



PERSONAGE IN SCIENCE

Professor V.M. Starzhinskii

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On March 10, 2008, the renowned Russian scientist in the area of mathematics and mechanics, Viacheslav Michailovich Starzhinskii, would have turned 90 years old. To commemorate Professor Starzhinskii's valuable contribution to nonlinear dynamics, the Editorial Board of the Journal presents a biographical sketch to his life and academic activities. A short review of his scientific achievements has also appeared in monograph "Advances in Stability Theory at the End of the 20th Century" (co-authored by a large team of contributors), copyrighted by Taylor and Francis, London, 2003.

1 V.M. Starzhinskii's Life

V.M. Starzhinskii was born in a family of school teachers on March 10 (February 25), 1918, in the village of Lemeshevichi of the Pinsky district belonging to the Pinsky region (now the Brest region in Belorussia).

His father, Michail Fedorovich Starzhinskii, born in 1893, was employed as a teacher until 1942. His mother, Anna Aleksandrovna Dyukova, born in 1893, had been a teacher in the village of Lemeshevich since 1928. During the Second World War (from June 22, 1941 to July 28, 1944) she stayed in the occupied territory in the town of Vysokoye in the family of her brother, the future famous astrophysicist, Ivan Aleksandrovich Dyukov. After Vysokoye was liberated, Anna Aleksandrovna worked there at the District Department of People's Education. In October of 1944 she moved to the small town of Veshnyaki in a vicinity of Moscow, where she was employed as a teacher at school number 6 almost throughout the end of her life.

Anna Aleksandrovna's family broke in 1922 and Viacheslav Michailovich stayed with his mother. In the Fall of 1935 he finished a secondary school in Veshnyaki and then was

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admitted to the Department of Mechanics and Mathematics of Moscow State University to study mechanics. During his academic years, in his search for an additional income, Viacheslav Mikhaylovich applied to the All-Union Correspondent Institute of Textile and Light Industry (A-UCITLI) and he was appointed as an adjunct faculty and he was involved in teaching Calculus courses. In 1950 he became a full-time faculty.

At that time, he got interested in automatic control systems. This influenced the topic of his upcoming PhD thesis “Some problems in the theory of tracking systems”, which he successfully defended in 1948 at the Scientific Research Institute of Mechanics in Moscow State University. His graduation from Moscow State University (with distinguished grades) coincided with the beginning of the Second World War. As the result, from 1941 to 1944, he worked as a constructor engineer at the military plants in the Stupino town of the Moscow region and in the town of Verkhnyaya Salda of the Sverdlov region. From 17.08.44 to 09.09.45 he taught at the Verkhne-Salda Avia-Metallurgical Technical School of Narkomaviaprom.

In October, 1945 Viacheslav Michailovich was accepted to a full-time post-graduate school at the Scientific Research Institute of Mechanics of Moscow State University. Upon a successful graduation, he defended the above mentioned thesis in June, 1948. In the same year (from 02.02.1948) he was appointed as a senior researcher in one of the scientific research institutes of the Ministry of Industry of Communications.

From the 1st of September, 1950 he became an associate Professor of Mathematics in Calculus Program at A-UCITLI.

On August 1, 1957, Viacheslav Michailovich became an associate Professor of Theoretical Mechanics Program at A-UCITLI. After defending (in March of 1958) his habilitation thesis he became a Professor and then the Chair of the Program of Theoretical Mechanics.

Viacheslav Michailovich married Tatyana Nikolayevna Litvinenko (born on 1925) in 1949, who was a student in the Schepkin school of arts and theater. They happily lived until Viacheslav Michailovich’s death (on December 5, 1993 at the age of 75).

During all this time Tatyana Nikolayevna was his best friend and a guardian angel. They raised two children: son Pavel (born in 1950 and died tragically during winter fishing at the age of 40) and daughter Vera (born in 1959). After finishing her education, Tatyana Nikolayevna Starzhinskaya (maiden name Litvinenko) was an actress at the Moscow Regional Theater of Drama.

