KAZAKH MATHEMATICAL JOURNAL

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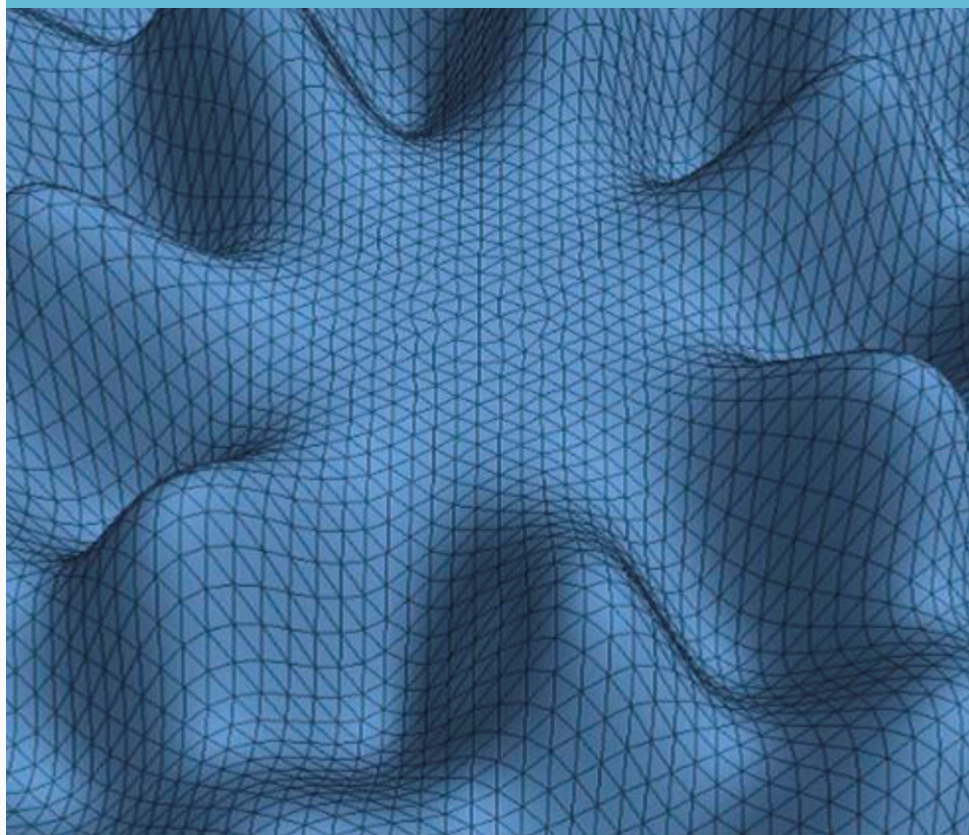
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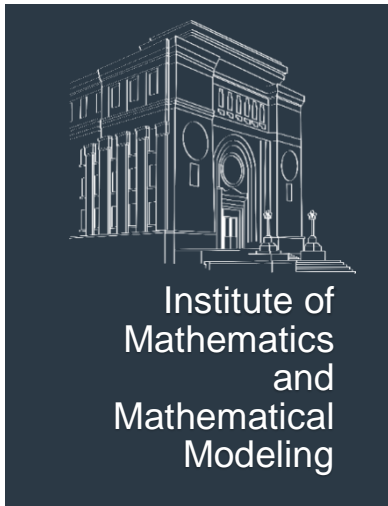
Kazakh Mathematical Journal

(founded in 2001 as "Mathematical Journal")

The journal is based on the Kazakh journal "Mathematical Journal", which is publishing by the Institute of Mathematics and Mathematical Modeling since 2001 (ISSN 1682-0525).

AIMS & SCOPE   Kazakh Mathematical Journal is an international journal dedicated to the latest advancement in mathematics.

The goal of this journal is to provide a forum for researchers and scientists to communicate their recent developments and to present their original results in various fields of mathematics.

Contributions are invited from researchers all over the world.

All the manuscripts must be prepared in English, and are subject to a rigorous and fair peer-review process.

