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THE TIMES OF YURI VASILYEVICH PROKHOROV

Yuri Vasilyevich Prokhorov is the *eminence grise* of Russian probability theory. Every one of us interested in probability or asymptotic statistics has come across his celebrated weak compactness theorem at one time or another. He was interviewed earlier by Larry Shepp (*Statistical Science*, v. 7, № 1, p. 123–130). That interview dealt largely with his impressive career and scientific work, his international contacts and the issue of discrimination in the Soviet Union.

The world has changed considerably in the intervening years and our knowledge and perspective of the past has developed accordingly. It seemed natural to us to talk once more to the man who lived through these turbulent times as the intellectual heir of Kolmogorov, and as one who was in a position to observe the inner workings of the powerful Soviet (later Russian) Academy of Sciences, the Steklov Mathematical Institute in Moscow, and the activities of his many colleagues throughout the country and elsewhere. This interview took place between November 13 and 28, 2006, at Bielefeld University. As it was more like a friendly three-way conversation than a formal interview, we did not identify the two interviewers, but merely indicated the person who asked a question as «interviewer.»

A promising young man

Interviewer: Yuri Vasilyevich, we are happy that you have agreed to a second interview after 15 years. First of all, let us encourage readers to read Larry Shepp's interview first, as we shall try to keep overlap at a minimum. However, we do need to start with a brief review of your early years. You were born in Moscow on December 15, 1929, and after the war started, the family moved to the town of Chistopol, about 800 km East of Moscow in August, 1941. I think that at this point you want to make a correction of the earlier interview.

Yu. P.: Yes, Larry mentioned that Chistopol is on the Volga, but it is not. It is on the Kama River. I realize that not many people will be interested in the exact location of Chistopol, but I like to get such details right. *Little foxes destroy the vineyards.*¹⁾

Interviewer: You returned to Moscow in August, 1943. Presumably, Moscow was a much safer place then.

Yu. P.: Before we left in August, 1941, the air defence was far from perfect and I saw lots of bombed buildings. In the fall of 1941 it became much more effective and even though the German army came very close to Moscow, there was less damage. At night aerostats were launched. They were attached to the ground with wires that were almost invisible for the pilots and could destroy a plane when it hit them. I later learned that Kolmogorov had recommended randomizing the location as well as the height of each

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¹⁾ Song of Solomon 2.15.

aerostat every night which made this threat completely unpredictable. When we were back in Moscow I saw the aerostats, but I only remember that they were handled by very pretty girls in nice uniforms.

Interviewer: In Chistopol on Kama you passed through grades 5 through 8 in 2 years and after your return to Moscow you repeated this performance by passing through grades 9 and 10 in a year. This gave you a high school diploma in the summer of 1944 at age 14 and after spending a brief period at the Bauman High School (now Moscow Technical University) to study engineering, you walked into the office of the Dean of the Faculty of Mechanics and Mathematics of Moscow University. Why and what happened?

Yu. P.: I had decided that I wanted to study mathematics, so in the winter of 1944–1945 I went to the Dean's office. Nowadays it is difficult to see the Dean, even for full professors. But I, a 14-year old boy, just walked in from the street and told the secretary I would like to speak to the Dean. Dean Golubev had a background in mathematics and gave courses at one of the military academies with the rank of general-major. He was thin and wore a pince-nez. He also wore an overcoat because it was cold at the university. He asked me very politely what I wanted. I replied that I would like to be a student of mathematics. «Maybe next year. You are young,» he replied. I asked him to give me permission to take exams for first-year students. During the winter you could take exams in analytic geometry, algebra, analysis, and English. He wrote something on a small piece of paper that would allow me to take these exams. I was graded «good» once and «excellent» three times, so I again asked the Dean to be admitted. In May 1945 I formally transferred to Moscow University.

Interviewer: What was life like as a freshman?

Yu. P.: At the university it was cold. When I arrived in the morning I took a chair and with that chair and my bag and coat I went from classroom to classroom: *Omnia mea mecum porto*²⁾. It was dangerous to leave a chair just for a moment because another student would take it. The large lecture halls of Moscow University were constructed in the 18th century and there were two small lamps on the ceiling. I had weak eyes, even in childhood, and by the time I was 16, one eye was -6 and the other -7 . I had difficulty reading what was written on the blackboard. But there was also an advantage. At age 16 I received a certificate that I was a soldier of the second kind, meaning that I did not have to serve in the army. Still my eyesight kept bothering me throughout my life. In the nineteen eighties it suddenly became much worse. The doctors had no explanation.

In contrast to some other departments and institutions, students in the department of mechanics and mathematics did not get a deferment from military service during 1944–1946. As a result, when I was admitted in 1945 there were almost no male students. In mathematics there were maybe 15–20 boys and about 100 girls. The boys were either too young for the army — like me — or they were wounded veterans who had been discharged.

Interviewer: What about professors? Where they still around in the middle of the war?

Yu. P.: Of course not all of them, but we were certainly kept busy. There were 16 or 17 seminars and special courses, and as students we competed who would attend the most. I myself took two courses in differential geometry from Finikov and Rashevsky, and one in symplectic geometry from Bakhvalov. I gave a talk on boundary properties in a seminar on analytic functions, attended a seminar of Gelfond on number theory and lectures of Novikov on mathematical logic. You cannot say we were not broadly educated!

Then in 1947 the great demobilization sharply increased the number of male students and for the girls it was of course a great opportunity to get married. These were the boys born in 1922–1923 and among them were very clever people. There was Bolshev going from the air force into statistics, Mischenko, student of Pontryagin on optimal control, and many others. Quite a few of them later became members of the Academy. It was an exciting time with teachers like Kolmogorov, Petrovskii, Stepanov, Nemytsky, Keldysh, and many others.

Interviewer: Please tell us how you first came to know Kolmogorov.

²⁾ *I carry all of my possessions with me.* — Seneca, Epistulae Morales 9.18–19.

Yu. P.: Kolmogorov gave me a topic for a seminar talk on the strong law of large numbers. Then he invited Sevastyanov and me to his apartment in Moscow on December 15, 1947. When he asked me, «How old are you?» I told him «Today is my birthday, and I'm now 18 years old.» He then wanted to know whether I liked skiing, and I said I did, whereupon he invited me to his house in Komarovka. So since 1947 I think I saw Kolmogorov for 15 or 17 years practically every day. It was an excellent education. He taught me mathematics, but also other important matters such as making things happen and getting them organized. Over the years he left more and more things to me and people got accustomed to view me as a kind of deputy of Kolmogorov. He also asked me to check his book with Gnedenko on limit theorems, and as a young man, I was mighty proud that they thanked me for the many corrections.

Interviewer: Did this early acquaintance also make you decide to choose probability theory as your main area?

Yu. P.: Yes, at first I was fascinated by number theory. Partly complex variables as well. But after Kolmogorov's lectures I decided that I would devote whatever abilities I had, to the study of probability theory.

I finished in June, 1949, and moved to the Division of Probability of the Steklov Institute. It was a small division, but with Kolmogorov, Smirnov, Khinchin, Sevastyanov, what more could you want? After some time I became a member of the scientific council of the Steklov Institute and I am still at the Institute after 57 years.

