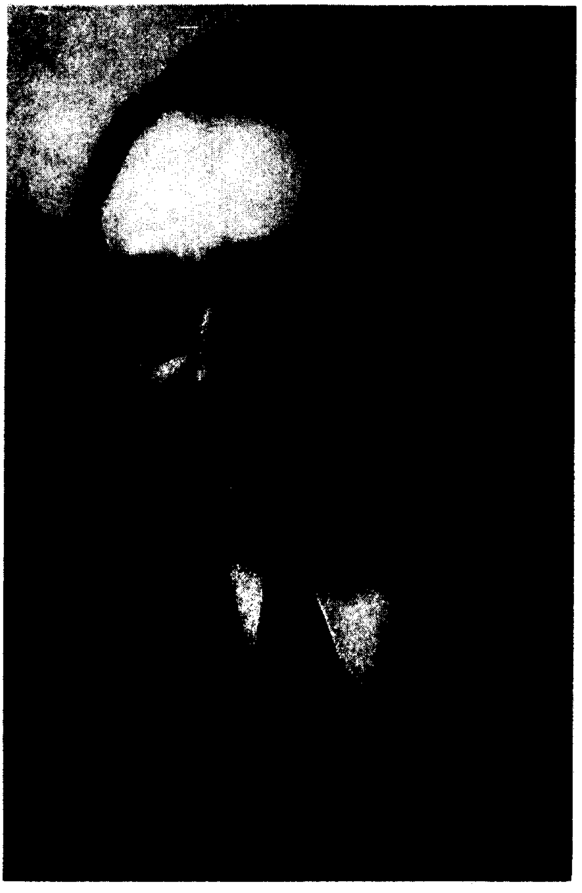

L.N. SRETENSKII

LEONID NIKOLAEVICH SRETENSKII

On his sixtieth birthday

Leonid Nikolaevich Sretenskii was born on February 27, 1902, in Moscow.

On completing his secondary education he entered the Physics and Mathematics Faculty of Moscow University in 1919. Leonid Nikolaevich Sretenskii studied under such eminent mathematicians as D.F. Egorov, N.N. Luzin, I.I. Privalov and S.P. Finikov. In 1925 Leonid Nikolaevich became an "aspirant" (graduate student*) of the Mathematics and Mechanics Institute of the University where he worked under the guidance of D.F. Egorov. In 1929 he defended a thesis for the degree of candidate on "The Volterra Equation in the Plane of a Complex Variable" [9]; between 1929 and 1934 Leonid Nikolaevich taught mathematics and mechanics at various Moscow technical institutes, whilst in 1934 he became Professor of Moscow University in the Faculty of Hydrodynamics.

From that time onwards his scientific and teaching activities were centered entirely within Moscow University.

In addition to teaching Leonid Nikolaevich has been doing a great deal of research: between 1931 and 1941 under the leadership of S.A. Chaplygin at the Theoretical Section of TsAGI (the Central Aero and Hydrodynamics Institute) and then at the Institute of Theoretical Geophysics of the Academy of Sciences USSR. Since 1951 he has been in charge of the Wave Theory Laboratory of the Moscow Hydrophysics Institute of the Academy of Sciences USSR.

In 1936 Leonid Nikolaevich was awarded the degree of Doctor of Physical and Mathematical Sciences without having to defend a thesis, in recognition of the body of his work on the hydrodynamics of wave motion.

In 1939 Leonid Nikolaevich was elected a Corresponding Member of the Academy of Sciences USSR with the sponsorship of academicians S.A. Chaplygin, N.N. Luzin, P.P. Lazarev and A.N. Krylov.

Leonid Nikolaevich Sretenskii has been engaged in Social-Scientific work on a large scale: for several years he was vice president of the

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* Editor's note.

Moscow Mathematical Society, he takes a direct part in the publication of the journals "Applied Mathematics and Mechanics", "Izvestiya ANSSSR" (Geophysics series), "Vestnik Moskovskogo Universiteta" (Mathematics and Mechanics series). Since 1959 Leonid Nikolaevich has been a member of the National Committee of the USSR on Theoretical and Applied Mechanics and of the Committee on Tides of the International Association of Physical Oceanography.

Leonid Nikolaevich spends considerable time in activities connected with the publication of Russian and Soviet Scientists' works. He acted as a member of the Commission which published the works of N.E. Zhukovskii, S.A. Chaplygin and N.N. Luzin, and at the moment he is heading the commission engaged in publishing the works of A.M. Liapunov.

In recognition of his services in hydrodynamics and geophysics and his painstaking teaching activities L.N. Sretenskii was awarded the Lenin Order and the Order of the Red Labour Insignia.

