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Leonid A. Kurdachenko

(dedicated to the 70th birthday)

This special issue of the journal is dedicated to the 70th birthday of an outstanding Ukrainian mathematician, Professor Leonid A. Kurdachenko.

Leonid A. Kurdachenko is definitely one of the most productive group theorists. His list of publications consists of more than 250 journal articles published in major mathematics journals in many countries including Ukraine, USA, Germany, Great Britain, Italy, Spain, China, Greece, Brazil, Hungary, Poland, Czech Republic, Turkey, and Russia. He is an author of

more than a dozen of books published by such prestigious publishers as John Wiley & Sons (USA), Birkhäuser (Swiss), World Scientific (United Kingdom), and others. He is a very popular invited speaker and visiting professor in many international conferences and universities, including University of Zaragoza, University of Naples, University of Salerno, University of Alabama, and others. He supervised 9 Ph.D. students and a D.Sc. student who actively work in algebra. His input in the development of Ukrainian algebra is difficult to overestimate.

Leonid was born on October 22, 1949 in Dnipro. In 1971 he graduated with the high honors from the Mechanics and Mathematics School of National Dnipro University. In 1969 Leonid Kurdachenko met Sergey N. Chernikov and in 1971 he became his postgraduate student. S. N. Chernikov is known not only as a great mathematician and one of the founders of infinite group theory, but also as a very influential and caring teacher. It is worthy to mention that among his numerous students we can list such prominent mathematicians as V. M. Glushkov, M. I. Kargapolov, V. S. Charin, V. P. Shunkov, Yu. I. Gorchakov, D. I. Zaitsev, and others. In 1974 Leonid Kurdachenko was awarded a Ph.D. degree and began his career as an assistant professor at the Department of Algebra and Geometry of National Dnipro University. In 1976 he became an associate professor, and in 1977 the Department Chair. In 1992 Leonid Kurdachenko defended his Doctor of Sciences thesis at St Petersburg University. He has been also awarded a Doctor of Sciences Degree by Kiev University. Since 1996 Leonid Kurdachenko is a Full Professor and Chair of the Department of Algebra and Geometry of National Dnipro University. In 1998 he was awarded by an honorary title Distinguished Scientist of Ukraine.

Leonid Kurdachenko is a world class expert and lead researcher in algebra. His areas of research where he made an outstanding, and sometime foundational inputs, includes, but not limited, with the following topics: restrictions on conjugacy classes (FC-groups and their generalizations); weak minimal and weak maximal condition on some family of subgroups; modules over group rings and linear groups; restrictions on factor-groups; restrictions on generalized normal subgroups; rank and section p-rank; an-

tipodes to normal subgroups and transitivity of some subgroup properties; the Schur theorem and related results; fuzzy groups (classical algebraic approach); Leibniz algebras (in the spirit of applying group theoretical methods).

Initially, the theory of FC-groups was developed in the frame of periodic groups. L. A. Kurdachenko showed that non-periodic FC-groups have their own nature, which is different from that of periodic FC-group. He obtained the first important results on non-periodic FC-groups and developed the foundation for their theory. In collaboration with M. Tomkinson and J. Otal, Leonid Kurdachenko continued deep studies of periodic FC-groups and obtained important results about their structure. A key role in the design and formation of topics related to the study of groups by the properties of classes of conjugate elements belongs to him.

One of the mainstreams in group theory (both infinite and finite) is the study of the influence of systems of subgroups on the structure of a group. L. A. Kurdachenko's significant input in this area is well-known. Inspired by D. I. Zaitsev, he successfully continued the initiated by R. Baer and D. I. Zaitsev study of groups with weak minimal and maximal conditions. L. A. Kurdachenko wrote a series of articles on groups with weak minimal and maximal conditions on normal subgroups. Together with V.E. Goretskii, G. Cutolo, H. Smith, I. Ya. Subbotin, L. S. Kazarin, P. Shumyatskii and others, he investigates groups with weak maximal and minimal conditions on different important families of subgroups.

Investigation of groups satisfying some conditions related to the subgroup arrangement allowed algebraists to introduce and describe many important classes of groups. The roots of such investigations lie in the works of P. Hall, R. Carter, J. Rose, and Z. Borevich. Lately, numerous interesting results in this area have been obtained by many authors. In collaboration with I. Ya. Subbotin, J. Otal, G. Vincenzi, A. Russo and others, L. A. Kurdachenko was able to discover some important properties of pronormal, Carter, abnormal, and contranormal subgroups of infinite groups and investigate their influence on the groups structure. Lately, together with A. Ballester-Bolinches and T. Pedraza, L. A. Kur-

dachenko published a cycle of interesting articles dedicated to properties of permutable and Sylow permutable subgroups in infinite periodic groups.

