

**Simon Gindikin**  
**Ithaca, March 31, 2010**

**A. Family History**

E. D. Let us begin with your background. How many generations of your family can you trace back?

S. G. Almost zero. I know a little bit about my grandparents. My grandmother on my mother's side was the only grandparent who saw me. I don't remember her at all. She passed away at the outset of WWII. Interestingly, my mom's dad died in the US. It is a fascinating story. He left Russia in the beginning of the century, shortly before WWI. He settled somewhere in Chicago. Rumor has it that he got pretty well-off and was planning to bring his family: my grandma, my mom and her sisters. WWI and the Revolution frustrated these plans. My grandma and her kids wanted to join him in the US, but it wasn't meant to be. He developed a ventral hernia, a professional ailment that he acquired working as a tanner at Russia. He died as a consequence of an unsuccessful surgical attempt to remove it. His family continued living in Russia, and so after some 70 years I am finally here.

E. D. Did you find any information about him?

S. G. No, I didn't even try. I only remember that my mother mentioned Chicago to me but nothing more than that. My mother and my grandmother tried to protect me by not disclosing any information about him.

E. D. Yes, the communist authorities looked askance on people who had relatives abroad.

S. G. Moreover, my grandfather was known to have been politically active in some labor movement (he was a low skilled worker in a leather factory), but it was unclear if he was a member of any political party. My aunt preferred to think that he had been a Bolshevik. I am not so sure about that.

So this is my mother's line of the family. My grandfather died in the US sometime during the Revolution in Russia. My grandmother died in evacuation during WWII. She saw me when I was a baby, but I don't remember her at all.

My father's family was from Berdychiv.<sup>1</sup> They were relatively well-off. My grandfather was a flour merchant I think. In the 30s he moved to Moscow, where all of his 3 children already lived: my dad, my uncle Yasha – he was arrested at 1937 and died in Kolyma camp<sup>2</sup> – and my aunt Liza. While in Moscow, he was caught in a police raid. I don't know any details. My father was reticent about it. Maybe he was trying to sell something illegally. I don't know. His children were trying to find a way to save him. Despite their efforts my grandfather disappeared never to be seen or heard of again.

His wife, my grandma, lived for sometime afterwards and passed away just before my birth, and I was named in her honor. She was named after a male relative of hers, Simon. This is all I know about my ancestors, which is not a lot.

E. D. And what about your parents?

S. G. My father was an engineer. A very talented man, he wasn't as successful in his career as he could have been if he had been from working-class background. He barely managed to get a university degree by taking evening classes. He worked as an engineer and died very early in the age of fifty-four. He had stones in both kidneys and passed away in 1959 when I was about to graduate from the university. He died just before my final exams. He died in April, a week before my first exam. It was a very unfortunate confluence of events.

As for my mother, she was from Mogilev (Belarus) and had a very limited education. Yet she was a very devoted mom. She has done a lot for me. In fact, she saved my life. As a child I was very ill. My family stayed in Moscow, and at one point in time I got very ill. My skin was covered with abscesses which never healed up. I suffered from this predicament for years. It was a difficult situation. I couldn't eat properly, nor was there any way to treat this condition. Nevertheless, she was very active in seeking out help and eventually found a doctor who was able to cure my condition. My case was so famous that it was even mentioned in medical literature. I was one of the first people in Russia to be treated with penicillin. I was about ten years old at the time. Since then the abscesses never came back.

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<sup>1</sup>A city in northern Ukraine. Before the Revolution it was home to one of the largest Jewish communities in the Russian Empire.

<sup>2</sup> [http://en.wikipedia.org/wiki/Kolyma#The\\_Arctic\\_death\\_camps](http://en.wikipedia.org/wiki/Kolyma#The_Arctic_death_camps)

## B. First Steps in Mathematics

E. D. Now let's talk about your mathematical history. Did you attend any circles?

S. G. Yes, I did.

E. D. What were these circles? Who were the leaders? Who do you remember?

S. G. I don't remember much about the leaders. As for my friends and peers who attended the circle with me, I have a lot of good memories. I remember Dima Arnold.

E. D. Did you attend the circle together?

S. G. Yes. Mark Freidlin was with us, I think. I am not entirely sure, because there were people whom I met in the circle and there were those whom I met while participating in math Olympiads. I think that Sasha Kirillov didn't attend the circle, but we knew each other from the Olympiads. I met Erik Vinberg at the Olympiads, but I am not sure if he attended the circle. I think Mark Freidlin did attend. Misha Shur, who is your student, also attended.<sup>3</sup>

E. D. Others whom you mentioned were my students too.

S. G. I am almost positive that Valya Tutubalin also attended. I remember him from the Olympiads as well as from our circle. There were many other people too. Do you remember Rosenthal?

E. D. Of course I do.

S. G. I also remember him from those times. We were good friends, but I haven't seen him in a long time.

E. D. He is in Israel.

S. G. Now that I enumerate all these people I realize how rarely I meet them. When I was in Moscow, I used to meet them more often. There were other people too.

E. D. What were your achievements in the Olympiads?

S. G. I think that the last time I participated in an Olympiad I got the third prize. Before that I had been awarded the third prize and had received an honorable mention a couple of times too. In all, I participated probably four times. My school was somewhat of a backwater, and it took me some time to discover the math circle and the Olympiads.

