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Highlights

E. D. How did you get interested in mathematics?

I. E. In grade six I got interested in technical drawing. I don't think they teach this subject in school anymore. I used a textbook for schools, and later a university textbook, to teach myself technical drawing. I started by drawing complex technical parts, like nuts and other things. I didn't continue doing that for a long time though. The only outcome of my interest was that I always had A's in technical drawing. Gradually I developed an interest in drawing curves.

E. D. You told me that you had a whole collection of curves.

I. E. I still have it. It turned out that very simple equations, with only two square roots, produce very nice curves: for example, two figure eights, one inside the other. Drawing curves went hand-in-hand with reading a popular book on mathematics entitled *The Magical Bicorn* written by Sergei Bobrov. My interest led me to join the evening mathematical program that you organized.¹ I was in grade eight at that time, and the Second School where the classes took place was very close to my house. It turned out that I was as good in solving math problems as others. I was accepted into grade nine of the mathematical program of the Second School.

E. D. Tell a little bit about the Second School.

I. E. The most positive thing about it was the intense atmosphere of interesting work, something that is absent in Soviet schools today. I remember how happy I was whenever I was sick because my sickness allowed me to stay at home and devote my whole time to working on problems for math competitions. By the way, here is the problem which I remember as my first serious achievement. The problem asked to prove that, if point O is located inside a triangle ABC , at least one of the angles OBA , OAC and OCB is not wider than 30 degrees. (This follows from a lemma contained in the work by Dynkin and Dmitriev entitled "On Characteristic Roots of Stochastic Matrices").

¹ [E. D.] In 1964-5 and in 1965-6 I organized a mathematical program in the Second School. A year earlier, I organized evening classes in order to scout for high school students in Moscow who had interest and talent in mathematics.

It took me a long time to solve the problem. Perhaps I didn't do it in the most effective way, but I cherish the memory of overcoming a serious challenge.

E. D. What do you remember from grade nine?

I. E. I remember the leader of our group, Boris Grigoriev. He was a very bright man. But above all I remember the challenging atmosphere of studying mathematics.

E. D. Not everyone, I would assume, felt comfortable in that atmosphere. What do you remember about Grigoriev and other teachers?

I. E. What do I remember about Grigoriev? I remember that at first I felt that, although I was solving assigned problems and doing everything required of me, he didn't value me enough. After half a year, however, I didn't feel that way anymore. Maybe I didn't adapt very quickly. There could be different reasons for why I felt underappreciated.

What do I remember about you? So far as math is concerned, at first I found it unusual and weird that during our walks in the forest we always played games. The winners were awarded a certain amount of "tugriks".²

E. D. Did you like that or not?

I. E. I didn't feel any particular way about it. All I know is that these "tugriks" did not provide sufficient incentive for me.

E. D. Alright. What else do you remember? What about your school friends?

I. E. As for my friends, I had five in my group. We shared three desks, one pair each, sitting at the leftmost row of the classroom. The first desk was occupied by Valera Myatlev and Vitya Kireev.³ Semyon Zarutin was the only student other than myself who attended the Second School all the way to grade nine. Both of us studied there from grade five.

We all had different personalities. Valera Myatlev was a big, athletic guy. Vitya Kireev was very persistent, proper, and thorough. Students called him the "conscience of the group". He always was a good friend. Now he is a deputy dean in Phystech⁴, in the faculty of Biophysics. He works with students and takes care of them. We see each other very often. We go to birthday parties together and visit each other at home. As for

² [E. D.] "Tugriks" were toy money used in outdoor activities and school events. They could be used to acquire all kinds of souvenirs: foreign postal stamps, postcards, badges etc.

³ [E. D.] During classes which took place in a big auditorium students sat at desks which I assigned to them. I did that to facilitate communication.

⁴ https://en.wikipedia.org/wiki/Moscow_Institute_of_Physics_and_Technology

Semyon Zarutin, he finished the Moscow Institute of Electronic Machine Building and worked in all kinds of research institutes, focusing on computers.

Sergey Natanzon works at the Institute of Geodesy and Cartography, he does mathematics. He has the works related to the theme of Sergey Petrovich Novikov, something about integrable hierarchy, it seems. I occasionally see his works in journal "Functional analysis". In addition, he is engaged in problems of real algebraic geometry (moduli and supermoduli spaces of real curves, it seems).

As for Sergei Beltyukov, we lost contact with him very quickly.

Myatlev is one of two of our classmates who stayed to work in the university. He works on applied statistics in the Faculty of Biology. He writes software for statistical analysis. **Gusein-Zade** continues to work in the Faculty of Geography. He was a Komsomol leader for a long time. He held the position of a vice-secretary on scientific work and eventually joined the Communist Party.

