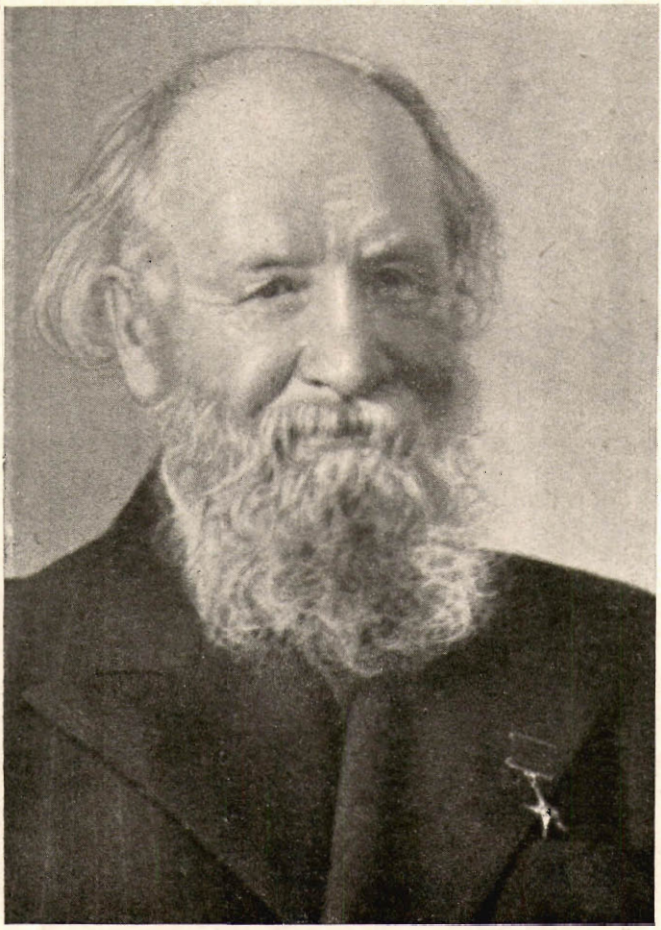

А. Крылов.

Институт механики Академии Наук Союза ССР
Прикладная математика и механика. Том X, 1946

*Светлой памяти Алексея Николаевича Крылова редколлегия журнала посвящает этот выпуск*

## А. Н. КРЫЛОВ

26 октября 1945 г. от нас ушел навсегда Алексей Николаевич Крылов. Наша страна потеряла ученого исключительного таланта, инженера выдающейся энергии, горячего патриота родины.

А. Н. Крылов родился в 1863 г. 15 августа в г. Алатыре б. Симбирской губ. ныне Ульяновской области. По своему происхождению Крылов принадлежал к передовой русской интеллигенции прошлого века. В 1884 г. А. Н. Крылов окончил Морской корпус, был произведен в мичманы и в 1885 г. написал свою первую научную работу. В 1890 г. он окончил кораблестроительное отделение Морской академии.

Под влиянием выдающегося математика А. Н. Коркина, лекции которого в С.-Петербургском университете он слушал в течение двух лет, сложились математические воззрения А. Н. Крылова, донесшего до нашего поколения замечательные традиции школы Чебышева.

Научную зрелость А. Н. Крылов проявил в своих первых работах и в 90-х годах прошлого столетия уже приобрел мировую известность исследованиями по теории качки корабля.

Оригинальный ум А. Н. Крылова, глубокий и ясный, сочетался с исключительными практическими дарованиями. Его изумительная по разносторонности научная деятельность проистекала из глубокого понимания связи между отдельными, для обычного глаза совершенно разнородными, явлениями. Математика и механика, астрономия и геофизика, физика и разнообразные области техники, история науки обязаны А. Н. Крылову глубокими оригинальными работами.

Наследство, оставленное А. Н. Крыловым, поражает своим объемом. Достаточно указать, что работы только по теории корабля и к ним примыкающие состоят из 4418 печатных страниц.

