Journal of Applied and Numerical Analysis
2023, Vol. 1, pp. 135–137
doi: 10.30970/ana.2023.1.135

60th anniversary of birthday of professor Roman Chapko

A. Beshley, I. Borachok, O. Ivanyshyn Yaman, V. Makarov, N. Mayko, V. Ryabichev, O. Timokha, V. Vasylyk, V. Vavrychuk

On October 26, 2023, the distinguished Ukrainian mathematician Roman Chapko, Doctor of Sciences, Professor in the Department of Computational Mathematics of the Faculty of Applied Mathematics and Informatics at Ivan Franko National University of Lviv, Ukraine, has turned 60. He is renowned in the broad mathematical community in Ukraine and beyond for his significant contributions to numerical analysis, computational mathematics, and mathematical modeling. His decades-long scientific activity has earned him a high reputation and has significantly elevated the standing of Ukrainian mathematics and science as a whole.

Roman Chapko was born in the Sambir district of the Lviv region. In 1980–1985, he studied Applied Mathematics at the Faculty of Applied Mathematics and Mechanics of Ivan Franko National University of Lviv. Subsequently, he continued his education at the graduate school of the same faculty under the guidance of Prof. Yosyf Ludkevych at the Department of Computational Mathematics. Following the successful completion of his graduate studies in 1989, Roman Chapko defended his thesis "Numerical solution of initial boundary value problems for the telegraph equation in the case of open surfaces" at Taras Shevchenko National University of Kyiv, earning the scientific degree of Candidate of Physical and Mathematical Sciences in the specialty 01.01.07 – Computational Mathematics. Roman often fondly recalls the kindness and intellectual guidance of his supervisor, who initiated the study of integral equations at the Department of Computational Mathematics. His teaching career commenced as an assistant at the Department of Computational Mathematics, and in 1993, he ascended to the position of associate professor within the same department. After Ukraine regained its independence in 1991, Roman Chapko has frequently participated in long internships at prestigious foreign universities. This was made possible through scholarships from organizations such as DAAD (German Academic Exchange Service), KAAD (Catholic Academic Exchange Service), DFG (German Research Fundation) projects and OeAD (Austria's Agency for Education and Internationalization). His most frequent destination was the University of Göttingen, where he collaborated with Prof. Dr. Rainer Kress, the renowned expert in computational mathematics, integral equations, inverse problems, and scattering theory.

In their collaborative work that began in 1993, Roman Chapko and Rainer Kress introduced and rigorously justified the quadrature method for Fredholm integral equations of the first kind with a periodic kernel exhibiting a logarithmic singularity, using trigonometric interpolation [3]. Applying different approaches to the approximation in a time variable, they also applied the method of integral equations to initial boundary value problems for various partial differential equations. As a result, the combination of the Rothe method and the boundary integral equations method [4] are included in the Encyclopedia of computational mechanics. These methods were then applied to inverse problems [5] for reconstructing the boundary of a domain where a certain differential relation with initial boundary conditions is satisfied and some additional data on another part of the boundary are given. Roman Chapko successfully uses the advantages of the method of integral equations for

studying problems in semi-infinite domains. In this case, the optimality of the proposed methods is achieved by using Green's functions for the canonical elements of the domain and by applying some new discretization tools – *sinc*-approximations. It is worth noting that on the recommendation of Roman Chapko, new graduates of the Department of Computational Mathematics have had the opportunityc to study and establish their scientific career abroad, notably in Göttingen.

Between 1998 and 1999, Roman Chapko pursued his doctoral studies at the Faculty of Cybernetics at Taras Shevchenko National University of Kyiv. In 2005 he defended his doctoral dissertation "Numerical solution of linear direct and nonlinear inverse evolutionary problems" at the Institute of Mathematics of the National Academy of Sciences of Ukraine and was awarded the scientific degree of Doctor of Physical and Mathematical Sciences in the specialty 01.01.07 – Computational Mathematics. His scientific consultant was Academician of the National Academy of Sciences of Ukraine, Prof. Volodymyr Makarov. This fruitful collaboration expanded the scope of Roman Chapko's research to encompass numerical solutions of evolutionary problems with operator coefficients, particularly those arising in the modeling of nonlinear fluid dynamics in tanks, a field known as sloshing [6].

Since the year 2000 and continuing to the present, Roman Chapko has served as the Head of the Department of Computational Mathematics at Ivan Franko National University of Lviv. In this role, he actively engages in teaching, delivering lectures on numerical methods, linear integral equations, and regularization methods for solving inverse problems. His teaching activities are closely intertwined with his research interests, which encompass the development of numerical algorithms for solving linear and nonlinear direct and inverse problems. These problems include mathematical models related to the Laplace equation, elastostatics, heat conduction, the biharmonic equation, the nonstationary Stokes equation, and more. These problems are analyzed in two- and three-dimensional domains, on open curves, in cases of axial symmetry, layers, inclusions, and various other configurations. In addition to inverse boundary reconstruction problems, Roman Chapko's research tackles Cauchy problems [2], which involve the restoration of boundary values. Currently, his research interests extend to differential equations with variable coefficients, integro-differential equations, the method of fundamental solutions [1], and various other areas.