Accepted papers will immediately appear online followed by printed hard copies. The journal publishes original papers including following potential topics, but are not limited to:

- Algebra and group theory
- Approximation theory
- Boundary value problems for differential equations
- Calculus of variations and optimal control
- Dynamical systems
- Free boundary problems
- Ill-posed problems
- Integral equations and integral transforms
- Inverse problems
- Mathematical modeling of heat and wave processes
- Model theory and theory of algorithms
- Numerical analysis and applications
- Operator theory
- Ordinary differential equations
- Partial differential equations
- Spectral theory
- Statistics and probability theory
- Theory of functions and functional analysis
- Wavelet analysis

We are also interested in short papers (letters) that clearly address a specific problem, and short survey or position papers that sketch the results or problems on a specific topic.

Authors of selected short papers would be invited to write a regular paper on the same topic for future issues of this journal.

Survey papers are also invited; however, authors considering submitting such a paper should consult with the editor regarding the proposed topic.

The journal «Kazakh Mathematical Journal» is published in four issues per volume, one volume per year.

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The Editorial Board of the Kazakh Mathematical Journal will monitor and safeguard publishing ethics.

CONTENTS

ORYMBEK AKHMETBEKOVICH ZHAUTYKOV
110th anniversary
of the outstanding scientist academician
(1911 - 1989)

Orymbek Akhmetbekovich Zhautykov was born in May 1911 in the Kounrad District (now the Aktogay District) of the Karaganda Region. From 1920 to 1930, he studied first in the village school and then in the schools of the first and second stages in Karkaralinsk. In 1934, he graduated from the Faculty of Physics and Mathematics of Kazakh Pedagogical Institute named after Abai and, as an excellent graduate, was appointed to the institute as a assistant. In succession, he was promoted to senior lecturer, associate professor, head of the department, dean of the Faculty of Physics and Mathematics, and deputy director of the institute for science and academic affairs. Zhautykov's scientific career started in Leningrad. In 1939, he entered the graduate school of Leningrad State University. His scientific supervisor was a famous mathematician, Professor I.P. Natanson. Zhautykov's research interests were shaped under the influence of such prominent mathematicians as V.I. Smirnov, L.V. Kantorovich, N.P. Erugin, N.A. Artemiev. The outbreak of the Great Patriotic War interrupted his studies in the graduate school. In 1941, O.A. Zhautykov started a fruitful scientific collaboration with K.P. Persidsky who came from Kazan to Alma-Ata. Professor Persidsky, the successor of scientific ideas of the outstanding Russian mathematician A.M. Liyapunov, organized the scientific seminar on the theory of stability. O.A. Zhautykov actively participated in the seminar. In 1944, he successfully defended his candidate dissertation entitled "Certain questions in the theory of stability of motion in the sense of Liyapunov". The thesis presented

an extension of the Liyapunov and Chetaev theorems on the instability of trivial solutions to systems of ordinary differential equations, and a number of results on the stability of solutions of associated systems. In early 1945, as part of a delegation of Kazakh scientists, O.A. Zhautykov arrived in Moscow to approve the structure and staff of the Academy of Sciences of the Kazakh SSR based on the existing branch of the Academy of Sciences of the USSR. During this period, in Moscow and Leningrad, he met with academicians I.M. Vinogradov, V.I. Smirnov, I.G. Petrovsky and other scientists. They discussed the problems and subjects of the future Sector of Mathematics and Mechanics, the establishment of which was planned as a part of the future Academy of Sciences of the Kazakh SSR and was warmly supported by those mathematicians. The Sector of Mathematics and Mechanics was established on March 1, 1945. At first, O.A. Zhautykov worked there as a senior researcher, and since 1951 he headed the Sector of Mathematics and Mechanics. During these years, he paid great attention to the training of highly qualified scientific and pedagogical staff for the republic. On his initiative and with his active participation, many young graduates of Kazakhstan universities, especially Kazakh State University named after S.M. Kirov and Kazakh Pedagogical Institute named after Abai, were sent to the central research institutions and universities of the republic. Scientific knowledge and directions received by young people in leading research centers built the basis for the further development of Kazakhstan mathematics. Many of them later became famous scientists and created their own scientific schools. O.A. Zhautykov's research was mainly focused on the theory of infinite systems of differential equations. He proved the existence of periodic solutions to infinite systems of differential equations and generalized Poincare's classical theorem on the analyticity of a solution with respect to a parameter. Developing the classical ideas of Poisson and Hamilton-Jacobi to countable canonical systems, O.A. Zhautykov proved the validity of the principle of least action for systems with an infinite number of degrees of freedom. O.A. Zhautykov made an important contribution to the theory of partial differential equations of the first order. He developed a method allowing one to obtain the representation of solutions in the case of a countable number of independent variables. Developing the ideas of Academician I.G. Petrovsky, O.A. Zhautykov investigated the question of the well-posedness of the Cauchy problem for infinite systems of first-order partial differential equations with two independent variables. He established conditions for the existence of a solution to the Cauchy problem for a countable system of first-order partial differential equations with a finite number of independent variables of general form. Extending the averaging principle of N.N. Bogolyubov in nonlinear mechanics to a countable system of differential equations, O.A. Zhautykov proved a generalized theorem on the integral continuous dependence of solutions on a parameter. In 1961, O.A. Zhautykov defended his doctoral dissertation entitled "Research on the theory of countable systems of differential equations". He paid close attention to approximate methods for solving differential equations and their use in applied problems. O.A. Zhautykov justified the applicability of the method of operational calculus for finding the exact and approximate