Однако, чтобы получить полное представление о громадной трудоспособности А. Н. Крылова, об его умении быстро и четко работать, нужно также просмотреть обширные работы по земному магнетизму и компасу, по строительной и прикладной механике, по баллистике, о способах определения орбит комет и планет по малому числу наблюдений и др., нужно вспомнить о замечательных переводах классиков естествознания Ньютона и Эйлера, обширные комментарии к которым представляют самостоятельный труд.

Только такому ученому, как С. А. Чаплыгину с его скупым, но содержатель-

ным лаконизмом и умением «видеть», удалось сделать[1], как он говорит, «краткую характеристику» научной деятельности А. Н. Крылова. И вряд ли кто другой, кроме А. И. Мандельштама с его блестящей эрудицией выдающегося физика, мог бы лучше показать[2], что многогранность А. Н. Крылова сочеталась с исключительной целеустремленностью его научного творчества.

Умение определить и поставить конкретную проблему, выбрать исходные предположения, довести решение до конца и получить исчерпывающие численные результаты—отличительные черты научного творчества А. Н. Крылова. Его исследования даже по наиболее сложным вопросам отличаются замечательной простотой, которая достигается в науке с таким же трудом как и в искусстве и присуща только большому мастеру, обладающему наиболее полным знанием и пониманием предмета.

Всей своей деятельностью А. Н. Крылов с поразительной силой показал единство науки и жизни и значение науки в приложениях. В своей книге [3] «Мои воспоминания», которая войдет в число интереснейших мемуарных произведений нашего времени, А. Н. Крылов на большом полотне, охватывающем несколько десятков лет, описывает свою кипучую практическую и инженерную деятельность. Особенно большое значение она имела для военно-морского флота. Работы А. Н. Крылова в области теории и строительной механики корабля, вибрации судов и механизмов, теории и практики артиллерийской стрельбы, теории гироскопов и успокоителей качки и его непосредственно личная инженерная и педагогическая деятельность сыграли исключительную роль в воспитании поколений культурных и высокообразованных морских специалистов и офицеров.

Научная деятельность А. Н. Крылова в 1916 г. была отмечена избранием его в действительные члены Академии Наук. В 1941 г. за работы по теории компаса и гироскопов А. Н. Крылову присуждается Сталинская премия первой степени.

13 июля 1943 г. указом Президиума Верховного Совета СССР академику А. Н. Крылову присуждается звание Героя Социалистического Труда за выдающиеся достижения в области математических наук, теории и практики отечественного кораблестроения и многолетнюю плодотворную работу по проектированию и строительству современных военноморских кораблей, а также крупнейшие заслуги в деле подготовки высококвалифицированных специалистов для военно-морского флота,—с вручением второго Ордена Ленина и золотой медали «Серп и молот».

Близкие друзья и товарищи по совместной работе навсегда запомнят обаятельный образ Алексея Николаевича. Редколлегия «Прикладной математики и механики» потеряла в его лице одного из основателей журнала.

28 октября 1945 г. на Волковом кладбище трудящиеся Ленинграда и моряки Балтийского флота отдали последние почести выдающемуся гражданину, который так много поработал для своей родины.

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[1] Доклад «Научная деятельность А. Н. Крылова», читанный на Общем собрании Академии Наук СССР 24 сентября 1933 г. Труды Физико-математ. института им В. А. Стеклова, том V, 1934).

[2] Доклад «О научных работах А. Н. Крылова», читанный на Общем собрании Академии Наук СССР 25—30 сентября 1943 г. Москва, Изд. АН СССР, 1944.

[3] Крылов, А. Н. Мои воспоминания.—М., АН СССР, 1942, 228 стр.

## ALEXEI NIKOLAYEVICH KRYLOV

The death of Academician Alexei Nikolayevich Krylov on October 26, 1945 will be felt as a loss not only to scientific circles in the Soviet Union and the entire world, but to shipbuilding engineers and seamen of all countries.