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<sup>3</sup> Interviews with all these people are a part of this collection.

### C. Rough Start

E. D. What about your admission into the university? How did that go?

S. G. It went pretty bad.

E. D. Tell me about it.

S. G. I didn't take entrance exams because I graduated from high school with a gold medal. I only had to pass an admission interview.

E. D. What year was that?

S. G. It was 1954.

E. D. The situation was already getting better, right?

S. G. Yes, around that time many Jews were admitted. Unfortunately, I wasn't one of them. I had an interview twice but neither attempt was successful.

E. D. Do you remember who interviewed you?

S. G. Yes, I do. Wait a minute ... His name is escaping me. I think you know him too. He was a probabilist who later worked in Steklovka.<sup>4</sup>

E. D. Zolotarev?

S. G. Zolotarev, yes.<sup>5</sup> He left a very bad impression on me. He was very cruel to me. I am not sure if his attitude can be attributed to anti-Semitism. Maybe my personality rubbed him the wrong way or maybe, since he was a young man, it was his way of asserting himself.

E. D. Whatever his motives, it must have been very unpleasant.

S. G. He was very rude during the interview. I don't want to draw any far-reaching conclusions about him on that basis alone. All I can say is that he was rude.

E. D. What was the result?

S. G. I was emotionally staggered. Perhaps I should have tried to get into Mekhmat by taking entrance exams like most other students, but I was so profoundly affected that I didn't even consider this option. Perhaps I should have known better, especially since I already experienced anti-Semitism first-hand while in school. Although there were a

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<sup>4</sup> Steklov Mathematical Institute.

<sup>5</sup> Interview with him is a part of this collection.

number of fellow students with criminal records, anti-Semitic remarks normally came from my teachers. Maybe I wasn't the most likeable kid. Go figure. I should have learned something from that experience, but people rarely take anything seriously until it affects them personally. It was the first serious blow, one that I wasn't prepared for. Neither was my father, who was emotionally affected by my difficulties. I was his only child, and it was a tragedy for him.

#### **D. Pedagogical Institute**

I didn't have the courage to do anything else and decided to try to get into the Department of Mathematics at the Pedagogical Institute. But it turned out that I missed the deadline. The only option left for me was the Department of Defectology which had a program preparing teachers of mathematics for special schools. I spent a certain amount of time there. The students there were very nice. The social atmosphere was great. In fact, most of the students were girls, although there were a few boys. I felt very comfortable there. Frankly, the atmosphere wasn't very conducive to studying. However, it was there that I began to establish some mathematical connections. Mind you, there were some good mathematicians in the Pedagogical Institute. For example, A. Luntz taught me mathematical analysis.

E. D. Was he a good teacher?

S. G. He was both a good teacher and a good mathematician. I have only good things to say about him. We were friends for many years afterwards. There were other people too. As a matter of fact, there were a number of excellent mathematicians in the Department of Mathematics. First and foremost, there was Pyotr Sergeevich Novikov.<sup>6</sup> Then there was Naum Yakovlevich Vilenkin.<sup>7</sup> At the time he was a young man still in his 30s. We quickly developed a close rapport, and our relationship continued for many years until his death. His influence was crucial for the choice of my future specialization in mathematics.

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<sup>6</sup> [http://en.wikipedia.org/wiki/Pyotr\\_Novikov](http://en.wikipedia.org/wiki/Pyotr_Novikov)

<sup>7</sup> [http://en.wikipedia.org/wiki/Naum\\_Vilenkin](http://en.wikipedia.org/wiki/Naum_Vilenkin)

Who else was there? There was Alexander Adolfovich Buchstab whom I remember with much fondness and gratitude. He was the official PhD adviser of Ilya<sup>8</sup> and mine too. As years went by I started to appreciate him even more. He was a careful person who tried to avoid conflicts with the Institute's administration and government officials. Today I understand that it's was only his way to survive in the terrible time when he lived. I belonged to a different generation which lived in more "vegetarian" times so to speak. In the 60s I thought that one's position on socio-political issues must be more sharply articulated.

He was a good mathematician. In the 40s he did some groundbreaking research on the sieve method for twins. He was evacuated during the war and lost his D. Sc. thesis. However, after the war he completely reconstructed the text with enormous calculations and eventually defended it. Afterwards he was inactive for almost 30 years. Then suddenly, when I was already a mature mathematician working in the Pedagogical Institute, he set a new record in the same area of mathematics. It was truly a gift of fortune that he was able to solve a famous problem in his old age.

I realized how good of a person he really was when I had to deliver a speech at his funeral. It was the dawn of *Perestroika*, and I just returned from abroad. I had a lot of things to say about him. I realized that he was an honorable person without any desire to be a hero. I also understood how important it is to be a good person and how difficult it is to live an honest life in times of gloom.

Then I met Vilenkin, although I don't remember under what circumstances. I attended his seminar on orthogonal polynomials. In my second year I tried to attend some lectures in the MSU, but it was impossible to get a permission to access the university building. I had this brave idea that I would simply audit lectures at the MSU, but it didn't work out. At the time it was almost impossible to transfer from the Pedagogical Institute to the MSU. Later I learned that some people managed to do that: Yasha Sinai<sup>9</sup> and a few others.

E. D. Yasha Sinai?

S. G. He wasn't admitted to the MSU two years earlier than me.

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<sup>8</sup> Interview with him is a part of this collection.

