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THE SEVENTIETH ANNIVERSARY OF THE JOURNAL *Prikladnaya Matematika i Mekhanika*☆

This year sees the 70th anniversary of the publication of the journal *Prikladnaya Matematika i Mekhanika*, the oldest Russian periodical devoted specially to problems of mechanics. As a regularly published journal of the Academy of Sciences, the first issue of *Prikladnaya Matematika i Mekhanika* appeared in 1937, and it has been published without interruption ever since.

However, the title *Prikladnaya Matematika i Mekhanika* first appeared in 1933, when the publication of a series of non-periodic collections began under this name. The decision to publish this series was taken in 1932 at the Second All-Union Conference on the Planning of Scientific Research in Heavy Industry. The publication of this series of collections was in response to the problems of the industrialization of Russia. In total, five issues were published in the period from 1933 to 1936 under the editorship of V. V. Golubev, A. A. Dinnik, A. I. Lur'ye (executive secretary), N. I. Muskhelishvili and Ye. L. Nikolai (senior editor). Of this first composition of the editorial board, A. I. Lur'ye remained an active member for almost half a century. The authors in the first issues of the collection included future celebrated scientists such as Ye. N. Blinova, I. N. Vekua, N. N. Davidenkov, I. A. Kibel', G. V. Kolosov, L. S. Leibenzon, S. G. Lekhnitskii, L. G. Loitsyanskii, S. G. Mikhlin, P. F. Papkovich, L. N. Sretenskii and others.

After reorganization, the editorial board of the regularly published journal was headed by B. G. Galerkin. The first editorial board consisted of A. N. Krylov, M. A. Lavrent'yev, A. I. Lur'ye, N. I. Muskhelishvili, A. I. Nekrasov, Ye. L. Nikolai, S. A. Chaplygin and others. Later on, many outstanding mechanics scientists joined the editorial board of the journal, including A. A. Il'yushin, A. Yu. Ishlinskii, M. V. Keldysh, L. I. Sedov and V. V. Struminskii. A great deal of organizational work for the journal was carried out for many years (1938–1971) by the editor N. A. Talitskikh, who did much to establish the style of the journal and was active in persuading capable scientists of the younger generation to write for the journal. After B. G. Galerkin, the editor-in-chiefs of the journal were N. G. Chetayev (1946–1959) and L. A. Galin (1960–1981). Since 1981, the editorial board has been headed by V. V. Rumyantsev.

Prominent scientists have taken part in the publication of the journal, and since 1940 these have been listed regularly in the journal. Publication in *Prikl. Mat. Mekh.* is rightly considered as an indication of high-quality research and is prestigious among mechanics scientists.

The journal has a high international reputation: it has been translated into English since 1958.

According to the tradition established in Russian science, research on mechanics is divided into three large areas: general mechanics, or systems mechanics; fluid mechanics; and the mechanics of solids. Papers in the journal over the 70 years of the journal's existence have clearly reflected the development of research in all these three areas of mechanics. Essentially, all the most important ideas and results that have determined the development of mechanics, the establishment of new lines of scientific research and also the appearance and development of new applications of mechanics in a period of rapid scientific and technical progress have been reflected in the journal to some degree.

In the area of general mechanics, basic research on analytical mechanics and the stability of motion has been published, continuing and developing the remarkable traditions of the Russian school, going back to the classical work by A. M. Lyapunov and N. G. Chetayev. Research on the control theory of dynamical systems appeared and

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was widely developed, in particular the theory of optimal control and differential games, the principles of which were set out by L. S. Pontryagin. In the area of the oscillation theory, research has continued on the theory of non-linear oscillations dating back to N. N. Bogolyubov, and many papers containing the solutions of important practical problems in this area were also published. Problems of the mechanics of outer space systems heralded entirely new applications for mechanics. After the launch of the first satellite in 1957, and the first manned space flight in 1961, papers on the dynamics of satellites and spacecraft appeared regularly, including papers on problems on orbital motion, on the motion of satellites about their centre of mass and on the motion of bodies with cavities containing fluid. The mechanics of gyroscopic systems underwent great development, particularly in the context of problems of inertial navigation for rockets, aircraft, spacecraft, and seagoing vessels. Work by A. Yu. Ishlinskii and his school made a key contribution to this line of research. One other new application for mechanics involves problems of the kinematics and dynamics of robotic systems, where classical theories of theoretical mechanics are combined with modern computer methods of analyzing complex multibody systems.