During this entire period I have also been teaching at Moscow University. In 1952 I gave my first special course on limit theorems and among my audience were Hasminskii, Borovkov, Zolotarev, and Yushkevich. I remember that when I started this course, Kolmogorov told me to be dignified and modest! In 1957 I was appointed full professor in the Department of Mathematics. At Moscow University there is a special cloakroom for professors with an attendant watching over their overcoats. He probably took me for a student and refused to take my coat. Luckily I spotted the rector of the university, academician Petrovsky and asked him: «Ivan Georgievich, please tell this gentleman that I'm entitled to leave my coat here.» The rector said: «Yuri Vasilyevich is young but he is a professor at the university. Please help him.»

In 1970 I moved from the Department of Mathematics to become the Chair of Mathematical Statistics in the new Department of Computational Mathematics and Cybernetics, where I have remained ever since.

Adventures with geologists

Interviewer: For a moment let us change to a somewhat lighter note. You and I both like to drink vodka, in civilized quantities of course. You once told me that you learned to drink with the miners in the Ural Mountains. This sounds exciting.

Yu. P.: Yes, Kolmogorov once told me that when he was young, he was drinking with sailors, but at the same time he objected to my drinking. One summer day a young geologist showed up at the Steklov Institute. His colleagues said he was an excellent geologist, but with a peculiar hobby of studying Cramér's book on mathematical statistics all day. When I spoke to him, he told me about granite, which is something I never saw outside Red Square. He then proposed that I should join a geologist party going to Central Kazakhstan. So I spent the summer of 1961 in Kazakhstan and the next summer in the Polar Ural, where there is no sunset during the summer. In 1963 we were near the Chinese border south of Chita, and in 1965, just after my return from the Berkeley Symposium, my friends and I went to Kamchatka. So in three weeks time, I saw the Pacific from both sides.

For me it was a different life. In these geologist parties, it does not matter who you are, what titles and degrees you have; you should just be a man of good character. When we left for Central Kazakhstan, a small ceremony was arranged, complete with herring and spiritus vini (alcoholic spirits) of 95%. These spirits are a special story. It is dangerous to breathe while drinking and you should drink some water immediately afterwards, because otherwise you ruin your throat. The geologists at the table were pleasantly surprised that a Prof. Dr. of Mathematics did pass this test, and quite frankly, so was I!

Incidentally, these high percentage spirits are transported to distant places in Russia, because water to dilute it is available everywhere and it makes no sense to carry it around.

Diluted to 55% it is called spirit for drinking.

By the way, this reminds me of another story involving herring and vodka. In Holland you have these herring stalls in the street, where they clean and sell raw salted herring. The Dutch grab the fish by the tail and eat it on the spot. So one day Ildar Ibragimov and I were in Leiden and I happened to have some vodka with me. Ildar told me that his wife would never allow him to drink vodka in the street, but if she would see me do it, it would probably be all right. So he suggested that we improve on this Dutch custom by having some vodka with our raw herring, and we did.

Interviewer: Wasn't there an anti-alcohol campaign during Gorbachev's rule, much like prohibition American style?

Yu. P.: Yes, but I do not think it was Gorbachev's idea. In a TV documentary he said that he used to drink in the old days and was still drinking today, but now the doctors recommended that he should only drink vodka. They say it was Gorbachev's deputy Ligachev who was the main figure in this anti-alcohol campaign. The campaign cost the state 72 billion roubles, which went into the so-called grey economy and was later used to buy factories and oil fields. It was a heavy blow for the state, but the party was against alcohol! But where is this party now? We do know where the alcohol is: on the shops' shelves! Ligachev claimed that in 1988 they saw that this campaign was becoming so dangerous for the USSR that they stopped it, but at that time they did not have enough power to stop the dissolution of the USSR itself! So in the Crimea they destroyed centuries old vineyards with exceptional types of grapes. It was really very stupid. It was just one of those initiatives which sound convincing, but in practical realization only lead to disaster. The leaders may have one idea, but at the local level many other things will play a role. As the proverb says: *«People are ready to burn down my house to get fried eggs for themselves.»*

There was another attempt this year, but Putin and the Russian prime-minister Fradkov were strongly opposed and tried to find out who was responsible for artificially limiting the supply of alcohol. This was because many people died or became very ill drinking bad alcohol produced by nobody knows whom. The price of the usual bottle of vodka is around 100 roubles, but you can buy an illegal bottle for 20 roubles and end up in hospital.

Interviewer: I understood that while they were trying to ban alcohol, there was a sudden shortage of sugar.

Yu. P.: Certainly, because people tried to produce alcohol themselves. The car factory ZIL produced a device which looked like a small case made of stainless steel. You carry this case with you, add sugar and water and after some time you are supposed to get good vodka. In Georgia for centuries they added some apricots or other fruit to give it a special flavour.

When Roosevelt became president of the USA, a delegation of American workers visited they USSR and Stalin met with them. They asked Stalin why there is no prohibition in the USSR. Stalin replied that (1) it will not stop the use of alcohol and (2) we need the 800 thousand golden roubles for the industrialization of the country. The reason I know this for a fact is that it was a compulsory subject for study when I was a student.

The Academy of Sciences

Interviewer: Let us return to more serious academic matters. In 1966 you became a corresponding member of the Soviet Academy of Sciences.

Yu. P.: Actually I was proposed for this in 1964, but failed to be elected. In the Division of Mathematics of the Academy some people thought that I was one of these overly abstract mathematicians they called «abstractionists» and for whom they had no use. Two years later I received strong support from the Minister of Geology who wrote that I did some important work with geologists, and apparently this changed their minds. Also Jerzy Neyman spoke to Bernstein and asked him to support me in the election. At the same time Neyman was thinking of nominating me for election in the National Academy of Sciences in the United States. He sent me the necessary forms to fill out, but I was timid enough to tell the Director of the Steklov Institute about this. He made a grimace as if he just tasted something very unsavoury. I was to be his deputy for 16 years and I decided not to go ahead with this.

What I had not realized was that becoming a corresponding member was not only an honour, but would also turn into a demanding job. The secretary of the Mathematics Division was Bogoljubov and upon my election I was appointed as his deputy. The division secretary took part in the work of the Presidium of the Academy, and in Bogoljubov's absence this task fell to me. At the time Bogoljubov was the head of the Institute of Nuclear Research in Dubna which is a very pleasant place about 100 km from Moscow. He had a dacha there, so he was absent from Moscow quite often. As his deputy this gave me a chance to see the work of the powerful presidium at first hand. I took my task very seriously and tried to advance the interest of mathematics and mathematicians, while avoiding any action that would benefit me personally. People noticed this and repaid me with their trust. For my part I learned how important problems involving large sums of money are solved by competent administration.

The Mathematics Division itself is also quite interesting but complicated. There is a permanent struggle between various subgroups. If there is a position for a new member, it is often difficult to reach a compromise on whom to propose. If there is no winner after three rounds of voting, then the position is lost and goes to another division. Of course the physicists are much better organized. They wait patiently until the mathematicians loose the position and immediately propose a physicist.

The heavy workload had a price and in 1968 I suffered a heart attack. I spent about a month in hospital and more or less completed my recovery by sports activities. During the winter after this I went skiing four times in the mountains at home and in France. In 1972 I became an Academician.

