

Victor Kac

Highlights

A. First Steps in Mathematics (Part 1, 0:50 – 2:53)

V. K. In the summer between the ninth and the tenth grade of high school I participated in the mathematical Olympiad of the Moldavian SSR. I was quite successful. I took the second prize.

E. D. Were you interested in math before that?

V. K. No, but my success inspired me, and from then on I was committed to mathematics. However, I didn't really know where to start. I went to the library, checked out a bunch of problem collections, and set about to work on them. I vividly remember that the first problem in the collection of math problems by Shakhno asked to prove an identity equation. It took me two days to prove it. Gradually, solving one problem after another, I improved my skills.

At about the same time I started attending mathematical circles organized under the auspices of the Kishinev¹ University. I came up on top in all subsequent Olympiads beating all other competitors.

E. D. In Kishinev?

V. K. Yes. Regrettably, I didn't get the chance to represent the republic in the All-Union Math Olympiad in Moscow. The selection process was skewed toward ethnic Moldovans. However, going through the process I met a girl who actually ended up going to Moscow. She was very confident in her abilities and was very vocal about her plans to apply to the Moscow State University. Her attitude boosted my confidence. I thought to myself: "If she can do it, maybe I have a chance too" [*Laughs*]. This is how I decided to apply to the MSU.

¹ Former name of Chisinau (capital city of Moldova).

B. Admission to Mekhmat (Part 1, 2:54 – 7:16)

E. D. When did it take place?

V. K. It was 1960. My performance in the entrance exams wasn't perfect, but I managed to get the required score.

E. D. You graduated from high school with a medal, didn't you?

V. K. Yes, I did. But at that time being a medalist didn't play any role in admissions. So, as I said, I got the required score, but it turned out this wasn't enough. The head of the admissions committee was Lensky, a notorious anti-Semite. He couldn't turn down the applicants who had the required score and were originally from Moscow, so he decided to reject the outsiders. We were told that there was limited vacancy in the dorms and that we could be admitted only if we obtained a temporary residency permit in the Moscow. I had no relatives in the city. I was still a young kid. I had no idea what to do. I called my mother, and she came to Moscow. Together we were walking the streets of the city, asking random strangers if they knew where we could find an apartment for rent. All our efforts were in vain. We tried to file complaints but to no avail.

So we decided to pack our bags and go back to Kishinev, hoping that my score would be sufficient to secure a spot at the Kishinev University. As we walked to the telephone station, we were discussing the whole matter in a loud voice. A random girl overheard our conversation and suggested that we should contact a certain old woman. She gave us her address. We decided to postpone getting in touch with the Admissions Office of the Kishinev University and the following morning went to meet that woman. It turned out she had a corner of her room for rent. There was an additional difficulty however. To obtain the temporary residency permit I had to provide a documented proof of admission. We "expedited" the process by bribing the person in charge of issuing the documents with a few bottles of Moldovan wine.

But there was yet another hurdle, though not as serious as the previous ones. By the time I obtained the permit there were no available spots in Mathematics. There were some in Mechanics. This last obstacle threw me of balance. I remember that I cried when I learned about this.

E. D. How old were you, seventeen or younger?

V. K. I was about sixteen years old. I studied in Mechanics for about a month. There were a lot of students in the program. Like me, many of them wanted to transfer to Mathematics but couldn't. It was decided to organize an additional group in the Mathematics program, the so called group 4A. At this point I faced another difficulty. Students who wanted to transfer to this group were required to take French. I studied German. To catch up with other students I had to study French on my own. My hard work paid off: I was finally accepted. In fact, I studied French so hard that when I transferred I was the best student in the entire class. Unfortunately, later on I started neglecting it and my marks went down. This was the only reason why I didn't qualify for a stipend increase in the second semester [*Laughs*].

C. Student Years (Part 1, 7:17 – 16:54)

E. D. What did you do during your freshman year? Did you feel comfortable or not so much?

V. K. I didn't feel comfortable because there were many talented people like Katok who eclipsed everyone else.

E. D. I had a similar experience to yours. I came to Moscow from Aktyubinsk, a small town in Kazakhstan. I used to be the best math student at home and felt overwhelmed by the level of talent shown by many of my peers in the MSU.

V. K. Yes, I found it very difficult to cope with. But I had no choice. I just kept on working, calculating derivatives and integrals.

E. D. Did you participate in any extracurricular activities and events?

V. K. Yes. From the very beginning I decided that I would take part in all activities and events I possibly could.

This reminds me of a funny story involving Delaunay.² It happened in October. I was a student for only about a month. When I first came to his class, he announced that he was looking for research assistants to help him develop his theories. He asked if anyone in the class was interested. Nobody raised their hand, but I said: "Why not? I am ready to

²http://en.wikipedia.org/wiki/Boris_Delaunay

participate.” There was another student who was interested, Kolya Dolbilin.³ Later he became Delaunay’s student. Interestingly the fact that I didn’t live in the dorm was a good thing. It turned out that that the Steklov Institute was only a few minutes walk from where I lived, so was very easy for me to visit Delaunay there.

E. D. Is it the same place where the Institute is located today?

V. K. Yes. I remember that in our first meetings he explained the term “group” and proved Lagrange’s theorem. Unfortunately, I was incapable of understanding anything of what he was saying. I don’t remember what the end result of my “research assistantship” was. I think there was no end result whatsoever, except for the opportunity to converse with a great mathematician. He was telling us all kinds of stories about Alexandrov⁴ and Shafarevich.⁵

E. D. He liked gossip.

V. K. Yes, very much so.

E. D. I had a similar experience with him but twenty years earlier. In 1940 I took his class on analytic geometry.

What happened next?

