ALEXEY BORISOVICH SHABAT

(to 75th anniversary)

20th of August, 2012 is the 75th anniversary of an outstanding mathematician, laureate of the State Prize of Russian Federation in the field of science and technics, the main researcher of Landau Institute for Theoretical Physics of RAS, doctor of physical and mathematical sciences, professor Shabat Alexey Borisovich.

Alexey Borisovich Shabat was born on August, 8, 1937 in Moscow in the family of scientists. The father, Boris Vladimirovich Shabat, was a well-known mathematician, professor of MSU on the department of functional analysis, the author of well-known textbooks «Methods for the theory of functions of a complex variable» and «Introduction to complex analysis», and the mother, Makarova Elena Alexandrovna, was a senior researcher of the Sternberg State Astronomic Institute of MSU.

In 1959 he graduated from the faculty of mechanics and mathematics of Lomonosov Moscow State University and defended his diploma in the department of differential equations under the supervision of professor M.I. Vishik.

The scientific activities of Shabat A.B. began during his student years. His first works were devoted to the boundary value problems for ordinary differential equations with a small parameter at higher derivative, the theory of elliptic equations, and to solving a series of problems in classical hydrodynamics.

In 1963 he defended his candidate (PhD) thesis «On gluing potential and vortex flow of a non-compressible fluid» in the Institute of Mathematics of SB AS USSR (Novosibirsk) under the supervision of the academician M.A. Lavrentiev. In 1975 he defended his doctoral (Habilitation) thesis «Transform operators and nonlinear equations» in the faculty of mechanics and mathematics of Lomonosov MSU.

At different times he worked in the Hydrodynamics Institute of Siberian Branch of AS USSR and Novosibirsk State University (1959-1973); in the Department of Physics and Mathematics of Ural Branch of AS USSR and Bashkir State Univeristy (Ufa,m 1974-1990); in the Landau Institute for Theoretical Physics (Chernogolovka, 1990-present); in Aliev Karachaevo-Cherkess State University (Karachaevsk, 2007-present).

The world fame and recognition not only by mathematicians but also by theoretical physicists were brought to him by his fundamental results in the modern theory of integrable systems related to the developing the method of the inverse scattering problem being a pearl of the mathematical physics in twentieth century.

A.B. Shabat made a fundamental contribution in the developing of the theory of solitons, a new method in the modern mathematical physics. In 1970-1979 jointly with V.E. Zakharov he created and developed a general scheme of integrating nonlinear differential equations by the method of the inverse scattering problem now world-known as «dressing method» or Zakharov-Shabat method. Namely, after the famous work [Zakharov V.E., Shabat A.B., «Exact theory of two-dimensional self-focusing and one-dimensional self-modulation of waves in nonlinear media», Soviet Physics-JETP, 1972, V. 34(1), P. 62-69] «method of the inverse scattering problem» became a method. In that years Shabat A.B. published also a series of the pioneer works developing the method of the inverse scattering problem, and used for the first time the Riemann-Hilbert problem for solving the inverse scattering problem.

In the end of 70s he proceeded to solving the problem on the classification of integrable equations. He has the priorityof employing the matrix Riemann-Hilbert problem for constructing solutions to the equations integrable by the method of the inverse scattering problem. For working on this project in Ufa a working group was created in which besides the pupils of A.B. Shabat (A.V. Zhiber, V.V. Sokolov, I.T. Khabibullin, S.I. Svinolupov, R.I. Yamilov, A.V. Adler) at dfferent times N.Kh. Ibragimov, A.N. Leznov, A.V. Mikhailov actively participated.

As a result of the work of this group, simple and effective integrability criteria were formulated being the necessary conditions for existence of generalized symmetries and conservation laws. A.B. Shabat jointly with his pupils completely described and classified the integrable systems of equations like non-linear Schr\"odinger equation and Langrange nonlinear chains with the interactions of nearest neighbours.

In 1974 A.B. Shabat organized a well-known and first in Russia conference on the soliton theory and the method of the inverse scattering problem. It gathered both a pleiad of outstanding scientists and a young generation.

In 80s on the basis of the proven by A.B. Shabat theorem on the existence of a generalized Lax pair for evolution equations having generalized symmetries a symmetries approach for the integrability problem was developed. Jointly with the pupils they developed effective integrability criteria, gave complete description and classification of integrable nonlinear equations generalizing Landau-Lifschitz anisotropic model. We also mention a series of the papers of A.B. Shabat (1987-2000) written in the collaboration with his pupils R.I. Yamilov and

V.A. Adler, where the completed the classification of Lagrange nonlinear chains with the interactions of nearest neighbours.

The works made by A.B. Shabat in 90s were devoted mostly to the developing the theory of discrete symmetries. He developed a rather general scheme of the discretization of spectral problems and studied lattice equations for main spectral problems. As an application of this theory, A.B. Shabat found new exactly solvable problem of one-dimensional quantum mechanics with «arithmetic» spectra and established a series of interesting facts for the Painlevé equations.

In 1996-1999 A.B. Shabat (jointly with V.E. Zakharov) obtained a grant as the head of a direction «Mathematical theory of exactly integrable nonlinear models» of a leading scientific school «Theory of nonlinear waves».

At the present time the interests of A.B. Shabat are concentrated on the classical problem on commuting differential operators in multi-dimensional domains.

A.B. Shabat was a coordinator of the consortium Einstein which organized and made a series of joint conferences NEEDS in Italy and Russia.

In 2001 he got an invitation to the Isaac Newton Institute for Mathematical Sciences in Cambridge as Rothschild Visiting Professor. In different years A.B. Shabat worked in the universities of Rome, Madride, Minnesota, Loughborough, Leeds, Montpellier.

A.B. Shabat is a member of the editorial boards of the journals «Theoretical and Mathematical Physics» (Moscow) and «Ufa Mathematical Journal» (Ufa), an expert of the Russian Foundation for Basic Researches, a member of the jury for PhD and Habilitation defenses of the Landau Institute for Theoretical Physics of RAS.

Among his pupils there are more than 10 candidates of sciences and 5 doctors of sciences. At the present time he successfully supervises a group of PhD students in North Caucasus within the theme «Integrable systems».

We say happy birthday to Alexey Borisovich in the occasion of his 75th anniversary, wish him a robust health, family prosperity, and new creative successes.

Editorial board of «Ufa Mathematical Journal»