Prof. Roman Chapko, with his proficiency in English, German, and Polish, maintains collaborative relationships with researchers from many countries around the world. His collaborative efforts have resulted in the publication of over forty articles in partnership with Prof. B.T. Johansson (Sweden) and Prof. L. Mindrinos (Greece). Roman Chapko has been the driving force behind the organization of international conferences, including "Integral Equations – 2010" and the "Ukrainian Conference on Applied Mathematics" (2017), notable for their extensive international participation. These conferences were graced by the presence of renowned mathematicians, including Prof. Dr. R. Kress and Prof. Dr.-Ing. W.L. Wendland. In 2012, Roman Chapko's significant contributions to science were recognized when he was awarded the State Prize of Ukraine in the field of science and technology for a series of scientific works (as part of the team of authors) titled "Discrete and functional methods of approximation theory and their application". Roman Chapko can be described in one phrase as a passionate advocate of computational mathematics since he works with his full dedication to maintain the high level of teaching this mathematical discipline, in every way popularizes its prestige among students, and stimulates the expansion of research in this direction at the faculty and beyond. He is always interested in new problems that can be solved by computer algorithms, and every time he is sure that it will definitely be possible to do this. Young scientists easily find support for their research from Prof. Chapko. On his initiative, informal seminars and meetings were organized at both the department and faculty levels, where everyone can learn a lot about applied mathematics and get useful advice. As a result of these activities at the department, he was scientific supervisor for seven candidate (PhD) theses in computational mathematics. Prof. Roman Chapko is a dedicated and pragmatic leader and mentor. He places great emphasis on the high-quality publication of scientific texts based on the TeX system, and he is a co-author of the

tutorial titled "Latex: Creating Mathematical Documents" (in Ukrainian). From 2009 to 2021, he served as the Responsible Editor of the Journal of Numerical and Applied Mathematics (Computational Mathematics series). Under his leadership, the journal was indexed in the scientometric database of Web of Science. Later, Roman Chapko and his colleagues established a new scientific periodical, the Journal of Applied and Numerical Analysis.

Prof. Roman Chapko is known for his exacting but understanding and pragmatic leadership style. He attaches great importance to publishing high-quality research in journals indexed in scientometric databases and those with an impact factor. This dedication is crucial for the successful completion of a doctoral thesis and enhances the university's prestige. He continuously advocates for a balanced curriculum that combines traditional applied mathematics courses with IT disciplines to ensure students are competitive in the job market. In 2021, Ivan Franko National University of Lviv honored Roman Chapko by awarding him the title of Honorary Professor. This recognition reflects his significant contributions to the advancement of science and education, the training of highly qualified scientific personnel, and his extensive and longstanding involvement in scientific, pedagogical, and social activities. Roman Chapko has a wonderful family. He passed on his passion for mathematics to his children. His daughter is awarded a PhD in financial mathematics. She is a co-author of the monograph "Time-Inconsistent Control Theory with Finance Applications". His son is awarded a PhD in computational mechanics at the KTH Royal Institute of Technology, Sweden. Roman Chapko is a true patriot of his country, with deep expertise in Ukrainian history and folk songs. He possesses a passion for traveling throughout Ukraine and maintains friendly ties with educational and scientific institutions across the country. Roman is known for his unwavering willingness to provide support. In particular, he has extended his support to colleagues who were forced to leave their homes due to the full-scale Russian invasion in 2022. His boundless energy, positive outlook, and great sense of humor inspire all those around him. The colleagues, friends, and students of Prof. Roman Chapko hold him in high esteem for his tireless work, competence, integrity, persistence, and openness. On the occasion of his 60th birthday, they extend their warmest congratulations and wishes for good health, personal well-being, the swift triumph of Ukraine, continued inspiration, and even greater achievements in the years ahead.

References

1. Borachok I., Chapko R., Johansson B.T.: A method of fundamental solutions for heat and wave propagation from lateral Cauchy data. Numerical Algorithms. **89**, 431-449 (2022)
2. Chapko R., Johansson B.T.: A boundary integral equation method for numerical solution of parabolic and hyperbolic Cauchy problems. Applied Numerical Mathematics. **129**, 104-119 (2018)
3. Chapko R., Kress R.: On a quadrature method for a logarithmic integral equation of the first kind. In Agarwal, ed.: World Scientific Series in Applicable Analysis. Contributions in Numerical Mathematics. **2**, 127-140 (1993)
4. Chapko R., Kress R.: Rothe's method for the heat equation and boundary integral equations. Journal of Integral Equations and Applications. **9**, 47-69 (1997)
5. Chapko R., Kress R., Yoon J.R.: On the numerical solution of an inverse boundary value problem for the heat equation. Inverse Problems. **14**, 853-867 (1998)
6. Gavrilyuk I., Makarov V., Chapko R.: On the numerical solution of linear evolution problems with an integral operator coefficient. Journal of Integral Equations and Applications. **11**, 37-56 (1999)