V. K. I got A’s in all my exams except French. By the end of the freshman year I was convinced that I knew all of math inside out and wasn’t sure what I was supposed to do next.

I don’t think we had very stimulating teachers in the first year. Kurosh⁶ taught algebra.

E. D. He is a good lecturer, I think.

V. K. We liked him a lot as a lecturer, but later I realized that he didn’t teach linear algebra the right way. Tumarkin taught analysis. No doubt, he is a nice person but not a very good lecturer.

E. D. I also took analysis with Tumarkin. It was a well-organized but rather boring course.

³ <http://dcglab.uniyar.ac.ru/en/staff/dolbilin>

⁴ http://en.wikipedia.org/wiki/Aleksandr_Danilovich_Aleksandrov

⁵ http://en.wikipedia.org/wiki/Igor_Shafarevich

⁶ http://en.wikipedia.org/wiki/Aleksandr_Gennadievich_Kurosh

V. K. I forgot to mention that after the first semester I finally received a spot in the dorm. At first there were three of us in a room for two. But after the first semester exams my two roommates were expelled, and for a while I had the entire room to myself.

I think that we started algebra in the second semester. Recitations⁷ was taught by Vinberg.⁸ At that time, in 1960, he was still a graduate student. He made a very good impression on us. Even though we were still young kids, we felt that he was an excellent teacher.

E. D. Kids are usually very sensitive to this sort of thing.

V. K. Somehow we felt that Pasyukov,⁹ who taught analytic geometry, was a hack, whereas Vinberg came across as a serious scholar. There was something genuine about him.

In the beginning of the second year Vinberg and Onishchik started running a seminar on Lie groups. By that time you already stepped aside and were no longer in charge of the seminar. Yet I still remember how in the first couple of sessions you deplored the fact that something had been proven by Kostant¹⁰ and not by one of the people participating in the seminar.

E. D. Yes, this was the end of the seminar or to be precise of my involvement in it. It continued afterwards but without me.

V. K. Recently, Weisfeiler¹¹ asked a few people, including Kostant, to write reference letters on my behalf. I wrote to each of them a few words of thanks. In a letter to Kostant I wrote that I heard about him for the first time in Dynkin's seminar. Kostant was very pleased to hear that.

In my second year I started working closely with Vinberg. I don't remember the problems that he assigned to me.

E. D. Were there any other students who worked with him at the same time?

V. K. His first students were Alexeevski and Weisfeiler.

E. D. But they were older, weren't they?

⁷A regularly scheduled session of problem solving associated with a lecture course.

⁸Interview with him is a part of this collection.

⁹ <http://mech.math.msu.su/departement/gentopol/pasyukov.html>

¹⁰ http://en.wikipedia.org/wiki/Bertram_Kostant

¹¹ http://en.wikipedia.org/wiki/Boris_Weisfeiler

V. K. Yes, they were two years older than I. In those times Vinberg didn't have much experience, nor did he develop any interesting problems he could assign. He didn't have a sense of direction yet. He gave me a problem to show that, if the all medians of every geodesic triangle on a surface have a common point, then the surface has constant curvature. I proved it. I remember that you praised my work very highly, and as a result I was awarded a prize in a competition for the best student paper.*[Laughs]*.

E. D. I don't remember that. *[Both laugh]*.

V. K. Unfortunately, this was the last prize I ever received as a student. My dream was to get an award of the Moscow Mathematical Society for young mathematicians, but it never came true, although I thought that I deserved it. Vinberg nominated my dissertation on infinite-dimensional Lie algebras, but Shafarevich's response was lukewarm. He said that my dissertation might well be outstanding, but not so outstanding as to merit the award.

In my fourth year Vinberg gave me an interesting problem on convex cones.

E. D. Did you and Vinberg publish a joint paper on this subject?

V. K. Yes, we published it when I was in my fourth year. It was an eye-catching work.

In the fifth year for my final project Vinberg assigned some problems that had to do with infinite-dimensional groups. This is how I started to specialize in this area.

I vividly remember the day when the most decisive idea on infinite-dimensional Lie algebras dawned on me. It was April 20, 1967. On that day I realized that I had to consider the growth of infinite-dimensional Lie algebras and classify those of polynomial growth.

D. Graduate Program (Part 1, 16:55 – 20:03)

E. D. Were you a graduate student at that time?

V. K. In 1965 I graduated from the university and entered the graduate program in Mekhmat. These were the times when getting admitted was easy. It was almost automatic. Anyone who wanted to become a grad student was accepted.

E. D. Provided of course it was a person whom the department approved of.

V. K. As a rule they did. As for my dissertation, by and large it was finished in the beginning of my second year of grad school.

However, there were some additional difficulties with the residency permit because I wasn't a permanent resident of Moscow.

E. D. This must have happened after you finished grad school.

V. K. Yes. I think that Vinberg wanted to find a position for me in the department. However, in the summer of 1967 I was embroiled in a scandal. That summer with the help of my friends who were Komsomol leaders I enlisted as a volunteer in a student construction brigade¹² in Hungary. We worked very hard for about three weeks and were planning to take a vacation on Lake Balaton during the fourth week. But at the end of the third week I got into a fight with another volunteer for reasons that I don't remember [*Laughs*]. Both of us were sent back home. The incident caused a huge scandal in the department. It put me on the brink of expulsion from the Komsomol and the MSU. The matter was put to a vote. Its outcome was: six votes in support of my expulsion from the Komsomol and the graduate program; seven for a strict reprimand.