solutions of infinite systems of differential equations. His research on the development of the truncation method, the method of small parameter and the averaging method made it possible to solve problems in the theory of oscillations of systems with an infinite number of degrees of freedom and many problems for infinite systems of ordinary differential and integro-differential equations. O.A. Zhautykov made a significant contribution to the study of the stability of integral manifolds of infinite systems of differential equations. He generalized the Liyapunov reduction principle and substantiated the use of the Laplace transform in constructing solutions of countable systems. A number of Zhautykov's works are devoted to the application of the methods of functional analysis to the study of problems of oscillations of distributed systems. Many researchers use his studies devoted to the vibrations of a rectilinear rod with account for the energy dissipation in the material as an application of functional analysis methods to vibration problems for elastic systems. O.A. Zhautykov was the first to consider boundary value problems for systems of differential equations with a countable number of parameters. Such problems often arise in control theory when transferring a controlled object to a certain position. The peculiarity of the control of systems with an infinite number of degrees of freedom is that the extremal principle does not hold for them without additional conditions. Based on the linearization of nonlinear systems of differential equations, O.A. Zhautykov established necessary optimality conditions for such systems. This allowed the problem of optimal control of distributed parameters to be reduced to a problem for an infinite system of differential equations. O.A. Zhautykov developed a constructive method for studying boundary value problems for ordinary differential equations. This method was applied to conduct a comprehensive analysis of the behavior of periodic solutions to equations with a small parameter in critical cases. In 1974, O.A. Zhautykov jointly with K.G. Valeev published the monograph "Infinite Systems of Differential Equations". The value of this monograph was that it collected the latest achievements in the theory of infinite systems of differential equations, and many of them belonged to the authors. The existence and uniqueness theorems for linear and nonlinear infinite systems, theorems on continuous dependence of a solution on a parameter, and theorems on extensibility of solutions were first presented in the monograph. Qualitative questions of infinite systems of differential equations with delayed argument were also comprehensively investigated. The book met with wide recognition far beyond the USSR. In 1976, O.A. Zhautykov was awarded the State Prize of the Kazakh SSR in the field of science and engineering. Many international scientists have cited O.A. Zhautykov's research findings in the study of initial and boundary value problems for differential equations with delayed argument. His theorems on the averaging and truncating countable systems of differential equations, as well as their applications to solving oscillation problems for elastic systems described by fourth-order partial differential equations, are presented in the monographs of Academician Yu.A. Mitropol'skiy "Averaging method in nonlinear mechanics" (Kiev: Naukova dumka, 1971) and "Asymptotic methods for solving partial differential equations" (Kiev: Vishcha shkola, 1979, co-author B.I. Moseenkov).

