

80th Birthday Anniversary of Yuriĭ Aleksandrovich Klovov



On May 10, 2009 Professor Yuriĭ Aleksandrovich Klovov, an outstanding specialist in the theory of differential equations, Doctor of Physical and Mathematical Sciences (Habilitation Doctor of Mathematics according to the classification of the Republic of Latvia) will be 80.

Yu. A. Klovov was born in 1929 in the village of Budarino of the Chapayev district of the Kazakh SSR. He lost his mother early and at the age of 7 was taken into the family of Eduard Ottovich Vaskis for fosterage.

Since 1947 Yu. A. Klovov have lived in Riga. In 1951 Yu. A. Klovov graduated from Latvian State University and started to work as a higher mathematics teacher at the Riga Institute of Civil Aviation Engineers. From 1956 to 1959, Yu. A. Klovov did his post-graduate studies at Moscow State University under the supervision of Professor V. V. Nemytskii. In 1959, he successfully defended Candidate of Sciences Thesis “Limit boundary value problem for the second order ordinary differential equation”. Later the results of the thesis became part of the monograph [17] published in Riga in 1966. This excellent book immediately gained attention of specialists and has been actively used by them up to now. In 1970, Yu. A. Klovov defended his Doctor of Sciences Thesis at the Leningrad State University.

From 1963 to 1966, Yu. A. Klovov worked at the Riga Institute of Civil Aviation Engineers, first as an associated professor and later as a full professor of the Chair of High Mathematics, and since 1966, his scientific activities are connected with Latvian University, where by that time a computation center had been established, among the first in the USSR. There Yu. A. Klovov in various times held the positions of head of a laboratory, head of a department, and Deputy Director responsible for scientific research. Jointly with A. Ya. Lepin he founded and during several decennials headed a scientific seminar on differential equations. He was one of the organizers of the conferences on ordinary differential equations organized by Computation Center of Latvian State University, which used to bring together specialists from many scientific centers of the USSR. Being deeply involved in the

scientific research, Yu. A. Klovok nevertheless spent a lot of time on the education of scientists. He has a lot of pupils and followers both in Latvia and outside its borders. Under his supervision, Candidate of Sciences theses were defended by N. I. Vasil'ev, L.N. Pospelov, S. A. Bespalova, F. Zh. Sadyrbayev, L. A. Lepin, M. M. Ad'yutov, G. P. Grizans.

Let us review the directions of Yu. A. Klovok's scientific research.

**Boundary Value Problems with Conditions at Infinity for Ordinary Differential Equations.** By generalizing and systematizing of the results on nonlinear boundary value problems known by that time, Yu. A. Klovok validated the limit processes and obtained important from both theoretical and practical viewpoints assertions for boundary value problems on semi-infinite and infinite intervals. For instance, he found existence conditions for absolutely bounded at infinity solutions of second order nonlinear ordinary differential equations, as well as conditions for the existence of solutions with prescribed limits at infinity. It is important that Bernstein conditions were not imposed on the equation  $x'' = f(t, x, x')$ , that is, the function  $f$  was allowed to grow in the third argument at a rate higher than a quadratic one. Separate results were obtained for second order autonomous equations. Three-point boundary value problems were also considered for the third order equation with conditions at the infinities of both signs. For the solution of some of the mentioned problems, constructive finite difference methods were proposed. The obtained results are set forth in the monograph [17], where a boundary value problem with conditions at infinity was also considered for the  $n$ -th order equation.

**Theory of Boundary Value Problems for Nonlinear Ordinary Differential Equations.** Starting from the 60ies of the last century, Yu. A. Klovok successfully applies the method of a priori estimates to investigation of nonlinear boundary value problems. He has proved quite general theorems on a priori estimates of solutions of nonlinear differential equations and systems by means of which fundamental results on solvability and unique solvability are established for two-point and multi-point boundary value problems in both regular and singular cases [22–31, 35, 38, 40, 41–46, 49, 51, 57, 63–65, 68, 72, 76–78, 89, 95–98, 102, 116–119, 122, 126–130, 133–135, 138, 141–144]. One can hardly overestimate the importance of those results for development of the theory of nonlinear boundary value problems.

**Automodel Solutions of Problems of Heat Conductivity and Gas Dynamics.** Mathematical modelling is one of the most powerful and efficient methods of studying various events and processes. Adequate mathematical models of the problems under investigation are difficult to study with traditional analytical methods of applied mathematics due to existence of essential nonlinearity and various singularities. For investigation of these models and obtaining solutions, powerful methods of computation mathematics are used. However, the obtained solutions, especially if they do not follow traditional patterns of behaviour of solutions, need strict theoretical justification. In close cooperation with a group of scientists headed by

the Academician A. A. Samarskiĭ, starting from 1982 Yu. A. Klovok was deeply involved in investigation of automodel solutions of nonlinear equations of parabolic type. Yu. A. Klovok succeeded in proving existence of non-monotone solutions for the so called regimes with exacerbation and theoretically estimated their number. In joint works with the pupils of the Academician A. A. Samarskiĭ Professors A. P. Mikhailov and N. V. Zmitrenko, Yu. A. Klovok developed new methods of investigation of non-classic boundary value problems for ordinary differential equations. These problems arise in investigation of automodel regimes for nonlinear problems of heat conductivity with a source of a special type as well as in the problem of the unstressed compression of gas. Due to the universal character of the approach, this theory and corresponding conclusions were then extended by various authors on the problems whose mathematical models are nonlinear parabolic equations.

**Emden-Fowler Type Equations.** Second order equations of the Emden-Fowler type are important for applications and are very interesting for mathematical research since they provide various examples of nonlinear oscillation and peculiar behavior. In this sphere, we should note the papers [123, 124], where respectively sub-linear and super-linear Emden-Fowler type equations were investigated. Such equations are characterized by the presence of quickly oscillating solutions. This property was adopted as definition of sub- and super-linearity. Exact estimates of perturbing terms of the equation were obtained under which the properties of super- and sub-linearity are preserved for the perturbed equation.

**Chebyshev's Polynomials and Their Utilization in Calculations.** In connection with solution of a series of practical problems within the framework of the work under the state contracts, an important place in the scientific research of Yu. A. Klovok is occupied by elaboration of computation methods of the theory of functions approximation, calculation of integrals, solution of differential and integral equations. The obtained results are presented in a series of papers written by staff members of the Computation Center of the Latvian University and in the monograph [58]. A distinguishing feature of the research in this sphere is obtaining of the methods more efficient than the classic ones. This was achieved by "reasonable mixture" of analytical and numerical approaches and taking into account specific character of the equations under investigation.

The scientific interests of Yu. A. Klovok cover a wide range of problems and is characterized by understanding their topicality, so the above presented short review is far from being complete. The style of the scientific research of Yu. A. Klovok, characterized by deepness of penetration into the matter and striving to obtaining finished results, should also be mentioned here. The obtained estimates, as a rule, are exact in the mathematical sense which means possibility of construction of contradicting examples in case the conditions are violated.

The books which Yu. A. Klovok wrote or participated in writing are intensively cited by researchers in corresponding areas. The monograph [45] should be especially mentioned which became a handbook for many specialists in the theory of boundary value problems.

The Department of Ordinary Differential Equations, founded and headed for a long period of time by Yu. A. Klovok, at present is transformed into Laboratory of Ordinary Differential Equations of Institute of Mathematics and Informatics of the Latvian University, where he continues intensive scientific activities.

We cordially wish to dearest Yuriĭ Aleksandrovich good health, prosperity and new successes in his scientific activities.

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#### LIST OF MAIN PUBLICATIONS OF YU. A. KLOKOV

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