So I wasn't sure what to do. I had to get married. Throughout this ordeal I received enormous help from Senya Gindikin¹³ and his close friend Mitya Fuchs,¹⁴ the son of Boris Abramovich Fuchs. Together they convinced Boris Abramovich to intercede on my behalf. Boris Abramovich managed to get me hired. Perhaps this was one of the contributing causes of his professional demise later on.

E. D. As far as I know, they got rid of him because he engaged in heated arguments concerning the policy of giving higher grades to students of working class background.

V. K. Yes, you're right, but this was only the last straw that broke the camel's back. Animosity toward him initially arose as a result of the position he took in my case.

E. School No 2 (Part 1, 20:04 – 22:29)

V. K. I think you hired me to teach School No 2 because of my work on medians in triangles which intersect at the center of gravity.

E. D. In what year of university were you?

¹² http://en.wikipedia.org/wiki/Student_construction_brigade

¹³ Interview with him is a part of this collection.

¹⁴ <http://www.math.ucdavis.edu/research/profiles/fuchs>

V. K. I believe I was at the end of my fourth year. I remember that you recruited the rest of the teaching staff based on my recommendations. I mean the rest of the students from my year. Among them were Katok,¹⁵ Ilya Novikov, and Boris Grigoriev. I also recommended to you Misha Shubin¹⁶ who was a good friend of mine. He was a year younger.

E. D. How did we get to know each other? Was it somehow related to your work on triangles?

V. K. Possibly, or perhaps somehow through Vinberg. I remember how you told me that you once asked Arnold¹⁷ if he heard about me. Arnold said that he didn't know me but that he heard a lot of good things about me. [*Laughs*].

E. D. My memory has started to fail me. I don't remember any of that.

V. K. I still very well remember my experience with School No. 2.

E. D. What exactly do you remember? Tell me something interesting. It doesn't have to be a long story.

V. K. I remember that you used to convene teachers' meetings very often, and we were not thrilled about this fact at all. One day I stayed after my class to discuss something with my students. I forgot that you were waiting for me. You got furious. I remember how you rushed into the classroom, banging your fists on the table and stomping your feet. [*Both laugh*]. When you burst into the classroom I was sitting on the table and explaining something to my students. I was in no hurry at all.

F. Gelfand¹⁸ (Part 1, 27:30 – 43:00)

V. K. My first meeting with Gelfand took place in 1965. I was a fifth-year student. He and Zeitlin, who passed away a year or two after that, organized a seminar on automata theory. I actively participated in it. They even planned to have me employed in the

¹⁵ Interview with him is a part of this collection.

¹⁶ Interview with him is a part of this collection.

¹⁷ http://en.wikipedia.org/wiki/Vladimir_Arnold

¹⁸ www-history.mcs.st-and.ac.uk/Biographies/Gelfand.html

molecular corpus. Gelfand liked me a lot and sent me to Piatetski-Shapiro.¹⁹Piatetski-Shapiro, however, didn't share Gelfand's sympathy toward me, and so these plans didn't come to fruition.

E. D. You didn't work with Piatetski-Shapiro at all, did you?

V. K. No, I didn't. My contacts with him were only superficial. A year later I ran into Gelfand in a corridor. He asked me what I was working on. At that time I was working on infinite-dimensional Lie algebras, and so I started telling him about it. He liked my ideas and offered me to come to his institute and present the topic to Graev and Kirillov. We took a cab and went there. It was lunchtime when we arrived. He disappeared behind the door, came back with some woman, and the three of us went for lunch. It was very obvious that Gelfand was flirting with her. He wasn't in the least deterred by my presence. [*Laughs*]. On our way to the restaurant, he was telling lots of jokes. One of them I still remember: "Do you like Madame Rabinovich? Partially".²⁰ Also, around that time a French musical film *The Umbrellas of Cherbourg* was a huge hit in Soviet cinemas. Gelfand said that he was a very sentimental person by nature and that this was perhaps the reason why he liked the movie so much. He also said that the movie reminded him of Henri Matisse whose art he was a huge fan of because of how cheerful it was. This was the general tenor of our lunchtime conversation.

Later Gelfand completely forgot about my topic. Kirillov²¹ and Graev were not impressed. A year or two later, when Vinberg presented my dissertation at the session of the Moscow Mathematical Society (I was too shy to do it myself), Gelfand responded with criticism. I think he was a bit jealous that the topic wasn't researched under his supervision. He asked Vinberg: "When do you think people will stop copying Cartan?" Vinberg was completely flabbergasted and just stood there with his mouth open. At which point Seryozha Novikov intervened, saying that my dissertation solves a serious problem and fills a significant gap in our knowledge. Gelfand didn't like Novikov's response, but he didn't dare to retort in a harsh way. He has always been apprehensive of Novikov.

¹⁹ Interview with him is a part of this collection.

²⁰ A wordplay in Russian: "partially" = "some parts of her".

²¹ Interview with him is a part of this collection.

E. D. There are people with whom he is always rude and those with whom he never is. For example, he is never rude with Kirillov.

V. K. So in response to Novikov he said: “You are much younger than Cartan. But if you had met him, he would have told you what the correct solution of this problem was.”