O.A. Zhautykov's contribution to the development of mathematical science is fully reflected in the collections "Mathematics in the USSR during Forty Years 1917-1957", "Mathematics in the USSR during Fifty Years 1917-1967", "Mechanics in the USSR during Fifty Years 1917-1967", in the four-volume book "The History of Domestic Mathematics", in the book "The Biographical Dictionary of Scientists in the Field of Mathematics". In 1962, O.A. Zhautykov was elected a full member of the Academy of Sciences of the Kazakh SSR for his fundamental research in the theory of differential equations and for his significant contribution to the development of mathematical science. Academician O.A. Zhautykov actively participated in numerous congresses, conferences and symposia on topical issues of mathematics and mechanics, held in the Soviet Union and abroad. In 1974, in recognition of his exceptional merit, O.A. Zhautykov was awarded the title of Honored Scientist of the Kazakh SSR. Along with intensive scientific activity, Academician O.A. Zhautykov paid constant attention to the education of the next generation of researchers in mathematics and mechanics. Fifteen candidate dissertations were defended under his supervision. He devoted more than fifty years to pedagogical activity delivering engaging and deeply meaningful lectures to students of Kazakh Pedagogical Institute, Kazakh State University, Kazakh Polytechnic Institute, and Kazakh Women's Pedagogical Institute. In 1958, O.A. Zhautykov published the first textbook on mathematical analysis in the Kazakh language, which became an important event in the history of Kazakhstan higher education. His example and experience contributed to the publishing of textbooks in national languages in other Soviet republics. O.A. Zhautykov was a prominent expert in the history and methodology of mathematics, a consistent popularizer of mathematical knowledge. In 1978, he wrote the book "Mathematics and Scientific and Technological Progress", where mathematical problems that significantly influenced the development of science and technology were presented in simple terms. O.A. Zhautykov published the first textbook on ordinary differential equations in the Kazakh language (in two parts, 1950 and 1952), essays about outstanding Russian mathematicians (1956), the books "From mental arithmetic to machine mathematics" (1959), "The history of the development of mathematics from ancient times to the early XVII century" (1967), and the textbook for teachers "Introduction to higher mathematics" (1984). Academician O.A. Zhautykov was a tireless and productive scientist. He published about 200 scientific and methodological works, textbooks, and articles. The efforts of Orymbek Akhmetbekovich Zhautykov to develop mathematical science in the republic, his tireless concern for young highly qualified staff and his great reputation among mathematicians contributed to the establishment the Institute of Mathematics and Mechanics of the Academy of Sciences of the Kazakh SSR (on the basis of the Sector of Mathematics and Mechanics) in 1965. From 1969 to 1985, O.A. Zhautykov headed the Department of Physical and Mathematical Sciences, holding the position of academician-secretary and being a member of the Presidium of the Academy of Sciences of the Kazakh SSR. For many years, he led the Joint Scientific Council, and then a specialized Council for the defense of candidate dissertations. He was the chair of the problem council in mathematics

at the Department of Physical and Mathematical Sciences, chairman of the methodological seminar at the Institute of Mathematics and Mechanics and chairman of the scientific and methodological council at the board of the republican society "Knowledge" for the promotion of physical and mathematical knowledge. He was the editor of a number of thematic collections ("Differential Equations and Their Applications", "Functional Analysis and Mathematical Physics"), a member of the editorial board, and then deputy editor-in-chief of the journal "News of the Academy of Sciences of the Kazakh SSR. Physics and Mathematics Series", a member of the editorial board of the journal "Bulletin of the Academy of Sciences of the Kazakh SSR". A number of monographs were published under his editorship. Realizing that today's schoolchildren will occupy tomorrow's university classrooms, O.A. Zhautykov paid special attention to the enhancement of physical and mathematical education in Kazakhstan schools. He delivered numerous lectures and presentations on educational problems for republican teachers. O.A. Zhautykov put a lot of efforts into organizing the Republican Physics and Mathematics School in Alma-Ata, which now bears his name. The students of this school listened to his popular lectures on elementary mathematics. Today, many graduates of the school have become famous scientists, occupy government positions and work fruitfully for the benefit of independent Kazakhstan. At Zhautykov's initiative, the Junior Academy of Sciences for schoolchildren was organized in Almaty. He was the honorary president of the Academy for many years. An outstanding scientist, great teacher, talented scientific organizer, academician of the Academy of Sciences of the Kazakh SSR, doctor of physical and mathematical sciences, professor, laureate of the State Prize of the Kazakh SSR, Orymbek Akhmetbekovich Zhautykov passed away on May 16, 1989. For great merit in the creation and development of mathematical science, the education of scientific and pedagogical personnel and in the enhancement of physical and mathematical education in Kazakhstan, O.A. Zhautykov was awarded the Order of the October Revolution, two Orders of the Badge of Honor, Certificate of Honor of the Supreme Council of the Kazakh SSR, and many medals and certificates. The Council of Ministers of the Kazakh SSR adopted a resolution on perpetuating the memory of the scientist. The Republican Physics and Mathematics School in Alma-Ata and secondary school No 1 in Karkaralinsk were named after Orymbek Akhmetbekovich Zhautykov. A memorial plaque was installed on the house, where he lived. In January 2005, within the walls of the Republican Physics and Mathematics School named after O.A. Zhautykov, the First International Zhautykov Olympiad in mathematics and physics was held. About 200 schoolchildren from 15 countries participated in the Olympiad. Since then, seventeen International Zhautykov Olympiads in mathematics, physics and computer science have been successfully held. This year, from 8 to 13 January, the 17th International Zhautykov Olympiad was first organized in an online format. The Olympiad was attended by 1006 schoolchildren from 21 countries, representing 146 teams from Kazakhstan, Australia, Azerbaijan, Armenia, Belarus, Bulgaria, Georgia, Denmark, India, Indonesia, Iran, Kyrgyzstan, Mongolia, Russia, Romania, Serbia, Tajikistan, Turkmenistan, Turkey, Uzbekistan, and Ukraine. The scientific

