Remembering Professor B. A. Shcherbakov (1924-2017)

David Cheban

Figure 1. *The first row from left to right A.V. Marinchuk (first), V. V. Nemytsky (second), K. S. Sibirsky (third). The second row is I. U. Bronshtein (third), B. A. Shcherbakov (fifth).*

I first learned about B. A. Shcherbakov and many other famous Moldovan mathematicians in 1969, when I was a first-year student at the Faculty of Mathematics and Cybernetics of Chisinau State from my classmates and from student information at the faculty (faculty wall newspapers, university newspaper, etc.).

Figure 2. *David Cheban is a first-year student of the Faculty of Mathematics and Cybernetics of the State University of Chisinau (1969).*

Shcherbakov B. A. (February 19, 1924 - March 11, 2017)

- Graduated from the Faculty of Physics and Mathematics of the State University of Chisinau in 1956.

- 1964 - Candidate of Physical and Mathematical Sciences (PhD).

- 1971 - Doctor of Physical and Mathematical Sciences (Habilitation).

- 1972 - Professor (full).

I met B. A. Shcherbakov in person in 1970, when he began teaching us an annual course of ordinary differential equations, and also led a scientific circle (for 2nd year students) on differential equations. Of all the mathematical disciplines that we were taught in the first two courses, I liked mathematical analysis and differential equations the most.

I enjoyed the manner of B. A. Shcherbakov's lectures. For example, I loved how free flowing were his lectures. He did not have any lecture notes with him, only sometimes took out a piece of paper with the condition of the tasks (if any were solved during the lecture). I also eagerly participated in the work of the scientific circle under the leadership of B. A. Shcherbakov. In addition to the reports of the participants of the circle, which were discussed at the meetings of the circle, tasks for independent solution were also proposed. I remember that one of the tasks was as follows. The classical Gronwall-Bellman inequality $u(t) \leq c + \int_0^t v(s)u(s)ds$ implies
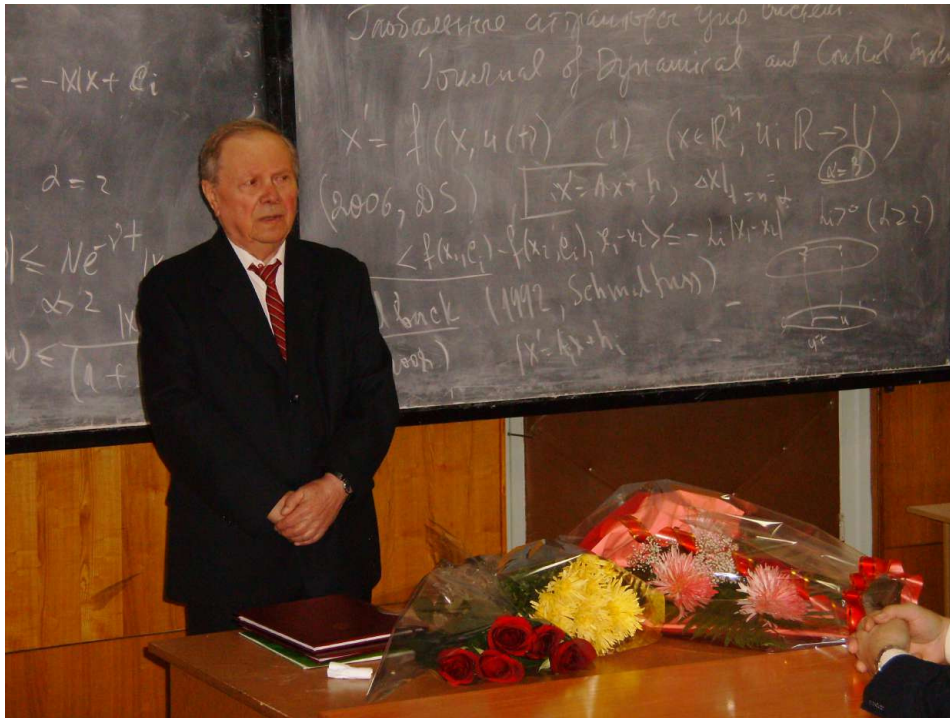
Figure 3. *Boris A. Shcherbakov - 2009*

