Efim Zelmanov

To the 60th anniversary

On September 7, 2015, a distinguished mathematician, one of the founders of our journal, Efim Isaakovich Zelmanov, turned 60. He was born in Khabarovsk, Soviet Union (now Russian Federation), while his mother grew up in the Ukrainian city Zhytomyr.

Efim's impressive mathematical abilities appeared in his school time. He attended Novosibirsk State University, obtaining his Master's degree in 1977. He received his Ph.D. from Novosibirsk State University in 1980 having had his research supervised by the prominent algebraists Professors L.A. Bokut and A.I. Shirshov. He defended his Doctor of Sciences dissertation (habilitation) at Leningrad (St. Petersburg) State University in 1985. In 1980–1989, Efim Zelmanov held research positions (by increasing levels: Junior, Senior, and Leading Researcher) at the Institute of Mathematics of the USSR Academy of Science at Novosibirsk (Academgorodok). In 1989–1992, he worked for different universities in the USA, Canada, Germany, and UK. In 1990, Zelmanov was appointed a professor at the University of Wisconsin-Madison in the United States. In 1994, he was appointed to the University of Chicago. In 1995–2002, he held a professorship at Yale University. In 2002, Efim Zelmanov was appointed as the Rita L. Atkinson Chair in Mathematics at University of California, San Diego. His honors include: Fields Medal (1994), College de France Medal (1991), and Andre Aizenstadt Prize (1996). Efim Zelmanov was elected to American Academy of Arts and Sciences (1996), the U.S. National Academy (2001), he is a Fellow of the American Mathematical Society (2012). He is Foreign Member of the Spanish Royal Academy of Sciences (1997), of the Korean Academy of Sciences and Technology (2008), and of the Brazilian Academy of Sciences (2012). He was awarded by the Honorary Doctor degree in Hagen (Germany), Oviedo (Spain), and Kyiv (Ukraine) Universities.

Professor Zelmanov was invited to speak at the International Congresses of Mathematicians in Warsaw (1983), Kyoto (1990), and Zurich (1994).

The thesis Efim Zelmanov presented for his Ph.D. was on nonassociative algebra, namely on Jordan algebras in the infinite dimensional case. He showed that Glennie's identity generates (in a certain sense) all identities that hold in the algebra. This and his consequent works completely changed the entire content of Jordan algebras. He was able to extend the known results from the classical theory of finite dimensional Jordan algebras to infinite dimensional Jordan algebras. Zelmanov's results on Jordan algebras were presented in his invited lecture at the International Congress of Mathematicians at Warsaw in 1983.

Lie rings were the next step in the study of non-associative rings. In 1987 Zelmanov solved one of the most famous open questions in the theory of Lie algebras at that time. He proved that the Engel identity $\mathrm{ad}^n(y) = 0$ implies that the algebra is necessarily nilpotent. Similar to the case of Jordan algebras, Zelmanov was able to extend important properties of finite dimensional Lie algebras to the infinite dimensional case.

The mentioned results (and the results obtained by Zelmanov later) on Lie and Jordan algebras dramatically changed the theory of non-associative algebras. They made Efim Zelmanov a leading expert in non-associative algebras. He and his coauthors were able to also make a fundamental contribution to associative algebras, super-algebras, associated modules and representations. Self-similar algebras and growth of algebras are among of the topics of Zelmanov's recent research.

In 1991, Zelmanov made one more significant step in his mathematical career by solving the famous Restricted Burnside Problem. This problem has its roots in one of the most remarkable mathematical problems known as the Burnside Problem introduced by Burnside in 1902. A version of this problem, formulated by Magnus in the 1930's is called the Restricted Burnside Problem. Prominent mathematicians such as Hall, Higman, Kostrikin and many others put significant efforts toward solving this problem. Using previously known results and his own results on Lie and Jordan algebras, Efim Zelmanov obtained a complete solution to the problem, which made a significant impact on the subsequent development of group theory. This constitutes a remarkable example of the effectiveness of the applications of ring theory and, more generally, of purely algebraic methods, to group theory. The result of Zelmanov yields that if a group G is finitely generated, residually finite, and satisfies the identity $X^n = 1$,

then it is finite. Thus in the residually finite case (which is one of the most important cases in applications) the situation is completely opposite to the situation in the case of arbitrary finitely generated groups (the Burnside Problem was solved by Adjan and Novikov in 1967).

In 1994, Zelmanov was awarded the Fields Medal for his works on Lie and Jordan algebras and on the solution of the Restricted Burnside Problem.

In 1991, Efim Zelmanov began his work on pro-p-groups. These groups play a crucial role in Number Theory because the Galois groups of field extensions are profinite groups and the primary p-case is the most significant via its relation to p-adic fields. In this area, very soon Efim Zelmanov obtained his remarkable result. He solved the Platonov Problem, a version of the Burnside Problem for compact topological groups. He proved that a compact torsion group is locally finite. After this work, pro-p groups began playing a significant role in Zelmanov's research.

Graded algebras, constructions of Golod-Shavarevich type, Kac-Moody algebras and their subalgebras, superalgebra versions of Lie, Jordan and other type of algebras, modules over them, representations, growth, etc., is a broad spectrum of the topics included in the research interest of E. Zelmanov. In 2010 he came up with the idea of self-similarity in theory of rings and successfully implemented it. The field of his interests goes far beyond algebra. It includes theoretical physics, random processes, discrete mathematics and much more.

Additionally to his research and teaching, Efim Zelmanov performs tremendous outreach activity. The broader impact of his dedication to the international mathematics community is difficult to overestimate. He served and is serving numerous national and international important committees (including those for the assignment of the Field Medal and the Abel Prize). He plays an important role in mathematical life in many countries, including USA, Germany, China, France, UK, South Korea, Brazil, and many others. Efim Zelmanov plays a tremendous role in supporting mathematical life in Ukraine. He regularly participates in and helps to organize mathematics conferences that take place in Ukraine, and in various ways supports many Ukrainian mathematicians.

E. Zelmanov's contribution to mathematics goes far beyond his remarkable research, teaching and outreach achievements. In different periods of time, as an editor of many major mathematics journals including 'The Annals of Mathematics', 'The Journal of Algebra', 'The Journal of the American Mathematical Society', 'The Bulletin of Mathematical Science' for which he is the Editor in Chief, 'Groups Geometry and Dynamics',

and 'Algebra and Discrete Mathematics', he strongly raised the bar of the quality of publications.

Professor Zelmanov is a great speaker and lecturer. He is one of the most popular presenters not only in the USA but in the world. He has a rare and excellent type of humor which makes his presentations and communication with him a great pleasure for everybody. He is a very caring person and wonderful friend, always ready to extend his help and support to his numerous friends and colleagues.

Efim Zelmanov has a wonderful family. He and his lovely wife Lena are loving and caring parents and grandparents.

Professor Zelmanov is one of the top researchers in the world, distinguished leader of the world mathematics community, and one of the most pleasant and nice people.

We most warmly congratulate him and wish him Siberian health, much happiness, new great discoveries, and wonderful students.

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