E. D. I am going to Moscow in a month. I hope I will be able to record interviews with my other students. This would have been impossible before the "Perestroika".

I. E. Of course, we can all meet together.

E. D. I am not sure if you remember or not that a year after you graduated there was a reunion meeting in the Second School. I insisted that wine be served. I have recordings of the meeting. In its formal part Vladimir Fyodorovich Ovchinnikov called students to come forward and presented them with medals. We pressured him to award medals to almost everyone. Did you get gold or silver?

I. E. Gold.

E. D. Obviously. To receive gold one had to work very hard. Then there were meetings of separate groups where former students reminisced about their experiences in the school. I recorded them too. Fedya Zak and Sergei Smagin told the story of the "war" between them. You probably don't know about it because they were not in your group. As prank, one subscribed the other to the journal *Obstetrics and Gynecology*. The other retaliated by subscribing his friend to *Zhenmin Zhibao*.⁵ In response, the first posted an ad asking to exchange a large apartment for a small one, which flooded his friend with hundreds of calls. In other words, it was a war waged in a very sophisticated manner.

⁵ The official newspaper of the Chinese Communist Party.

What do you remember about your teachers? You talked a little bit about Grigoriev, but the leader of each group had two teaching assistants. There were also professional teachers.

I. E. From among professional teachers, as far as other subjects are concerned, I remember most of all Felix Alexandrovich Raskolnikov, my teacher of literature.

E. D. This is very interesting. What do you remember about him?

I. E. I have very positive memories of him, although I can't say that all my classmates do. I knew him from grade five, when I first came to the Second School, but he wasn't my only teacher of literature there. His teaching style was very engaging and informal. In particular, he was very interested in language and often asked questions about the etymology of certain words. Around the same time I read the book of Uspenski *A Word about Words*, so that I had a huge advantage over other students. It turned out he also read that book, and since then we developed a good relationship.

E. D. How can you explain the fact that you received a gold medal? He didn't give a lot of A's I believe.

I. E. He assigned a very unusual essay topic to the two groups of nine-graders that he taught: "A Path of My Spiritual and Moral Development." Writing on this topic involved disclosure of very personal information. He was the only person who read the essays. I don't know what other people wrote, but he was particularly impressed with mine.

E. D. Do you remember what you wrote?

I. D. Yes, I do. I still have a copy.

E. D. Please tell.

I. E. I wrote about my personal experiences, my relationship with parents, friends, and the world at large. There was no politics in the essay.

E. D. Tell me now about your university years.

I. E. When I came to the MSU, I started working on a problem that had been assigned in one of the previous math competitions in the Second School. It involved a certain generalization of the results of Dmitriev and Dynkin concerning characteristic roots of positive matrices. In that paper an algebraic problem was reduced to a geometric problem on a plane. The task was to consider an analogous situation in three-dimensional space. In my first semester I was so fascinated with this problem that I

neither was able nor wanted to work on anything else. As a result, my first semester grades were not all A's. I got two B's, my only B's as a student in Mekhmat.

E. D. Did you solve the problem?

I. E. I solved it to such a degree that it was publishable. Unfortunately, there was a lot in it that remained unclear. In the twenty years that passed since then I tried to tackle the problem three times but didn't make much progress.

E. D. Maybe the problem is not formulated well.

I. E. By the end of the first semester I made so much progress on it that you recommended that I write a paper. This was my first paper, and I was writing it slowly and painfully. Moreover, I felt absolutely exhausted. You helped me a lot with this paper, but I finished it only in the summer when we went to the Minor Academy of Sciences in the Crimea.⁶

E. D. What happened to this paper?

I. E. The first, shorter version was published in the *Uspekhi*, whereas a more detailed one appeared in the mathematical series of the *MSU Bulletin*.

E. D. I still believe that regardless of the actual significance of the first result, it is very important for a young mathematician to learn how to present the result well.

I. E. Absolutely. Moreover, I had to deal with the word limit, and therefore tried to be as concise as possible. This proved to be a very useful exercise.

E. D. Do you have any positive or negative memories about the trip to the Crimea?

I. E. Well, the only negative memory is that I fell sick. I developed a huge apostem which required surgical intervention. Then I got a fever, and Irina Genrikhovna⁷ simply saved my life by administering penicillin injections.

