PERSONALIA

SHESTAKOV ALEXANDER LEONIDOVICH (TO THE 65th ANNIVERSARY)

Science begins as soon as measure begins. Exact science is inconceivable without measure.

D.I. Mendeleev

A.L. Shestakov turned 65 on June 22, 2017.

Student years, scientific and pedagogical work, as well as scientific and organizational activities of Alexander Leonidovich Shestakov are connected with the South Ural State University. A.L. Shestakov entered the instrument-making department of the Chelyabinsk Polytechnic Institute (the name of SUSU until 1990) in the summer of 1969. Already in his student years, Alexander Leonidovich showed himself as a person who loves and knows how to work with people.

A.L. Shestakov graduated with honors the Chelyabinsk Polytechnic Institute in the department of «Automatic Control Systems» and became a trainee teacher of this department (at the rate of an engineer, since there were no free teaching rates) in 1975. Alexander Leonidovich transferred to the position of junior staff scientist in 1976. His teacher was Professor G.S. Chernorutskiy, a honored worker of science and technology [1–3], who was able to entrust responsible projects to the young people. A table simulator with a digital control system was created by the technical documentation of the Department «Automatic Control System » prepared with the direct participation of A.L. Shestakov at the request of the Miass Missile Center in 1979 for the first time in the USSR. To this end, responsible executor A.L. Shestakov was sent to Miass for more than 2 years. In 1979, when A.L. Shestakov enrolled in graduate school, he was already an

established researcher. Thesis for the degree of candidate of technical sciences was defended by him in 1981. Four author's certificates for inventions were received on the subject of the thesis. After the defense of his thesis, Alexander Leonidovich worked as an engineer, senior staff scientist, assistant (1983), associate professor (1984) of the Department «Information and measurement technology». During these years A.L. Shestakov continued to develop control systems for dynamic table simulator for ground modeling of flight of marine ballistic missiles. He decided the main theoretical problems on control of dynamic table simulators with an excessive number of degrees of freedom. The method to synthesize control systems with minimal sensitivity to random parameters of the system was developed by Alexander Leonidovich and allowed to create dynamic table simulators for complex testing of control systems for such missiles with unique technical characteristics. The next step in the scientific growth of the scientist was the defense of his doctoral dissertation in February, 1993. The topic of the dissertation is connected with processing information in ground-based test and measurement systems for products of missile and space technology. A.L. Shestakov becomes a head of the Department «Information and measurement technology» in March, 1994, and receives a certificate of the professor in 1995.

Alexander Leonidovich became a dean of the instrument-making faculty in 1996. A successful scientist and administrator A.L. Shestakov was appointed a pro-rector for scientific work at SUSU already in 1999. In less than 6 years of his work in this position, the number of defending doctoral and candidate dissertations in the university became more than doubled, the volume of funding for scientific research increased in more than six times, and the admission to postgraduate study becomes almost doubled. Alexander Leonidovich took an active part in the creation of the concept of social and economic development of the Chelyabinsk region in 2004, and became one of the authors proposed the innovative development program of the region in 2005. A.L. Shestakov developed long-term plans to open technoparks in the field of engineering, construction, information technologies.

A.L. Shestakov was elected a rector of the South Ural State University on June 27, 2005. In 2007, under the direct supervision of Alexander Leonidovich Shestakov, SUSU was among 40 winners in the competition between innovative educational projects of the Ministry of Education of the Russian Federation. The project received the Grand Prix of the All-Russian Exhibition Center in Moscow. The South Ural State University was the only university in the Urals Federal District, which got the status of the National Research University in 2010. A new period of development in more severe conditions of competition of ratings, globalization, openness began for the university. The correct choice of the university's strategy by the rector A.L. Shestakov and his team, as well as a powerful development dynamics, allowed SUSU in 2015 to be among 21 universities that received a state support in the framework of Project 5-100 to increase the competitiveness of the universities of the Russian Federation among the world's key research and educational centers.

A.L. Shestakov was elected the chairman of the Council of Rectors of the Universities of the Urals Federal District, which is actively working to develop the university system, in 2012. In this post A.L. Shestakov solved the main problem of building a consolidated position of the rector's corps of the district, which allows on the basis of examining the best experience to unite universities in order to achieve the goals of the development of science and education of the Urals. In 2014, at the X Congress of the Russian Union of

Rectors, A.L. Shestakov in his speech suggested that universities should be included in the development of regional development strategies, and in particular, universities should become centers of regional development. President of the Russian Federation V.V. Putin supported this idea as absolutely accurate and emphasized the need for accounting the regional and national problems.

Alexander Leonidovich Shestakov is a member of the Legislative Assembly of the Chelyabinsk region of the IV-VI convocation, he actively works in the Committee for Social Policy, Education and Culture.

The main scientific interests of Alexander Leonidovich Shestakov are concentrated in the theory of dynamic measurements [4, 5]. Alexander Leonidovich developed new structures of dynamic measurement systems [6], including various dynamic models of error estimation channels for such systems [7–9]. Also, Alexander Leonidovich developed structures of iterative dynamical systems and investigated their properties [10]. Aleksandr Leonidovich Shestakov proposed the structure of a self-adjusting dynamic measurement system, and his student E.V. Soldatkina obtained algorithms to adjust the system parameters by the criterion of a minimum estimate of the dynamic error [11]. In order to reduce the dynamic error of measurements, A.L. Shestakov proposed to develop dynamic models of measuring systems operating in a sliding mode [12]. M.N. Bizyaev, the student of A.L. Shestakov, obtained a solution to the problem of reconstructing a dynamically distorted signal by the method of sliding regimes [13, 14].

