanov (Lenin) Electrotechnical Institute, of the Leningrad Telephone Plant, etc. He taught courses in optics and acoustics at the Leningrad Polytechnic Institute and directed the Acoustics Department organized by him at the Budeny Academy of Communications. In 1933 he was elected a Corresponding Member of the USSR Academy of Sciences.

In 1937, under Andreev's directions, a group was formed on the acoustic design of the Palace of the Soviets. In 1940, Andreev moved to Moscow to head the Acoustics Laboratory of the Physics Institute of the USSR Academy of Sciences. He was able to gather together a strong staff of acoustics experts in this laboratory.

Immediately after the start of the war with Germany, Andreev became active in defense work. He organized a number of scientific and technical groups working under his direct guidance in the fleet in operation in the Black Sea, the Baltic Sea, the Caspian Sea, and in the Volga River flotilla. One of such groups, in the work of which Andreev took personal part, was engaged in combatting German acoustic mines. Preliminary scientific experimental and theoretical research was completed in 1942, and at the end of April of the same year he completed the preparation for an expedition to the Black Sea, of major proportions for that time. The expedition consisted of six persons and was placed, together with its scientific equipment, in a freight wagon. The trip from Kazan', to which the Physics Institute was at that time evacuated, to Moscow took a whole week, since all paths were blocked by military echelons. While on the road, Andreev organized scientific seminars, and treated the participants with black coffee. (Andreev had a reserve of about 40 lbs of Brazilian coffee beans. This had to last for the entire time of the expedition, 11 months, at the Black Sea theater of military operations.) For directing the work of the expedition, Andreev received a government prize.

In the postwar period, Andreev continued his work, heading the acoustic laboratory of the Physics Institute, and then, after transforming it into an Acoustic Institute, he directed a division of this Institute.

Under his direction, research was organized in a number of new trends, such as the propagation of sound in layered media, electromechanical active materials, nonlinear acoustics, and others.

In recent years, Andreev's greatest attention was devoted to problems of physiological acoustics and biophysics. In recognition of Andreev's outstanding work in the field of physics and acoustics, he was elected a full member of the USSR Academy of Sciences in 1953.

Andreev is characterized by large activity for the scientific society. While still a student he joined the Russian Physics and Chemistry Society, and in 1933 he became its chairman. In 1935 he organized the Acoustics Commission of the USSR Academy of Sciences, to coordinate research in the field of acous-

tics in the entire country. For a number of years he was a member of the International Commission on Acoustics.

Subsequently Andreev was a member of the editorial boards of many of the largest physics journals. He was editor in chief of the Journal of Experimental and Theoretical Physics, of the Journal of Technical Physics, and others. In 1954 he founded and headed the Acoustics Journal of the USSR Academy of Sciences. Andreev is also a member of the editorial board of the International Acoustics Journal. Andreev pays much attention to popularization of advanced science.

The most characteristic feature of Andreev as a scientist is the continuous interest in new problems, a dislike for dwelling on already "outdated" branches of science, an acute scientific sensitivity to the choice of the most interesting and fundamentally new trends.

In recent years he surprised his students and co-workers many times with the ease with which he foregoes the familiar groups of problems, which have already been solved and where it is possible to work fruitfully without any particular scientific risk, and turns to quite new uncharted fields. He always warns his co-workers against scientific stagnation, teaches them to have a broad outlook and to undertake boldly fundamental problems that discover new prospects.

All those who were fortunate to work with Andreev are strongly impressed by his personal attractiveness, his lively mind, the unusual mobility and ease of communication. Being a strict and demanding leader, Andreev is still cordial and fatherly towards his co-workers and has simple unforced manners.

Evenings spent at his home, which reveal the outstanding high culture of its domestic world, remain for a long time in the memory of his co-workers.

A distinguishing feature of his character is also

the love of nature, particularly the nature of Middle Russia and the northern regions. The lakes of Karelia, the wilderness areas near Plashcheev Lake, the forests and small rivers below Moscow are the favorite places for his vacations.

Andreev retained the physical toughness and the sportsman's spirit, which he acquired as a youth, for his entire life. While working in the laboratory, he usually performed gymnastic exercises in the courtyard during intermissions, or played volleyball and tennis.

Hunting, fishing, sailing, skiing are his favorite vacation activities. In 1953 his acquaintances met him with surprise in the Nevsky Prospekt, carrying a tremendous package in hand. Andreev was about to master the use of Lapland skis. Already passing his eighth decade, he regarded as a failure any summer in which he could spend only ten nights in the open air.

Andreev's entire life and activity were imbued with the deepest and most noble patriotism, love of his country, and pride in the progress of our science. His world-wide reputation as one of the founders of modern acoustics led to his being elected in 1953 a member of the International Acoustics Commission and his being awarded in 1959 an honorary doctorate in Technical Sciences by the Dresden Higher Technical School.

For merits in the development of Soviet science, Andreev was rewarded with three Orders of Lenin, the Order of Labor Red Banner, and medals. In October 1960 he was given the title of Outstanding Worker of Science and Technology of the RSFSR.

His students, co-workers, and friends congratulate him warmly on his birthday and wish him health and long life, filled with live interest in everything new in science.

Translated by J. G. Adashko