

## ANATOLII V. ZHUCHOK

---

*To the 50th anniversary*



On December 24, 2023, Professor Anatolii V. Zhuchok, a Ukrainian mathematician and one of the Editors-in-Chief of the journal “Algebra and Discrete Mathematics” celebrated his 50th birthday.

Anatolii Zhuchok was born in Khartsyzk, Donetsk Region, Ukraine, in a family of teachers. His mother was a mathematics teacher and the vice-director of a high school, and the father a physics teacher and the director of another high school. He developed a strong interest in mathematics still at school, due to his parents. In 1991, after the graduation from the high school no. 18 in Artemivsk, Donetsk region, Ukraine (now Bakhmut), Anatolii entered the Faculty of Physics and Mathematics of Sloviansk State Pedagogical Institute (now the Donbas State Pedagogical University) and graduated from the institute with the high honors. In 1996, Anatolii Zhuchok became a teacher at the high school in the village of Opytne in the Artemivsk district of the Donetsk region where he worked for more than 4 years. The director of the school was his father, and Anatolii always recalls these years as a very productive period of his life that greatly influenced his future career and formed his personality.

Professor A. Zhuchok academic career started at the Sloviansk State Pedagogical University in 2000. From 2000 till 2006 he worked as an assistant at the Department of Algebra. In 2000, Anatolii entered a graduate study program at the Sloviansk State Pedagogical University. His scientific advisor there was Professor Vitaliy M. Usenko. V. M. Usenko is known not only for his research in semigroups and near-rings but also as an organizer of the 1st International Algebraic Conference in Ukraine. The conference was dedicated to the memory of Usenko's scientific advisor Professor Lazar M. Gluskin who was one of the founders of semigroup theory. Since then every two years this type of conferences take place in Ukraine (the last, 14th, was in 2023 in Sumy). Due to the initiative of V. M. Usenko, two esteemed international journals – “Algebra and Discrete Mathematics” and “Ukrainian Mathematical Bulletin”, – were founded. In 2006, Anatolii Zhuchok successfully defended his Ph.D thesis titled “Decompositions of free products of semigroups” at the Kyiv Taras Shevchenko National University.

In 2006, Zhuchok moved and joined the Luhansk Taras Shevchenko National University as an Associate Professor of the Department of Mathematical Analysis and Algebra. From 2006 till 2009 he served as an Associate Professor of this department and a Senior Researcher in the Luhansk Branch at the Institute of Applied Mathematics and Mechanics (IAMM) of the National Academy of Sciences of Ukraine. In 2009–2012, he worked on his Doctor of Sciences thesis (habilitation) at the Kyiv Taras Shevchenko National University, with Professor Volodymyr V. Kyrychenko as his scientific advisor. Anatolii is also thankful to Professor Boris V. Novikov and Professor Vitaliy I. Sushchansky for useful discussions during this period. In 2012, he successfully defended his Doctor of Sciences thesis titled “Structural properties of dimonoids” at the Kyiv Taras Shevchenko National University.

Since 2012 Anatolii Zhuchok works at the mathematical department at the Luhansk Taras Shevchenko National University: as a Professor and the Head of the Department (2013–2021). In 2012–2013, he also held the position of Leading Researcher in the Luhansk Branch of the IAMM of the National Academy of Sciences of Ukraine. In 2014, he was awarded the title of Full Professor. Since 2014 A. Zhuchok is a Director of the Luhansk branch of the IAMM of the NAS of Ukraine, and since 2021 he is a Vice-Rector for Scientific and Pedagogical Work at the Luhansk Taras Shevchenko National University (Ukraine).

At the beginning of the 2000s, A. Zhuchok's research activity has been concentrated in semigroup theory. His first achievements were in

the description of decompositions of free products of semigroups in the terms of bands of semigroups. Namely, Anatolii extended some results of M. Petrich and P. V. Silva concerning congruences on free semigroups to the case of free products of semigroups. Further more he studied various problems in semigroup theory related to free monoids, Clifford semigroups, translational hulls, endomorphism semigroups, automorphism groups, etc.

In the following years, the scientific interests of Anatolii Zhuchok broadened. He mainly studied the problems of universal algebra in connection with semigroup theory. He started his works on a new area, dimonoid theory. The notion of a dimonoid was originally introduced by J.-L. Loday while studying periodicity phenomena in algebraic  $K$ -theory. A. Zhuchok proved that the system of axioms of dimonoids is independent and Cayley's theorem for semigroups has an analog in the class of dimonoids. Then he constructed a new model for the free dimonoid of an arbitrary rank and solved the word problem for a series of relatively free dimonoids. He also proposed an innovative approach to constructing dimonoids which is based on using a semigroup operation. These studies are reflected in his two monographs, "Dialgebras" (2011) and "Elements of dimonoid theory" (2014), both published by the Institute of Mathematics of the National Academy of Sciences of Ukraine.

This direction of research of A. Zhuchok was closely related with the study of (generalized) digroups and generalized dimonoids. The roots of such investigations lie in the works of J.-L. Loday and M. K. Kinyon. In co-authorship with Professor Guenter Pilz, a renowned authority in near-ring theory, Anatolii presented new models for certain free algebras of small ranks. He constructed one of the first interesting examples from a class of (generalized) digroups together with his brother Professor Yuri V. Zhuchok. For generalized dimonoids, he developed variety theory in which the concept of a free object plays a central role.

