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NEWS AND NOTICES

SIXTY YEARS OF PROFESSOR VALTER ŠEDA

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RNDr. Valter Šeda, DrSc., Professor of Mathematics at the Faculty of Mathematics and Physics of Comenius University in Bratislava, a prominent Czechoslovak mathematician and distinguished teacher, celebrated the sixtieth anniversary of his birthday on April 11, 1991.

Valter Šeda was born in Sered' (district of Galanta, Slovakia). He attended the secondary school in Kežmarok, passing the final examination in 1949. After completing his study of Mathematics at the Faculty of Science of Comenius University, he graduated in 1953 and became a research student (aspirant) in the Department of Mathematical Analysis under the supervision of Professors J. Hronec and O. Borůvka. Since 1956 he was Assistant Professor in the same Department, in 1964 he was appointed Associated Professor (Dozent) and in 1982, after having defended his DrSc. dissertation, Full Professor. In the periods 1972–1974 and 1981-1990 he was Head of the Department.

The scientific work of Prof. Šeda has been focused on ordinary differential equations. He started with ordinary differential equations of the second order in complex domain, dealing with transformations of differential equations, various properties of solutions as e.g. oscillatoricity and growth of solutions on the open complex plane and in the unit circle [1, 2, 4, 6, 7, 14]. In [2] he solved an interesting problem proposed by O. Borůvka: find all differential equations of the second order of the form $y'' = q(z)y$ on the open plane whose two linearly independent solutions, or one solution and its derivative, have prescribed zero points. Šeda proved that there are infinitely many such equations. Next, he developed a theory of transformations of the linear differential equation of the n-th order with its righthand side in the real domain. He studied the relation of transformable differential equations to the distribution of the zero points of their solutions [8, 10, 11]. Considerable part of his research is devoted to the boundary value problems—he wrote almost 30 papers on the topic, developing and applying several methods for the investigation of these problems. For example, he developed the method of antitone operators and applied it in order to establish existence and uniqueness theorems for two-point boundary value problems [33]. Let us mention an interesting result claiming the existence of one, and for n even, even two funnels of solutions around each solution of a certain nonlinear differential equation of the n-th order. Another result concerns the two-point boundary value problem in the case that a certain set of differential operators is inversely monotone (inversely antimonotone). This result enabled him to find a sufficient condition for the existence of a periodic solution of the nonlinear differential equation of the 3rd order. The de la Valeé Poussin boundary value problem

$$Lx = \sum_{j=0}^{n} p_j(t)x^{(n-j)} = f(t,x), \tag{1}$$

$$x^{(i)}(s_k) = A_{ik} \in R, \quad i = 0,1,\ldots,r_k - 1, \quad k = 1,\ldots,m \tag{2}$$

with $2 \leqslant m \leqslant n$, $1 \leqslant r_k$, $r_1 + \ldots + r_m = n$ is studied in [25] by the methods of isotone mappings. Here Šeda made use of the existence of upper and lower solutions and of the Green function with a constant sign of the corresponding homogeneous boundary value problem, but also of a fixed point theorem in a partially ordered space. Further, he generalized the maximum principle for solutions of differential inequalities, then known for the inequalities of the 2nd order. On the basis of this principle we can prove not only existence theorems but also the uniqueness of solution of certain two-point boundary value problems. When studying multipoint boundary value problems

$$x^{(n)} = f(t,x,\ldots,x^{(n-1)}),$$

(2) in [26], Šeda used Hartman's method of n-parametric systems. In [34] he studied the existence and uniqueness of solution of the nonlinear boundary value problem

$$Lx = f(t,x),$$
$$B_i x = \sum_{j=1}^{n}(M_{ij}x^{(j-1)}(a) + N_{ij}x^{(j-1)}(b)) = c_i, \quad (i = 1,\ldots,n)$$

(M_{ij}, N_{ij}, c_i are given reals) provided the eigenvalues of the selfadjoint boundary value problem $Lx = \lambda x$, $B_i x = 0$ ($i = 1, \ldots, n$) are bounded from one side.

In his research concerning the boundary value problems, Šeda to a great extent exploited methods of functional analysis, fixed point theorems in various function spaces, theorems on surjective mappings [39, 42, 45, 47, 49, 50] and Mawhin's theory [43]. They enabled him to investigate also various generalized types of boundary value problems [36, 39, 52] and a number of problems concerning partial and functional differential equations [24, 39]. Asymptotic and other properties of solutions (existence of monotone or oscillatory solutions and others) are studied in [31, 46]. Šeda used generalizations of Kiguradze's lemmas to derive conditions for the existence of oscillatory and nonoscillatory solutions of functional differential equations with deviated argument [37, 40]. Several papers are devoted to applications: in [23] Šeda solved a boundary value problem for a nonlinear differential equation of the 4th order appearing in the theory of semiconductors. In [27] he studied a certain model describing the Belousov-Zhabotinskii reaction. Here Šeda proved stability of certain steady solutions and also the existence of periodic solutions. In [30] he dealt with a boundary value problem generalizing the Thomas-Fermi problem, and in [44] he studied the problem of bending of a curved beam.