Sretenskii's scientific activities have many facets; they include numerous publications on hydrodynamics, geophysics, theoretical mechanics and mathematics. L.N. Sretenskii is one of the greatest specialists on wave motion in fluids in the Soviet Union.

L.N. Sretenskii has published more than one hundred papers and this includes three monographs.

The first mathematical works of L.N. Sretenskii [2, 3, 4, 7, 12] are devoted to problems in differential geometry. In his dissertation for the degree of candidate L.N. Sretenskii [9] was the first to raise the question of the systematic study by methods of the theory of analytic functions of solutions of the Volterra integral equation, considered over the whole plane of a complex variable. In his thesis there is a study of singularities of the integral equation with variable upper limits. In his subsequent works [33, 85] Leonid Nikolaevich considered the problem of determining the shape of an attracting body in terms of its Newtonian potential over a plane, and he also demonstrated the uniqueness of the determination of the shape of an attracting body in terms of its external potential. Basing himself on the Lemma of P.S. Novikov on the orthogonality of the density of a body of zero external potential to any harmonic function, L.N. Sretenskii proved the theorem of uniqueness for several new conditions relating to the shape of the body.

In 1938 L.N. Sretenskii's monograph "Theory of Equilibrium Shapes of a Fluid Rotating Mass" [35] was published. This work contains a discussion of the basis of the theory of equilibrium figures and also the studies by A.M. Liapunov on figures or shapes of bifurcation. In 1946

L.N. Sretenskii published a book on the theory of the Newton potential [50]; this is not only a scientific text book but is an original monograph based on the fundamental work of A.M. Liapunov on the problem of equilibrium figures in the Dirichlet problem. Much of Sretenskii's creative work is devoted to important practical investigations in applied hydrodynamics associated with ship theory. His works on wave resistance are amongst these [16, 22, 24, 29-31, 38, 51, 52, 95, 104], theory of planing [14, 18, 39], theory of oscillation of a floating body [25] the motion of bodies under a liquid surface [32, 53] and the motion of a solid body with a hollowed out space partly filled with liquid [67]. It is a feature of these studies that many of the problems in them are for the first time elucidated from the point of view of exact hydrodynamics. In the paper "Theoretical Studies of Wave Resistance" [24] a new derivation of the Mitchell formulas is given and formulas are obtained for the first time for the wave resistance of a ship moving on the surface of a liquid in channels of both infinite and finite depth, and the effects of the walls on the wave resistance are explained.

In one of his fairly recent works [104] he solved the problem of determining the wave drag of a ship moving over the surface of a stratified liquid. Paper [52] deals with the motion of a ship travelling in a circular path with the assumption of constant velocity. The well-known Kelvin results on ship waves are developed in this paper. In [14] one of the first solutions to the planing problem is given.

To L.N. Sretenskii belongs the credit for original studies on general problems in wave theory [15, 60, 65, 81, 82]. In [15] he studies wave motions on separating surfaces and on free surfaces of two liquids of different densities as applied to the phenomenon of "dead water", which was originally discovered by F. Nansen on the "Fram". L.N. Sretenskii was the first to give a full geometrical description of the wave system which develops when a ship moves under conditions of dead water. Wave resistance of a ship under the influence of dead water is determined in [104].

A group of papers by L.N. Sretenskii [60, 65, 81, 82] contains studies on the development and propagation of waves on the surface of a liquid due to moving and stationary local disturbances.

In several papers on hydrodynamics the problem posed by meteorologists on wave motions on the separating surfaces of two fluids flowing in the same direction at different velocities had already been solved. Sretenskii's work [70] contains an extension of these studies: he has solved the problem of waves on the separating surface of two flows whose velocities differ in magnitude and direction. The results of these investigations can be applied to a theoretical explanation of cirro cumulus clouds. Waves on the surface of two separating flows which arise as a result of initial disturbances of the separating surfaces are studied in [86]. A special case of initial deviations is also studied in detail and it is demonstrated that a stationary observer will notice almost periodic elevations and drops in the surface of the liquid. This phenomenon is not revealed in the normal Cauchy-Poisson problem.

In 1936 Sretenskii's monograph was published "Theory of Wave Motion of Fluids". It is one of the most complete guides to the theory of waves.