<sup>9</sup> Interview with him is a part of this collection.

E. D. Are you sure?

S. G. Yes, I am. He wasn't admitted.

E. D. But he attended my seminar in his first or second year.

S. G. He managed to transfer fairly quickly but he couldn't get in at first. I don't remember the details but I think his grandfather (V. F. Kagan)<sup>10</sup> was very upset about that.

E. D. He was one of the early participants, and he wrote a very good paper in my seminar.

S. G. It is well known that there were very few Jews who got accepted during that admission cycle. There were only three: Lena Vul, Leonid Volevich,<sup>11</sup> and another person whose name I forgot. Yasha was the fourth one, but he joined them later.

So transferring to Mekhmat was out of the question. At the very least I was hoping to transfer to the Department of Mathematics at the Pedagogical Institute itself, but it wasn't an easy task either. The aforementioned Vilenkin tried to help me with the transfer. By the way, Shidlovsky,<sup>12</sup> who was mentioned in the interview of Ilya, also tried to help me. He taught in the Department of Defectology but he wasn't my teacher. I know that he has an ambiguous reputation but he tried to help me then.

E. D. Did you know Ilya at the time?

S. G. No, but my friend showed him to me one time. It happened in 1954, when he and Sorkin, whom he mentions in his interview, were at the end of their graduate studies. I attended the seminar of Vilenkin. The participants were mostly fourth year students. My friend Sergey Genkin, who recently passed away, showed me "two geniuses of the Pedagogical Institute." One of them was Piatetski-Shapiro. I was very impressed by his aristocratic-sounding hyphenated last name. He and Sorkin recently defended their theses. I saw the poster announcing their defense. I saw Piatetski-Shapiro and Sorkin there, but I wasn't formally introduced to them.

E. D. How did you manage to transfer?

S. G. Thanks to Vilenkin and others.

E. D. When did it happen?

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<sup>10</sup> [http://en.wikipedia.org/wiki/Veniamin\\_Kagan](http://en.wikipedia.org/wiki/Veniamin_Kagan)

<sup>11</sup> <http://resources.metapress.com/pdf-preview.axd?code=dx34t14081573qu5&size=largest>

<sup>12</sup> <http://www.numbertheory.org/pdfs/shidlovsky.pdf>

S. G. It happened very quickly. I believe I barely finished my first semester.

E. D. Do you know that the very fact that the Pedagogical Institute produced such a distinguished mathematician as you is very remarkable? This fact is often mentioned in various memoirs.

S. G. I am aware that my case is well-known, although, as I learned later, there were a number of good mathematicians who graduated from the Pedagogical Institute around the same time. They were fourth-year students when I met them.

E. D. Can you name anyone who became famous?

S. G. There was such a remarkable person as Alik Muchnik.<sup>13</sup> I am not sure if you know him.

E. D. Yes, I do. He was sick, wasn't he?

S. G. At the time he was still healthy. He got sick later. Moreover, I used to specialize in logic, and we wrote a couple of papers together. It was an interesting and serious work. People know this paper. I was surprised to discover that some people in the US who specialize in computer sciences knew about my contributions in the field of logic. It was not my only work. I wrote a whole book on logic when I was in graduate school. A translation of this book was published by Springer.<sup>14</sup>

To come back to your question about my transfer, it was a difficult process. They had no problem settling the matter with the Department of Mathematics. Obviously, the agreement had to be reached with both departments. And I remember the reaction of the chair of the Department of Defectology. He wrote that he did not want his department to serve as a springboard for certain opportunistic young people. He was right I think. *[Everyone laughs]*.

There were other good mathematicians. S. Adian<sup>15</sup> is also a graduate of the Pedagogical Institute.

E. D. But he is not widely known as such.

S. G. Yes, but he was Novikov's student. It was inevitable that those who were turned down by the MSU would end up at the Pedagogical Institute.

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<sup>13</sup> [http://en.wikipedia.org/wiki/Albert\\_Muchnik](http://en.wikipedia.org/wiki/Albert_Muchnik)

<sup>14</sup> <http://www.springer.com/mathematics/book/978-0-387-96179-8>

<sup>15</sup> [http://en.wikipedia.org/wiki/Sergei\\_Adian](http://en.wikipedia.org/wiki/Sergei_Adian)



This is how I ended up in Fizmat<sup>16</sup> at the Pedagogical Institute. It was located close to the Novodevichy Convent, in the Tikhomirov building. I had a lot of good friends there, not only among mathematicians but among physicists too. All my peers were nice people.

### **E. Auditing Classes at Mekhmat**

E. D. When did you start to audit classes at the MSU?

S. G. As soon as I got my pass. Obtaining it proved to be a big problem. I don't remember how I managed to get one. Maybe Vilenkin helped me. It was hard to get it. I remember one could get a one-off pass to attend a particular seminar or something like that. To apply I had to provide some formal letters. To be honest I don't remember.

E. D. So when did you start attending?

S. G. Very early on, at the end of my first year or more likely starting from my second year. In my second year I attended your class on probability theory.

It was 1955. From this time on I started attending on a regular basis. Vilenkin recommended that I focus on representation theory. I started reading up on this subject. I remember that I bought the famous book of Gelfand and Naimark<sup>17</sup> "*Unitary Representations of Classical Groups*", commonly known in Moscow as "the blue book" because of the color of its cover. I think I wrote a term paper on representation theory in my second year.