The studies related to weak minimal conditions led L. A. Kurdachenko to the theory of modules over group rings. Some types of modules that were investigated by L. A. Kurdachenko, are proved to be useful in the studies of the influence of factor-groups on the structure of the group. In collaboration with I. Ya. Subbotin and J. Otal, L. A. Kurdachenko was able to make a significant input in this theory. It was reflected in the book of L. A. Kurdachenko, J. Otal, I. Ya. Subbotin *Groups With Prescribed Quotient Groups and Associated Module Theory*, World Scientific, New Jersey, London, Singapore, Hong Kong, 2002.

Research activities of L. A. Kurdachenko in the theory of modules were not only limited to those that have applications to group theory. On the contrary, he, along with other algebraists, ensured that the theory of modules over group rings ceases to be an application, but finds its own theme. This was largely facilitated in the book by L. A. Kurdachenko, J. Otal, I. Ya. Subbotin *Artinian Modules Over Group Ring*, Series Frontiers in Mathematics, Birkhäuser, Basel, 2007.

The theory of modules over group rings is closely related to the theory of linear groups. Some of its problems led to the need of study linear groups over vector spaces of infinite dimension. Theory of finite-dimensional linear groups, i.e., subgroups of the group $GL(F, A)$ where A is a finite-dimensional vector space over a field F, is one of the best developed algebraic theories. However, if A is infinite-dimensional, then the situation is totally different. L. A. Kurdachenko proposed new approaches to the study of infinite-dimensional linear groups, based on the introduced by him a promising concept of the central dimension, and on the study of the influence of natural families of the G-invariant subspaces on the structure of such linear groups. Based on these investigations, a quite impressive cycle of articles on infinite-dimensional linear groups have been written by L. A. Kurdachenko in collaboration with M. Evans, M. R. Dixon, I. Ya. Subbotin, J. Otal, J. M. Muños-Escolano, and N.N. Semko. The main results of that study are published in the book *Linear Groups:*

The Accent on Infinite Demensionality, CRC/Francis and Taylor, 2020, written by L. A. Kurdachenko in collaboration with M. R. Dixon and I. Ya. Subbotin.

In recent years, an important place in the research of L. A. Kurdachenko was occupied with issues related to important numerical invariants of groups — its sectional rank, 0-rank and special rank, as well as topics that study the relationships between factor-groups by hypercenters and (locally) nilpotent residuals. These studies are reflected in the book M. R. Dixon, L. A. Kurdachenko, I. Ya. Subbotin *Ranks Of Groups: The Tools, Characteristics and Restrictions*, John Wiley & Sons, New Jersey, 2016.

In the last couple of years, L. A. Kurdachenko began research in a completely new field for himself – Leibniz algebras. This is a class of non-associative algebras that are generalizations of Lie algebras. More precisely, Lie algebras are anti-commutative Leibniz algebras. The main emphasis in these studies is on topics that show the specifics of Leibniz algebras, their difference from Lie algebras, which turned out to be very significant when considering the initial natural problems of Leibniz algebras.

One of the recent interests of L. A. Kurdachenko is in the area of fuzzy groups. He was able to reduce the notion of a fuzzy group to an algebraic structure which could be investigated by regular algebraic methods. It brought a desirable order in the area of researches on fuzzy groups.

Of course, all of that is a very short and general description of L. A. Kurdachenko's research achievements, and we were not able to mention many of his important results in this brief note.

Leonid Kurdachenko is known as a great teacher. He published a couple of text books on algebra, including the books M. R. Dixon, L. A. Kurdachenko, I. Ya. Subbotin *An Introduction to Essential Algebraic Structures*, John Wiley & Sons, Hoboken, New Jersey, 2014, and M. R. Dixon, L. A. Kurdachenko, I. Ya. Subbotin *Algebra and Number Theory: an Integrated Approach*, John Wiley & Sons, Hoboken, New Jersey, 2010. These books are actively used by American and Chinese instructors in their algebra courses. The most recent book M. R. Dixon, L. A. Kurdachenko,

I. Ya. Subbotin *Ranks of Groups: The Tools, Characteristics, and Restrictions*, John Wiley & Sons, Hoboken, New Jersey, 2017 was also used in some lecture courses for graduate students in USA and Italy.

Leonid has many friends and collaborators around the globe. He is a very friendly, honest, and generous person, beloved husband, father and grandfather.

L. A. Kurdachenko is a very energetic and enthusiastic mathematician with more achievements to come. His research activity grows every year covering new and new areas of algebra. We warmly congratulate him on his 70th birthday and wish him strong health and many more successful years of research and teaching.

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