Fluid mechanics has made considerable strides over the 70 years of publication of the journal. Detailed research has been carried out on the hydrodynamics of ideal and viscous fluids and on the theory of waves and jets. The Russian school of hydrodynamics obtained a number of classical results in this area: it is sufficient to cite papers by M. I. Keldysh, N. Ye. Kochin, M. A. Lavrent'yev, A. I. Nekrasov, L. I. Sedov and L. N. Sretenskii, many of which were published in *Prikl. Mat. Mekh.*. As is well known, the principles of the aerodynamics of aircraft at the dawn of avionics were set out in work by the Russian scientists N. Ye. Zhukovskii and S. A. Chaplygin. The rapid progress of aviation, and then of rocketry, required a huge amount of research on the gas dynamics of subsonic, transonic, supersonic and hypersonic flows. Fundamental research in these fields was published by A. A. Dorodnitsyn, A. A. Il'yushin, V. V. Struminskii and S. A. Khristianovich. The theory of self-similar solutions and blast waves, developed by L. I. Sedov and his school, was another area of gas dynamics that was important for applications. This theory was very central in relation to the development of nuclear weapons. Detailed research was conducted on problems of the theory of fluid flow in porous media; P. Ya. Kochin, L. S. Leibenzon and others worked in this area. Considerable space in the pages of the journal is devoted to problems of hydrodynamic instability, turbulence and also the motion of multiphase media. In connection with new problems of aerodynamics, power engineering and chemical engineering, research on physicochemical and magneto hydrodynamics, in which classical equations of fluid mechanics are supplemented by equations describing the processes of dissociation, ionization and chemical transformations, and also electromagnetic field equations, has developed considerably. Research at the point where mechanics meets physics and chemistry is regularly published in *Prikl. Mat. Mekh.*. The journal also pays great attention to general problems of continuum mechanics, including the development of various models of media with complex rheological properties.

In the area of the mechanics of solids, Russian science again has renowned traditions. The work by N. I. Muskhelishvili on the theory of elasticity is rightly treasured in the field of mechanics. These traditions were developed in comprehensive research on the theory of elasticity and plasticity by I. I. Vorovich, L. A. Galin, E. I. Grigolyuk, A. A. Il'yushin, A. Yu. Ishlinskii, V. V. Novozhilov, Yu. N. Rabotnov, V. V. Sokolovskii, V. I. Feodos'yev and their students and followers. The journal regularly gives space to investigations in this area. An important place in research on the mechanics of solids is occupied by investigations on strength and fracture theory in relation both to the investigation of crack growth and propagation and to the analysis of damage and fatigue of materials. Such research is particularly important for evaluating the strength of critical constructions and structures. Investigations on the contact interaction of solids and on problems of the friction and wear of contacting surfaces, which are published in the journal, are of practical importance. Research on the theory of the propagation and diffraction of elastic waves and on the vibrations of elastic structures is being developed. Along with this, the theory of waves in complex deformable media taking into account the effects of non-linearity and hysteresis has been developed.

The journal *Prikladnaya Matematika i Mekhanika* generally publishes papers in which the results obtained have a rigorous theoretical foundation. In addition, experimental checking of the hypotheses adopted and the results obtained is important. Computational methods of mechanics have also been widely used, which is reflected in the pages of the journal.

Several decades after the founding of the journal, other journals on mechanics appeared in the Academy's system: *Izvestiya Akad. Nauk Mekhanika Zhidkosti i Gaza*, *Izvestiya Akad. Nauk Mekhanika Tverdogo Tela* and *Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki*. There is close cooperation between *Prikl. Mat. Mekh.* and these journals, making it possible in a number of cases, taking the specific nature of the journals into account, to send papers from one journal to another.

At the present time, after the difficult period of the 1990s, signs of growth in the Russian economy are becoming increasingly clear. We are faced with the tasks of modernizing Russian science and developing basic and applied research. Mechanics has an important role to play in this process; it is simultaneously both a basic science and the basis for many important technical applications. The new tasks require both further development of mechanics itself and a broadening of its interaction with related sections of other sciences: mathematics, control science, physics, chemistry, biology and earth and space sciences, and also efforts to solve practical problems arising in engineering and the Russian economy.

The journal *Prikladnaya Matematika i Mekhanika* considers it its duty in the years ahead to maintain the high quality of the papers published, to help to develop Russian mechanics and expand its practical applications, and also to coordinate the activity of Russian mechanics scientists for these purposes.

Translated by P.S.C.