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SCIENTIFIC AND PERSONAL LIFE OF B. A. SEVASTYANOV*

V. Vatutin

Boris Alexandrovich Sevastyanov was born in Moscow on September 29, 1923. His parents were jobless at that time and, as he told me several times, he was "not too nice present" to his parents.

At the end of his school education he attended lectures in mathematics for pupils of Moscow conducted by the professors of the Moscow State University. Kurosh and Alexander Gel'fond (the last solved later the seventh Hilbert problem) were among them.

After finishing his school in 1941, he entered the Faculty of Mechanics and Mathematics at the Moscow State University. His studies were interrupted by World War II. Here you can see the student document of Sevastyanov.

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As the German troops approached Moscow in October, 1941, Moscow State University was closed and Sevastyanov found a job in a small workmens cooperative association where he performed the duties of a puncher: stamp operator for two months. Then the lectures at the Moscow State University renewed in the building that escaped the nazi bombing.

In August–October 1942 all the students of the Moscow State University were mobilized to fell timber (trees) near Moscow. Sevastyanov told me that it was a difficult time, hunger, cold weather. Once he and three other students were sent to bring loafs of bread for the whole group. It was 10 kilometers from their campus. When they got the bread they, being very hungry, decided to eat two loafs irrespectively of the future penalties. Sevastyanov remembered that they really scared for the outcome of their deal. When they returned to the campus and the head of the campus (a military men) recalculated the number of loafs it happened that there were two extra! In fact, the woman gave them 4 additional loafs. Sevastyanov told me that at that moment he had such a regret and hunger that he had never had after.

In November 1942 the whole group went back to Moscow. However, Sevastyanov did not finish the second year – the time for the Soviet troops was difficult and he was taken to the Red Army to serve as a guard in a Moscow prison. In 1943 he entered the Stalin Moscow Institute of Steel. Here his family name by a mistake was transformed from SAvOstyanov to SEvAstyanov.

«Все студенты обязаны сдавать экзамены за полный курс каждого предмета, вошедшего в учебные планы, а также сдавать зачеты по практическим работам после того, как данный курс прослушан студентами полностью.

Экзамены по сложным предметам, имеющим самостоятельные разделы, производятся по частям, но не чаще, чем два раза в год.

Экзамены производятся профессорами и доцентами ведущими соответствующие лекционные курсы), утвержденными в этом звании.

...Ввести во всех высших учебных заведениях единый студенческий билет и единый матрикул (зачетная книжка). В матрикул заносятся все предметы, обязательные для прохождения, и запись о сдаче экзаменов и зачетов.

Отмечать в матрикуле сдачу экзаменов и зачетов и проставлять отметки имеет право только профессор, проводивший экзамен, и доцент, принимавший зачет».

(Из постановления СНК СССР и ЦК ВКП(б) от 23/VI—36 г. «О работе высших учебных заведений и о руководстве высшей школой»).

...Во всех высших учебных заведениях СССР ввести с 1/IX—38 г. оценку знаний по четырехбалльной системе: «отлично», «хорошо», «посредственно» и «неудовлетворительно».

(Из приказа Всесоюзного Комитета по делам высшей школы при СНК СССР № 2826 от 6/IX—38 г., изданного на основании постановления СНК СССР «О днях единовременных занятий, оценке успеваемости и преподавании физической культуры в высших учебных заведениях Союза ССР»).

Место печати

Личная подпись студент

МОСКОВСКИЙ ОРДЕНА ТРУДОВОГО КРАСНОГО ЗНАМЕНИ ИНСТИТУТ СТАЛИ имени И. В. СТАЛИНА

ЗАЧЕТНАЯ КНИЖКА

Фамилия, имя, отчество Сабостьянов Е.А.