As early as 1954, before the International Congress of Mathematicians in Amsterdam, Kolmogorov said to me: «Yura, I decided to leave probability and move to another subject, say, ergodic problems in celestial mechanics.»³⁾ He suggested beautiful problems to his students such as the three body problem. From then on he sent people to me if something should be decided concerning probability theory. When the Division of Mathematics of the Academy appointed a committee for probability with Skorokhod, Koroljuk, Petrov, Ibragimov, Borovkov, and many others as members, Kolmogorov insisted that I should chair this committee. Once a year we met in a suburb of Moscow and discussed matters of common interest, concerning publications and dissertations, for instance. I would be sitting to the right of Kolmogorov who was, of course, still the leader. But in this way people got accustomed to talk to me about any problems they had, so that Kolmogorov would not be bothered except in very rare cases. Of course this was exactly what Kolmogorov had in mind! So after he became seriously ill and then passed away, there was no break and it was a very smooth transition period when the leadership came to me. As always, I tried to convince people rather than to press them.

Interviewer: In Western Europe we admired the Soviet Academy for taking an independent position, as it did, for instance, in the Sakharov case. As you obviously know the Academy inside out, let us discuss in how far the Academy is really independent of political interference and pressure.

Yu. P.: The Academy is definitely an independent organization. In Soviet times some members of the Central Committee wanted to be elected as Academicians. A gentleman from Belorussia — in fact the President of the Belorussian Academy — even proposed to elect Brezhnev as a member of the Academy in the Division of Process Control. He argued that Brezhnev controlled the entire state! Sometimes such candidates passed the first step in the appropriate division, but the General Assembly usually voted against them. These votes are secret.

However, it so happens that while we are having this interview, there is a movement to turn the Academy into a State organization. The President of the Academy would no longer be elected by the members, but appointed by the President of the country. This movement started just six months ago and it is very powerful. Of course the Academy wishes to remain independent and as far as I understand, Putin is also against these plans.

³⁾ Kolmogorov developed a method to avoid the problem of «small denominators» in the series describing the mutual perturbation of the movement of celestial bodies, which subsequently led to the famous KAM-Theory (Kolmogorov–Arnol'd–Moser).

In this uncertain situation he has allowed the Academy to postpone the election of the next president for two years. So the present president Osipov will remain in office for two years after his five-year tenure is finished. What happens after that, nobody knows.

Interviewer: But who are proposing these changes? People in the government?

Yu. P.: Partly. But I think the initiative comes from business people. You see, the Academy owns a lot of very valuable real estate. It owns areas in the centre of Moscow, in very fashionable places, and also outside of Moscow. Of course developers would like to replace small buildings such as the Mathematical Institute and the Institute of Physics by 3, 4, or 5 star hotels, and maybe, casinos and brothels. Several attempts were already made to get hold of this property of the Academy, but so far they failed. But if the Academy would be a State organization, the government could do whatever it wanted. Today there is one government, tomorrow another; today one president, tomorrow someone else. So the Academy would be subject to all political oscillations⁴⁾. In Soviet times, nobody approached this matter in this way. The Central Committee and the Government had other means to pressure the Academy, but not like this. Some people believe that the Church should be part of the State, but the Church hierarchy said that there is no need for this at all and that it would be harmful for the Church. The same is true for the Academy.

Interviewer: Please tell us how the Academy reacted to the political pressure to expel Sakharov.

Yu. P.: Before I do that, I would like to tell you how Sakharov became an Academician. In 1953 two outstanding physicists Kurchatov, who was officially the Head of the atomic project, and Tamm, came to the general meeting of the Division of Mathematics and Physics (it was still a joint division at the time). They appealed to the members to believe them that Sakharov should be an Academician, even though they could not explain why. Of course there were rumours among scientists and some people — including Kolmogorov — had some idea of what Sakharov was doing. Sakharov had three golden stars of Socialist Labour and the times when these stars were awarded coincided more or less with the dates of successful experiments with a nuclear weapon. So Sakharov became an Academician very early.

When the Academy came under pressure to expel Sakharov for his political views, Academy President Alexandrov simply replied that it would be impossible to get the necessary 2/3 of the votes for this. Then Sakharov was sent in exile to Nizhny Novgorod where he remained under house arrest. He was later brought back to Moscow and to power by Gorbachev who supported him.

The case of Sakharov was not at all exceptional. During the entire Soviet period hardly anyone was expelled from the Academy. Of course the Academy could not protect its members against other problems with the regime, especially in the days of Stalin. Nina Solomonovna Stern was in exile in Kazakhstan at about the time of the Jewish doctors' case, an alleged plot to murder the political and military leadership of the Soviet Union. When she returned to Moscow and asked to be reinstated in the Academy, she was told «Please go to your bank and check your account. Your salary as an Academician was paid during the years of your absence.» The geneticist Nikolai Vavilov, whose brother Sergei was president of the Academy, died in prison but he was not expelled from the Academy. So in a sense, Academy membership is like royalty or nobility: You can be beheaded, but you are beheaded while being a king or a duke. Those who were in power found this difficult to understand. They remove people in very high positions from the Party with the stroke of a pen. But the Academy is not a party!

By the way, it was not exceptional in those days that one family member would hold an important position while another would be in prison or executed. Kaganovich was among the six people closest to Stalin when his brother was shot. Molotov's wife Polina Zhemchuzhina and the wife of Kalinin were in prison. There were TV documentaries

⁴⁾ At the time of publication of this interview, it seems that this threat to the independence of the Academy has been temporarily (?) lifted. The economic crisis has had the healthy effect that right now few people in Moscow are interested in building five star hotels, casinos, or even brothels.

«Wives of the Kremlin» about this. When people from the NKVD came to arrest the wife of Semyon Budenny, Hero of the Soviet Union, he drew his famous sabre and threatened to kill them. They had to give up and when Stalin heard about this, he roared with laughter and ordered them not to repeat this effort. Similarly an attempt of the NKVD to arrest Voroshilov's wife was stopped when he threatened to shoot them. There is a — strictly fictional — film called «The wife of Stalin,» where Stalin tells his Russian wife: «All of my friends have married Jewish girls. These girls are very clever and obey their husbands. And you love only yourself and not me.»

Interviewer: I guess there is some historical truth in this, in the sense that quite a few revolutionary leaders had Jewish wives?

Yu. P.: Yes, definitely. Earlier under Lenin quite a few of the leaders themselves were Jewish too and you can find Jews in leading positions in the KGB throughout the Soviet period. In Lenin's time, they often changed their names. Trotsky was in fact Bronstein and Kamenev was Rosenfeld. There is a cynical anecdote of a Jew who applied to have his name changed to Ivanov. Some time later he wanted his name changed to Petrov and when asked why he did not change it to Petrov right away, he explained: «If someone asks me what my former name is, I can now say Ivanov.» Of course the worst anti-Semitism occurred near the end of Stalin's rule, but we'll speak about that later.

Interviewer: Did not the Academy also have honorary and foreign members?

Yu. P.: Before the revolution honorary members were, say, members of the family of the Czar. Konstantin Romanov, the brother of Nikolai II even became President of the Academy. He published translations of Shakespeare into Russian under the pen name KR. Also ruling heads of other countries, such as Emperor Wilhelm I, who was elected in the same year as Gauss. Poisson became a member during the centenary celebration of the Academy in 1824.

