Maltsev (or Malcev), Anatoly Ivanovich | Encyclopedia.com

(*b*. Misheronsky, near Moscow, Russia, 27 November 1909; *d*. Novosibirsk, U.S.S.R., 7 July 1967)

mathematics.

The son of a glassblower, Maltsev graduated in 1931 from Moscow University and completed his graduate work there under A. N. Kolmogorov. He received his M.S. in 1937 and the D.S. in 1941 and became professor of mathematics in 1944. He was a corresponding member of the Academy of Sciences of the U.S.S.R. from 1953 and was elected a member in 1958.

From 1932 to 1960 Maltsev taught mathematics at the Ivanovo Pedagogical Institute in Moscow, rising from assistant to head of the department of algebra. He worked at the Mathematical Institute of the Academy in Moscow from 1941 to 1960, when he became head of the department of algebra at the Mathematical Institute of the Siberian branch of the Academy in Novosibirsk as well as head of the chair of algebra and mathematical logic at the University of Novosibirsk. He received the State Prize in 1946 for his work in algebra and, in 1964, the Lenin Prize for his work in the application of mathematical logic to algebra and in the theory of algebraic systems. In 1956 he was named Honored Scientist of the Russian Federation and in 1963 was elected president of the Siberian Mathematical Society.

Maltsev's most important work was in algebra and mathematical logic. In his first publication (1936), which dealt with a general method for obtaining local theorems in mathematical logic, he provided such a theorem for the limited calculus of predicates of arbitrary signature. By means of this theorem an arbitrary set of formulas of this calculus is noncontradictory when—and only when—any finite subset of this set is noncontradictory. In this work the theorem of the extension of infinite models was also proved. Both theorems are important in mathematical logic and in the theory of models, the creation of which Maltsev himself was largely responsible for. His local method enabled him to prove (1941) a series of important theorems of the theory of groups and other algebraic systems. In 1956 he generalized his local theorems to cover many classes of models. Ideas similar to those presented in the last of these works led A. Robinson to formulate his nonstandard analysis, in which actual infinitesimally small and great magnitudes obtained an original substantiation.

Maltsev's most important works in algebra dealt with the theory of Lie groups. He proved (1940, 1943) that for a Lie group to have an exact linear representation, linear representability of the radical of this Lie group and the corresponding factor group constitutes a necessary and sufficient condition. In 1941 he proved that Cartan's theorem of the inclusion of an arbitrary local Lie group into a full Lie group cannot be generalized for local general topological groups. In 1944 he described all semisimple subgroups of simple Lie groups of infinite classes and exceptional classes G and F, and proved the conjugateness of semisimple factors in Levi's decomposition of Lie groups and algebras.

The following year Maltsev defined the rational submodulus of Lie algebra, characterizing the Lie group by the finite-leaved covering; and he discovered the criteria for a subgroup of a Lie group, corresponding to a given subalgebra of Lie algebra, to be closed. He also proved that maximal compact subgroups of a connected Lie group are conjugate (Cartan's problem) and that a Lie group is homeomorphic to a direct product of such a subgroup by Euclidean space. In 1948 he obtained important results in the theory of nilpotent manifolds, i.e. homogeneous manifolds the fundamental groups of which are nilpotent Lie groups. In 1951 he proved the so-called Maltsev-Kolchin theorem of solvable linear groups and studied properties of solvable groups of integer matrices and new classes of solvable groups. In 1955 he constructed an alternative analogue of Lie groups and a corresponding analogue of Lie algebras that are now called Maltsev algebras. In 1957 he constructed the general theory of free topological algebras as being a generalization of topological groups.

In the last ten years of his life Maltsev obtained important results in the theory of algebraic systems and models and in the synthesis of algebra and mathematical logic, which he described in a series of papers and in the posthumous *Algebraicheskie sistemy* ("Algebraic Systems," 1970). His results in the theory of algorithms are presented in the monograph *Algoritmy i rekursivnye funktsii* ("Algorithms and Recursive Functions," 1965). Maltsev was the author of an important textbook of algebra, *Osnovy lineynoy algebry* ("Foundations of Linear Algebra," 1948), founded the journal *Algebra i logika*. *Seminar*, and was editor-in-chief of *Sibirskii matematicheskii zhurnal*.

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