ideas and directions of O.A. Zhautykov have been successfully developed by his students and followers. One of his well-known students is Doctor of Physical and Mathematical Sciences, Professor Sartabanov Zhaishylyk Almagambetovich, who has been successfully working at Aktobe Regional University named after K. Zhubanov for many years. Zh.A. Sartabanov and his students extend the methods and scientific results obtained by O.A. Zhautykov to new and important classes of partial differential equations. A talented student of Academician Zhautykov was Doctor of Physical and Mathematical Sciences, Professor Dulat Syzdykbekovich Dzhumabaev. He created his own mathematical school, which implements the fundamental ideas of Orymbek Akhmetbekovich Zhautykov in combination with the Dzhumabaev parameterization method. His numerous students successfully work at leading universities of Kazakhstan and at the Institute of Mathematics and Mathematical Modeling. Unfortunately, Professor Dzhumabaev passed away in 2020. In 2014, the Scientific Library of the Academy of Sciences with the support of the family released a unique book "Zhautykov Orymbek Akhmetbekovich, Academician of the Academy of Sciences of the Kazakh SSR" in the Scientific and biographical series "Prominent figures in Kazakhstan science". The book reflects the life and work of O.A. Zhautykov and contains his biographical information, literature about him, documents from home archives (letters, memoirs of contemporaries, his poems, individual reviews, photographs), as well as a chronological and alphabetical lists of his research papers. In the preface of the book, the son of the academician, Doctor of Physical and Mathematical Sciences, Professor Bolat Orymbekovich Zhautykov writes: "The book offered to your attention is neither a memoir nor a biography, but is a collection of documents, letters, essays, drafts concerning the life and scientific work of the Academician of the Academy of Sciences of the Kazakh SSR, Professor, Doctor of Physical and Mathematical Sciences Orymbek Akhmetbekovich Zhautykov. It has been 100 years since his birth, and for more than 20 years now he has not been with us. The further his time goes away, the stronger the need to characterize him, his versatile creative activity. As it seems to us, materials preserved in the family archive make it possible to do this in the most adequate way. Unfortunately, the collection does not reflect his pedagogical activity, which accompanied him all his life. The documents and letters are arranged in chronological order. Some letters from one respondent are placed next to each other, despite the fact that they are separated by some significant time interval. All correspondence from the pre-war period has not survived. It should be noted that Orymbek Akhmetbekovich considered the creation of the Institute of Mathematics in the system of the Academy of Sciences of the Kazakh SSR as one of his most significant achievements. Therefore, the book contains copies of letters and draft resolutions prepared by Orymbek Akhmetbekovich for the decision-making administrative bodies of the Republic and the governance of the Academy of Sciences, as well as letters from other correspondents related to the upcoming opening of the institute. Within the framework of that system of science administration in the USSR, the already adopted resolution on the establishment of the institute had to be "pushed"through the high offices in Moscow, which, overcoming

various bureaucratic difficulties, Orymbek Akhmetbekovich successfully implemented. The collection presents the biographical sketches of people with whom Orymbek Akhmetbekovich corresponded and had friendly relations. These sketches give an idea of the scopes of their personalities, as well as the wide range of his correspondents."

This year, 2021, marks the 30th anniversary of Kazakhstan's independence. On this significant date, we honor iconic personalities of the Kazakh land, who made an outstanding contribution to science and education in our country. In the year of the 110th anniversary of Academician O.A. Zhautykov, we are proud to pay tribute to his memory and respect for his invaluable contribution to the formation and development of Kazakhstan mathematical science and higher education.