During the Soviet years honorary members were also elected and the last three were Gamaleya who was a specialist in biology and medicine, Stalin and Molotov. Gamaleya died in the forties and Stalin in 1953, which left Molotov as the only honorary member. The Presidium did not know what to do about this and at last decided to abolish the notion of honorary member altogether, so that Molotov automatically lost this title. Stalin used to call Molotov jokingly «cast-iron butt» for his capacity to sit in his chair and work for many hours without stopping. Molotov lived up to this nickname and proved to be remarkably tough. He became a member of the Central Committee of the Party in 1921 and died in 1986 at the age of 96. A few years later the names of Gamaleya, Stalin, and Molotov were discretely deleted from the list of past and present Academy members. Perhaps we should now consider restoring the notion of honorary academician. There are obvious advantages and disadvantages!

In recent years strange new Academies appeared, such as the Academy of TV Arts, the Academy of Journalists, etc. The main reason seems to be that the members of these Academies sign their letters as Academician Ivanov or Academician Petrov without mentioning to which Academy this refers. The same thing happened in Stalin's time, but Stalin himself decreed that the word Academician could only be used for members of the Academy of Sciences of the USSR. In practical matters like this, Stalin was often quite sensible. He spent much time in prison and in exile in far away places, so perhaps he knew real life much better than most people. He was a professional revolutionary, unlike the next generations of bureaucrats whose life was largely restricted by the walls of their offices.

Interviewer: Let us look at the public image of the Academy. It has always been a highly prestigious institution and Academicians commanded a great deal of respect in the Soviet Union.

Yu. P.: When Kolmogorov died his obituary was published in the two central Soviet newspapers «Pravda» and «Izvestia» and signed by all members of the Politburo, members of the Government and the Academy. They wrote that Soviet science should be proud that such a scientist worked in our country. Kolmogorov received a golden star of Hero of Socialist Labour and seven orders of Lenin, which was the highest distinction in the USSR.

Interviewer: Obviously Kolmogorov was exceptional, but why were science and scientists so important?

Yu. P.: People understood, especially after the war, the important contributions of science to our national defence. Stalin met with Kurchatov, the head of the atomic project, and at the end of their conversation Stalin said: «Scientists are people who do not ask much for themselves. Please ask them what they need for more effective research.» Kurchatov collected opinions and soon large settlements for members of the Academy with houses imported from Finland appeared in Mozhinka, Abramtsevo, and Lutsino. The scientists received these houses free of charge. Vinogradov said: «I have a hectare of land with my own river and my own mushrooms.» Not only physicists and chemists who participated in the nuclear programme were rewarded, but scientists in other fields received similar privileges.

Interviewer: And what is the situation now? Are Academicians still very important people?

Yu. P.: I would not say so. When I was young, Kolmogorov told me: «Yura, keep in mind that each member of the Academy equals one research institute!» This is no longer so. Major defence programs have come to a stop and we do not hear much about the aerospace program anymore.

Interviewer: Science could also contribute to the strategic industrial development of the country. Does not the government care about this?

Yu. P.: Nowadays we buy everything abroad: Modern technical development, computers, and so on. Even the Ministry of Defence buys the computers they need, say, in Germany, our main trade partner. Presumably they check a PC to see whether some additional hardware was put inside. In Soviet time we tried to make everything ourselves. That was not wise. Now we sell oil, gas and electricity to other countries and buy what we need. The wisdom of this is not clear either.

An effort was made to develop a modern computer at Zelenograd not far from Moscow. Some kind of Silicon Valley. Khrushchev supported the project, but Brezhnev did not give real support and the project collapsed. Such things do not only depend on the scientists, but also on the political leadership.

Discrimination

Interviewer: In the earlier interview with Shepp the extent of discrimination of Jews in the Soviet Union was discussed at some length. Then and above, you argued that Jews played an important role in the early Soviet regime and that evidence of serious systematic discrimination in the sciences before World War II would be difficult to find. You also noted that the worst anti-Semitism occurred near the end of the Stalin era. Without reopening this discussion, would you mind elaborating on the last point?

Yu. P.: In the interview it says World War I, but I obviously meant World War II.

All right, a few words about Stalin's last years. When the State of Israel was founded in 1948 it was immediately recognized by the Soviet Union. Especially Stalin himself supported this. He thought that Israel could perhaps be drawn into the sphere of influence of the Soviet Union, rather than the United States. When Golda Meir became the first Israeli ambassador to the USSR in 1948–1949, she naturally met Soviet leaders and also spoke (in Yiddish) with Molotov's wife. Golda Meir told Stalin, «You have a Jewish Autonomic Republic in the Far East of the Soviet Union. Why not give the Crimea to the Jewish people?» Stalin probably did not react, but after she left he said: «I don't like the idea of having American warships in the Black Sea.» Some time later he had apparently given up the idea of this approach to Israel, because in the last few years of his life he started a vicious anti-Semitic campaign that culminated in hundreds of arrests after an alleged plot of Jewish doctors to kill members of the Soviet elite had been «uncovered.» Three weeks after Stalin's death in 1953, Beria insisted that this campaign should be stopped and all people connected with the affair be released from prison. Timashuk, the lady who was the main witness in the case, died in a car accident, which is the shortest way to solve such problems. So altogether this was a brief but serious outburst of anti-Semitism.

I also remember a discussion between Shepp and Statulevicius when Shepp insisted that during World War II, Jews in Lithuania suffered much more from the local population than from the Germans. After twenty minutes Statulevicius agreed. However, this is not directly relevant for discrimination in science. More to the point is my experience in choosing the delegation of probabilists for the Congress in Nice. It required a lot of effort

but I succeeded to include Gikhman in the delegation. Then people said: «He is not an ordinary Jew. He is a probabilistic Jew.»

Finally, let me dig up a curious fact from Czarist times. There was a so-called settlement line surrounding an area in Belorussia and the Ukraine that Jews were not allowed to enter. There were exceptions for midwives, important merchants and people with higher education who could cross this line. In the first edition of the Soviet Encyclopaedia you can read that Sergei Bernstein could not get higher education in Russia before the revolution. He went to Paris and returned as a person with higher education and could live in Russia wherever he wanted.

Interviewer: I imagine that Khrushchev put a definite end to the Stalin era. But how does the average Russian feel about this?

Yu. P.: When Khrushchev gave his speech against the Cult of Personality at the XXth Party Congress in 1956, the delegates were invited to the Kremlin at 2 a.m. and the speech continued until 6 a.m. They then went back to their homes and hotels. Two days later the full text of the speech was published in the United States. Two months later, the speech was read at the Steklov Institute, first to Party members, then to members of the Scientific Council, and later to the others. The speech was never published in the Soviet Union. Many people were not ready for these things, or for the many changes that would follow. They are tired. For ordinary people it is important to know what the world will be like tomorrow and next year. Repeated major changes make people uncertain and their lives very difficult.

Interviewer: Later Jewish people who applied for visa allowing them to emigrate to Israel had very serious problems.