Forty three years of work at A-UCITLI proved to be most fruitful in the life of Viacheslav Michailovich. In 1952 he published his first paper [2]. In the period of 1952-1957, the same journal published seven more papers of his on the problems of stability of periodic motions. During this time, Viacheslav Mikhailovich took a doctoral course for his habilitation degree at the Institute of Problems of Mechanics Of Academy of Sciences (his supervisor was the Corresponding Member of Ac. of Sci. of USSR, Professor N.G. Chetayev), and in 1957 he defended his habilitation thesis.

2 Main Directions of His Research

V.M. Starzhinskii published more than 150 articles and books (including 27 monographs and textbooks). His work covers the following areas:

1. The second Lyapunov method: first, second, third and fourth order equations;

2. Stability of periodic motions: estimations of characteristic constants in the second and n-th order systems; the theory of parametric resonance Maté and Hill equations;
3. Oscillations of substantially nonlinear systems, combination of the Lyapunov and Poincaré methods, oscillating chains, energy jump, damped oscillating systems, computation of normal modes; normal modes for third, fourth and sixth order systems;
4. Application of parametric resonance theory to acoustic and electromagnetic waveguides;
5. Dynamics of a solid body: dimensionless form of the Euler-Poisson equations, oscillations of a heavy body with a fixed point, exclusive cases of Kovalevskaya gyroscope motion, QP-procedure for Kovalevskaya's case.
6. Applied problems: calculation of thread tension, elastic shaft, dynamical stability of rods, problem of three bodies, torsion oscillations of crank-shafts, pendulum on spring, thread mechanics, servosystems, cyclical accelerators.

3 Teaching Activity

Viacheslav Michailovich was a skillful lecturer. He conveyed a very complex material to his students in a clear fashion, without a compromise to the depth. His teaching experience of many years was also led to the publication of the following textbooks:

1. Hertsverg, E.Ya., Starzhinskii, V.M. Statics. Moscow: A-UCITLI, 1964, 236 p.
2. Starzhinskii, V.M. Kinematics, Moscow: A-UCITLI, 1964, 115 p.
3. Starzhinskii, V.M. Dynamics, Moscow: A-UCITLI, 1962, 166 p.
4. Starzhinskii, V.M. Dynamics, Moscow: A-UCITLI, 1965, 230 p.
5. Starzhinskii, V.M. Mechanics (Section "Mechanics of solid body"), Moscow: A-UCITLI, 1968, 270 p.
6. Starzhinskii, V.M. Theoretical Mechanics, Moscow: Nauka, 1980. 464 p.
7. Starzhinski V.M. Mecanique rationell. Moscow: Mir, 1984. 469 p. (in French)
8. Starzhinski V.M. Mecanica teorica. Moscow: Mir, 1984. 544 p. (in Portuguese)
9. Starzhinski V.M. Mecanica teorica. Moscow: Mir, 1985. 519 p. (in Spanish)
10. Starzhinskii V.M. An Advanced Course of Theoretical Mechanics for Engineering Students. Moscow: Mir, 1982. 472 p. (in English)
11. Starzhinskii, V.M. Theoretical Mechanics, Moscow: Mir, 1986. 528 p. (in Russian)

Between 1980 and 1988 Professor Starzhinskii gave a series of lectures on nonlinear oscillations and parametric resonance for post-graduate students of the Mechanical and Mathematical Department of Moscow State University. His lectures have always been a success and as they attracted many listeners who were inspired by his lectures. He worked actively with post-graduates and supervised four doctoral and five habilitation theses.

4 Scholarly Activity

Professor Starzhinskii was among active contributors to Mathematical Encyclopedia. He also contributed two volumes:

1. Nonlinear Oscillations (Vol. III, 1982. – P. 956–958);
2. Parametric Resonance (Vol. IV, 1984. – P. 216–218).

He compiled a bibliography of Liapunov's lectures and contributed to the publication of "New Books Abroad" (see Moscow: Mir, 1979, issue 11; 1980, issue 5; 1982, issues 5, 6; 1984, issue 2). He was a member of Scientific-Methodical Council of Theoretical Mechanics of Minvuz, USSR, and a member of Mir Publisher's Editorial Board.