E. D. What about good memories?

I. E. I remember that we toured the entire coastline of the peninsula. We travelled all over the Crimea, visiting Sevastopol, Sudak. We took a trip on a hydrofoil boat and climbed North Dmerdzhi peak. I remember that we brought bottles of mineral water with us, and when we reached the peak I was so thirsty that I gulped down two

⁶ This was a summer camp for high school students in the Crimea who were interested in math. The directors of the program were Kolmogorov and Dynkin. Kolmogorov was assisted by his graduate student, Zhurbenko, while Dynkin by his first-year students (graduates of the Second School): Gusein-Zade, Dynkin, Evstigneev, Kuznetsov, and Smagin.

⁷ Dynkin's wife.

bottles one after another. I also remember how, being away from my parents, I drank my first bottle of champagne with my friends Olya Dynkina, Sergei Smagin, and Sergei Kuznetsov.

E. D. What was the outcome?

I. E. Nothing bad happened.

E. D. Let's get back to Mekhmat. Tell me about your professors and classes.

I. E. I didn't show up in classes regularly.

E. D. Did you work at home?

I. E. I established a rule for myself that every academic year I had to produce a paper, and I managed to abide by it. After five years in the university I had five published papers. I remember that exam periods involved a lot of intensive and interesting work, because I used to study the material just before the exam. Exam periods lasted for a little less than a month, with five to six days intervals between the exams. I took some of my exams ahead of time. That's why I had intervals of seven to ten days. I learned the material of an entire class in seven to ten days. Markushevich's class on analytical functions was my favorite.

E. D. It is a truly fascinating area of mathematics. I taught analytical functions for a few years at Cornell.

I. E. I also liked Vishik's⁸ lectures on partial differential equations. This was one of the few classes that I attended regularly, partly because one couldn't learn the subject from books.

E. D. Did you take any of my classes?

I. E. I took your course on advanced probability. I also took your class on Martin's boundaries. The content of the class was based on your paper in the *Uspekhi* which focused on a specific case. This paper was the first in the series of your papers on Martin's boundaries.

E. D. Who else do you remember?

I. E. I took probability theory with Sinai.⁹ But to be honest I wasn't too excited about it and relied on textbook for my exam. Of course, I remember very well Stas Molchanov.¹⁰ He supervised my honors thesis on products of random matrices. It was

⁸ Interview with him is a part of this collection.

⁹ http://en.wikipedia.org/wiki/Yakov_G._Sinai

¹⁰ Interview with him is a part of this collection

based on the works of Tutubalin and Furstenberg, who multiplied independent random matrices. My approach involved multiplying random matrices linked into a Markov chain. Since that time this area of study has developed quite a bit.

E. D. I bet Stas was a good supervisor.

I. E. Yes, he was. He also taught a very interesting seminar.

E. D. And then I invited you to join my seminar in CEMI.¹¹

I. E. I remember your seminar in CEMI. It took place in the old building of the Presidium of the Academy of Sciences which now hosts its international department. The seminar started when I was in my fifth year of university. I had an official letter of acceptance to the graduate program in Mekhmat. But, having consulted my parents, I decided in favor of CEMI. My parents told me that it was up to me, but they said that a PhD program at an institute of the Academy of Sciences would be quite a good choice.

E. D. Aside from you, my group in CEMI included Seryozha Kuznetsov, Misha Taksar, and Seryozha Natanzon. Some of them were accepted into the graduate program, others were hired as junior research associates, if I am not mistaken.

I. E. Yes, Sergei Kuznetsov and Misha Taksar were hired, whereas Sergei Natanzon and I were graduate students.

E. D. There was no practical difference though.

I. E. Probably not.

E. D. Tell me about your candidate's dissertation.

I. E. I finished writing my dissertation quite early. You and I deliberated if I should submit it or wait a little bit. My task consisted in constructing a probability analogue of Gale's model in the infinite interval of time. I did the bulk of the work in the summer, between Mekhmat and the graduate program in CEMI. But I didn't solve the problem that summer. A number of unexpected problems popped up. To deal with them I had to study a new technique, the Yosida-Hewitt theorem which I wasn't familiar with before. Most of the remaining work was finished in two Natanzon after I started the graduate program. Afterwards, I only polished it and added stuff. My paper published in the collection *Mathematical Models in Economics* was based on my dissertation. By fall of 1972, that is a year after I started the graduate program, it was finished. After another year I was hired as a junior research associate in CEMI.

¹¹ Central Economics and Mathematics Institute of the Academy of Sciences of the USSR.

E. D. Perhaps you will take some consolation for a year long delay in the defense of your dissertation in the fact that, according to Kolmogorov, he preferred to remain a graduate student for an extra year, even though he was already an accomplished scholar; he thought that it would give him more time and freedom for mathematical creativity.