Yu. P.: There were very different periods. The first reaction was very negative. It was considered unpatriotic behaviour that should be punished. It was proposed that these Jews should pay large sums of money for the education they received in the USSR. Some Western journalists commented tongue-in-cheek that it would be more profitable for the USSR to educate more Jews than to develop industry and agriculture. Another idea was that the scientific councils that awarded degrees of candidate and doctor should cancel the degrees of these Jews. However, these councils operate by secret voting, so this invention of the administration never worked either. I know this for a fact because I did some work for the Supreme Committee on Attestation.

The number of applicants peaked in the late seventies and many of these people had great difficulties. Under Gorbachev the situation changed. It became much easier to go abroad for all kinds of people, including those who wanted to emigrate.

How to predict who could travel

Interviewer: For a number of years during the Soviet period I wrestled with the problem how to invite conference speakers from the Soviet Union who would have something interesting to say and would actually show up. There were usually lots of suggestions for interesting speakers, but they never came when invited. For me the practical solution of this problem was to talk to Albert Shiryaev who would discuss this back home with the appropriate people and would then suggest some excellent speakers who actually came. However, I am still curious to know how it could be predicted who would get permission for foreign travel.

Yu. P.: You know, Francis Bacon wrote in one of his essays that the State never gives credit to the unmarried.⁵⁾ Because most of those who went to the enemy, or at least to the United States, were single! But in Soviet times there was a professor of chemistry who went to Canada and did not come back. People from the Foreign Department told Academician Semionov, the Nobel Prize laureate for his branching processes in physics, that they had recommended that it was better not to send this gentleman abroad. Why? He had three wives. Yes, consecutively, but this is also not good! So it is better not to send him. When he remained in Canada there was some scandal. These things came in

⁵⁾ *Unmarried men are best friends, best masters, best servants, but not always best subjects, for they are light to run away, and almost all fugitives are of this condition.* — Of Marriage and Single Life, Francis Bacon Essays (1601).

waves and after such an incident the rules would be tightened. For example, at one point these limitations on foreign travel were weakened, but then a Deputy Minister of Aviation did not come back from France and immediately the rules were tightened. But after some time there was a generally known procedure. First you went abroad to one of the people's democratic republics: Hungary, or Poland, etc. Poland was a little suspicious. At first you go abroad in company, to a conference, not alone. Next you would go to a developing country like India and if there are still no objections, you may be able to go to Britain or the US. But some colleagues of mine were told that if they wanted to go to the US, then they'd better join the Party. They did, but for me that would go several steps too far!

Interviewer: But it cannot be as simple as that.

Yu. P.: Of course there is more to it than this. Even today there is a problem if you have ever handled classified information. When you apply for a foreign passport you have to fill out a form which contains the question whether you have the right to read classified documents. A colleague of mine did have this right, but never used it. He decided to write NO on the form, but was punished for giving false information. A friend of mine, who worked for 3 years on a nuclear project, was not allowed to go abroad for 18 years. Through the Division of Mathematics of the Academy I got involved in an attempt to straighten this out because Bogoljubov thought that I could find the proper arguments even though I knew nothing about the case. Much later I noticed that all buses in Bielefeld have a quotation from the bible right next to the driver that explains Bogoljubov's strategy. It reads: *«Verlaß dich auf den Herrn von ganzen Herzen»* but omits the second part of the quote that continues with: *«und verlaß dich nicht auf deinen Verstand.»*⁶⁾

The problem with classified information is that in advising the authorities about a proposal to send someone abroad, I cannot say that they should let this person go because he did not have access to classified information. This is also classified information that I am not supposed to know. Once when Bogoljubov was on vacation and I was acting Head of the Mathematics Division, they did not allow Dobrushin to go abroad because he once worked for some applied institute that objected to this trip. There was nothing I could do about it.

Some people joined defence institutes where they do classified work on purpose. They may be able to get an apartment in Moscow or double their salary if they agree to get stars on their shoulders. Later they find out that there is also a downside to this.

Interviewer: I remember that at an ISI Session many years ago someone who was obviously not a scientist, spoke about Lenin's thoughts about statistics, or something like that. How could that happen?

Yu. P.: Most likely they invited a delegation without mentioning all of the names of the members. Just to take part in the meeting. Of course, people with administrative power would take advantage of this and push some other candidate off the list.

Interviewer: I understand that refusing a scientist permission for foreign travel was also used as punishment for breaking the rules.

Yu. P.: Certainly! In the late sixties a group of 99 scientists, mostly mathematicians, signed a letter of protest to the Ministry of Health concerning a mathematician who had been put in a psychiatric clinic without a proper investigation. Unfortunately, the letter was read in a BBC radio transmission before it had reached the Ministry. This infuriated the government and the 99 were denied permission to go abroad for many years.

Interviewer: One final question about foreign travel of a different kind. Jerzy Neyman invited Kolmogorov to visit Berkeley and it was announced many times that he would come. However, it never happened. I don't suppose that he wouldn't get permission. Do you know what the reason was?

Yu. P.: Kolmogorov's last flight was in the fall of 1954 when we attended a very interesting meeting on probability and mathematical statistics organized in Berlin by Gnedenko, who was at that time at Humboldt University. On the way there was one stop at Warsaw or Prague and Kolmogorov asked the pilot to go down as slowly as possible because his ears were hurting from the pressure change as the plane went down. After that he never

⁶⁾ *Trust in the Lord with all your heart and do not rely on your own insight.* — Proverbs of Solomon 3.5.

travelled by air again. Of course he could travel in Europe by train, but he still wanted to visit the United States. He asked the Foreign Department of the Academy to let him go by boat. But they refused because it was too much trouble for them with visa and so on. He tried a number of times and thought he would succeed eventually, which is why he never gave up plans to come to Berkeley but never made it either.

Interviewer: This sounds like the same problem that Lucien Le Cam suffered. In his case it was cured by the simple trick of putting tiny tubes in his eardrums to release the pressure. They used to do that with children with frequent ear infections.

Meetings abroad: ICM and Berkeley Symposium

Interviewer: Your travel abroad followed the pattern you have just described: First you went to the meeting organized by Gnedenko in East Berlin in 1954 when Kolmogorov's ear problems manifested themselves. In 1956 you went to the first information theory meeting in Prague and in 1958 you came to Western Europe when you attended the International Congress of Mathematicians (ICM) in Edinburgh. Please tell us about these ICM's and the International Mathematical Union (IMU), the body that organizes these congresses every four years. Relations between IMU and the Soviet Union had been somewhat stormy in the past.

Yu. P.: Yes, in 1950 in Cambridge, Mass. in the United States, nobody from the Soviet Union attended. In Amsterdam in 1954, after the death of Stalin, Kolmogorov, Alexandrov, Nikol'sky, and Panov attended. Kolmogorov gave the opening lecture. The congress was held at the famous concert hall *Concertgebouw* in Amsterdam, and as a true lover of classical music Kolmogorov began his lecture by saying: «I know this auditorium as the place where Mengelberg conducted his orchestra.» The closing lecture was given by John von Neumann.

Interviewer: We knew Kolmogorov, Alexandrov, and Nikol'sky. But who was Panov?

Yu. P.: I believe Panov was an expert in computing problems. But perhaps he was just accompanying the others.

Interviewer: ... and keeping an eye on them, I suppose.