V.M. Starzhinskii was rewarded with three medals of honor. In 1985 he received the reward "For Successes in the Field of Higher Education".

5 List of Monographs and Books by V.M. Starzhinskii

- [1] Linear Differential Equations with Periodic Coefficients. Y. Wiley, 1975, vol. 1, 386 p. (with V.A. Yakubovich)
- [2] Linear Differential Equations with Periodic Coefficients. Y. Wiley, 1975, vol. 2, pp. 387–839. (with V.A. Yakubovich)
- [3] Applied Methods of Nonlinear Oscillations, Moscow: Nauka, 1977, 255 p. (in Russian)
- [4] Applied Methods in the Theory of Nonlinear Oscillations. Moscow: Mir, 1984, 264 p.
- [5] Méthodes Appliquées en Théorie des Oscillations non Linéaires. Moscow: Mir, 1985, 288 p.
- [6] Parametric Resonance in Linear Systems. Moscow: Nauka, 1987, 328 p. (with V.A. Yakubovich)
- [7] To the Theory of Nonlinear Oscillations, Moscow: Moscow State University, 1970, Part I, 108 p.
- [8] To the Theory of Nonlinear Oscillations, Moscow: Moscow State University, 1972, Part II, 60 p.
- [9] To the Theory of Nonlinear Oscillations, Moscow: Moscow State University, 1974, Part III, 99 p.
- [10] To the Theory of Nonlinear Oscillations, Moscow: Moscow State University, 1975, Part IV, 60 p.
- [11] Linear Differential Equations with Periodic Coefficients and their Application, Moscow: Nauka, 1972, 912 p. (with V.A. Yakubovich)
- [12] On Stability of Periodic Motions. Bul. Inst. Politehn., Din. Iasi, 1969, Serie nova 4–8, Part I, no. 3–4, pp. 9–68, Part II, 5 (9), no. 1–2, pp. 51–100.
- [13] On the Stability of Periodic Motions. Amer. Math. Soc. Trans., 1963, Ser. 2, Part I, 33, pp. 59–121, Part II, i.d. pp. 123–187.

6 Selected Articles

- [1] (1948). The effect of clearance and friction on the motion of follow-up electric drive. ONTI NII PSSM.
- [2] (1952). Sufficient stability conditions for a mechanical system with one degree of freedom. *Prikl. Mat. Mekh.*, **16**(3), 369–374 (Russian).