Krylov was born in 1863, in the town of Alatyr, in a family of Russian intelligentzia which was connected with such outstanding intellectuals of the second half of the 19th century as the physiologist Sechenoff, the famous mathematician Liapounoff and many others. Soon after graduation from the Naval Institute (1884), Krylov wrote his first famous work on the deviation of the compass. This work marked the beginning of a long and brilliant career in science, whose scope may be judged by the list of works of which he is the author[1]. Krylov was recognised as an outstanding scientist at the very beginning of his career.

In 1914 he was elected corresponding member of the Academy of Sciences and awarded the degree of honourary doctor of applied mathematics by the Moscow University. In 1916, he was elected full member of the Academy of Sciences, and from that time on, he was so taken up with scientific problems that one might have thought he would have neither time nor energy for practical work. However, such was not the case. Beginning in 1900, Krylov was successively director of the Testing Pool for ship models, member of the Naval Committee, Chief Inspector of Shipbuilding, Chairman of the Naval Geophysics Observatory, Chief of the Military-Meteorological Department, etc. etc. After the October Revolution, Krylov was appointed Head of the Naval Academy, and in 1921 was sent abroad to direct the transport of locomotives by sea—a new and most complex task. In the same year, he was made Head of the Naval Department of the Railway mission in Berlin, where he was chief of the important section for inspection of newly-acquired ships abroad. For a number of years, Krylov was consultant for such large enterprises as the Oil Syndicate, the Soviet Trading Fleet and he was Head of the Russian Society of Shipbuilding Engineers.

Krylov's main scientific-research work lay in the theory of the motion of ships, his labours in the field making him known in mathematical and engineering circles the world over. The problem of the rolling of a ship in waves whose crests are parallel to the motion of the ship was raised very long ago; the problem being investigated in the works of Froud assuming the dimensions of the vessel to be very small in comparison with the length of the wave. However, in the study of pitching, such simplification was impossible; and the problem might well have seemed insoluble. Nevertheless in 1896, Krylov, then still a young scientist, published his «New Theory of the Pitching Motion of Ships on Waves and of the Stresses Produced by this Motion», in which he gives a thoroughgoing solution of the problem he raised. The work was published first as a short paper in the proceedings of the Paris Academy, and then as a long paper in both English and French. Here, the method he presents of investigating the influence of trochoidal Herstner waves moving in the direction of the motion of the ship makes it possible to explain all the phenomena of pitching and to compute the oscillations of the vessel and the stresses set up in the body by them. Observations carried out of the motion of the

[1] A complete list of Krylov's works is given below (page 8).

Russian cruiser «Admiral Kornilov» and the French ship «Annamite» substantiate Krylov's theoretical calculations fully.

Krylov then went on to investigate the general case of the motion of a ship when its course lies at any given angle to the direction of the waves, and summed up his conclusions in a paper entitled «General Theory of the Oscillations of a Ship on Waves», which was also published in English and French. Here he followed the same path he had outlined in his previous work, making all the necessary changes in setting up the differential equations of the motion of the body of the ship, whose position now had to be defined by all six parameters (three coordinates of the centre of gravity and three Euler angles). This led to increasing the number of equations to be integrated. The new problem did not raise any particularly difficult new questions, and in his work «On Stresses Experienced by a Ship in a Seaway», published by the Institute of Naval Architects in London, Krylov presents a computation of the strains set up in a ship in this more complicated case.

These classic works placed Krylov in the first rank of world authorities on the theory of ships. The Society of English Shipbuilding Engineers awarded him the gold medal of the Society, an honour bestowed on no foreigner before him. Such works as those mentioned above and his work in the theory of rolling stabilizers, Schlick gyroscopic stabilizers and Fram cisterns won recognition everywhere. Krylov was entrusted with writing the chapter on the theory of ships in the great encyclopedia of mathematical sciences, begun prior to World War I under the supervision of the famous mathematician Klein. The compilers of the encyclopedia set themselves the task, as Boltsman said, of finding the leading specialists in each field to draw up the various articles. Krylov's works are studied all over the world and are a guide to shipbuilding. In 1942 he was elected an honourary member of the Society of English Shipbuilding Engineers.