Yu. P.: Maybe. There is an interesting sequel to the fact that Kolmogorov and von Neumann were the only two plenary speakers in Amsterdam. At one time we asked Springer to publish a translation of Khinchin's collected papers. We were thinking of the blue series where Pontryagin's collected papers were published. Doob was greatly in favour of this plan but Springer refused. The collected papers of Kolmogorov did not appear in this series either. The reason for that was that Springer sent a young gentleman to negotiate with Kolmogorov about publishing his collected papers, but he did not seem to know who Kolmogorov was and did not approach his errand very tactfully. This was right after the Amsterdam congress and by way of explanation Kolmogorov said: «Right now I'm sharing first and second place in the world with somebody else.» When the young man returned to Heidelberg with this message and his lack of success, he was immediately sent back to Moscow with instructions to agree with everything Kolmogorov asked for, but it was too late. The rights went to another publisher.

Interviewer: This was not at all the style of Julius Springer, the founder of Springer, who was a personal friend of people like Einstein and Hilbert!

Yu. P.: Right. And Kolmogorov told me that when Felix Klein was editor of *Math. Annalen*, he also contacted authors very often himself.

In 1958 in Edinburgh many more people from the USSR attended the ICM. There was even a «tourist group» for young people including three probabilists: Statulevicius, Sirazhdinov, and me. This opportunity to meet people like Feller and Kac was very important for me.

In 1970 in Nice I had more responsibilities. I already mentioned that it was hard work to get Gikhman permission to attend, but together with Pontryagin, Yablonskii, Mushelishvili, and Lavrentiev who was vice-president of IMU at the time, I also belonged to the official Soviet delegation that took part in the meeting of the general assembly of IMU. In the years that followed I served on the committee to select invited speakers and on the committee for the Fields medal. Next I was elected vice-president of IMU for the period 1978–1982. It was a very difficult period because the next ICM had been

scheduled for 1982 in Warsaw, but this was the time of Solidarnost and the situation in Poland was very unstable. The possibility of moving the ICM to another venue was discussed. During a meeting of the executive committee of IMU in Paris, Czesław Olech of the Mathematical Institute of the Polish Academy of Sciences and I argued that the ICM had only been cancelled during both World Wars and that there was no reason to do so again. The final decision was to organize the ICM in Warsaw, but one year later in 1983. The French supported their catholic brethren in Poland and I promised to send 300 participants to Warsaw. Indeed, the ICM did take place in Warsaw in 1983, Faddeev became vice-president and later president of IMU.

Interviewer: In 1945 Jerzy Neyman organized the (first) Berkeley Symposium on Mathematical Statistics and Probability. Five more were to follow at five year intervals until the sixth and final symposium in 1970. Neyman's idea was to make researchers all over the world partners in the development of probability and statistics. During the 5th symposium in 1965 we were sitting in a lecture room listening to one of the speakers when the door of the room opened and you quietly walked into the room with Linnik and Yaglom. For the first time a delegation from the Soviet Union had arrived and people started to applaud. The speaker was standing with his back to you and probably thought he had said something sensational.

Yu. P.: Yes, everybody congratulated Neyman because the Russian probabilists were finally taking part for the first time and were having their papers published in the Proceedings of the Berkeley Symposium. For us the symposium was a unique opportunity for meeting and getting personally acquainted with so many interesting people. Five one-hour lectures a day with coffee breaks and dinner also gave you a chance to find out what these people were doing. For me this was a very important thing for the rest of my life. Then there was a 3–4 day break around Independence Day and Linnik and I went to Asilomar.

Interviewer: There was also an excursion to Stinson Beach and I believe that you and I were the only people foolish enough to try and go for a swim in the ocean. We did not realize that the water over there comes straight from Alaska. I was quite skinny in those days and almost froze.

Yu. P.: Linnik was never one to waste time on such things, so on the day we arrived in Berkeley he bought a small typewriter and started to write some paper. Yaglom and I knocked on the door of his room and when he opened the door he was wearing his pants and a heavy mackintosh and in the corner of the room we saw a large carton of milk and a straw.

Interviewer: He was probably working very vigorously on one of these very long and complicated papers of his.

Yu. P.: Certainly. He was very surprised that in a discussion of one of his papers in the Mathematical Reviews the reviewer remarked at the end that there was a gap in the proof of Lemma 64. So 63 lemmas were fine, but there was a problem with Lemma 64. I said «Yuri Vladimirovich, please look...» but he said «No, no. This gap can easily be repaired.»

Let me take this opportunity to tell you a bit more about Linnik because he was such an interesting character. We can return to the Berkeley Symposium in a minute. Linnik's father was a Ukrainian astronomer and also an Academician. His mother was half Tartar, half Jewish. Linnik used to say: «They cannot have anything against me because I am baptized, my children are baptized and I am good at arithmetic.»

Interviewer: Did not he also have three wives?

Yu. P.: No, according to him he had five wives, but the first, third, and fifth coincided.

Linnik started out in number theory and for his work he received a Stalin prize and became a corresponding member of the Academy in 1953. In the meantime he had published his first paper in probability in 1947, possibly because Vinogradov and Bernstein insisted that he should move to this new domain. Speaking about his work in probability he said later: «I introduced heavy theory of functions of complex variables in probability.» If you read his papers you see that this is true. Before him, nobody would have thought of using Lindelöf's principle or the properties of zeros of entire functions, etc., in probability.

Interviewer: The problems that Linnik left are very hard.

Yu. P.: I once asked Wassily Hoeffding about the work of Linnik. He smiled and said: «Hmmm. Too much analysis.»

Interviewer: That is typical for Hoeffding, who was the master of simplicity. He never stopped until he could prove his results with the absolute minimum of technical tools.

Yu. P.: Linnik was really in functional analysis. He never gave a probability course for mathematicians at Leningrad University. He said: «I do not like these sigma-algebras. I have Romanovsky and Sudakov. They know.»

Interviewer: He did not like Lusin-type analysis.

Yu. P.: Linnik had an office in LOMI, the Leningrad branch of the Steklov Institute. He liked people who knew several foreign languages. He knew perhaps ten languages: Bulgarian, Polish, etc. On his desk there was a bell-button he could push. If he pushed it once, it meant that Kagan should come; twice Romanovsky or Sudakov; three times Mitrofanova, the lady who worked with him. Linnik also tried to protect Kagan who had serious problems after applying for visa for Israel.

In Moscow nobody checks when people come to work and leave. Your results are what counts. In LOMI people were afraid that Linnik would become director. Every day he arrived at 9 a.m. and left at 6 p.m. and people felt sure that he would expect the same from them.

Interviewer: Somewhere I read a story that Kolmogorov wrote his famous *Grundbegriffe der Wahrscheinlichkeitstheorie* because he needed money to have the roof of his «dacha» in Komarovka repaired. The person who wrote this quoted this jokingly as a major triumph of capitalism! However, you told me that this story is really about Linnik's roof.

Yu. P.: Well, Linnik once told me: «I have no money now. I gave 150,000 roubles to my father-in-law for building my «dacha.» He assured me that this would be enough, but now the money is gone and only a part of the first floor is finished. So I wrote a book about the method of least squares.» Writing a book was perhaps the only way to get a large amount of money at once, because the publisher pays in advance.

Interviewer: Thank you for sketching an interesting and very clear picture of Linnik. Now let's go back to the Berkeley Symposium, or rather to your travel through the US after this.