One of the interesting classes of universal algebras called trioids was initially introduced in 2004 by J.-L. Loday and M. O. Ronco in the context of algebraic topology. Anatolii Zhuchok made a significant contribution to the development of trioid theory. He presented new examples of trioid-theoretical constructions. In particular, the free trioid of an arbitrary rank, and described a series of the least congruences on trioids with some restrictions on operations. Developing the decomposition method, he was able to extend the known structural results from semigroup theory to trioids. Anatolii proposed explicit constructions for some relatively free trioids and, recently, established independence of axioms of trioids.

One of the current directions of the research of A. V. Zhuchok is devoted to the study of interassociative semigroups. For these investigations, in 2016 he introduced the notion of a doppelsemigroup via axiomatics of a doppelalgebra, and began to study this new branch of algebra. This area of research takes its roots in the works of J.-L. Loday and B. Richter. Doppelsemigroups have turned out to be very useful for studying interassociative semigroups since they allow to use methods of universal algebra. Anatolii gave numerous examples of (strong) doppelsemigroups and demonstrated that the system of axioms of strong doppelsemigroups is independent. He constructed a free product and a series of free algebras in the variety of doppelsemigroups. In particular, in joint papers with M. Demko, K. Knauer and J. Koppitz, he presented and studied various interesting types of relatively free doppelsemigroups. These results were summarized in his monograph titled “Relatively free doppelsemigroups”, published in 2018 by the University of Potsdam in Germany.

In the next period, Anatolii’s attention was drawn to the study of  $n$ -tuple semigroups appeared in the theory of  $n$ -tuple algebras of associative type. In his papers some results on doppelsemigroups were generalized on  $n$ -tuple semigroups. In a joint paper with J. Koppitz, he presented a free product of  $n$ -tuple semigroups and studied its structure.

A. Zhuchok’s research in algebra was supported by international fellowships and grants. His fellowships include the following: Fellowship of the Alexander von Humboldt Foundation (Germany), JESH fellowship award of the Austrian Academy of Science, Fellowship for Ukrainian Scientists of the Erwin Schrödinger International Institute for Mathematics and Physics (Austria), Scholarship in the framework of the DAAD Programme (Germany), Scholarship in the framework of the French program for university teachers and scholars with extensive work experience, and Scholarship in the framework of the National Scholarship Programme of Slovakia two times. He received Grant of the National Research Foundation of Ukraine, and Research grant of the Ministry of Education and Science of Ukraine three times. Anatolii Volodymyrovych was awarded the President’s of Ukraine grant for scientific research in 2018.

A. Zhuchok has more than 160 scientific publications including three monographs. He participated in international scientific conferences and seminars in many countries including Austria, Italy, France, Germany, Sweden, Portugal, Poland, Slovakia, Estonia, Bulgaria and others. He has fruitful scientific collaboration with mathematicians from Germany, Austria, France and Slovakia.

A. V. Zhuchok has many scientific-organizational activities. He is an expert of the section “Mathematics” of the Scientific Council of the Ministry of Education and Science of Ukraine since 2015, and a member of the expert group for assessing the effectiveness of higher education institutions in terms of their scientific (scientific and technical) activities in the scientific direction “Mathematical Sciences and Natural Sciences” at the Ministry of Education and Science of Ukraine since 2020. He is one of the main organizers of 8th International Algebraic Conference in Ukraine dedicated to the 60th anniversary of Professor V. M. Usenko. He worked in organizing committees of many another international conferences in Ukraine. Since 2006 Anatolii works in the journal “Algebra and Discrete Mathematics”: as Scientific Secretary at the beginning, Vice Editor-in-Chief since 2015 and Editor-in-Chief since 2017.

In 2017, Professor Anatolii V. Zhuchok was awarded the honorary title Distinguished Scientist of Ukraine. In 2021, the President of Ukraine awarded him the Order of Merit, III degree.

In 2021, he was approved as a member of the Scientific Committee of the National Council of Ukraine for the Development of Science and Technology under the Cabinet of Ministers of Ukraine.

He is a very caring person who is always ready to extend his help and support to his friends and colleagues.

Today, Anatolii, as always, works a lot, is full of optimism and new creative ideas. We warmly congratulate Anatolii Zhuchok on the occasion of his 50th birthday and wish him strong health, further fruitful scientific achievements and good luck.

*O. D. Artemovych, V. V. Bavula, O. O. Bezushchak,  
V. M. Bondarenko, V. Dlab, V. S. Drensky, Yu. A. Drozd,  
V. M. Futorny, R. I. Grigorchuk, J. H. Koppitz,  
L. A. Kurdachenko, T. D. Lukashova, V. V. Lyubashenko,  
Z. S. Marciniak, V. S. Mazorchuk, V. V. Nekrashevych,  
A. S. Oliynyk, B. V. Oliynyk, A. Yu. Olshanskii,  
A. P. Petravchuk, G. F. Pilz, M. V. Pratsiovytyi,  
I. V. Protasov, O. O. Pypka, I. P. Shestakov,  
M. M. Semko, I. Ya. Subbotin, P. D. Varbanets,  
R. A. Zatorsky, E. I. Zelmanov, Yu. V. Zhuchok*