Vladimir Aleksandrovich Kondrat'ev

(Obituary)

On March 11, 2010, Vladimir Aleksandrovich Kondrat'ev, a prominent mathematician, Professor of Moscow M. V. Lomonosov State University, Doctor of Physical and Mathematical Sciences, suddenly passed away at the age of 75.

V. A. Kondrat'ev was born on July 2, 1935, in the city of Samara (Kuybyshev). His father, Aleksandr Sergeyevich Kondrat'ev was a professor of mechanics at the Kuybyshev Industrial Institute, while his mother Evgeniya Vasil'evna was a teacher of mathematics at a secondary school. In 1952 V. A. Kondrat'ev graduated from the school No. 6 of Kuybyshev with Golden Medal and entered the Faculty of Mechanics and Mathematics of Moscow M. V. Lomonosov State University which he graduated in 1957. In 1959, under supervision of S. A. Gal'pern, V. A. Kondrat'ev defended his Candidate of Science Thesis "On Zeros of Solutions of Linear Differential Equations of Order Higher than Two", while in 1965 he defended his

Doctor of Science Thesis "Boundary Value Problems for Elliptic and Parabolic Equations with Singularities at the Boundary". V. A. Kondrat'ev was deeply influenced by I. G. Petrovskiĭ in choosing the area of his scientific interests. Since 1961, V. A. Kondrat'ev had been working at the Chair of Differential Equations of the Faculty of Mechanics and Mathematics of the Moscow State University.

V. A. Kondrat'ev obtained first scientific results in his undergraduate years, and they dealt with investigation of oscillation of solutions of linear ordinary differential equations. He obtained a nonoscillation criterion for second order linear differential equations which easily implied all nonoscillation criteria known by that time. The papers of V. A. Kondrat'ev which laid the basis of his Candidate thesis include elegant proofs of Sturm-type theorems on separation of zeros, as well as oscillation and nonoscillation criteria for solutions of third and fourth order linear differential equations. Later on, he generalized these results for the case of linear differential equations of arbitrary order and obtained a depending on equations' order estimate of number of zeros of a solution as the right end of the interval tends to infinity.

V. A. Kondrat'ev initiated a systematic investigation of elliptic and parabolic problems in domains with nonsmooth boundaries. The first result he obtained in this direction concerned parabolic equations in a noncylindrical domain with characteristic points at the boundary. V. A. Kondrat'ev obtained a solvability criterion for boundary value problems in weighted Sobolev spaces and found the asymptotics of solutions in the vicinity of a characteristic point. A theory of elliptic equations in domains with conic points at the boundary is another important achievement of V. A. Kondrat'ev in this direction. In his papers devoted to this theory a universal method is developed which is applicable to a wide range of equations in domains with isolated singularities at the boundary. These results provided a basis for his doctoral thesis. In a series of papers that have already become classical, V. A. Kondrat'ev introduced and studied the notion of capacity for higher order elliptic equations. His results have served as a starting point for many investigations. Due to those works the notion of capacity was widely applied to Sobolev's imbedding theorems as well as to the theory of higher order elliptic equations - the issues of the unique solvability of the first boundary value problem, smoothness of solutions near the boundary, removable singularities of solutions.

V. A. Kondrat'ev (jointly with O. A. Oleĭnik and I. Kopaček) investigated the regularity of solutions of elliptic equations in the vicinity of a boundary point, and established best values of the Holder exponents for second order elliptic equations.

In sixties, while dealing with asymptotic behavior of solutions of elliptic equations at angular points, V. A. Kondrat'ev decided to use a product of polynomials by logarithms of polynomials for transformation of variables for linearization of a system of ordinary differential equation in the vicinity

of a singular point. This approach gave rise to a series of investigations which resulted in elaboration of the theory of finitely smooth equivalence and linearization of systems of ordinary differential equations in vicinity of a non-degenerate singular point.

V.A. Kondrat'ev (jointly with Yu. V. Egorov) obtained fundamental results dedicated to the boundary value problem with oblique derivative for elliptic equations.

V. A. Kondrat'ev (jointly with E. M. Landis) obtained a series of important results for divergent and non-divergent second order elliptic equations with nonsmooth coefficients. In their famous work a theorem on removable character of isolated singularity of solutions was obtained. Besides, the authors found sufficient conditions for each entire nonnegative solution to be trivial. Earlier similar results were known only in the case where the left hand side of the equation is the Laplace operator.

Jointly with L. Veron, V. A. Kondrat'ev obtained results on asymptotic properties of solutions of nonlinear elliptic and parabolic equations in unbounded domains.

V. A. Kondrat'ev investigated the problem on completeness of the system of eigen- and adjoint functions of elliptic operators. He found conditions to be imposed on the principal part of the operator for guaranteeing the completeness of eigen- and adjoint functions of the Dirichlet problem for second order elliptic operator of divergent type in the spaces $\overset{\circ}{W}{}^1_p$, $p \geq 1$, and weighted Sobolev spaces.

V. A. Kondrat'ev (jointly with Yu. V. Egorov and B. Schultze) established completeness of systems of eigen- and adjoint functions of boundary value problems for $2m$th order elliptic operators in the space $W_2^{2m}(\Omega)$ with Lopatinskiĭ type boundary conditions in a bounded domain whose boundary is everywhere smooth except for neighborhoods of a finite number of points where it is a conic surface.

V. A. Kondrat'ev, jointly with V. G. Maz'ya and M.A. Shubin, extended A.M Molchanov's discrete spectrum criterion to the case of an operator of more general type than the Schrodinger operator.

In the last years of his life, V. A. Kondrat'ev fruitfully worked in the sphere of the theory of nonlinear problems for equations of mathematical physics. He developed (jointly with L. Veron) methods enabling one to obtain asymptotic expansions of solutions of such problems. These methods initiated many scientific investigations both in Russia and abroad.

V. A. Kondrat'ev was actively engaged in the blow-up problem, that is, the problem of absence of nontrivial global solutions of nonlinear equations (jointly with V. A. Galaktionov, Yu. V. Egorov and S. I. Pokhozhaev).

The last remarkable work of V. A. Kondrat'ev "On positive solutions of the heat conduction equation satisfying a nonlinear boundary condition" will appear in the journal "Differentsial'nye Uravneniya", v. 46, 2010.

V. A. Kondrat'ev devoted much attention to the work with his pupils. He created a scientific school on qualitative theory of differential equations. The investigations in the sphere of qualitative theory of ordinary differential equations and partial differential equations whose basis was laid by V. A. Kondrat'ev were continued in the works of his pupils. Among his pupils there are 6 Doctors and 35 Candidates of Science.

The name of Vladimir Aleksandrovich Kondrat'ev will always remain in the history of mathematics, while his memory will live in our hearts.

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G. Kvinikadze, A. Lomtatidze, N. Kh. Rozov