Yu. P.: We had quite a few invitations after the symposium, but not enough time to go everywhere. Linnik, Yaglom, and I paid a brief visit to Lukacs at Catholic University in Washington DC, and went to Columbia University and Cornell. At Columbia we met Herbert Robbins. When I asked whether he wrote «*What is mathematics*» with Courant, he replied, «Yes, I am the famous Robbins.» He was very friendly to us. I met Robbins again in 1991. Of course he had grown older, but he was still very critical about his colleagues.

Interviewer: That sounds like Robbins all right! I understand his relationship with Courant was far from perfect. He was also very cynical, but I really liked him.

Yu. P.: Before we went to Cornell, Linnik said to me: «Yuri, please write to Wolfowitz that we need some money to visit Cornell.» I did and we received a brief reply: «Dear Yuri, Your travel expenses will be more than met.»

I had met Jacob Wolfowitz before, together with Gnedenko. On that occasion he said to us: «I have a car with me, I can bring you to your hotel. It is inconvenient for me. But I can bring you to the hotel.»

In 1963 Wolfowitz attended a conference in Tbilisi. On the way there we had dinner in hotel Ukraina. Wolfowitz checked his coat in the cloakroom, but when we left he told us he had lost the ticket with his number on it. I asked him whether he could identify his coat and he did. I explained the situation and gave 5 roubles to the attendant. At the time this was not an entirely trivial amount, but the problem was solved. Afterwards Yaglom told me: «He did not lose the ticket, but he just wanted to see what would happen.»

Interviewer: It sounds as if you were the subject of some psychological experiment.

Yu. P.: At Cornell we also met Kiefer and Hunt. Hunt told me he would very much like to visit Moscow. I asked him whom he would be interested in seeing. He said, «Vladimir Kutz,» who was the world champion 10,000 meter runner at the time.

The World Meeting at Tashkent

Interviewer: You said earlier that Kolmogorov not only taught you mathematics, but also how to make things happen and getting them organized. This is indeed a very difficult art and the Bernoulli Society World Meeting in Tashkent in 1986 must have been one of your masterpieces! It was the first meeting where large numbers of mathematical statisticians and probabilists from all over the world got together to discuss their science at a very high level.

I presume it is easier and nicer to organize such a meeting in a Republic away from Moscow, but on the other hand the enormous distance between Moscow and Tashkent must have posed some problems too.

Yu. P.: For me it was a real struggle to organize this congress. Some people in mathematics were jealous and tried to prevent the congress from being held, or at least to create some difficulties for its organization. Luckily I got some support from Marchuk who was at that time Head of the Committee on Science and Technology and a member of government. Also V. Kotel'nikov, first vice president of the Academy supported me and my colleagues.

The local organizer in Tashkent was S. Kh. Sirazhdinov. At the recommendation of Romanovsky he spent two years from 1949 to 1951 at the Steklov Institute in Moscow to complete his Doctor of Science thesis with Kolmogorov as advisor. After that Kolmogorov offered him a position in the Department of Mathematics of Moscow University which he held for three more years. In Uzbekistan there was some resentment of people who told Kolmogorov that they would also like to work in Moscow. But life in Moscow is very different from that in Tashkent in many aspects such as climate and food, so Sirazhdinov decided to return to Tashkent. After his return he soon became Director of the Mathematical Institute named after Romanovsky, then he was elected Academician, next Vice-President of the Academy of Uzbekistan and Rector of the University of Tashkent. He also held many other positions. Clearly we had a very powerful friend in Tashkent.

You ask about the advantage of organizing a meeting like this in one of the Republics. In Moscow perhaps the President of the Academy could get in touch directly with the people in government who make the decisions, but even for him this would probably not be easy. In the Republics the lines of command were much shorter. Shirazhdinov could very easily make an appointment with the first secretary or the prime-minister of the Republic Uzbekistan. Moreover, important large congresses increased the prestige of the Republic. Shirazhdinov and I visited the prime-minister and gave him a conference bag. In return he provided financial support for the conference and made 50–70 cars with drivers available for the invited speakers. Also you and I, David Kendall and David Cox lived in the residence where apartment # 1 was used by Brezhnev when he came to Tashkent.

Interviewer: Yes, I vividly remember my apartment in the residence. What impressed me most were a large wall safe, a gigantic TV set and Persian carpets even in the bathroom. Also the setting in a park was very pleasant. When I asked whether I needed some kind of identification to get past the armed guards at the gate, I was told this was not necessary because they would recognize my face!

Yu. P.: This meeting was inconceivable in Moscow or Leningrad. So we preferred the Republics. And we are not the only ones: physicists and specialists in mechanics prefer to arrange conferences there. Also the Soviet–Japanese (later Russian–Japanese) meetings were held in Khabarovsk, Tashkent, Tbilisi, and Kiev. In all cases the reasons were the same.

Let me mention an interesting occurrence during the congress. Mark Freidlin was asked to present an invited Section report. I was in another building when he presented his paper. People came to me to tell me that he invited everyone to Israel. This did not seem possible and Freidlin's invitation seemed to have upset some people. I have my own opinion about this matter, but during a conversation with Freidlin that followed, I noticed something interesting. While we spoke, other people were standing far away from us, not approaching, but watching what we were doing. You see, this is not a new feature of Russian people. In the beginning of the 19th century Lermontov wrote in the introduction of «Hero of our time» that when people see two diplomats having a friendly conversation

during a dinner, they believe that each of them is betraying his country⁷⁾. They do not understand polite behaviour, independent of one's point of view.

Interviewer: You also handed out a number of beautiful Bernoulli medals to people who worked hard to make the meeting a success.

Yu. P.: Yes, A. Holevo found a very good specialist who made the medal. Through my geologist friend I also obtained a small box made of malachite which I presented to Mr. Drescher, the representative of Springer-Verlag who arranged the book exhibition. He left all the books brought for the exhibition in Tashkent.

We also had help from an unexpected quarter. At one point we had to wrap up several hundreds of books and nobody had the time and energy for this chore. One of my colleagues found some children who were willing to do this for a small reward.

Interviewer: Let me add one personal memory of this meeting. The Bernoulli Society has a tradition to organize a mid-week excursion for all participants during their meetings, and some other societies now do the same. I have participated in hikes, watched various performances, sailed down the Nile, but the excursion (by airplane) to Samarkand was a lifetime experience.

Applied Statistics

Interviewer: Yuri, there seems to be a feeling that applied statistics was not doing very well in the USSR. With a few notable exceptions, very little applied work of high quality became known to the outside world. What can you tell us about that?

Yu. P.: After the Tashkent conference the First Secretary of the Communist Party in Uzbekistan invited several participants. Among them was David Kendall who said that statistics in the USSR was in a bad state. One can think of several reasons for this.

When statistical data were collected, they were often kept secret. For example, the number of people having a certain blood type, or suffering from a certain disease, constituted strategic data and were therefore not made available. But even when statistical data were available, there was still the question how useful they were. People like Khrushchev did not believe in the limitation of science. According to him any problem could be solved if we wanted to. However, statistics is useful only in societies in a more or less stable situation. When the situation changes from day to day and from month to month, it is generally impossible to predict the future, with or without the use of statistics. The future with Jeltsin was one, that with Putin another. With Putin's successors it may again be different. Another example: it was announced on TV that at least 20% of all medicine is fake. Aspirin you buy may not be aspirin at all. So why study the properties of a drug when it is simpler and cheaper to sell fake stuff?