E. D. Which courses did you audit?

S. G. I attended all of them. I audited a huge amount of courses. In my second year I attended Analysis III. I tried to go to Kolmogorov's course on measure theory. The problem with this class was that sometimes I had a hard time understanding Kolmogorov's speech, let alone math.

E. D. [*Laughs*].

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<sup>16</sup> The Department of Physics and Mathematics

<sup>17</sup><http://www-history.mcs.st-and.ac.uk/Biographies/Naimark.html>

S. G. I attended a lot of courses. My daily routine was as follows. I would leave the Tikhomirov Building as early as I could. I would cross the bridge on the Ring Road, take a bus on the river walk by the chemical factory, and go to the Lenin Hills.<sup>18</sup>

I was very inquisitive, and in my second year I attended the 2<sup>nd</sup> Conference on Functional Analysis. I went there just for the spectacle. This is where I saw many famous people: Gelfand,<sup>19</sup> Landau,<sup>20</sup> Krein,<sup>21</sup> Naimark and others. It was a wonderful conference. After that I started attending Gelfand's seminar. I didn't understand much at first, but by the time I was in my third year I started to understand things better.

### F. Dynkin's Seminar

What happened next I have already described in the preface of the book devoted to your seminar.<sup>22</sup> You announced a year-long course on differential manifolds, but then you said that you preferred the seminar format because it would allow students to be more actively involved.

E. D. It was a seminar from the very beginning, wasn't it?

S. G. No, in the first semester it was just a regular course. You did have a different seminar with your students. You offered a seminar on Lie groups in the second semester of my third year in 1957. It wasn't a big seminar. It featured presentations by students. Most students in it were my peers who studied in Mekhmat: Erik Vinberg; I think Sasha Kirillov was there too. I am not sure about Arnold.

E. D. I don't think so.

S. G. I don't think so either. Shur was there.

E. D. Karpelevich?

S. G. No, I am positive he wasn't there at the time. It was a seminar for third-year students. I think that Mark Freidlin attended in the beginning.<sup>23</sup>

E. D. It's quite possible. Perhaps Tutubalin too?

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<sup>18</sup> Nowadays Sparrow Hills, location of the main building of the Moscow State University.

<sup>19</sup> [http://en.wikipedia.org/wiki/Israel\\_Gelfand](http://en.wikipedia.org/wiki/Israel_Gelfand)

<sup>20</sup> [http://en.wikipedia.org/wiki/Lev\\_Landau](http://en.wikipedia.org/wiki/Lev_Landau)

<sup>21</sup> [http://en.wikipedia.org/wiki/Mark\\_Krein](http://en.wikipedia.org/wiki/Mark_Krein)

<sup>22</sup> <http://www.math.cornell.edu/~ebd/ebda.html#4>

<sup>23</sup> Interviews with them are a part of this collection.

S. G. Oh, yes, Tutubalin was there for sure.

E. D. When I interviewed them, they reminisced how I used to assign problems on Lie groups.

S. G. So I took this seminar. I remember it quite well because it was the beginning of everything for me. This was 1957. The seminar resumed after the summer break. This time you invited some of your older students: Alik Berezin, Friedrich Karpelevich, Onischik -- although he may have been there from the get-go.

E. D. But Onishchik was younger than others.

S. G. Yes, he was a graduate student at the time. The other ones were already mature scholars. I was on close terms with Alik Berezin. I was taking his class and already started collaborating with him. I remember that he gave me to read his thesis. It was an absolutely remarkable piece of work. I learned a lot from it.

E. D. What was it about? Operators?

S. G. It was about the radial parts of Laplace operators on symmetric spaces.

E. D. Yes, yes, I know.

S. G. He also assigned me some problems that I tried to do. I collaborated a lot with him. He taught a course on representations which was quite good.

E. D. Was he a member of Mekhmat faculty already? I remember that he had some difficulty finding an academic position. At one point he used to teach in an evening school.

S. G. He no longer worked there. He was recently hired by Mekhmat. I remember how Alik, a red-cheeked young man, was giving a long talk at the Conference on Functional Analysis. Then there was a story with his PhD thesis defense, which you talked about earlier. It was quite a show for me. Gelfand thought that Alik deserved to receive a *Doktor Nauk* (Sc. D) for his work. Such a possibility to jump through one degree was a rare distinction. So Gelfand tried to secure the support of A. I. Maltsev,<sup>24</sup> who wasn't one of the opponents but attended on Alik's defense. There was a public quarrel between Gelfand and Maltsev. Gelfand said that Berezin's thesis was better than the 2<sup>nd</sup> thesis of Maltsev. Maltsev didn't look very happy. One might think that Gelfand's careless remark was the reason for Maltsev's opposition. However, as I learned later, the outcome was predetermined, and Gelfand just wanted to take a small revenge on Maltsev.