Editorial board of the journal
«Kazakh Mathematical Journal»

The major publications by Zhautykov O.A.

1 Жаутыков О.А. Некоторые теоремы устойчивости движения // Изв. АН КазССР. Сер. матем. и мех. – 1947. Вып. 1. – С. 88–100; Zhautykov O.A. Some theorems of the stability of the movement // Izv. AN KazSSR. Ser. matem. i meh. – 1947. Iss. 1. – P. 88–100.

2 Жаутыков О.А. Задача Коши для счетной системы уравнений с частными производными // Изв. АН КазССР. Сер. матем. и мех. – 1949. Вып. 3. – С. 85–90; Zhautykov O.A. Cauchy problem for a countable system of partial differential equations // Izv. AN KazSSR. Ser. matem. i meh. – 1949. Iss. 3. – P. 85–90.

3 Жәутіков О.А. Жай дифференциалдық теңдеулер. Жоғары оқу орындарына арналған оқулық. I-бөлім. – Алматы: Мектеп, 1950. – 52 б.; Zhautykov O.A. Ordinary differential equations. Textbook for university. Part I. – Almaty: Mektep. 1950. – 52 p.

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110th anniversary of the outstanding scientist, corresponding member of the Academy of Sciences of the Republic of Kazakhstan
ENGVAN INSUGOVICH KIM
(1911-1994)

In November 2021, it was the 110th anniversary of the birth of the outstanding scientist, Doctor of Science in Physics and Mathematics, Professor E.I. Kim, who made a significant contribution to the development of mathematical science in Kazakhstan, created a school for the study of equations of mathematical physics and raised many students who continue his research.

Engvan Insugovich Kim was born on November 12, 1911 in the village of Ust-Sidimi, Khasansky District, Primorsky Territory, into a Korean family, the family of Insug Kim (who came from peasants, then became a railway worker).

In 1929, after graduating from a seven-year school , he entered the Nikolsko-Ussuri Korean Pedagogical college in the mathematical department. After graduating with honors in 1932 from the College, he, on the advice of a teacher (according to the memoirs of E.I. Kim, who noticed the mathematical abilities of a young man), decided to continue his studies at Moscow State University. As Engvan Insugovich later recalled, the road to Moscow took about a month, and on the way, he ate mainly fried grain taken from home. Arriving in Moscow, Engvan, almost not knowing Russian, but having received excellent marks in mathematics and physics, entered the Faculty of Mechanics and Mathematics of Moscow State University. Years of hard study, language learning, attendance at scientific seminars began under the guidance of scientists, well-known to all mathematicians: A.N. Tikhonov and S.L. Sobolev.

In 1937, Kim graduated from the University with honors and was sent to work at the Vladivostok Korean Pedagogical Institute, where he arrived with his wife. But unfortunately, in the same 1937, almost the entire Korean diaspora was resettled from the Far East to Central Asia (mainly Kazakhstan, Uzbekistan, Kyrgyzstan).

Engvan Insugovich also left Vladivostok for Kazakhstan and was hired by Kyzyl-Orda Pedagogical Institute (KPI), where from 1937 to 1945 he held both teaching and administrative positions and also spent a lot of time doing mathematical research. The first field of his scientific researches (suggested to him by S.L. Sobolev) was the determination of solvability conditions for general boundary value problems for harmonic functions.

For the results obtained, E.I. Kim, after defending his dissertation in 1942 on the topic: "The Hilbert problem for a multi-connected domain", awarded the degree of Candidate of Science in Physics and Mathematics. The defence took place in the Academic Council of the United Ukrainian University, which was evacuated in Kyzyl-Orda at that time. In 1943 he received the academic title of associate professor.

In 1945, E.I. Kim went to work at Kazakh State University named after S.M. Kirov in Alma-Ata, as the head of the Department of Geometry, and supervised the scientific work of graduate students. In 1951 he moved to Rostov-on-Don, where he worked as the head of the Department of Geometry and Dean of the Faculty of Physics and Mathematics of the Pedagogical Institute.

From 1953 to 1956 he was a postdoc student at Mathematical Institute named after V.A. Steklov of the USSR Academy of Sciences in Moscow. His scientific adviser was the outstanding mathematician I.N. Vekua, later Academician of the AS USSR.