There were other periods when the Academy was heavily pressed to make some statistical recommendations. When Abraham Wald's work became known after the war, it was clear that this could produce considerable savings in finding the defective items in mass production. Academy President M. Keldysh spoke to Kolmogorov and insisted that he start investigations in this area. Students of Kolmogorov such as Sevastyanov, Bolshev, and Sirazhdinov went to major factories in Moscow such as Frazer which produced drills and made some recommendations. From time to time the necessary statistical data were collected, but when our mathematicians went to the factories themselves they saw in a rather obvious way that on Mondays the percentage defectives was much higher after the workers had spent their Sundays drinking vodka. So statistical quality control is not much help, if you cannot enforce a minimum amount of discipline. Some time later Kolmogorov and Bolshev studied the toxic effects of medicines and reported to the Ministry of Health, but unfortunately the results disappeared.

Interviewer: I believe that in the automobile industry they call these unsatisfactory products «Monday morning cars.» I think that you are basically saying that statistics makes little sense if the rules of the game are not clear, or at least not being followed.

⁷⁾ *Our public is like the person from the sticks who, overhearing a conversation between two diplomats belonging to hostile courts, becomes convinced that each is being false to his own government for the sake of a tender mutual friendship.* — Lermontov, M. (1840). *A Hero of Our Time*, Author's preface to the 2nd edition.

You are absolutely right. But was quality control not enforced for important products for which correct performance is really critical?

Yu. P.: Yes, in the production of shells to be used against tanks, they did use quality control because of the major risks involved. They would develop their own standards, or use those of other countries, for instance Japan where quality control was far advanced.

Interviewer: Let me try to suggest another reason why applied statistics may not have been easy. Suppose you are the director of a factory that produces tractors. The 5-year plan says that you will produce 10,000 tractors. A statistician shows up and wants to know how many tractors you have produced. Of course you say 10,000 because otherwise you'll be in trouble. Statistics based on such «data» is of course nonsense.

Yu. P.: Yes, the violation of the plan had very bad consequences for those who violated it.

There is yet one more circumstance that contributed to the unsatisfactory development of applied statistics, and perhaps applied mathematics in general. During the war and many years after, many mathematicians were involved in applied research on problems related to our national defence such as atomic research, and later to the aerospace program. Kolmogorov, for instance, investigated procedures for artillery fire and found that it is not a good idea to try and hit the target with every shot. An artificially larger dispersion around the target is usually better. Lawrentjev invented cumulative anti-tank shells. Bogoljubov, Vladimirov, Tikhonov, and others were active participants in the atomic program. Before he became president of the Academy, Keldysh was closely connected with the space project and computed the trajectory of a space device travelling around the moon to get information about the back of the moon. Chentsov did important research on an aerospace problem and also on the problem of detecting underground explosions.

At the time I graduated in the late nineteen forties mathematicians had no problem finding jobs. Some people continued their education as PhD students, but others started working in defence related institutes. Recruiters for these institutes were sitting behind a table in one of the large auditoriums of the old university building in the centre of Moscow and asked students: «How would you like an interesting job within five minutes from a subway station?» That was about all the information they provided. When you accepted the offer, you found yourself at one of a number of very serious institutes which — for instance — did not produce rockets, but computed their trajectories.

Interviewer: I would imagine that cybernetics of Norbert Wiener could play a useful role here, but I understand the party did not like it.

Yu. P.: There were different views concerning cybernetics: one from the Marxist theorists and another from the Defence Ministry. The defence people were more enthusiastic! Two popular books at that time were Wiener's «Extrapolation of random processes,» which was called the yellow peril because of its bright yellow cover, and volume I of Feller's «Introduction to Probability Theory and Its Applications,» which gave solutions to many problems for discrete random variables, that were unknown to specialists in Moscow.

So applied mathematicians were quite active in those days, but then times changed. Officially, the Russian Federation had no more enemies and therefore no need to develop weapons. Jeltsin said that our rockets were not directed at any one particular place, so presumably their directions were uniformly distributed over the half-sphere. Defence spending went down sharply and funding for the aerospace program also decreased considerably. Of course applied research suffered accordingly.

Interviewer: Finally there was the problem of applied research that went against the official views in the USSR. A prominent example is Kolmogorov's 1940 paper «On a new confirmation of Mendel's laws» in which he showed with elementary statistical methods that the same data used by Lysenko's proponents to discredit Mendel's theory, were in fact an impressive confirmation of the theory. This was not without risk as Lysenko's ideas on inheritability of acquired characteristics were supposed to revolutionize Soviet agriculture and were strongly supported by Party leaders. For all of these reasons, it is hardly surprising that applied statistics was not too popular.

Yu. P.: It is interesting to note that when the Russian translation of volume I of Feller's «Introduction to Probability Theory and Its Applications» appeared, the part dealing with the theory of Mendel and Morgan was omitted. Kolmogorov agreed because he figured that it was a choice between losing 1–2% of the text, and not publishing the

book in Russian at all. He was convinced that the complete text would be published eventually, and the second Russian edition already proved him right.

Kolmogorov

Interviewer: Toward the end of this interview you said: «I tried to tell you what I know about mathematical life in the Soviet Union.» You most certainly have, and if you have made one thing clear, it is the role of the towering figure of Kolmogorov in this history. It seems almost impossible that one person could influence matters to such an extent. When he was in Moscow, Tuesday through Thursday and part of Friday, people wanted to talk to him all of the time. However he had a perfect way of recovering from this kind of stress during the remainder of the week.

Yu. P.: His wife said: «Andrei, in Moscow you have no time to eat dinner with a phone permanently in your hand.» But in the house that he and Alexandrov owned in Komarovka it was a different world. Here mathematics, culture and physical exercise played the major role.

There was gymnastic exercise and it was a strictly regulated life. At 8 a.m. coffee, milk, cheese and black bread. At 1 p.m. lunch, consisting of half a litre of fresh milk from a neighbouring farm, white bread and jam. After lunch skiing, and in summertime some other exercise. At 5 p.m. dinner. The colour of the table cloth changed every time, so there were three colours during the day. At 7 p.m. tea, and after tea Kolmogorov invited students for scientific conversation. But that could also happen at other moments, for example during skiing, so the students had better be well prepared! After that there was time to listen to classical music or to read. Reading was often Russian classics, but for Alexandrov's students it was compulsory to read «Faust» in German. To me it all was like an oasis, like an island with a very organized life and a friendly atmosphere.

Interviewer: The people who came to Komarovka, were of course mainly from the Moscow school of probability. Leningrad was far away. However, I understand that Ildar Ibragimov was an exception and spent much time in Kolmogorov's house in Komarovka.

Yu. P.: Yes, Ibragimov was perhaps the only representative of the Leningrad school of probability who spent much time in Kolmogorov's house. He was between the Leningrad and the Moscow school of probability. The two of them also made long trips to South Osetia.

Interviewer: I am happy to hear that the house in Komarovka is still being used, so perhaps we shall meet there one day! Yuri, we thank you for taking the trouble to give us this extensive interview.