Krylov, Aleksei Nikolaevich | Encyclopedia.com

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(*b*.Visyaga, Simbirskoy province [now Ulynovskaya oblast], Russia, 15 august 1863; *d*. Leningrad, U.S.S.R., 26 October 1945)

mathematics, mechanics, engineering

Krylov was born on the estate of his father, Nikolai Aleksandrovich Krlov, a former artillery officer. In 1878 he entered the Maritime High School in St. Oetersburg. When he left in 1884 he was appointed to the copas unit of the Main Hydrographic Administration, where he began research on a theory of compass deviation, a problem to which he often returned. In 1888 Krylov joned the department of ship construction of the Petersburg Maritime Academu where he received through mathematical grounding under the guidance of A. N. Korkin, a distinguished disciple of Chebyshev. In 1890 Krylov graduated first in his class from the Maritime Academy and at Korkin's suggestion remained there to teach mathematics. he taught various theoretical and engineering sciences for almost fifty years at this milrary-maritine institute, creating from among his students a large school of shipbuilders who were both engineers and scientists. From 1900 to 1908, he directed the experimental basin, where he engaged in extensive research and tested models of various vessels. Krylov's work covered an unusually wide spectrum of the problem of what Euler referred to as navel science: theories of buoyancy, stability, rolling and pitching, vibration, and performance, and compass theories. His investigations always ledc to a numerical answer. He proposed new and easier methods of calculating the stuctural elemetns of a ship, and his tables of seaworthiness quickly received worldwide acceptance. From 1908 to 1910 Krylov, who had attained the rank of general, served as chief inspector for shipbuilding and was a preseident of the Naritime Engineering Committee. His courage and integrity led to conflicts with officials of the Maritime ministry and to his refusal to do further work for them.

In 1914, Moscow University awarded Krylov the degree of doctor of applied mathematics, *honor is causa*, and the Russian Academy of science elected him a corresponding member. he was elected to full membership in 1916.

After the October Revolution, Krylov sided with the Soviet Government. During this period he continued to be both active and productive. From 1927 to 1932 he was director of the Physics and Mathematics Institute of the Soviet Academy of Sciences. He also played an important role in the organization, in 1929, of the division of engineering sciences of the Soviet Academy. The title of honor scientist and engineer of the Russian Soviet Federated Socialist Republic was conferred upon Krylov in 1939, and in 1943 he was awarded the state prize (for his work in compass theory) and the title of hero of socialist labor.

While using mathematics and mechanics to work out his theory of ships, Krylov simultaneously improved the methods of both disciplines, especially that in the theory of vibrations and that of approximate calculations. In a paper on forced vibrations of fixed-section pivots (1905), he presented an original development of Fourier's method or solving boundary value problems, pointing out its applicability to a series of important questions: for example, the theory of steam-driven machine indicators, the measurement

of gas pressure in th conduit of an instrument, and the twisting vibrations of a roller with a flywheel on its end. Closely related to this group of problems was his ingenious and practical method for increasing the speed of convergence in Fourier and relat3d series (1912). he also derived a new method for solving the secular equation that serves to determine the frequency of small vibrations in mechanical systems (1931). This method is simpler than those of Lagrange, Laplace, Jacobi, and Leverrie. In addition, Krylov perfected several methods for the approximate solution of ordinary differential equations (1917).

In his mathematical education and his general view of mathematics, Krylov belonged to the Peterburg school of Chebyshev,. Most representatives of this school, using concrete problems as their point of departure, developed primarily in a purely theoretical direction. Krylov, however, proceed from theoretical foundations to the effective solution of practical engineering problems.

Krylov's practical interest were combined with a deep understand of the ideas and methods of classical mathematics and mechanics of the seventeenth, eighteenth, and nineteenth centuries; and in the works of Newton, Euler, and Gauss he found forgotten methods that were applicable a to the solution of contemporary problems.

BIBLIOGRAPHY

I. Original Works. Krylov's works are collected in *Sobranie trudov* ("Complete Works"), 11 vols. (Moscow—Leningrad, 1936–1951). His original development of Fourier's method appears in the article "Über die erawungenern Schwingungen von gleichförmigen elastischen Stähen," in *Mathematische Annalen*, **61** (1905), 211–234; further work on Fourier and related series is found in *O nekotorykh differentisalnkyh uravneniakj matejmaticheskoy fizik, imeyuschchikh prilozhenie v teknichekikh voprosakh* ("On Several Differential Equations of Mathematical Physics Which Have Application in Engineering Problems" St. Peterburg, 1912). For his work on the secular equation see "O chislennom reshenii uravnenia, kotorym v tekhnicheskikh system" ("On the Numerical Solution of Equation by Which are Determined in Technical Problems the Frequencies of Small Vibrations of Material Systems"), in *lzvestiya Akademii nauk S.S.S.R.*, Otd. mat, nauk (1931), 491–539; see also *ibid* (1933), 1–44.

Among his numerous works in the history of science, his Russian translation of Newton's *Principia (Mathematicheskie nachala naturalnoy pohilosophii*., St. Petersburg, 1915) is especially noteworthy for its lucidity and for the depth of its scientific commentary.

II. Secondary Literature. A list of Krylov's works appears in N. A. Kryzhanovskaya, *Akademik a. N. Krylov, bibliograqfichesky ukazatel* ("Academician A. N. Krylov, Bibliographical Guide"; Lenigard, 1952). for a study of Krylov's life, see S. Y. Shtraykh, *Aleksei Nikoaevich Krlov, ego zhizn i deyatelnost* ("Aleksei Nikolaevich Krylov, His life and Work"; Moscow—Leningrad, 1950).

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