- [3] (1953). On stability of a mechanical system with one degree of freedom. *Prikl. Mat. Mekh.*, **17**(1), 117–122 (Russian).
- [4] (1954). A review of work on the conditions of stability of the trivial solution of a system of linear differential equations with periodic coefficients. *Prikl. Mat. Mekh.*, **18**(4), 469–510.
- [5] (1954). On stability of trivial solution of second order differential equation with periodic coefficients. *Inzhen. Sbornik*, **18**, 119–138 (Russian).
- [6] (1955). A remark to the stability investigation of periodic motions. *Prikl. Mat. Mekh.*, **19**(1), 119–120 (Russian).
- [7] (1957). On stability of periodic motions in a special case. *Prikl. Mat. Mekh.*, **21**(5), 720–722 (Russian).
- [8] (1958). On stability of trivial solution of linear systems with periodic coefficients. *Prikl. Mat. Mekh.*, **22**(5), 646–656 (Russian).
- [9] (1958, 1959). On stability of periodic motions. *Bul. Inst. Politehn., Din. Iasi*, Serie noua 4–8, Part I, no. 3–4, 19–68; Part II, 5(9), no. 1–2, 51–100 (Russian).
- [10] (1959). To the problem on boundedness of solution to system of linear differential equations with periodic coefficients. *Trudy 3 Vsesouzn. Mat. S'ezda*, **4**, 37–39 (Russian).
- [11] (1959). Torsion oscillations of loom crankshafts. *Nauchn. Dokl. Vysshei shkoly mashyn. i priborostroen.*, **1**, 51–57 (Russian).
- [12] (1959). On Liapunov's method of estimating characteristic constant. *Izd. Akad. Nauk USSR, OTN, Mekh. Mashinostroen.*, **4**, 46–55 (Russian).
- [13] (1960). On stability of trivial solution of system of two linear differential equations with periodic coefficients. *Prikl. Mat. Mekh.*, **24**(3), 578–581 (Russian).
- [14] (1960). The stability of periodic motions in a special case. *Royal Aircraft Establishment*, no. 883, 2–4.
- [15] (1961). Free not entirely elastic oscillating chains. *Izd. Akad. Nauk USSR, OTN, Mekh. Mashinostroen.*, **6**, 68–73 (Russian).
- [16] (1962). Free entirely elastic oscillating chains. *Prikl. Mat. Mekh.*, **26**(1), 172–181 (Russian).
- [17] (1963). Oscillating chains. *Proceedings of International Symposium on Nonlinear Vibrations*, Vol. 1., Naukova Dumka, Kiev, 446–455 (Russian).
- [18] (1963). On the stability of periodic motion. *Amer. Math. Soc. Trans.*, Ser.2, Part I, **33**, 59–121; Part II, i.d. 123–187.
- [19] (1964). On the stability of periodic regimes. *Nonlin. Vibrations Problems*, PWN, Warszawa, **5**, 360–369.
- [20] (1967). Parametric resonance in systems close to the canonical ones. *Inzhen. Zh. Mekh. Tver. Tela*, **3**(3), 174–180 (Russian).
- [21] (1968). On one version of the method of determining periodic solutions. *Inzhen. Zh. Mekh. Tver. Tela.*, **4**(6), 67–71 (Russian).
- [22] (1968). To the theory of parametric resonance. *Proc. of the Fourth Conf. of Nonlin. Oscil.*, Prague, 475–480.
- [23] (1968). Dynamic stability of thin-walled rods loaded with longitudinal periodic forces. *Proc. of the Fourth Conf. of Nonlin. Oscil.*, Prague, 467–474.
- [24] (1970, 1971, 1972). *On the Theory of Non-Linear Vibration*. Part 1, Part 2, Part 3, Izd. Moscow University (Russian).
- [25] (1973). Certain problems of the theory of nonlinear vibrations. *Izv. Yassk. Politekh. Inst.*, Part 1, **19**(**23**), Nos. 1–2, 113–120; Part 2, **19**(**23**), Nos. 3–4, 127–134.

- [26] (1969, 1970, 1971). Theory of periodic waveguides. *Izv. Yassk. Politekh. Inst.*, Part 1, **15(19)**, Nos. 3–4, 7–16; Part 2, **16(20)**, Nos. 3–4, 21–30; Part 3, **17(21)**, Nos. 3–4, 31–37. (with V.I. Koroza)
- [27] (1971). Anwendung der Theorie linearer Differentialgleichungen mit periodischen Koeffizienten in der Mechanik. *Mitteilungen der Math.*, Gesellschaft DDR, **1**, 53–65.
- [28] (1971). Interruption of spring oscillations of the mathematical pendulum. *Inzhen. Zh. Mekh. Tver. Tela*, **7(2)**, 154–156 (Russian).
- [29] (1966). Parameterresonanz in fastkanonischen systemen. *ZAMM*, **46(7)**, 459–464. (with I. Bairoiter)
- [30] (1976). Orbital stability in a partial case of the problem of n bodies. *Izbr. Voprosy Dinam.*, Nauka, Moscow, 7–11 (Russian).
- [31] (1971, 1973) Einige Probleme nichtlinearer schwingungen. *ZAMM*, Part 1, **51(6)**, 455–469; Part 2, **53(8)**, 453–462.