The mathematical erudition of Valter Šeda manifests itself also in his pedagogical and organizational activities. His lectures are elegant and attractive. Many of his students, who are now renowned mathematicians, wrote their first scientific papers under his guidance. He is author of the lecture notes "Complex Analysis" as well as coauthor of the textbook "Ordinary Differential Equations" and of "Small Encyklopedia of Mathematics". We will not present his numerous offices in various committees and boards but only mention his significant part in organizing international conferences on differential equations EQUADIFF in Czechoslovakia.

On the occasion of his sixtieth birthday, we wish Professor Šeda firm health, personal happiness and many successes in his work.

List of publications

Scientific papers:

[1] Transformation of integrals of ordinary linear differential equations of the 2nd order in complex domain (Slovak), Acta F.R.N. Univ. Comen. *V–VI* (1957), 229–254.

[2] On some properties of solutions of the differential equation $y'' = Q(z)y$, where $Q(z)$ is an entire function (Slovak), Acta F.R.N. Univ. Comen. *III–V* (1959), 223–253.

[3] A note to a paper of Clunie, Acta F.R.N. Univ. Comen. *III–V* (1959), 255–260.

[4] On the Properties of Linear Differential Equations of the Second Order in the Complex Domain, Proc. Conf. held in Prague in Sept. 1962, House of the Czech. Acad. of Sci., Prague, 1963, pp. 179–186.

[5] On the concept of the inverse analytic function (Slovak), Mat. Fyz. Čas *13* (1963), 177–192.

[6] Several theorems on the linear differential equation of the second order of Jacobi type in complex domain (Russian). Čas. Pěst. Mat. 88 (1963), 29–58.
Correction to the paper "Several theorems on the linear differential equation of the second order of Jacobi type in complex domain (Russian), Čas. Pěst. Mat. *89* (1964), 359–361.

[7] An application of the fundamental theorem of conformal mapping in the theory of linear differential equations of the 2nd order (Russian), Čas. Pěst. Mat. *89* (1964), 10–27.

[8] Über die Transformation der linearen Differentialgleichungen n-ter Ordnung I., Čas. Pěst. Mat. *90* (1965), 385–412.

[9] Über die Existenz der linear Differentialgleichungen zweiter Ordnung im komplexen Gebiet welche den Differentialgleichungen mit konstanten Koeffizienten ähnlich sind, Acta F.R.N. Univ. Comen. *X* (1965), 31–40.