In order to solve the problem of reducing the error of dynamic measurements arisen from the sensor inertia and random noise at the output, A.L. Shestakov proposed to use a dynamic model of measuring systems with the measured coordinate vector of the state of the primary measuring transducer [15], and his student D.Yu. Iosifov developed algorithms for reconstructing dynamically distorted signals for this case and a method to adjust optimally the parameters of the correcting device of the measuring system [16].

In order to filter the reconstructed signal, A.L. Shestakov suggested to use the neural network approach [17]. As a result, A.S. Volosnikov developed neural network models and algorithms to reconstruct signals of dynamic measuring systems.

A wide range of results of solving dynamic measurement problems by methods of the automatic control theory obtained in the scientific school of Alexander Leonidovich Shestakov is presented in his monograph [18].

Note that the obtained results are successfully used in other areas. The problems of dynamic weighing are solved under the leadership of A.L. Shestakov. In particular, the algorithm for processing a signal from a weight measuring system with adaptation to the parameters of perturbations was proposed in [19], as well as an increasing the accuracy of measuring the humidity of solids during the operation of thermogravimetric means of moisture metering using the algorithms of information processing and decision making was considered in [20]. In order to solve the problems of increasing the accuracy of modern measurement transducers of pressure for automatic process control systems, the students of A.L. Shestkov developed various algorithms for processing information [21, 22], and solved the problem of selecting and justifying the models of the transform function of the pressure transducers [23] and the problem of optimizing the transform functions of measurement transducers [24].

For the last 7 years scientific schools of A.L. Shestakov and Professor G.A. Sviridyuk work together on the development of their new mathematical approach to solve one of

the main problems of dynamic measurements. The main idea of the approach is to solve the problem of reconstructing dynamically distorted signals by optimal control methods for the Leontief type systems [25]. The model of measuring device used in all studies of A.L. Shestakov and his students is exactly such system. At the same time, the Leontief type system is a particular finite-dimensional case of Sobolev type equations, considered by G.A. Sviridyuk and his students. Based on the theory of degenerate semigroups and the method of phase space, the scientific school of G.A. Sviridyuk obtained the results [26], which allow to start both qualitative and numerical studies in solving dynamic measurement problems.

Taking into account the fact that the problem of reconstructing a dynamically distorted signal is solved by optimal control methods, A.L. Shestakov proposed to call it *the problem of optimal dynamic measurement*. This model is described in [27] taking into account the inertia of the measuring device. E.I. Nazarova investigated numerical solutions to the optimal measurement problems, obtained the algorithm of numerical solution [28], and developed the algorithm of the program [29]. The next step in the development of this direction was the creation of a mathematical model, taking into account both the inertia of the measuring device and its mechanical resonance. A mathematical model for this case was developed by A.L. Shestakov and G.A. Sviridiuk [30]. Yu.V. Khudyakov, the student of A.L. Shestakov, presented a numerical study of the model under various conditions of resonant action in [31], and showed in [32] that the Leontief type system allows to model complex measuring devices. Promising direction in the theory of optimal dynamic measurement is the study of the model taking into account a noise of the form "white noise" [33–35], as well as the model of a measuring device with deterministic multiplicative action [36].

Note that Alexander Leonidovich Shestakov actively manages the scientific and research work of the Department «Informational and Measuring Technology». The results are numerous publications and patents [37, 38]. For example, estimates of the carrier frequency of a random sequence of impulses and the condition number in the Prony method are obtained in [39] and [40], respectively; the application of the Kalman filter to the problems of measurement of both fluid level and fluid density is studied in [41], the work aspects of the temperature trunsdusers are investigated in [42–47], etc.

Let us especially note the attention of the international scientific community to the results of the research conducted by A.L. Shestakov. Repeatedly, a special section devoted to the dynamic measurements was created at the IMEKO congresses and TC21 conferences, and A.L. Shestakov was the chairman of the section [48–51].

Alexander Leonidovich Shestakov prepared 11 candidates and 2 doctors of technical sciences; he is the chairman of two dissertational councils in SUSU.

For his many years of fruitful scientific, pedagogical and scientific organizational activities, Alexander Leonidovich Shestakov was awarded the medal of the Order of Merit for the Fatherland of the II degree (2013), the medal of the Legislative Assembly of the Chelyabinsk region «For Services in Lawmaking Activity » (2012), the title «Honored Worker of the Higher School of the Russian Federation » (2003), the medal «300 years to the Russian Navy» (1996) and the medal «Centennial of the Russian Submarine Forces » (2005). Also, for his work in the field of missile and space technology, Alexander Leonidovich was awarded the medal named after academician V.P. Makeyev (1997), the medal named after academician N.A. Pilyugin (2001), the medal named after academician

N.A. Semihatov (2005). A.L. Shestakov is a full member of the Metrology Academy of Russia.

We wish Alexander Leonidovich good health, new bright creative achievements and successful students, the implementation of his large-scale plans and increase of the competitiveness of his beloved university!

Editorial Board of the Journal (A.V. Keller, E.I. Nazarova, M.A. Sagadeeva, G.A. Sviridyuk, V.I. Zalyapin)

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ШЕСТАКОВ АЛЕКСАНДР ЛЕОНИДОВИЧ
(к 65-летию со дня рождения)

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