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<sup>24</sup> [http://en.wikipedia.org/wiki/Anatoly\\_Maltsev](http://en.wikipedia.org/wiki/Anatoly_Maltsev)

I remember how Alik decided to offer a course on representations. It was roughly around the same time. Not many people attended it. I remember that Igor Girsanov<sup>25</sup> attended it. It was a very good course. His original plan was to explain the entire theory of representations in two years. I remember how Gelfand criticized Alik for that. Due to Gelfand's pressure Berezin had to settle for a year-long or a semester-long course. Nevertheless, the course was extremely useful. I still have my notebook from this class. I think this was my third year. It was more likely my third year when I started collaborating with Alik. I started to learn a few things and continued taking an inordinate amount of specialized courses every year. I attended various seminars. I spent half of my day in the Pedagogical Institute and the other half, till late in the evening, in Mekhmat.

What happened next? I think I have already described that somewhere in print, namely, how Ilya joined your seminar.

E. D. He arrived from Kaluga.

S. G. Yes, he just arrived from Kaluga where he was sent at 1954 to work after the graduate study. I think it was 1958.

E.B. I remember that. I remember how all of us went for a camping trip to Oka river. It was in spring, after I returned from China.

S. G. Yes, after you got back from China. We had quite an adventure getting on the train. The boarding for people who were late was absolutely insane. They were pulled into the car through a half opened window. Nikita Vvedenskaya and Friedrikh Karpelevich were pulled in successfully, but Karpelevich's wife refused to play this game and was left behind. We had a lot of fun. You brought some petards or fireworks.

E. D. Yes, I brought them from China.

S. G. I think we had a couple of such camping trips. It was absolutely wonderful. We slept in tents. Dobrushin and his first wife were with us. I didn't know him at the time. There were some other people who had a loud party, and I remember how you observed: "Our docents are having a lot of fun." [*Laughs*].

E. D. [*Laughs*].

S. G. Igor Girsanov was there too. We rented boats and travelled along the river. Everything was well organized, and the natural landscape was unbelievably beautiful.

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<sup>25</sup> [http://en.wikipedia.org/wiki/Igor\\_Girsanov](http://en.wikipedia.org/wiki/Igor_Girsanov)

E. D. I vaguely remember that we attached our boats to a motorboat.

S. G. Yes, this is exactly what we did. We pulled our boats on a motorboat and then drifted in them downstream. There was a house where you used to spend your summers. We stayed in it overnight.

E. D. We slept on bare floor in that house.

S. G. No, I think we pitched our tents outside the house. But maybe somebody slept in the house. It was a fantastic trip.

E. D. These kinds of things are always fantastic when you are young.

S. G. I think Ilya wasn't with us on this trip. I must say that – and I mentioned that in my conversation with Erik Vinberg – we learned so much in your seminar. I don't think you can learn as much in a regular course.

E. D. The most important task for me was to have you collaborate with one another.

S. G. It was a seminar where you could see how people think. I think I have written about it somewhere. People in the seminar, especially Ilya, Alik, and Friedrich often presented their papers to us in a very raw form, and we could see the whole kitchen so to speak. We could see how they thought through certain problems and how they presented their ideas. I remember some of their papers even to this day. I remember that Friedrich came up with the boundary of symmetric spaces. All of this was taking shape right in front of our eyes. And when Ilya joined the seminar, Erik and I were completely blown away because he presented something new every week. One time Alik and he presented their paper on the so-called Wang's spaces.

E. D. Wang used to work at Cornell.

S. G. Oh really?

E. D. Our department established an Assistant Professor position named in his honor.

S. G. Wang of course did more than that. He also created a classification of Kahlerian homogeneous manifolds with semi-simple Lie groups.

E. D. He died prematurely from cancer.

S. G. So Alik and Ilya presented this paper. Incidentally, I was one of the editors of Ilya's *Selected Works*,<sup>26</sup> and I discovered some major omissions in this paper. Its flaws were so serious that I couldn't include the paper in the collection. I am surprised nobody in so many years had the time to read the paper carefully.

At the time Onishchik was our expert on complex manifolds. He knew a lot. Arkady was an erudite person.

E. D. He taught us a lot of things.

S. G. Yes, he did. I remember how Ilya asked him: "Listen, Arkady, has it been finally proven that all bounded complex homogeneous domains are symmetric?" "I don't think so," answered Arkady, "but it has been almost proven. It has been proven for unimodular groups". The following week Ilya constructed an example of a non-symmetric homogeneous domain. Where else could you witness something like that. The history of mathematics was unfolding right in front of our eyes. It was very instructive. It is in this seminar that Erik and I learned the Siegel domains. It was there that we started working on various subjects in Ilya's project. It was the time when we became mathematicians in the true sense of the word. In the end the three of us managed to prove that all bounded complex homogeneous domains are realized as Siegel's domains of 2<sup>nd</sup> kind. It all began there in that seminar. This seminar was amazing. I have neither participated in nor heard of any such seminar

E. D. There were better ones perhaps.

S. G. Which ones?

E. D. Gelfand's seminar, for instance.

S. G. It was a completely different seminar. It wasn't a place to start research. But you are absolutely right. In fact, I have written about it in a volume marking Gelfand's anniversary. One might argue about his teaching style. Personally I didn't find it particularly appealing. But you can't deny that his seminar was a public demonstration of his thought processes, and I have to admit it was a difficult and brave choice. If you were fortunate enough not to be used as his teaching prop, you could take a lot from this "mathematical kitchen."

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<sup>26</sup>James Cogdell, Simon Gindikin, and Peter Sarnak, editors (2000), *Selected Works of Ilya Piatetski-Shapiro*. American Mathematical Society.