$u(t) \leq ce^{\int_0^t v(s)ds}$, for any continuous non-negative functions u, v and a non-negative constant c. In the circle, the proof was given for the case $c > 0$, and the case $c = 0$ was offered to the participants of the circle to prove themselves. Which I subsequently did and showed to B. A. Shcherbakov. Of course, I was pleased that I was able to cope with the proposed task. Moreover, in the spring semester, when reading the topic "Systems of differential equations", B. A. Shcherbakov used this Lemma to prove the uniqueness of the solution to the Cauchy problem and said in front of all my classmates that this lemma in the case when c=0 was proved by your classmate with a moderate level of rigor. When we were in the 3rd year, a book written by the famous American mathematician Ph. Hartman was published in Russian, which contained a proof of the Gronwall-Bellman lemma and provided a proof, including for the case $c = 0$, and practically the same as what I had. This largely determined my final choice for further specialization in the qualitative theory of differential equations. In the third year, at the initiative of B. A. Shcherbakov, I was released from compulsory attendance, and I began to study under the guidance of B. A. Shcherbakov as my supervisor according to an individual plan approved by the department. Being advised by B. A. Shcherbakov, instead of some compulsory subjects (pedagogy, psychology, methods of teaching mathematics and some others), I attended some special courses that were not taught at our Department of Differential Equations. For example, such as set theory, topology (which were

read at the Department of Higher Algebra by I. I. Parovichenko), and also studied some sections of mathematics independently, such as group theory, linear differential equations in Banach spaces, additional chapters of functional analysis. Under the guidance of B. A. Shcherbakov, I continued to actively engage in scientific work and at the beginning of the fourth year I already received my first independent scientific results, which I reported in scientific circles of the department. In the autumn of 1973, the All-Union Scientific Conference on the Qualitative Theory of Differential Equations (QTDE) was held in Samarkand (Uzbekistan, then Soviet Union), where I was lucky enough to participate in and make a scientific presentation [1, p.216]. This became possible thanks to my supervisor B. A. Shcherbakov, as only his personal petition to the rector of the university made this trip possible. My participation in this conference was fully funded by the university, and this, even at that time, was a very expensive project. This conference itself and the way the Chisinau mathematicians were represented in it (I mean above all K. S. Sibirsky, B. A. Shcherbakov and I. U. Bronstein) made a very strong impression on me. There, for the first time, I personally saw and heard many famous Soviet mathematicians. While still a student, under the guidance of B. A. Shcherbakov, I prepared and submitted for publication a scientific article in the journal "Mathematical Research", which was published in 1974 [2]. As a 5th year student, B. A. Shcherbakov invited me to make a presentation at scientific seminar on the qualitative theory of differential equations (K. S. Sibirsky led the seminar), which I did in the fall of 1973. After successfully defending my master thesis (1974) under the guidance of B. A. Shcherbakov, I was sent to PhD school at the department. During 1974-1977, I wrote my PhD thesis under the scientific supervision of B. A. Shcherbakov. In March 1977, I was given leave of completion from PhD school due to the fact that I completed my thesis ahead of schedule and submitted it for defense (which I successfully defended in January 1978 at the Belarusian State University). From March 3, 1977 (I remember this date well, since the next day the strongest earthquake occurred in Moldova) to August 31, 2020, I worked at the Faculty of Mathematics and Computer Science: lecturer (1977-1982), associate professor (1982-1992) and full professor (1992-2020). From January 2020 to present, I am the principal researcher at the Laboratory of Fundamental and Applied Mathematics. In conclusion, I would like to thankfully emphasize once again the huge role played by B. A. Shcherbakov in my professional development.

Selected Publications of Shcherbakov B. A.