Afterwards I had a few more encounters with him. One of them took place during the episode that had to do with representations of quivers. Do you know anything about that?

E. D. No, I don't think so.

V. K. It happened so that there were certain Coxeter functors which were discovered simultaneously by Roiter,²² Bernstein, and myself. I learned about it accidentally when I brought up the subject in a conversation with Bernstein.²³ Almost immediately Bernstein, Gelfand, and Ponamarev published a paper on the subject. I wrote about that to Roiter, but neither he nor I followed up with our own publications.

Around the same time Gelfand invited me to his house. I told him that I thought that the problem with quivers was related to infinite-dimensional Lie algebras and explained why. He liked what I said, and we decided to continue collaborating in this area. He invited me again. This time there were four of us, including Serezha Gelfand²⁴ and Bernstein. We discussed something. I told them about the infinite-dimensional algebras. He expressed his approval again. He said he didn't remember that we had already discussed the subject before and that he was ashamed that he didn't know anything about it. He also said something strange, namely that if we met somewhere in Paris he would definitely remember our conversation, but more likely not because we would rather go to the Louvre instead of talking about mathematics. Then he entertained me with records. I remember that he played *The Magic Flute*. He tried to test my knowledge. I said it was Mozart, but unfortunately I wasn't familiar with *The Magic Flute*. He made fun of me that I didn't know this famous opera.

We agreed to continue our collaboration, and he invited me to present my character formula in his seminar. When I showed up in his seminar, he didn't remember what we

²² <http://www.mathematik.uni-bielefeld.de/~sek/collect/roiter.pdf>

²³ <http://www.math.tau.ac.il/~bernstei/>

²⁴ Sergei Gelfand – son of Israel Gelfand – Publisher of American Mathematical Society since 2007.

agreed on, and I decided not to remind him. So there was no presentation. And when I came to his house, there was nobody home. It turned out he was away in some urgent meeting or something like that. This was the end of our “collaboration.”

E. D. So you never became his coauthor.

V. K. No [*Laughs*]. My relationship with Gelfand ended on sour note. It happened when I already lived in the US, and Kostant told me that it would be nice to have Gelfand write a letter of reference for me because everyone in MIT admired him. I think they somewhat exaggerated his achievements. When I shared my opinion with Kostant he strongly disagreed.

Anyhow, I called my brother and told him that Kostant thinks it would be a good idea to obtain a reference letter from Gelfand. My brother went to see Gelfand. Gelfand didn't let him in. They stood in the entrance hall by the trash bins and discussed the matter. Gelfand said that he had already given a reference letter to Kostant once and that he regretted it. As for me, he recognized that my research was trendy but he wasn't sure what would come out of it in the long run. Gelfand said that I had only one major publication. When my brother pointed out that I had many other papers, he acknowledged them and changed the subject. He said that there were many mathematicians in the US who were looking for jobs and that they were in a much worse situation than I. “Vitya's situation is not that bad,” he said. “I don't know what else he wants. I like Vitya and would be happy to help, but there are other people who are better than him. I would rather help them.” In conclusion he said: “I have to consult with other people. Give me a call later.” When my brother called him back, he said that he wished to receive a formal request for a reference letter and that only in that case he would write one. I decided not to pursue this any further.

E. D. Gelfand is not an easy person to deal with. In your particular case he had nothing to gain.

V. K. What bothers me the most is that he did absolutely nothing to help Vinberg, although he probably could.

I remember that I had another very interesting conversation with him. It took place when we were in a cab. He said that it would be good for me to attend his seminar. To support his claim he said. “Consider these two mathematicians,” he said, “Kirillov and

Vinberg. Both of them are good scholars. But Kirillov attended my seminar, whereas Vinberg didn't. It's not just a coincidence that Kirillov is way ahead of Vinberg in terms of his career." I was too young back then and did not fully understand that there was a fundamental difference between the two but in an opposite way.

E. D. What else do you remember about Gelfand?

V. K. I remember how during one of your presentations in his seminar (I don't remember what it was about) you drew a non-convex graph on the board and asked the audience to find something on that graph. Arnold, who had a lightning fast reaction, said that it was necessary to build a convex hull and do something with it. You looked surprised and asked him how he figured it out. "Well, obviously," he said, "if you draw a non-convex graph, the first thing you have to do is to build a convex hull". [*Laughs*].

In his introduction to your talk Gelfand said that he was glad that you wanted to present on this topic after a twenty year hiatus. I think you gave your last talk on simple roots in 1947. [*Both laugh*].

E. D. Not quite but definitely a long time ago. I believe my last talk was on the Campbell-Hansdorff formula.

V. K. He also said that he was hoping you would continue giving more talks on the topic, but I think it never happened again [*Both laugh*].

E. D. Yes, it was my last talk.

V. K. Recently, I had a conversation with Guillemin, a mathematician from MIT who now focuses on integral geometry.²⁵ He still very much admires the works of Gelfand on integral geometry. I pointed out that all of Gelfand's papers on integral geometry were written in co-authorship with Graev. Neither Gelfand nor Graev published anything on the subject on their own. So I was a little surprised that he referred to these papers as Gelfand's. Graev is very different from Gelfand. He is always quiet and nobody knows what kind of person he is. Who knows, maybe he is genius.