E. D. Most certainly so.

S. G. By the way Gelfand chose your seminar (and not his own!) for his first presentation of integral geometry. This is how I learned about another research area that later became central in my mathematical career.

### **G. Graduate School and First Publications**

S. G. Such was my life until 1959. By that time I developed a very close relationship with Ilya.

E. D. Then you went to graduate school, right?

S. G. I was admitted into a PhD program.

E. D. In the Pedagogical Institute?

S. G. Yes. I started working with Ilya.

E. D. And what was Ilya's status at the time?

S. G. He worked at the Moscow Institute of Applied Mathematics. He was hired there as soon as he came to Moscow. I worked with Ilya. I was also very close with Erik. We wrote several papers together. By the end of my PhD studies I published a long paper in the *Uspekhi* under the title "Analysis in Homogeneous Domains."<sup>27</sup> I remember that, when for the first time I applied to the NSF here in the US, I received a response letter which conveyed an ill-disguised surprise at the fact that I was still alive. Normally in the US people don't have such long academic careers. One reason is that they simply don't start so early. I published this paper when I was 19 or 20 years old. Working closely with Ilya was a wonderful period of time. In terms of mathematics, this was the best time of my life.

Since we are on the subject of the Pedagogical Institute, I must say that I also learned a lot from Pyotr Sergeyevich Novikov, who is one of the brightest people I ever met in my entire life. He was an absolutely amazing person. He was very easygoing and friendly with others, regardless of their status or rank. He had a profound knowledge of many different areas of science and culture. I think I made the right choice. Although I knew that I would end up focusing on Lie groups, I continued working with him too. In fact, this is how I learned logic. I even wrote a book on logic which was published by Springer. Also, when I

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<sup>27</sup> "Analysis in Homogeneous Domains", *Russ Math Surv*, 1964, 19 (4), 1-89.

was a PhD student, for a few years we ran a seminar together. I believe I learned a lot from him. It was a true blessing to see him teach. He was a very remarkable person indeed.

So when I finished my PhD, I stayed in the Institute as a faculty member at Novikov's chair. The times changed. It was 1962 by the time I finished my PhD, and my thesis on homogeneous domains is widely known up to this day. I am not sure if you remember this subject. There was a book by L. K. Hua<sup>28</sup> which was quite popular in Moscow at the time. In it the author computes multidimensional integral formulas similar to Cauchy formula for classical symmetric domains. There were beautiful multidimensional matrix formulas – analogous to some classical formulas. Behind 4 series of classical domains there are two exceptional domains. It was a problem to find integral formulas for these 2 domains as well. Hua's tools apparently didn't work there. I discovered these formulas, as well as similar formulas for arbitrary homogeneous domains, not necessarily symmetric ones. When I once met Hua in Leningrad at the conference around this time I shared my results with him, and he couldn't believe that it was possible.

So after I started delving deeper into this subject, I also started discussing my calculations with Karpelevich. It is quite something when you have a lot of experts around you.

E. D. Yes, this is how things were in Moscow.

S. G. Yes, you can't find this kind of environment anywhere else.

E. D. Maybe in Paris.

S. G. Maybe. Anyhow, I was showing him my formulas containing multidimensional gamma functions. And so we started working together meeting several times a week. It was an incredibly fruitful collaboration. Our first meetings took place when he still lived near Elokhov Cathedral on Spartakovskaya Street. I remember that at the time he was a chain-smoker. He smoked "Belomor."<sup>29</sup> The amount he smoked was incredible.

E. D. Yes, he used to smoke a lot.

S. G. We were full of enthusiasm. I remember that for some reason he always used to dry his cigarettes on the radiator. [*Laughs*].

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<sup>28</sup> <http://www-history.mcs.st-and.ac.uk/Biographies/Hua.html>

<sup>29</sup> A brand of cigarettes without filter. They were the cheapest and the strongest cigarettes in the USSR.



E. D. [*Laughs*].

S. G. I also remember his mom. I don't remember how often we met but sure that a few times every week. It's an absolutely amazing thing when you look at a multidimensional integral and suddenly realize that it is susceptible to computation. Eventually we became so versed in doing that that we could understand each other almost telepathically. This reminds me of one interesting episode which took place in your seminar. One time Ilya was presenting something at the board, and, as it was often the case with him, at one point he paused for a while to think about something. Apparently realizing that his proof didn't work, he said (and I remember this word for word): "Here one could also play on that," and fell silent again. To which Friedrikh immediately replied: "No, you can't." [*Everyone laughs*]. After a few moments of silence, Ilya said: "Yes, you can. I already did it." [*Everyone laughs*]. Friedrikh and I collaborated for several years, and it was a true blessing to work with him.

E. D. Together you published a very famous paper.

S. G. There was also another one. In fact we published a whole series of papers together. The first paper is famous worldwide.<sup>30</sup> Then there was another one where we introduced intertwining operators. There is an interesting story behind the first one. Originally we wrote it as a note for the *Doklady*, but we exceeded the word limit. We had to cut something out, but this was impossible because the whole paper consisted of calculations. In the end we found a way to present our calculations in a more elegant and concise way. Then we wrote another paper.<sup>31</sup> This second paper, where we came up with the so-called intertwining operators, wasn't translated.