[10] On a Class of Linear Differential Equations of the n-th Order, Čas. Pěst. Mat. *92* (1967), 247–261.
[11] Über die Transformation der linearen Differentialgleichungen n-ter Ordnung II., Čas. Pěst. Mat. *92* (1967), 418–435.
[12] A Remark to Quasilinearization, J. Math. Anal. Appl. *23* (1968), 130–138.
[13] An Application of Green's Function in the Differential Equations, Differential Equations and Their Applications, Proc. of the Conf. held in Bratislava, SPN, Bratislava, 1969.
[14] On Some Properties of a Solution of the Schwarzian Differential Equation, Czech. Math. J. *19(94)* (1969), 91–98.
[15] A Comparison Theorem in the Theory of the Second-order Linear Differential Transformations, Spisy Přír. fak. Univ. J. E. Purkyně v Brně *T 5* (1969), 7–18.
[16] An Application of the Second-order Linear Differential Transformations to a Non-Linear Differential Equation, Spisy Přír. fak. Univ. J. E. Purkyně v Brně *500* (1969), 31–36.
[17] A Remark To Theory of the Heat Equation, Ann. Mat. Pura Appl. *86* (1970), 357–366.
[18] On the Existence of a Generalized Solution to the First Initial-Boundary Value Problem for a Nonlinear Parabolic Equation, Ann. Mat. Pura Appl. *87* (1970), 375–388.
[19] On an Application of the Stone Theorem in the Theory of Differential Equations, Čas. Pěst. Mat. *97* (1972), 83–189.
[20] On a Boundary Value Problem for a Nonlinear Second-Order Differential Equation, Mat. Čas. *22* (1972), 231–234.
[21] On a Nonlinear Boundary Value Problem of Higher Order, Proc. of the Czech. Conf. on Diff. Equat. and Their Appl., J. E. Purkyně Univ., Brno, 1972, pp. 145–153.
[22] On the Three-Point Boundary-Value Problem for a Non-Linear Third Order Ordinary Differential Equation, Arch. Math. 2, Scripta Fac. Sci. Nat. UJEP Brunensis *8* (1972), 85–98.
[23] On a Nonlinear Boundary Value Problem, Acta F.R.N. Univ. Comen. Math. *30* (1975), 95–119.
[24] Über Koinzidenzsätze und deren Anwendung auf Funktionaldifferentialgleichungen, Beiträge zur Analysis *7* (1977), 278–290, (with D. Göhde).
[25] Two Remark on Boundary Value Problems for Ordinary Differential Equations, J. Differential Equations *26* (1977), 278–290.
[26] Three Sufficient Conditions for Compactness of a Family of Solutions of Ordinary Differential Equations, Equazioni Differenziali Ordinarie ed Equazioni Funzionalli, Communicazioni del Convegno Equadiff 78, Firenze, 1978, pp. 223–235.
[27] On the Existence of Oscillatory Solutions in the Waisbuch-Salomon-Atlan Model for the Belousov-Zhabotinskij Reaction, Aplikace Matematiky *23* (1978), 280–294.
[28] On a Modification of the Method of Majorants, Acta F.R.N. Univ. Comen. Math. *34* (1979), 137–155.
[29] A partially ordered space connected with the de la Vallée Poussin problem, Equadiff IV Proceedings, Prague 1977, Springer-Verlag, Berlin-Heidelberg-New York, 1979, pp. 374–383.
[30] On a Generalization of the Thomas-Fermi Equation, Acta Math. Univ. Comen. *39* (1980), 97–114.
[31] A Class of Differential Equations Similar to Linear Equations, Math. Slovaca *30* (1980), 433–441.
[32] On a Boundary Value Problem of the Fourth Order, Čas. Pěst. Mat. *106* (1981), 65–74.
[33] Antitone Operators and Ordinary Differential Equations, Czech. Math. J. *31(106)* (1981), 531–553.

[34] On a nonlinear perturbation of a self-adjoint boundary value problem, Equadiff 5, Proceedings of the Conference held in Bratislava 1981, Teubner Verlagsgesellschaft, Leipzig, 1982, pp. 318–328.
[35] On a Fučík problem, Annales Polon. Math. *XLII* (1983), 321–331.
[36] On the vector multipoint boundary value problem (Russian), Doklady seminara Inst. prikl. mat. in. I. N. Vekua, Tbilisi, 1985, pp. 27–30.
[37] Nonoscillatory solutions of differential equations with deviating argument, Czech. Math. J. *36(111)* (1986), 93–107.
[38] On a vector multipoint boundary value problem, Archivum Math. Brno *22* (1986), 75–92.
[39] Surjectivity and boundary value problems, Equadiff 6, Proceedings of the International Conference on Differential Equations and their Applications held in Brno, Czechoslovakia, J. E. Purkyně Univ., Brno, 1986, pp. 161–170.
[40] On nonlinear differential systems with deviating arguments, Czech. Math. J. *36* (1986), 450–466.
[41] A remark to a multipoint boundary value problem, Archivum Math. Brno *23* (1987), 121–130.
[42] Surjectivity and its application to boundary value problems (Russian), Funkcional'nyje i čislennyje metody matematičeskoj fiziki, Naukova-Dumka, Kijev, 1988, pp. 245–250.
[43] Some remarks to coincidence theory, Czech. Math. J. *38(113)* (1988), 554–572.
[44] On a linear eigenvalue problem, Acta Math. Univ. Comen. *LIV-LV* (1988), 217–223.
[45] Some fixed point theorems for multivalued mappings, Czech. Math. J. *39(114)* (1989), 147–164.
[46] On a class of linear n-th order differential equations, Czech. Math. J. *39(114)* (1989), 350–369.
[47] A correct problem at a resonance, Differential and Integral Equations *2* (1989), 384–396.
[48] On some non-linear boundary value problems for ordinary differential equations, Archivum Mathematicum Brno *25* (1989), 207–222.
[49] Surjectivity of an operator, Czech. Math. J. *40(115)* (1990), 46–63.
[50] On correctness of the generalized boundary value problem for systems of ordinary differential equations, Archivum Mathematicum Brno *26* (1990), 181–185.
[51] On some properties of the solution of the differential equation $u'' + \frac{2u'}{r} = u - u^3$, Aplikace matematiky *35* (1990), 315–336, (with J. Pekár).
[52] On a boundary value problem with general linear conditions, Equadiff 7, Proceedings of the conference held in Prague 1989, Teubner Verlagsgesselschaft, Leipzig, 1990, pp. 118–122.

For lecture notes, occasional papers and translations (all in Slovak) see Mathematica Bohemica 116(1991), 439–444.