In 1956, after completing his doctoral studies, E.I. Kim moved to Ukraine, where he has maintained good scientific contacts since defending his doctoral thesis. He was the head of the Department of Higher Mathematics at the Kharkov Polytechnic Institute, and still devoted a lot of time to scientific research.

In 1959, he defended his thesis for the title of Doctor of Science in Physics and Mathematics "On a class of singular integral equations and some problems for piecewise homogeneous materials". Such equations arise, in particular, when solving boundary value problems for the heat equation with piecewise constant coefficients by the method of thermal potentials. As Engvan Insugovich himself noted in his dissertation, similar integral equations were studied earlier, in particular, in the works of A.B. Datsev and G. Mintz, where it was stated that they can be solved by the method of successive approximations, since they are similar to Volterra equations of the second kind. However, in a work published in the DAN USSR back in 1953, E.I. Kim showed, that this is a special class of singular equations for which successive approximations do not converge to a solution. In the subsequent works, which became the basis of the dissertation, he proposed and substantiated regularization methods, and also determined the exact upper bounds for the spectrum of the main integral operator of these equations. These studies are a significant contribution to the theory of Volterra

integral equations, since they define a special class of equations that have the properties of the Fredholm's equations.

In 1960, E.I. Kim received the academic title of professor. Being in Kharkov, he along with teaching and scientific work, maintained close ties with Kazakhstan, supervised postgraduate students from Kazakh State University. Among his first students, who later defended Candidate of Science dissertations, were B.B. Baimukhanov, L.P. Ivanova, Sh.T. Irkegulov, K.K. Kabdykairov, S.A. Usoltsev. The next group included A.A. Askarov, L.Zh. Zhumabekov, V.Kh. Ni, M.O. Orynbasarov, S.N. Kharin. After returning to Kazakhstan, many of them worked as teachers in various universities and continued their scientific research.

In 1964, E.I. Kim was elected a corresponding member of the Academy of Sciences of the Kazakh SSR, moved to Alma-Ata, and from that time began the Kazakhstan period in his life, which lasted until its end. The main part of this time was devoted to scientific work, teaching and training of scientists. Basically thanks to his efforts, in 1964 the Laboratory of Equations of Mathematical Physics (EMPh) was created at the Institute of Mathematics and Mechanics of the Academy of Sciences of the Kazakh SSR, as well as the Department of EMPh at Kazakh State University. For a number of years he headed both of these divisions. And then he worked in them as a leading researcher and professor. At the same time, E.I. Kim organized a citywide weekly scientific seminar on the equations of mathematical physics, which played an important role in the training of mathematical scientists in the country. He was a brilliant lecturer. At his lectures, there were always many participants and visitors, who also reported the results of their works. These were not only graduate students, but also students of Kazakh State University, and teachers from other universities in Alma-Ata and other regions of Kazakhstan, scientists.

These initiatives of E.I. Kim and the results achieved by the graduates of the EMPh department, members of the EMPh laboratory, participants of the seminar, made a significant contribution to the development of mathematical researches on partial differential equations in Kazakhstan as well as increasing their level. For instance, an member of the EMPh laboratory Dr. M.T. Jenaliyev, after defending his doctoral dissertation, for a number of years was the head of the Institute of Mathematics (IM) of the National Academy of Sciences (NAS) of RK in Almaty. The graduate of the Department of EMPh, Doctor of Sciences in Physics and Mathematics E.S. Smailov headed the Institute of Applied Mathematics in Karaganda. One of the first students of E.I. Kim, who also worked at KazSU and in the laboratory of the EMPh, S.N. Kharin became an academician of the NAS RK, other students and employees of E.I. Kim worked as teachers at universities in many cities of Kazakhstan.

It can be noted, for example, that at Karaganda University, alongside with Dr. E.S. Smailov also worked (and are working) Doctor of Sciences in Physics and Mathematics M.I. Ramazanov, Candidates of Sciences in Physics and Mathematics: T.E. Omarov, S. Mataev, M.A. Perevertun. Candidate of Sciences K.K. Kabdykairov was the vice-rector of Semipalatinsk University (at that time – the Pedagogical Institute), etc.

The followers of E.I. Kim continued researches related to the above singular integral equations. Significant results in the theory of partial differential equations and their applications are associated with their names. These are singular integral equations, initial-boundary value problems for parabolic equations and for equations with discontinuous coefficients, nonlinear problems with free boundaries, and problems in angular and degenerate domains.