Books

1. Shcherbakov B. A., Topologic Dynamics and Poisson Stability of Solutions of Differential Equations. Ştiinţa, Chişinău, 1972, 231 p.(in Russian)

2. Shcherbakov B. A., Poisson Stability of Motions of Dynamical Systems and Solutions of Differential Equations. Ştiinţa, Chişinău, 1985, 147 p. (in Russian)

Papers

1. Shcherbakov B. A., Classification of Poisson-stable motions. Pseudorecurrent motions. Sov. Math., Dokl. 3, pp.1320-1322 (in Russian) (1962) [English translation from Dokl. Akad. Nauk SSSR 146, pp.322-324 (1962)]

2. Shcherbakov B. A., Decomposition of a set of Poisson-stable motions into invariant classes. Sov. Math., Dokl. 4, pp.1270-1274 (1963) (in Russian) [English translation from Dokl. Akad. Nauk SSSR 152, pp.71-74 (1963).]

3. Shcherbakov B. A., Composing classes of Poisson stable motions. Sibirsk. Mat. Zh., Vol.5, No.6, 1964, pp.1397–1417. (in Russian).

4. Shcherbakov, B. A. Dynamical systems. Review of papers given at the Kishinev seminar on the qualitative theory of differential equations. Differ. Equations 1(1965), pp.199-203 (in Russian) [English translation from Differ. Uravn. 1, pp.260-266 (1965)].

5. Shcherbakov B. A., Recurrent Solutions of Differential Equations. Sov. Math., Dokl. 7, pp.534-538 (1966) (in Russian) [English translation from Dokl. Akad. Nauk SSSR 167, pp.1004-1007 (1966)].

6. Shcherbakov B. A., Recurrent Solutions of Differential Equations and the General Theory of Dynamical Systems. Differentsial'nye Uravneniya, Vol.3, No.9, 1967, pp.1450-1460. (in Russian) [English translation in Differential Equations, Vol.3, No.9, 1967, pp.758-763].

7. Shcherbakov B. A., Poisson Stable Solutions of Differential Equations and Topological Dynamics. Differencial'nye Uravnenija, Vol.5, No.11, 1969, pp.2144–2155 (in Russian) [English translation: Differential Equations, Vol.5, No.11, 1969, pp.1608-1616].

8. Shcherbakov, B. A. The method of limit transformations in the problem of existence of Poisson stable solutions of differential equations. Sov. Math., Dokl. 11, pp.223-226 (1970) (in Russian) [English translation from Dokl. Akad. Nauk SSSR 190, pp.796-799 (1970)].

9. Shcherbakov B. A., The Comparability of Motions of Dynamical Systems with Regard to the Nature of their Recurrence. Differential Equations, Vol.11, No. 7, 1975, pp.1246–1255 (in Russian) [English translation: Differential Equations, Vol.11. No.7, pp.937-943].

10. Shcherbakov B. A. and Cheban D. N., Asymptotically Poisson Stable Motions of Dynamical Systems and Comparability of Their Reccurence in Limit. Differentsial'nye Uravneniya, Vol. 13, No.5, 1977, pp.898–906 (in Russian) [English translation in Differential Equations, Vol.13 , No. 5, 1978, pp.618-624].

11. Shcherbakov B. A. and Fal'ko N. S., The Minimality of Sets and the Poisson Stability of Motions in Homomorphic Dynamical Systems. Differencial'nye Uravnenija, Vol.13, no. 6, 1977, pp.1091–1097 (in Russian) [English translation: Differential Equations, Vol.13. No.6, 1977, pp.755-758].

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References

[1] CHEBAN D. N., *On the asymptotic behavior of solutions of differential equations.* Abstract of speech at the 3rd All-Union Conference on the Qualitative Theory of Differential Equations. Samarkand, 1973, p. 216.

[2] CHEBAN D. N., *Uniformly isochron solutions of linear system of differential equations.* Kishinev, "Shtiintsa". 1974, Vol. 32, No.2, pp. 204-213.