Of particular note in the field of ordnance is Krylov's «Sur l'intégration numérique approchée des équations différentielles avec application au calcul des trajectoires des projectiles» (Paris, 1927), in which the author gives a detailed procedure for computing the trajectory of a projectile. Another is «On the Rotatory Motion of an Elongated Projectile in Flight». In this work, he corrects the errors in the old Mayevsky theory, making it conform to experimental results.

At the beginning of the present century, Krylov turned his attention to various problems connected with elastic oscillations of mechanical systems. Of the highest interest is his work «On Stresses Set up in an Elastic System by a Dynamic Load», in which the author gives a clear and generalized procedure to be followed in the solution of such problems, accompanying it by striking examples. We note here the interesting fact that Krylov found an error in the work of the world famous Levi-Civita, who, through a wrong application of his own perfectly correct formula for the coefficient used in calculating stresses in a bridge, came to the inadmissible conclusion that the lowest speed in crossing the bridge is the most dangerous. Krylov pointed out the error in the application and the proper method of using the formula.

A problem that occupied the minds of shipbuilding engineers at the beginning of the century was that of vibration. The problem had not yet been investigated theoretically, and engineers had no idea of how to combat this harmful and often destructive force. Krylov began to work on the problem in 1901, and succeeded in

showing that the vibration resulted from the fact that the period of the beats of the machinery, and particularly of the pistons, was approximately the same as that of the oscillations of the ship or its parts. The vessel in this case behaved as if it were a giant tuning fork a hundred or more meters in length.

Krylov's theory not only provided a clear analysis of the phenomenon, but also the means of eliminating it, and it has been adopted in sbipbuilding practice both at home and abroad.

Another significant work by Krylov is «Calculation of a Beam Resting on an Elastic Foundation», a problem previously investigated by the Japanese scientist Hayashi. Hayashi's method involved long and complicated computations. Krylov suggests a brilliant and original solution involving but two equations with two unknowns in all cases of load.

Finally, we must speak of Krylovs «Definition of means of successive approximations in finding the solution of certain differential equations of oscillatory motion», in which all the solutions are given in the form of a power series of small parameters; and of his «Numerical solution of equations which determine the frequency of small oscillations of material systems in technical questions».

No discussion of Krylov's work would be complete without mention of his translation of Newton's «Philosophiae Naturalis Principia Mathematica», on which he laboured for six hours a day over a period of two years. There is hardly a scientist anywhere in the world who has had such a grasp of Newton's genius as had Krylov, and his detailed commentaries to the «Principia» form an independent work by themselves. In the history of astronomy and the history of physics Krylov was one of the most outstanding figures. His importance to science was due not only to the profundity of his studies of the work of Newton, Euler, Laplace, and Gauss, and not only to his discovering a number of mistakes in the understanding of their works; but rather to the fact that he himself combined a remarkable sense of the historical development of science with unusual creative power. Anyone who has read Krylov's discussions on the means of determining the orbits of comets and planets on the basis of a small number of observations, or who has looked into his translation and commentary to Euler's «New Theory of the Motion of the Moon», or who has looked into his translation of the «Principia» must agree that Krylov should be considered a significant figure in the history of science.

Krylov's work is marked by unusual skill in defining and setting up concrete problems, outlining the assumptions, in carrying out problems to the end and supplying them with complete numerical calculations. His work, even when it deals with the most complicated problems, is marked by beautiful simplicity; a simplicity achieved in science with the same difficulty as it is in art and which can be attained only by the consummate master, possessed of the most profound knowledge and understanding of his subject.

The Soviet government repeatedly expressed its appreciation of Krylov's work. In 1939 he was awarded the Order of Lenin. In 1941 he was awarded the Stalin prize, and in 1943 the title of Hero of Socialist Labour was conferred on him.

On October 28, the people of Leningrad and the entire Soviet Union paid their last respects to Alexei Nikolayevich Krylov, the friend of shipbuilders and seamen, and truly great scientist. In him the Journal of Applied Mathematics and Mechanics has lost a member of its editorial board.