²⁵ <http://math.mit.edu/people/profile.php?pid=87>

E. D. The same applies to Gelfand's works on representation theory of Lie groups. Gelfand and Naimark wrote them together, but it was only Gelfand who received the Stalin Prize.²⁶

V. K. Really? I didn't know about that.

E. D. Yes, there were no papers written by Gelfand alone.

V. K. How would you explain that?

E. D. Well, it is certainly true that he played a more active role in organizing the whole project.

V. K. He is definitely more involved in promoting their works, but this is an entirely different aspect.

G. Vinberg (Part 2, 0:00 – 9:30)

E. D. What about your relationship with Vinberg? Did you communicate with him only on matters related to research? He is a very reserved person.

V. K. Yes, he is.

E. D. And yet a very nice person too. I had quite a few encounters with him at various points in my career.

V. K. We addressed each other in a formal way. We developed as close a relationship as was possible given how reserved he was in communicating with others. I called him Ernest Borisovich,²⁷ but he called me Vitya. I often visited him at home. We often went on hiking trips together.

I was about to leave the USSR in the beginning of January – January 4, 1977 to be precise. Vinberg, his student Popov²⁸ and I held a farewell get-together at the Slavyansky Bazar.²⁹ You probably don't know Popov. He is Vinberg's student, a very nice person, good

²⁶ The State Stalin Prize, usually called the Stalin Prize, existed from 1941 to 1954. It essentially played the same role as the USSR State Prize later on. Upon the establishment of the USSR State Prize, the diplomas and badges of the recipients of Stalin Prize were changed to that of USSR State Prize.

²⁷ In Russia, the patronymic is an official part of the name, used in all official documents, and when addressing somebody in a polite or formal way.

²⁸ http://www.mathnet.ru/php/person.phtml?option_lang=eng&personid=8935

²⁹ An upscale restaurant on Bolshaya Ordynka Street in Moscow.

mathematician, and a close friend of mine. It was the very end of December. December 30, I believe. We spent five hours there.

E. D. Didn't you have to reserve a table in advance?

V. K. No. We came there in the afternoon and stayed till late in the evening. At first we had general conversation, but gradually we turned to the *raison d'être* of our meeting, my departure to the US. I don't remember exactly what Vinberg was saying, but his position was unclear. So I decided to make a provocative toast. I suggested that the three of us meet next year somewhere in the US. I think I said "in Boston" because my mother lived there, so it made sense to say "in Boston." Vinberg didn't look thrilled. He said that first of all it was practically impossible because he wasn't Jewish and secondly that to leave the country was against his moral principles. He also said that injustice exists everywhere. I objected to it, saying that in the US one at least can fight injustice. "But what is so bad here?" he asked. How would you respond to something like that? I said that in the USSR one has to lie all the time in order to survive. He said that I was wrong, at which point Popov sided with me and reminded Vinberg about how we had to attend *politzyaniya*.³⁰

E. D. Slavyansky Bazaar is not the most suitable place for such conversations. The place is frequented by foreigners and is probably full of hidden microphones.

V. K. Really? We didn't take that into account.

E. D. It won't make any difference to you now.

V. K. We didn't think about that. But to go back to Vinberg, it is difficult to debate in this kind of situations. We had a brief discussion about Weisfeiler.

I think that since then Vinberg's views have changed significantly because of the troubles he had with his dissertation. His idea was that there are a few rotten apples like Pontryagin³¹ that spoil the fun for everyone. Remove them, and everything will be just fine. He doesn't seem to understand that there is a deep-seated systemic problem.

E. D. Were you in the habit of discussing politics with him?

V. K. Yes, I was.

³⁰ Sessions on political education involving propagandist and theoretical subjects.

³¹ http://en.wikipedia.org/wiki/Lev_Pontryagin

E. D. I never did. There is always a political subtext however. When we try to help people like Natanson³² or anyone else we understand each other without discussing the politics behind our actions. It may well be, however, that each person has his own subtext.

V. K. Vinberg's subtext is that there are several powerful villains who ruin it for everyone. If they didn't exist, everything would be fine. Moreover, he told me that he started to realize that the problems he had with getting admitted into the university were most likely due to his Jewish sounding last name. He managed to get into the MSU only thanks to his relative who was a close friend of Petrovski.³³ He never thought about it this way before. The issue came up again many years later when had troubles with his dissertation.

Perhaps his views were influenced by his mother. She is a wonderful and honest woman and yet very indoctrinated in communist ideology. She is an old-school member of the *Komsomol* who remained loyal to her ideals throughout her entire life. This is despite the fact that her life turned out incredibly tragic.

E. D. In what sense? Personal or political?

V. K. Her personal life. The entire Vinberg family was very talented. His uncle is a very prominent biologist.³⁴ He lives in Leningrad now and was recently elected a corresponding member of the Academy of Sciences. His father was bright man as well. He is a very famous engineer who became paralyzed early on in his life. For nearly twenty years, his wife carried the burden of taking care of him. Their kids were affected as well. His father passed away when Vinberg was an undergrad. His mother didn't work because she had to take care of her kids and her husband who barely could work. Toward the end of his life he was still able to walk but would often lose balance and collapse. As years went by, he almost completely recovered from paralysis, only to fall victim of a heart attack or something like that.

E. D. When Erik was still an undergrad?

³² http://www.mathsoc.spb.ru/pers/natans_j/

³³ http://en.wikipedia.org/wiki/Ivan_Petrovsky

³⁴ <http://encyclopedia2.thefreedictionary.com/Georgii+Vinberg>

V. K. And at that point the Soviet regime showed how much it cared about its most loyal supporters. His mom started receiving a pension of 30 roubles while Vinberg was living off of a monthly stipend of 25 roubles a month.