E. D. Didn't *Izvestiya* translate all the articles?

S. G. At that particular period of time there were two years when they didn't.

E. D. There were also translations of the American Mathematical Society.

S. G. Anyhow, it wasn't translated. We had published two papers (our 2<sup>nd</sup> and 3<sup>rd</sup> joint papers) which were translated into English twenty years after their publication.

E. D. It used to happen sometimes.

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<sup>30</sup> Gindikin, S. G.; Karpelevich, F. I. Plancherel measure for symmetric Riemannian spaces of non-positive curvature. (Russian) *Dokl. Akad. Nauk SSSR* 145:1962 252–255.

<sup>31</sup> Gindikin, S. G.; Karpelevich, F. I. An integral associated with Riemannian symmetric spaces of non-positive curvature (in Russian) *Izv. Akad. Nauk SSSR Ser. Mat.* 30 1966 1147–1156.

S. G. We had two papers like that. Another such paper was on integral geometry.<sup>32</sup> It had to do with combinatorics of roots. We published it in Kazan, in a collection of papers in honor of Chebotarev. Obviously, nobody translated this volume. I doubt that anyone saw it even in Moscow. The choice of venue was an obvious mistake on our part. Both papers were translated 20 years later in the *Mathematica Selecta*, a new journal which published translations of papers written in Russian. Although our work on intertwining operators was not recognized in due time, the problem on integral geometry was solved soon after the publication of the translation.

E. D. Who solved it?

S. G. Koornwinder<sup>33</sup> read the translation and encouraged his student Beerends to work on the problem.

## H. The First Trip Abroad

S. G. For the first time I went to the West, in 1988. I went to England. You never travelled to the West from the USSR, did you?

E. D. No, they never let me.

S. G. Prior to my visit to England, I traveled a few times to the countries of the Soviet bloc. Sometimes they let me out, other times they didn't. But this was my first trip beyond the "Iron Curtain". It was the beginning of *Perestroika*. The fact that I was allowed to go was a complete surprise to me. There is an interesting story behind this trip. I was invited by Penrose.<sup>34</sup> He tried to establish a contact with me a number of times. Now I realize how bizarre everything must have seemed to him. He couldn't understand how our system worked. He tried to figure out what he needed to do to invite me. You know perfectly well how things worked there. I remember that when E. Stein<sup>35</sup> visited in Moscow he seemed reluctant to talk with several mathematicians, including Henkin<sup>36</sup> and me. Only later I

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<sup>32</sup>Gindikina S. G. and Karpelevich F. I., "A problem of integral geometry," *In Memoriam: N. G. Chebotarev*, Izdat. Kazan. Univ, Kazan, 1964, pp. 30-43.

<sup>33</sup> <http://staff.science.uva.nl/~thk/>

<sup>34</sup> [http://en.wikipedia.org/wiki/Roger\\_Penrose](http://en.wikipedia.org/wiki/Roger_Penrose)

<sup>35</sup> [http://en.wikipedia.org/wiki/Elias\\_M.\\_Stein](http://en.wikipedia.org/wiki/Elias_M._Stein)

<sup>36</sup> <http://mathecon.cemi.rssi.ru/en/henkin/index.htm>

learned that he was told that mathematicians in Moscow, including myself, were not at all interested in hosting him. [*Laughs*].

E. D. Why? [*Laughs*].

S. G. Not interested and that's it.

E. D. Who told him that? NKVD?

S. G. No. He traveled with the delegation of the National Academy of Sciences, and to visit the USSR he needed to have some kind of program. He said that he wanted to meet certain researchers at the MSU and other institutions in Moscow. He was told that the people he mentioned did in fact work at the MSU but that they had absolutely no time to meet with him. [*Laughs*].

E. D. When did this happen?

S. G. It happened somewhere in the end of the 70s.

E. D. Well, those were crazy times.

E. D. I also visited Moscow in the context of an exchange program between the Soviet and the American Academies, but this happened in 1989.

S. G. Yes, I remember that I met you then. I also remember how humiliating was this whole process of applying for a permission to go abroad. In 1988 I went for conference in Durham.<sup>37</sup> Are you familiar with this place?

E. D. Yes, of course.

S. G. I had a lot of problems filing the required paperwork. My flight was on Saturday. On Friday I was still not sure what was going on. I spent the whole day waiting for my documents in the Ministry of Education. Finally, in the evening, about 6pm, two female workers who were processing my application showed up. One of them said, as she was handing me my passport: "While you travel abroad, my husband will get fed up with it and leave me." [*Laughs*].

E. D. What does it have to do with anything? [*Laughs*].

S. G. She meant that she would get home very late. She brought my passport after her work hours.

E. D. Now I see.

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<sup>37</sup> EPSRC Durham Symposia (<http://www.maths.dur.ac.uk/lms/>)

S. G. Another absurdity is that you stand in line to get your passport but you don't know whether they have it or not [*Laughs*]. I was very surprised when I was told that they had my passport.

E. D. But this was already 1988. Mikhail Sergeevich [Gorbachev] was the general secretary.

S. G. True, but the old ways persisted. When they gave me my passport I couldn't believe that something like that was possible. They told me: "Go to the finance department to receive your money and your plane ticket." I went there and got my ticket. Getting money, however, wasn't as easy. "We have no money," they said, "If you still want to go, it's up to you." [*Laughs*]. And it's not like I was going to London itself. I had to find a way to get to Durham, which is up north, close to Scotland. I told them: "Alright. I am going." I had no hard currency at all but I thought to myself: "At the very least I'll see what the London Airport looks like."

