# IN MEMORY OF IGOR DMITRIEVICH ADO

DIETRICH BURDE AND VSEVOLOD GUBAREV

Abstract. We give a translation from Russian into English of the article "Памяти Игоря Дмитриевича Адо" written by A.V. Dorodnov and I.I. Sakhaev and published in Izv. Vyssh. Uchebn. Zaved. Mat. no. 8, (1984), 87–88. It is an orbituary for I. D. Ado. A translation might be useful in general, and in particular for a possible Wikipedia entry of Ado's life in English. In the references we list all known 12 publications of I.D. Ado, taken from the article and the MATHSCINET of the AMS. The original orbituary only lists 9 publications.

On June 29th 1983 the famous Soviet mathematician, doctor of physical and mathematical sciences and Professor Igor Dmitrievich Ado passed away at the age of 73. I.D. Ado was born in Kazan in January 1910 into the family of a state employee and he lived in Kazan till the end of his life. After leaving school Igor Dmitrievich entered the faculty of mathematics and physics at Kazan State University, named after V.I. Lenin, from which he graduated successfully in 1931. He was admitted to the PhD study at the Chair of Mathematics (since 1934 – Chair of Algebra) under the supervision of N.G. Chebotarev. Igor Dmitrievich finished successfully his PhD study by preparing a scientific qualifying work for the degree of a Candidate (PhD) of physical and mathematical sciences. The University board awarded him for this work the degree of *Doctor nauk* (doctor of sciences) of physic-mathematical sciences. Igor Dmitrievich solved in his thesis a current problem of modern algebra connected to representation theory of Lie algebras and Lie groups. More precisely, he obtained the result which is now known as *Ado's Theorem*: every finite-dimensional Lie algebra over a field of characteristic zero has a faithful finite-dimensional linear representation.

In 1932, during the International Mathematical Congress in Zürich, N.G. Chebotarev realized in the conversation with van der Waerden that the problem of representations of finite-dimensional Lie algebras was still open. After that N.G. Chebotarev suggested this problem to I.D. Ado as the theme of his future thesis. Igor Dmitrievich solved the problem and obtained a brilliant result, which brought him worldwide fame.

Ado' Theorem has attracted the attention of many famous mathematicians who tried to improve its proof. In 1938 É. Cartan gave another proof and in 1947 I.D. Ado found a new proof of his theorem [7]. In 1937 G. Birkhoff proved Ado's Theorem for nilpotent Lie algebras. In 1948 K. Iwasawa proved the theorem for a field of positive characteristic $p > 0$, so that the result about faithful linear representation of finite-dimensional Lie algebras is now also called the *Ado-Iwasawa Theorem*.

I.D. Ado got a series of results on the structure of finite continuous groups [1], on representations of finite continuous groups by linear substitutions [2] and on nilpotent algebras and $p$-groups [3]. He had a significant interest in group theory and stated some results in character

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theory of finite groups [4] and in local finite $p$-groups with minimality condition for normal factors [5, 6, 9]. His last scientific work [10] without coauthors was devoted to the theory of linear representations of finite groups.

After the defense of his doctoral thesis Igor Dmitrievich started to work at Kazan State University. Since 1936 till 1942 he held the position of a professor at the Chair of Algebra. In 1942 I.D. Ado moved to the Kazan State Chemical Technological Institute named after S.M. Kirov, where he hoed the position of a the Chair of High Mathematics until his death. He held the position of a professor from 1942 to 1958 and from 1970 to 1983. During the period from 1958 to 1970 he was the head of the chair.

Igor Dmitrievich was a wonderful teacher. He gave lectures on high theoretical level and at the same time comprehensible for students. On seminars he solved the tasks pretending that he saw them for the first time. He claimed hypotheses, checked them, highlighted particular cases and led students to the final solution. He thought out loud and taught students to think. Students and colleagues respected him and loved him.

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## References

[1] I. D. Ado: *On the structure of finite continuous groups.* (Russian) Bull. Phys. Math. Soc. Kazan, Vol. **6**, Issue 3 (1934), 38–42.

[2] I. D. Ado: *Note on the representation of finite continuous groups by means of linear substitutions.* (Russian) Bull. Phys. Math. Soc. Kazan, Vol. **6**, Issue 3 (1935), 1–43.

[3] I. D. Ado: *On nilpotent algebras and p-groups.* (Russian) Doklady Acad. Sci. URSS (N. S.) **40** (1943), 299–301.

[4] I. D. Ado: *On the theory of characters of finite groups.* (Russian) Doklady Acad. Nauk SSSR (N. S.) **50** (1945), 11–14.

[5] I. D. Ado: *On subgroups of the countable symmetric group.* (Russian) Doklady Akad. Nauk SSSR (N.S.) **50** (1945), 15–17.

[6] I. D. Ado: *On locally finite p-groups with the minimality condition for normal divisors.* (Russian) C. R. Doklady Acad. Sci. URSS (N.S.) **54** (1946), 471–473.

[7] I. D. Ado: *The representation of Lie algebras by matrices.* (Russian) Uspehi Matem. Nauk (N.S.) **2**, No. 6 (22) (1947), 159–173.

[8] I. D. Ado: *The representation of Lie algebras by matrices.* Amer. Math. Soc. Translation **1949**, no. 2 (1949), 21 pp.

[9] I. D. Ado: *Proof of the countability of a locally finite p-group with the minimal condition for normal divisors.* (Russian) Doklady Akad. Nauk SSSR (N.S.) **58** (1947), 523–524.

[10] I. D. Ado: *On the theory of linear representations of finite groups.* (Russian) Mat. Sb. (N.S.) **36**, no. 78 (1955), 25–30.

[11] I. D. Ado, V. D. Černokalskaja: *Generalized characters.* (Russian) In Memoriam: N. G. Čebotarev (Russian) Izdat. Kazan. Univ. Kazan (1964), 3–6.

[12] I. D. Ado, R. A. Rahmatullin: *The representation of a finite group by permutations over class elements.* (Russian) Kazan. Him. Tehnolog. Inst. Trudy Vyp. **43**, no. 2 (1969), 3–7.

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