Факультет Механич. Специальность Металлич. пр-ва

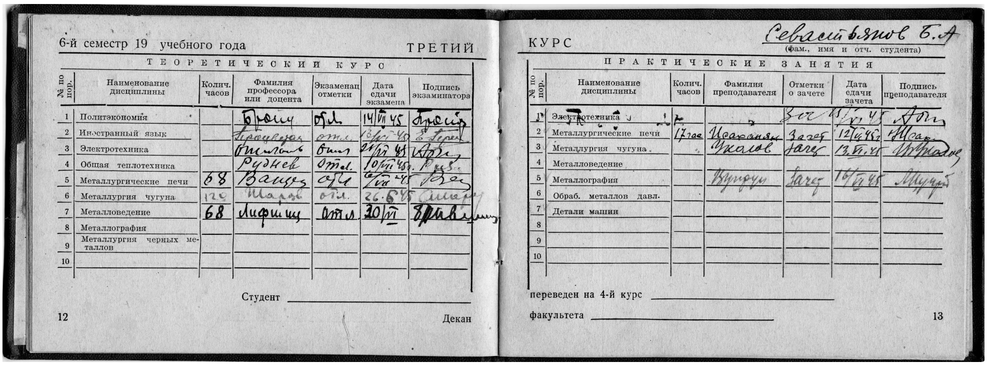
Поступил (переведен) на II курс из М.Г.У.

Зам. директора по научно-учебной части

Декан факультета

(Дата выдачи зачетной книжки)

In this institute Sevastyanov studied until 1945. When he decided to come back to the Faculty of Mechanics and Mathematics at Moscow State University the rector of the Stalin Moscow Institute of Steel told him that he was making a mistake: everything is known in mathematics but producing steel and products of steel is an interesting and promising job. However, as we know, Sevastyanov selected mathematics.


6-й семестр 19 учебного года ТРЕТИЙ КУРС Севастьянов Б. А
(фам., имя и отч. студента)

ТЕОРЕТИЧЕСКИЙ КУРС

№ по пор.	Наименование дисциплины	Колич. часов	Фамилия профессора или доцента	Экзаменац. отметки	Дата сдачи экзамена	Подпись экзаминатора
1	Политэкономия		[illegible]	отл.	14/VII 45	[illegible]
2	Иностранный язык		[illegible]	отл.	13/VI 45	[illegible]
3	Электротехника		[illegible]	отл.	24/VI 45	[illegible]
4	Общая теплотехника		Руднев	отл.	10/VII 45	[illegible]
5	Металлургические печи	68	[illegible]	отл.	6/VII 45	[illegible]
6	Металлургия чугуна	120	Шаров	отл.	26.6.45	[illegible]
7	Металловедение	68	Лифшиц	отл.	30/VI	[illegible]
8	Металлография					
9	Металлургия черных металлов					
10						

Студент ______

12 Декан

ПРАКТИЧЕСКИЕ ЗАНЯТИЯ

№ по пор.	Наименование дисциплины	Колич. часов	Фамилия преподавателя	Отметки о зачете	Дата сдачи зачета	Подпись преподавателя
1	Электротехника			зач	18/VI 45	[illegible]
2	Металлургические печи	17 час	[illegible]	зачет	12/VI 45	[illegible]
3	Металлургия чугуна		Уколов	зачет	13.VI.45	[illegible]
4	Металловедение					
5	Металлография		[illegible]	зачет	16/VI 45	[illegible]
6	Обраб. металлов давл.					
7	Детали машин					
8						
9						
10						

переведен на 4-й курс ______

факультета ______ 13

In the fall of 1946 Sevastyanov became a member of Kolmogorov's seminar in branching processes. Among the members of the seminar were Dynkin, Dmitriev, Monin and A. Yaglom. During that semester Kolmogorov began the first working session of the traditional seminar on probability theory at the Faculty of Mechanics and Mathematics of the Moscow State University with the problem of families' extinction. He talked about existing research and presented a new problem on finding the probability of extinction in the case of two types of multiplying objects (for example, biological species, active molecules in chemical processes, particles in physical processes, and so on).

I would like to recall you that the term "branching processes" has appeared for the first time in the paper "Branching random processes", due to Kolmogorov and Dmitriev (Dokl. Akad. Nauk SSSR 56 (1), 7-10, (1947)) in which branching processes with several types of particles were investigated.

Almost immediately the paper "Calculation of final probabilities for branching random processes", written by Kolmogorov and Sevastyanov, appeared in Dokl. Akad. Nauk SSSR 56 (8), 783–786 (1947).

In this paper a system of equations was deduced for the limiting distribution of the number of particles in a two-type branching process with types T_1 and T_2:

$$\mathbf{P}\{T_1 \to 2T_1\} = \mathbf{P}\{T_1 \to T_2\} = \frac{1}{2}\,,\ \mathbf{P}\{T_2 \to T_2\} = 1.$$

If ζ_n is the total number of type T_2 particles given that the process is initiated by n particles of type T_1, then the distribution of ζ_n/n^2 weakly converges, as $n \to \infty$, to the Borel-Tanner distribution.