(Part 2, 13:00-17:00)

V. K. As I said earlier, my last meeting with Vinberg ended with him saying that he did not approve of my decision to leave the country.

E. D. But he didn't criticize you, did he?

V. K. No, he didn't. He said that it's my personal decision but that he didn't approve of it. When I said that I had no other way because my mom and my youngest brother were both in the US, he started developing unrealistic scenarios suggesting that my mom could return back to Moscow. He also suggested that perhaps my father-in-law could find me a job. It was so naive of him to say that. Then we said good-bye, and he left but then came back and asked to send his regards to Boris Weisfeiler.

E. D. I had a different experience. After I applied for an exit visa, my house, where we never had a lot of guests, was suddenly swarming with visitors. Vinberg was among them, but we mostly talked about practical matters. He asked me to meet certain people in the US and talk to them about the research topics he was interested in. It is because he is older than you that he allows himself to say what he really thinks. With me it is different. I am older than he. Therefore he refrained from telling me his opinion.

E. Katok (Part 2, 15:18-17:00)

E. D. Tell me about Katok and your other peers. You talked about your teachers and your students. Now it's time to say a few words about your peers.

V. K. We were close friends with Katok.

E. D. I remember when I first heard his name. I was running a circle for fifth-year students, when all of a sudden another circle popped up in the faculty. It was run by Kirillov and Katok.

V. K. Katok must have been still in high school.

E. D. No he was a freshman. Obviously, Kirillov was already a professor. But the two organized a circle for first- and second-year students. This is how I first heard of him. Later I got to know him closer when I recruited him to teach in School No. 2.

V. K. In his earlier years as a student he was absolutely intolerable. *[Laughs]*. It was impossible to have a normal conversation with him. He always tried to overwhelm his opponent with his energy, intellect, and knowledge. Nevertheless, we somehow managed to become friends. I remember that I celebrated my first New Year in Moscow with him and his family. I liked his mother. His brother was there too. That New Year party was memorable.

H. Arnold and Others (Part 2, 23:00-28:00)

E. D. Bernstein has a younger brother, David.

V. K. Yes. He didn't publish anything for a long time. But recently he published a very good paper. It's a very well-written paper. It heralded the beginning of a whole new area of research which was based on the findings of Arnold.

E. D. Arnold is also a remarkable person.

V. K. Yes, not only is he an outstanding mathematician, he is a wonderful human being. I know that firsthand.

E. D. Explain.

V. K. I had very few contacts with him. But recently, about two years ago, I wrote a paper on superalgebras, and I didn't know where to submit it because it was about 150 pages long. At first I wanted to submit it to *Izvestiya*. Before sending it I gave a call to Shafarevich.³⁵ Shafarevich said that the editorial board didn't favor papers on algebra. Later I realized that it meant that the editorial board didn't like Jews because for some unknown reason the majority of Jewish mathematicians focus on algebra.

E. D. Not necessarily. They are in every field. *[Laughs]*.

V. K. Maybe you are right. But Kostant arrived independently to the same conclusion.

³⁵ http://en.wikipedia.org/wiki/Igor_Shafarevich

E. D. When I came to Cornell I was amazed with how many of my colleagues are Jews.

V. K. Do you mean those who work on probability theory?

E. D. Yes, all probabilists at Cornell are Jews. There are four of us who belong to an older generation: Kesten,³⁶ Kiefer, Spitzer, and myself. All four of us are Jews. I don't know how the HR department allows that. [*Both laugh*].

V. K. Alright, add probability theory. Kostant said that there were not many Jews working in geometry. I guess if we split mathematics into algebra and geometry we can say that there are more Jews who work in algebra. Apparently this is what Shafarevich had in mind. He said that he would certainly support me but there were other six editors who were likely to reject my paper.

Apart from that there was the issue of length. My paper was too long. He said that the editorial board instituted 80-page word limit for all contributions to the journal. He tried to steer the conversation away from the covert anti-Semitic policies of the board. In response I pointed out that longer papers are often published in parts. After a long pause he said: "Well, of course you can try." [*Laughs*]. That was the end of our conversation.

E. D. Did you submit it to the *Uspekhi*?

V. K. Yes, thanks to Arnold it was accepted in the *Uspekhi*, although it ended up being backlogged for two years. By the way, this was one of the reasons why I decided to leave the country without much publicity. There were two. The first one was Vinberg's upcoming dissertation defense. The second was the fact that my paper was not yet published. It turned out, however, that they failed Vinberg anyway, without my assistance, and my paper didn't get published either.

(Part 3, 0:10-16:00)

When the editor of the *Uspekhi* tried to contact me, I was already gone. I was in Rome. My brother simply went to the office of the journal and took the manuscript. I forwarded it to Carlo Rota, and he quickly published it in the *Advances*.

³⁶ <http://www.math.cornell.edu/People/Faculty/kesten.html>

E. D. I once had an awkward conversation with him. I met him at a party. He introduced himself. He looked very young. I imagined him as a bolding, grizzled, and bearded man. [*Laughs*]. I didn't quite understand who was in front of me. I started asking him about his research.

V. K. He works in many different areas.

E. D. I made the mistake of talking to him as an advanced scholar would talk to a rookie. [*Laughs*]. When I realized who he was, I tried to explain that I knew who he was but the awkwardness remained.