E.I. Kim was especially interested in the problems to which ordinary research methods are not applicable, which do not fit into a general theory, and for their solution it is necessary to show ingenuity and apply non-standard approaches.

The results of E.I. Kim in the theory of singular integral Volterra-Fredholm's equations were further developed and obtained numerous applications in his joint work with students, while the research topics were significantly expanded. In particular, E.I. Kim together with B.B. Baimukhanov, L.P. Ivanova, K.K. Kabdykairov, V.Kh. Ni, L.Zh. Zhumabekov, S.E. Bazarbaeva and others studied various initial boundary value problems for equations and systems of equations of parabolic type; with E.M. Khairullin, T.V. Nekrasova studied boundary value problems with boundary conditions containing high-order derivatives of the sought functions. Methods for solving problems for parabolic equations with discontinuous coefficients were developed by M.A. Abdrakhmanov, Sh.A. Kulakhmetova, V.Kh. Ni, F.G. Biryukova, K.D. Kulekeev, R.N. Kantaeva and others and then effectively used in solving problems of conjugation of various types of equations.

A special class of singular integral equations generated by boundary value problems for degenerate domains with moving boundaries was studied. In this direction E.I. Kim and his students S.N. Kharin, G.I. Bizhanova, M.I. Ramazanov, M.T. Jenaliyev, T.E. Omarov, A.A. Kavokin, U.K. Koylyshov, S.S. Domalevsky obtained a number of complete results on the solvability of such problems.

It should also be noted the very significant results obtained by Doctor of Sci M.O. Orynbasarov in the investigations of boundary value problems for equations of parabolic type in domains with corner points or edges (in the multidimensional case).

E.I. Kim paid great attention to nonlinear problems, problems with free boundaries, in particular, the Stefan problem with the domain degenerating at the initial moment of time, for which asymptotic as well analytical methods of solution were developed. S.N. Kharin, A.A. Kavokin, Ya.A. Krasnov, G.I. Bizhanova worked with him in this direction.

In the laboratory of EMPh of the Institute of Mathematics of the AS of the Kazakh SSR, apart from fundamental research, another direction of research was formed. This is an applied direction that originated in the years of E.I. Kim at KhPI. It was headed by S.N. Kharin, now an academician of the NAS of RK. Developed methods for solving boundary value problems for heat equations are widely used in applied problems, in particular, in the theory of electrical contacts were published in monographs. In this direction significant results were obtained in joint work with D.U. Kim, M.A. Perevertun, S.P. Gorodnichev, A.T. Kulakhmetova, Yu.R. Shpadi, S.S. Domalevsky and other students of E.I. Kim and S.N. Kharin.

In total E.I. Kim personally published and co-authored about 130 scientific articles, many of which were published in central mathematical journals, as well as two monographs (co-authored), made reports at International, All-Union, Republican conferences. He prepared 36 candidates of science in physics and mathematics, 7 of his students received the degree of Doctor of science in Physics and Mathematics.

E.I. Kim did a lot of additional public work. He was a member of the NAS RK Problem Council on physical and mathematical sciences, member of the Specialized Council for the defense of dissertations, the editorial council of the All-Union "Engineering-Physical Journal", the journal "Proceedings of the Academy of Sciences of the Kazakh SSR. Series of Physics and Mathematics".

For great merits in the development of mathematics in Kazakhstan as well as for fruitful public-pedagogical activity, E.I. Kim was awarded the title "Honoured Worker of Science of the Kazakh SSR", awarded the Certificate of Honour of the Presidium of the Supreme Council of the Kazakh SSR, and inscribed in the "Golden Book of Honour" of the Kazakh SSR.

E.I. Kim passed away on December 14, 1994 after a serious illness. Until the last minute, his wife Claudia Semenovna Kim and their daughter Evgenia looked after him. He lived a wonderful life filled with work, creative searches. The affair, which he served all his life, lives and continues to develop by his students and followers.

More detailed information about the remarkable mathematician E.I. Kim can be found in publications:

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2. Г.И.Бижанова. Член-Корреспондент АН КазССР Енгван Инсугович Ким // Математический журнал. 2011, Т. 11. No. 2 (40). С.12–16, Изд. Институт математики МОН РК.

Editorial board of the journal
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List of the main published works of E.I. Kim

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