Sevastyanov described the story of appearance of the paper as follows:

"Being a fourth-year student at the time, I was the only newcomer at that seminar. I became interested in this problem and so on afterwards presented my

own solution to the problem at the seminar. Kolmogorov immediately generalized the problem to the case of several types of particles. I was able to solve that problem as well. That is how I joined the ranks of Kolmogorovs students. When I went back from the summer vacations in 1947, Kolmogorov showed me a paper in Doklady of the Academy of Sciences of the URSS. This paper had two authors: Kolmogorov and Sevastyanov and includes a more general result than that established by me. The whole paper was written by Kolmogorov only!"

That was the starting point of a long scientific life: the first paper due to Sevastyanov was published in 1947 and the last in 2010 – 63 years in total!

It was not an easy deal to be a student of Kolmogorov! Indeed, Kolmogorov had an habit to discuss mathematical problems while skiing in winter (!) and semi-naked. So, Sevastyanov was forced to do the same. Here is one of the pictures of Sevastyanov's practice.

Sevastyanov graduated from the Faculty of Mechanics and Mathematics of the Moscow State University only in 1948. The same year Sevastyanov became a junior research fellow at the Steklov Mathematical Institute, Academy of Sciences of the USSR; since then all his life was connected with the Steklov Mathematical Institute and mathematics.

From 1948 to 1951, Sevastyanov was a postgraduate student at the Research Institute of Mathematics at Moscow State University. He became one of the first post-war students of Kolmogorov and not only learned mathematics under

Kolmogorov's supervision but also absorbed Kolmogorov's views on the attitude to science, surrounding people, and life.

In 1951, realizing that certain models of branching processes could be used in the research of chain reactions, Kolmogorov tried to get input from leading physicists at the Academy of Sciences on unclassified publications for further research on the topic. It was a difficult time, the time of the Cold War, and none of the scientists dared to express his opinion. Then it was decided to give this research a confidential status and proceed with it only at the Steklov Mathematical Institute.

Now I again cite Sevastyanov:

"The situation was totally absurd. I had just finished my Phd dissertation. The first three chapters were published, while the fourth and fifth chapters were considered to be highly confidential. Since I did not have security clearance, the fourth and fifth chapters were taken away from me and locked up in a safe. They stayed there for the next five years. I was the only one who really needed that research. The decision to grant me security clearance and provide me with access to my dissertation (all this time it had been denied to me) was made a year later. But the whole absurdity lasted for another five years. I kept on researching more complex models of branching processes. All my research was in a handwritten form in a notebook, which was given to me in the morning, to be taken away at night and safely locked in the safe at the Mathematical Institute. I could only discuss the results of my research confidentially with my scientific supervisor Kolmogorov. The results of my research were not in any way connected with applied works. Mutual paranoia about "what if" resulted in the termination of all publications in the field of branching processes in the USA. This universal "silence" lasted for the next five years. Only when the political climate showed signs of "global warming", when Khrushev brought Academician Kurchatov to England, where the latter made a presentation on "controlled thermonucleus", Kolmogorov finally found a brave physicist. This was academician Yakov Zeldovitch, who, along with academician Sakharov and other Soviet scientists, participated in creating the nuclear bomb in the USSR. He wrote, on a piece of paper torn out of a notepad, that my research was not related to a secret research, and thus, may be published."

In his dissertation Sevastyanov gave the foundation of the theory of branching processes. Developing the results of his dissertation, Sevastyanov obtained fundamental results in almost all principal directions in the theory of branching processes: branching processes with immigration, general branching processes with arbitrary distribution of particle lifetimes, transition phenomena in branch-

ing processes, diffusion branching processes, controlled branching processes, and regularity conditions. Sevastyanovs monograph Branching Processes that accumulated the major result of the theory of branching processes appeared in 1971 and was translated later on into Japanese and German.

