

## HIDAYAT MAHAMMAD OGLU HUSEYNOV–70



On January 20, 2021, Hidayat Mahammad oglu Huseynov turned into his 70 – a talented mathematician and a wonderful colleague, an outstanding teacher, specialist in the spectral theory of operators, Doctor of Physical and Mathematical Sciences, Professor of the Department of Applied Mathematics at Baku State University (BSU).

H.M. Huseynov was born in the village of Agtakla in Gardabani region of the Republic of Georgia and there he graduated from the high school. In 1968 he got accepted into the Faculty of Mechanics and Mathematics of Azerbaijan State University, from which he graduated in 1973 and was admitted to the graduate school of the Institute of Mathematics and Mechanics (IMM) of the Academy of Sciences of Azerbaijan. He worked at IMM as a postgraduate student and later as a senior research fellow until 1990. From 1990 till these days he has been working at the Department of Applied Mathematics of Baku State University.

Professor H.M. Huseynov is a well-known specialist in the field of inverse spectral problems and integrable nonlinear equations of mathematical physics. A characteristic feature of H.M. Huseynov's scientific work is the depth of his scientific interests and deep penetration into the essence of the researched problems, which leads to the achievement of fundamental results.

From the very beginning of his studies at the University, H.M. Huseynov got inspired to get involved in scientific research. As a second-year student, he met M.G. Gasymov, a young doctor of sciences of that time, from the Faculty of Mechanics and Mathematics of Moscow State University. Scientific work under the guidance of such an outstanding analyst shaped H.M. Huseynov as a mathematician and largely defined his future scientific career.

In 1975 H.M. Huseynov got admitted into the postgraduate of the Institute of Mathematics and Mechanics of the Academy of Sciences of Azerbaijan, where he continued to study under the scientific guidance of Academician M.G. Gasymov. H.M. Huseynov's first research works were devoted to the study of inverse problems for the system of Dirac equations. He solved the inverse scattering problem for the multichannel system of Dirac equations. While solving it, he derived a transformation operator and Levinson-type formulae. In 1978 H.M. Huseynov successfully defended his Ph.D. thesis.

Apparently, discovering the continuity of so-called reflection coefficient for one-dimensional Schrödinger equation brought considerable fame to

H.M. Huseynov. In the direct and inverse scattering problems for the last equation, it is natural when the first moment of the potential is finite. It is the condition that was used in L.D. Faddeev's fundamental works. However, the behavior of the reflection coefficient at the edge of the continuous spectrum has been studied inaccurately. This caused criticism in P. Deift's and E. Trubovitz's works, after which there was a necessity to have a stronger condition on the potential. However, after the significant research on the behavior of the reflection coefficient at the edge of the continuous spectrum, V.A. Marchenko showed that the diagram in L.D. Faddeev's works for potentials with finite first moments remains true. However, the problem of the continuity of the reflection coefficient at zero remained unsolved. H.M. Huseynov in 1983 proved its continuity. This made it possible to simplify the formulation of the conditions of the L.D. Faddeev's well-known theorem, and its results were used in the works of various mathematicians to clarify the behavior of scattering data and to study nonlinear equations.

H.M. Huseynov's scientific interest and the remarkable intuition had a huge impact on his works devoted to solving inverse spectral problems for ordinary differential operators of higher order and a polynomial bunch of Sturm-Liouville operators. He found an integral representation of a new type for higher-order equations, studied their kernels in detail, and derived integral equations that allowed solving inverse scattering problems. To describe the properties of the kernel, the representation of the Jost solution, he used Riemann-Liouville fractional integration and fractional differentiation operators. With this method, H.M. Huseynov obtained various representations for the Jost solution, in particular, the Schrödinger equation with a potential polynomially depending on the spectral parameter. It should be emphasized that some of these representations are not triangular. At the same time, they have been effectively used in the study of direct and inverse spectral problems. H.M. Huseynov's results formed the basis for his doctoral dissertation, which he successfully defended in 1998. While reviewing H.M. Huseynov's doctoral dissertation, academician V.A. Marchenko praised him as a scientist who "possesses an extraordinary talent as a mathematician and analyst and is able to attract a wide range of research methods to solve difficult problems".

The work on inverse problems for Sturm-Liouville operators and diffusion with nonseparated boundary conditions was H.M. Huseynov's one of the important research topics. Professor H.M. Huseynov and his student I.M. Nabiev obtained a number of fundamental results in this direction. The results obtained in this area are still actively cited by mathematicians around the world.

H.M. Huseynov's fundamental new results, obtained with co-authors R.T. Pashaev, R.Kh. Amirov and A.A. Nabiev on representation for the solutions of equations with discontinuous coefficients, description of self-adjoint extensions of differential operators of even order, transformation operator for integral-differential equations, inverse problems for bunch of differential operators, should also be noted.

Experience with differential operators turned out to be even more useful in inverse problems for difference operators. H.M. Huseynov and his student A.Kh. Khanmamedov were the first to show the connection between the discrete analogs

of the Sturm-Liouville and Dirac operators in their works. They studied inverse scattering problems for the latter operators. H.M. Huseynov's works devoted to the spectral theory of differential operators with increasing potentials plays the significant role in his scientific achievements. Together with his students, he studied inverse spectral problems for the anharmonic oscillator and for the Stark operator.

Another direction in H.M. Huseynov's scientific work is associated with the study of some nonlinear equations that have different applications in crystallography, plasma physics and zoology. H.M. Huseynov and his students studied nonlinear Toda and Volterra chains, their soliton solutions and the asymptotics of solutions.

Together with the students H.M. Huseynov completed a series of studies on the spectral theory of differential operators with discontinuity conditions at some points. Such problems are related to the discontinuous properties of the medium. Algorithms for solving inverse spectral problems and methods of analysis obtained in these works have a wide range of applications.

H.M. Huseynov's contribution into problems whose boundary conditions contain a spectral parameter turned out to be more interesting. Under his leadership, a number of important results were obtained concerning the inverse spectral problem for Sturm-Liouville operators with a spectral parameter in the boundary condition.

H.M. Huseynov's contribution in development of the inverse problem method was determined not only by his purely technical achievements, but also by his role as an active teacher. Under his scientific leadership, 12 Ph.D. theses were defended and 4 of them are doctors of physical and mathematical sciences. H.M. Huseynov has been invited as a plenary speaker to many international conferences. His works, published abroad brought him well-deserved fame. H.M. Huseynov's great scientific work always combined with active pedagogical activity. A brilliant lecturer and talented teacher, he made a great contribution in improving mathematical education at the Faculty of Applied Mathematics and Cybernetics at BSU.

Due to his works, H.M. Huseynov acquired a high scientific authority. Professor H.M. Huseynov is a true patriot, brave and principled person. Currently, H.M. Huseynov continues his active mathematical life, participating in many scientific events. He serves on the editorial boards of some international mathematical journals. His fruitful scientific, teaching and educational-methodical work H.M. Huseynov combines with active social activities, participating in dissertation councils.

H.M. Huseynov turns into his seventy with full of energy and creative plans. We, his friends, colleagues and students, congratulate H.M. Huseynov and we wish him health, happiness and further creative success for the sake of science and national education.

*Mahammad Mehdiyev, Yusif Mamedov, Misir Mardanov, Mamed Bayramoglu, Bilal Bilalov, Vagif Guliyev, Akbar Aliyev, Nizameddin Iskenderov, Hamidulla Aslanov, Hamzaga Orujov, Nihan Aliyev, Shakir Yusubov, Vali Kurbanov, Ibrahim Nabiev, Agil Khanmamedov*