Another memorable experience was the flight itself. My seat neighbor was a vice minister of construction. I remember how impressed he was when he glimpsed the building of London Heathrow Airport. He was drinking a lot during the flight and was completely wasted by the time we landed in London. He leaned over and said: "Since I consider you a trustworthy person," – apparently he thought that the mere fact that I was allowed to go abroad qualified me as such – "I can tell you that we will never be able to build anything this well." [*Laughs*].

I was pleasantly surprised to find that a person was already waiting for me in the airport with a card with my name. At first I thought it was a graduate student, but it turned out he was a distinguished scholar.

E. D. No, they wouldn't send a graduate student.

S. G. Well, you used to tell me that this is how it works. How could I know? [*Laughs*]. I also remember how disappointed I felt when he told me that Roger Penrose and he booked a hotel for me just outside London and that they would take me from there to Durham on the following day. "What a bummer!" I thought. I would have preferred to spend my first night at London even though I didn't have a penny." [*Laughs*].

E. D. [*Laughs*].

S. G. There was a financial issue. I didn't get any money from the Ministry of Education in Moscow, nor did it seem that I would get anything from these damned capitalists. [*Laughs*] I couldn't buy a beer or a bus ticket to get to the downtown. As it turned out, they gave me a check. I simply didn't have any idea what a check was. [*Everyone laughs*]. I had a stack of colorful flyers in my hotel room, and it turned out that I tucked the check that they gave me into this pile. After we had found the check, they were astounded to learn that I didn't know what to do with it. They asked me if I had a bank account. I said: "What are you talking about?" [*Everyone laughs*].

E. D. It would be better if they took you to the bank.

S. G. Eventually they did.

Gradually I started feeling more and more comfortable. At the same time a congress on mathematical physics took place in Wales.<sup>38</sup> My hosts told me: "Since you are already here in the UK, why don't you go to the congress as well." I said: "Of course I will." But to do that I had to change my plane ticket because I was supposed to leave the UK on the following day after the conference at Durham. So I decided to change my ticket. With me was Yasha Sinai who attended another conference in Durham. He was also invited to go to Wales. Together we decided to write a letter to our ambassador in the UK, Mr. Zamyatin.<sup>39</sup> We asked him for a permission to extend our visit in order to attend the congress in Wales. Obviously, we didn't get any reply. Yasha flew back home. It was not his first trip to the West and he was much more experienced in these things. He thought that an unauthorized extension of the trip was a very serious violation of the rules and that they would never let me out of the country again." I said: "I don't know when I will have another chance to go abroad. If they let me out of the country this time, I will use this opportunity to the fullest. I am going to Wales."

E. D. To Swansea?

S. G. Swansea, yes. And so I went without any second thoughts or a permission from our dear ambassador.

E. D. In 1988 this whole system was already crumbling.

S. G. Yes, but the situation was still unclear.

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<sup>38</sup> [http://en.wikipedia.org/wiki/International\\_Congress\\_on\\_Mathematical\\_Physics](http://en.wikipedia.org/wiki/International_Congress_on_Mathematical_Physics)

<sup>39</sup> [http://en.wikipedia.org/wiki/Leonid\\_Zamyatin](http://en.wikipedia.org/wiki/Leonid_Zamyatin)

E. D. Half a year later the Berlin Wall went down.

S. G. At any rate, at this particular moment what I did was an act of madness. You see, at that time people who travelled abroad still had to surrender to the Soviet embassy whatever foreign currency they were bringing back with them. As for me, I was resolved not give them a penny. How dare they ask money from me when they refused to give me any in the first place! There was a person (whom you know and whom I don't want to name) who told me that I was courting danger and that I should surrender at least a little bit of what I brought with me. I told him that they would not see a penny from me. I am not a stingy person but ... It was considered common courtesy to give them a little bit.

So I went to Swansea, where I met Yulik Dobrushin. We had a wonderful time there. We spent most of it in pubs. Yulik was very eager to communicate with the locals but his spoken English just wasn't good enough.

E. D. Moreover, they probably spoke in a local dialect.

S. G. I think they spoke English. They were simple folk: local fishermen and the like.

E. D. Even in London there is a great variety of dialects.

S. G. Anyhow, we loved this one pub so much that we went there three times a day.

E. D. There must be a lot of good pubs there.

S. G. In Swansea? Yes. The weather was terrible. We walked with him around the city. I remember that at some point we met Vitya Maslov.<sup>40</sup> I also met Misha Gromov.<sup>41</sup> The moment I met him he started cursing the West: "There are no good places here. You can't live anywhere. New York is a nightmare. The US is an awful country. Life in Paris is also bad. One good thing about Paris is that at least there is good cinema there, which is my sole relief." [*Everyone laughs*].

E. D. [*Laughs*].

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<sup>40</sup> <http://www.maths.ed.ac.uk/~aar/papers/maslovbio.pdf>

<sup>41</sup> [http://en.wikipedia.org/wiki/Mikhail\\_Gromov\\_%28mathematician%29](http://en.wikipedia.org/wiki/Mikhail_Gromov_%28mathematician%29)