V. K. Arnold's reaction was unusual for the Soviet reality. When Vinberg learned about everything, he was scared and recommended that my paper should be withdrawn. But when my brother consulted Arnold, Arnold said that it had to be published.

E. D. This was after you already left.

V. K. Although Vinberg had nothing to do with my decision to leave the country.

E. D. Do you know the story of Shilov?³⁷ The faculty created a hostile work environment for him, and he eventually died of a heart attack. The faculty refused to reappoint him as a professor on the grounds that he wasn't doing enough to combat Zionism. Several of his graduate students immigrated to Israel.

V. K. Kirillov was an opponent at my dissertation defense. He wasn't enthusiastic about it at all. Add to this a very negative review of Kostrikin³⁸ who, unlike Kirillov, was personally interested in failing me because I refuted some of his results. I can understand Kostrikin but not Kirillov. After their response I thought that I failed my defense. Fortunately, these were different times.

E. D. Were both of them your opponents?

V. K. Yes. By the way, Shafarevich showed up at the end. I think he wanted to say something positive about my work. He was late though.

* * *

³⁷ http://en.wikipedia.org/wiki/Georgiy_Shilov

³⁸ http://en.wikipedia.org/wiki/Alexei_Kostrikin

E. D. Manin was among those who came to say good-bye when I was leaving the country.³⁹

V. K. Manin was almost fired from the Steklov Institute because he married a Jewish woman.

E. D. His mother was Jewish too.

V. K. Yes. He didn't know his father, so he can be considered a hundred per cent Jewish. His father was certainly Russian, to judge by his middle name (Ivanovich),⁴⁰ but his upbringing was Jewish. His mother was a typical Jewish mom.

E. D. He came to say good-bye when I was leaving. He is a very gifted and honest man.

V. K. No doubt about that. But there is something enigmatic about him.

E. D. Kirillov also came to say good-bye a day or two before my departure.

V. K. What I don't like about Kirillov is that he likes to communicate with others with an air of straightforward familiarity that I don't always find appropriate. But no doubt he is a good person too.

E. D. I can tell you now without fearing the KGB (I am sure they won't get hold of this recording), that it was thanks to Kirillov that I received the pictures of the students of the Second School which I showed you. When he visited me shortly before my departure, I told him that I couldn't take these pictures and asked him if he could transfer them through a third person. He readily agreed, and after I left handed them to a Canadian scholar with whom he worked as a translator. The Canadian mailed them to me. So it is thanks to Kirillov that you can now see yourself, your former colleagues and students on these old pictures.

Kirillov became Gelfand's student. As I said earlier, Gelfand was rude with some but nice with others. Kirillov belongs to the second category. He was a bright student. He was in the same year as Arnold, and for a while the two followed the same career trajectory. Even their defenses were scheduled on the same day at the IAM.⁴¹ It was decided to give both of them the degree of Doctor of Sciences for their work.

³⁹ http://en.wikipedia.org/wiki/Yuri_I._Manin

⁴⁰ From Ivan, a Russian name *par excellence*.

⁴¹ Keldysh Institute of Applied Mathematics.

V. K. Yes, but they gave it to Kirillov and not to Arnold.

E. D. Arnold declined.

V. K. Did he?! This is absolutely amazing.

E. D. By that time Arnold already finished another paper, much more promising than the previous one. Well, maybe I am exaggerating a bit. The second paper was on the method of small parameter. In other words, it was at least just as good, interesting, and important as the first one. I served as an opponent at Kirillov's defense. His dissertation was pretty good, and I concurred with Gelfand that Kirillov deserved to be awarded the degree.

V. K. This is completely unthinkable today.

E. D. I served as an opponent for all kinds of people. For instance, I was an opponent at Glushkov's defense.

V. K. Defense of his doctoral dissertation?

E. D. Yes. Kurosh invited me.

V. K. What was it about?

E. D. It was about topological groups. Back then he was a very diffident person.

V. K. What an incredible career he had. It is not entirely clear how careers are made in the Soviet Union. How is it possible that a young bashful individual overnight becomes a big shot?

E. D. I would assume there were some reasons why it happened to him. One also needs a certain amount of luck. Maybe the fact that he worked in cybernetics played a role.

V. K. But what he did was a shoddy piece of work, wasn't it?

E. D. As you know, one can make a career based on a shoddy piece of work. On the other hand, you cannot deny that he is a very hard worker.

I. Molchanov (Part 3, 10:30 – 16:29)

E. D. What can you tell about Stasik?⁴²

⁴²Interview with him is a part of this collection.

V. K. What can I say? He is a very nice guy. I am very pleased with the fact that it was I who introduced him to his future wife.

E. D. How did it happen?

V. K. I think I also was the one who recommended that you hire her to work in the Second school.

E. D. I almost forgot all of that. But now I remember that at first Vinberg recommended you to me, and then together we discussed other potential candidates from your year.

V. K. I remember how before the beginning of the school year Stasik, Natasha Levin, and I met at a nearby restaurant *Yunost'* [lit. "youth"] where he met her for the first time.

E. D. Did she work as an assistant to her future spouse or was it someone else?

V. K. She worked with Novikov I believe. Stasik played an important role in my education. Coming from the outskirts of the Soviet Union, my education was lacking. I had no idea about many things. Native Muscovites learn about Van Gogh and Pasternak in school. It's not the same in Kishinev.