The results of Sevastyanov in the field of branching processes were developed by his pupils and followers (in the alphabetic order) in the following directions:

Transient phenomena (a sequence of arrays of processes converging to the critical ones):

V. Chistyakov, E. Dyakonova, G. Makarov, V. Vatutin, O. V'ugin

Branching processes with immigration:

V. Chistyakov, E. Dyakonova, G. Makarov, S. Sagitov, V. Vatutin, A. Zubkov, N. Yanev

Branching processes with diffusion of particles and measure-valued processes

P. Maister, V. Vatutin

Age-dependent and general branching processes

P. Jagers, V. Vatutin, A. Yakymiv

Explosion of the Bellman-Harris processes

S. Grishechkin, V. Vatutin

Controlled branching processes (including bounded from above and below)

A. Zubkov, N. Yanev

Branching processes with interaction of particles (new particles are generated by groups of the existing ones)

A. Kalinkin

Branching processes and random mappings

G. Makarov, V. Kolchin

It is only rather recently that the further development of the theory of branching processes, due to its new applications in chemistry and biology, has led to fundamentally new directions: branching random walks, measure-valued branching processes, and branching processes in random environment.

The scientific interests of Sevastyanov extended beyond the theory of branching processes. He also obtained classical results in other fields of probability theory: invariance theorems in queueing theory, a convenient modification of the method of moments in proving Poisson limit theorems for sums of dependent indicators, and a generalization of renewal theory to the multidimensional case.

The development of one or another field of mathematics or other sciences is largely determined by the practical needs of the states, industry, financial structures, etc. From the early 1950s, Sevastyanov (just as other Russian and foreign

scientists during the last few centuries) was engaged in research in the field of cryptography, which is a source of diverse and challenging mathematical problems. In the 1960s, inspired by some of these problems, Sevastyanov, together with Chistyakov, Kolchin, and others, started to intensively develop the theory of random allocations of particles to cells, which subsequently made this direction (initially seemed a rather particular one) into an important field of modern probability theory. Sevastyanovs monograph "Random Allocations" written jointly with Kolchin and Chistyakov, was translated in the USA soon after its publication. The language of the theory of random allocations has become convenient in the statement and solution of problems in various fields of practical application of probabilistic and statistical methods. Further progress in the theory of random allocations and its applications has led to the development of new methods for studying the distributions of sums of dependent random variables and various characteristics of random combinatorial objects, and thereby to the creation of the Russian probabilistic-combinatorial school. Sevastyanov obtained important results on the distributions of matrix permanents over finite fields, on random mappings of finite sets, on probabilistic problems in the theory of Boolean functions, and on the theory of stochastic automata.

Sevastyanov was a brilliant lecturer. He wrote several textbooks which were translated into several languages, including

Probability Theory for Engineers (with V. K. Zaharov, V. P. Chistyakov). — New York: Optimization Software, 1987, 161 p. (in English)

Teoria de las probabilidades (with V. K. Zaharov, V. P. Chistyakov). — Moscow: Mir, 1985, 152 p. (in Spanish)

Problems in the Theory of Probability (with V. P. Chistyakov, A. M. Zubkov). — Moscow: Mir, 1985, 160 p. (in English)

Valoszinuseg-elmeleti Feladatok (with V. P. Chistyakov, A. M. Zubkov). — Budapest: Tankonyvkiado, 1987, 354 p. (in Hungarian)

In March 1999, Chalmers University of Technology (Gothenburg, Sweden) awarded Boris Alexandrovich the "Honoris Causa" degree. In the long history of Chalmers University it was only the fourth case when the honorary degree was awarded to a mathematician (earlier, this degree was given to J.-L. Lions (France, 1983), J. H. Bramble (USA, 1985), and T. E. Harris (USA, 1989)).

Sevastyanov was really excited by this event: the previous time when he was abroad was in 1971 at the International Congress of Mathematicians. He even had some doubts to go to Sweden or not. Finally, under my and Peter Jagers' pressure he decided to go.

The award ceremony took place in the concert hall of an exhibition complex in Gothenburg on the 7th of May, 1999. Brigitta Dahl, the speaker of the Riksdag, took part in the ceremony. Here is a picture of Sevastyanov with Peter Jagers just after the end of the award ceremony.

The diversity of scientific interests of Sevastyanov, his intense research activity (he published more than 100 articles and monographs from 1947 to 2010), his ability to pose mathematical problems in an attractive form, as well as his human qualities such as objectivity, sincerity and uncompromising, responsible attitude attracted other mathematicians and like-minded persons to him. He formed the scientific profile of the Department of Discrete Mathematics at the Steklov Mathematical Institute.

Boris Aleksandrovich Sevastyanov passed away on August 30, 2013. Everybody who was acquainted with him will cherish the memory of this outstanding mathematician and remarkable person.

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