A method due to Sretenskii of simultaneously applying Euler and Lagrange variables has made it possible to solve very effectively various problems in the theory of waves of finite amplitude. Wave motions of fluids arising due to periodically distributed pressures over a free surface [77] have been studied by this method. Special attention has been given to the case represented by the free wave lengths equalling the wave lengths of the distributed pressures. This case cannot be dealt with by the method of wave theory of infinitely small amplitudes. A problem of stationary three-dimensional waves which had not been attacked before was very effectively handled by the simultaneous application of the Euler and Lagrange variables. Sretenskii succeeded in elucidating an algorithm which made it possible to solve the problem of finite amplitude waves to any degree of approximation [78, 85]. By means of the method of simultaneous amplication of both systems of variables Sretenskii determined progressive waves of finite amplitude propagating along the surface of a liquid confined between two circular cylindrical surfaces with vertical generators [87]. This work makes it possible to study a steady wave machine in circular channels.

A significant improvement on the well known second method of Stokes [71] was suggested by Sretenskii for application to the theory of steady finite amplitude waves. He demonstrated that the determination of steady waves reduces to solution of an infinite system of cubic equations.

In [107, 110] the Cauchy-Poisson problem is solved for certain initial conditions taking account of the finite height of the waves developed. The solution of this problem obtained in Lagrange variables gives velocities of liquid particles and the elevations of its surface in the form of Lindschtedt-Poincare type series, the series not involving epoch terms.

Sretenskii has been responsible for a whole series of fundamental works on the theory of tides [19, 27, 28, 45, 55, 59, 88]. In one of these [19] tides are studied in a nonhomogeneous liquid and it is demonstrated that the integration of equations for this case can be reduced to integrating the equations of tides in a single layer liquid.

The solution is found for the motion of a free tidal wave within a rotating channel for given conditions of entry into the channel [28]. In [27] Sretenskii succeeded in giving an accurate theory of free tidal waves within a polar basin. Maps were obtained which illustrated the comlicated character of reflections of Kelvin waves.

Sretenskii analysed the propagation of tidal waves in the oceanic hemisphere of the earth and constructed a daily tidal map representing a distribution of tides taking account of the shapes of the continents and islands of that hemisphere [45]. He also carried out a widescale investigation of long term tides and using asymptotic expansions of integrals of differential equations he found the periods of free vibrations of the level of the polar seas [55].

At the present time Sretenskii is occupied with the important problem of tsunami waves and elastic waves in the earth's crust caused by underwater earthquakes [72, 88, 92, 107, 112, 113]. He studied elastic waves which arise due to supplementary stresses caused by tidal generated forces and underwater earthquakes causing deformations on the surfaces of the oceans [72, 88, 92, 113]. It was through these studies that a start was made in predicting waves by means of tsunami waves from records of seismic stations. Further on he recommends methods of working out the height of tsunami waves and methods are given of mapping waves in areas close to the shores [107, 112].

Sretenskii also turned his attention to several problems in the theory of a viscous fluid [41, 54, 106]. He studied waves on the surface of a viscous liquid [41], arising as a result of an initial elevation. Here also he dealt with several forms of steady motion of a viscous fluid, and the wave resistance of a constant system of normal pressures displacing uniformly over the surface of a liquid are also dealt with here. The latter problem is developed more fully in [106], which was presented in Holland at the International Symposium on the Behaviour of Ships in Waves in 1957. Formulas were put forward in this work which made it possible to allow for the effect of viscosity on wave drag of a ship of the Mitchell type. In [54] Sretenskii solved the problem of diffusion of a vortex pair in extending the solution of V.I. Nekrasov on the diffusion of a single vortex.

Works [98, 101, 102] deal with several problems in the theory of gas flows at subsonic velocities. Sretenskii developed a method by which it was possible to arrive at accurate solutions of the problem of stream motion of a gas under conditions in which the well-known method due to S.A. Chaplygin cannot be applied. A detailed analysis of the solution is carried out on the basis of Poincare's method as applied to the theory of Herz wave diffraction. Poincare's method allowed Sretenskii to extend his studies to the propagation of waves on a surface of a heavy liquid [60, 65, 67] for various conditions under which they arose.

In ending this short review of Sretenskii's work one should not omit his various papers devoted to problems in theoretical mechanics and to acoustics.

One of the characteristic features of Sretenskii's creative ability is the clarity of his mathematical and physical formulation of the problem, the rigor and depth of his investigation and his high analytical ability.

Over thirty years of Sretenskii's life have been devoted to the education of the younger generation of Soviet scientists. Lecture courses read by him at the mechanical mathematical faculty of Moscow University are remarkable for their originality, their fundamental content and the novelty or freshness of the thought behind them, and they attract young people to a devotion for science. Much effort has been devoted by Sretenskii to the coaching of young scientists towards their graduate study.

More than forty students completed their graduate studies and defended theses to become "candidates of science" under his guidance.

Sretenskii's high principles, his humility and his cheerfulness have always aroused the greatest respect and affection of his colleagues and his students.

The Editorial Staff of this Journal wish him health and every success in the promotion of Science.

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