E. D. But Stasik comes from the periphery as well. He came to Moscow from a small village in the Ivanovo region.

V. K. Yes, but he was raised in an educated family. If you do some background research on village kids who get admitted into the university, you will find that most of them are from the families of teachers or priests.

E. D. True, but you cannot compare a village teacher with a university professor in Moscow.

V. K. You are right. I think he taught himself a lot of things. He knew poetry very well and stimulated my interest in it. We were very close friends for a long time. We even lived in the same dorm.

E. D. Did you have a room of your own?

V. K. Yes. I was in my fifth year of university or in the first year of grad school, while he was at the end of his graduate studies.

E. D. He is a little older than you, isn't he?

V. K. Yes, he is about three years older. There is a very funny story about how he came to Moscow to apply to the MSU. He had a very heavy suitcase with his belongings. At

that time the subway went only as far as the Lenin Hills. So he came of the subway, saw the main building of the university, and headed straight towards the temple of science [Laughs].

E. D. He is an incredibly likeable person. Everyone loves him.

V. K. His dad is a very interesting person as well. It was fascinating to observe the two families together at the wedding of Stasik and Natasha. They represented two completely different segments of Soviet society.

E. D. A Russian village teacher and a Jewish professor.

V. K. A village teacher who was the son of a priest. They couldn't be more different.

J. Immigration (Part 3, 16:30-25:00)

V. K. The year I left the Soviet Union was absolutely sensational for me. I doubt you will find many people of my age who experienced as many new things in such a short period of time as I have. Aside from that unfortunate trip to Hungary, I never went abroad before. In January of this year I arrived in Vienna. I spent there about a week walking around the city and arguing with the Sochnut⁴³ who wanted me to go to Israel.

E. D. I heard that the living conditions for immigrants in transit staying in Vienna are quite bad.

V. K. No, they weren't bad at all. Dealing with the Sochnut was the only negative experience. Indeed, they put me through hell before they let me move on to the States. They tried so hard to convince me to go to Israel.

My next stop was Rome. I hope I will have another chance to live for a couple of months in Rome.

E. D. Why not? Your whole life is ahead of you.

V. K. Two month is a long time.

⁴³ The Jewish Agency for Israel serves as the largest organization in charge of immigration and absorption of Jews from the Diaspora into Israel, and works with Jewish people inside and outside Israel to ensure the future of a connected, committed, global Jewish society with a strong Israel at its center.

E. D. You can go there for an entire year. This is quite possible. If you have someone you want to collaborate with in Rome, you can take a leave of absence and go.

V. K. I love Rome. It would be nice to go back there sometime.

E. D. Did you establish any contacts in Rome? I understand of course that you should first take your time to settle here.

V. K. Yes. In Rome I met Claudio Procesi⁴⁴ who helped me a lot while I stayed there. I think that I can productively cooperate with him.

E. D. Is he a professor at the University of Rome? There is the Mathematical Institute of Castelnuovo there, right?

V. K. The Italians used to have a strong school of algebraic geometry. Unfortunately, it was destroyed by the fascists. The same happened in Germany, and the same is happening now in Russia.

E. D. Yes, fascists are all alike everywhere, although Italian fascists were the least brutal of all fascists.

V. K. But the Italians invented fascism. Fascism appeared in Italy before it took root in Germany.

E. D. They may have invented fascism, but the Italian fascism was not anti-Semitic.

V. K. Right.

E. D. So how did you spend your time in Rome?

V. K. I didn't study much. There were no conditions to study. Nor, to be honest, did I have any desire.

E. D. What about the living conditions?

V. K. It was very difficult in the beginning?

E. D. Did you live in Ostia or in Rome?

V. K. I lived in Rome.

E. D. Did you rent an apartment or a room?

V. K. I met there a young man from Leningrad and the two of us rented a room together. It was extremely dirty and paid a lot of money for it. Then I realized that I could probably ask for help from local mathematicians. My friend, Rukhin, was go-getter. He

⁴⁴http://en.wikipedia.org/wiki/Claudio_Procesi

immediately found somebody who could help us. I asked that person if he knew any algebra scholars in Rome. He pointed to a man by the name Procesi. I went straight to his office and found him there. He turned out to be a very nice person and a good mathematician. This spring he is coming to MIT for the whole semester. He found a room for me at his mother-in-law's house. Procesi arranged my trip to Scuola Normale in Pisa, where I stayed in an upscale hotel. Thus began the second stage of my sojourn in Italy. I had a great time in Pisa.

E. D. Did you get paid for your talks?

V. K. Yes, I did. 100,000 liras! This is how it works there. Students can eat for free. Room and board are included in tuition, pretty much like in Harvard. Dinner costs 400 liras which is basically for free, and there is a buffet including wine and beer. This was a very memorable week in my indigent immigrant life. Although I could stay longer, I decided not to waste time and travelled all over the north of Italy: Florence, Venice, Milan, Ravenna. Ravenna is a fascinating place with many ancient temples. I also visited San Marino, which was my childhood dream [*Laughs*]. When I came back, the telegram from MIT already arrived, and it was time to leave.

(Part 3, 26:30-28:00)

So I came to Boston and met my family. On the following day I took off for a conference in Virginia. There I met lots of new people. I could barely remember their names unless of course I heard about them before. When I came back to Boston, I had to attend a new series of events in Harvard, MIT, Yale, and California.

E. D. Did you present your results in MIT in front of a big audience?

V. K. There is Brandeis-Harvard-MIT Joint Mathematics Colloquium. I presented my results in Harvard. My talk was on invariant theory.