

# A CONVERSATION WITH B.V.GNEDENKO

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## Abstract.

This material is a brief presentation of the interview with B.V. Gnedenko that took place in Washington on May 25, 1991. Apart from Gnedenko himself, present were Nozer Singpurwalla, Richard Smith, Gnedenko's son Dimitri, and Distinguished Visiting Professor at the George Washington University Igor Ushakov from Moscow.

At the beginning there are materials that has been abstracted by N. Singpurwalla and R. Smith from tributes paid to Gnedenko on his 50th, 60th and 70th birthdays.

In 1937, under the influence of Khinchin and Kolmogorov, Gnedenko became interested in limit theorems for sums of independent random variables. In the subsequent years, drawing upon results of de Finetti, Kolmogorov and Levy, for the class of infinitely divisible distributions, he derived a series of results in the above topic that are now regarded as his most important contributions to the theory of probability. Gnedenko's research into limit theorems were summed up in a (1949) monograph with Kolmogorov, entitled "*Limit Distributions for Sums of Independent Random Variables*". This monograph was awarded the Chebyshev prize in 1951 and was translated into many languages: English, German, Polish, Hungarian and Chinese, to name a few. This monograph resolved the classic problems of limit theorems for sums of independent random variables, begun by Chebyshev, Lyapunov and Markov.

During 1940-1943, he published several papers on limit distributions for the maximum term of a series of random variables, where he obtained the most definitive results on the necessary conditions of convergence and the domains of attraction of each of the possible limit laws. His work was the first mathematically rigorous treatment of the fundamental limit theorems of extreme value theory. In its influence on the probabilistic theory of extremes, the paper set the agenda for the next 30 years.

In 1941 he published a paper, "*Geiger-Muller Counters*," in the *Journal of Experimental and Theoretical Physics*. This paper is a landmark in what is now known as the theory of reliability. Gnedenko's contributions to the development of this subject and his role in evolution of the Soviet school of reliability are covered by Professor Igor Ushakov's postscript at the end of this interview.

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In 1950, Gnedenko's interest turned to problems in mathematical statistics. Kolmogorov and Smirnov had proved the first theorems establishing the limit distributions for the maximum deviation of an empirical distribution function from the theoretical and for the maximum difference of empirical distributions from two independent samples. Gnedenko succeeded in developing effective methods for obtaining the exact distributions in the case of finite samples in these and other related problems. This cycle of his work received worldwide recognition, because it served as a basis for compiling tables, which are valuable in applied statistics. During the sixties, Gnedenko's interests turned to a new series of problems, namely those of the theory of queues and the theory of reliability. His books on these topics, "*Mathematical Methods in the Theory of Reliability*", with Yu.K. Belyaev and A.D. Solov'yev, and "*Elements of Queuing Theory*", with I.N. Kovalenko, are familiar to anyone having an interest in these subjects.

Besides being an enthusiastic research mathematician, Gnedenko is also a brilliant teacher and popularizer of mathematics. His textbook "*A Course on Probability Theory*" has been used with universal success, both in the Soviet Union and abroad; it has been translated into all the major languages of the world. The history and philosophy of mathematics is another sphere of interest of Gnedenko. In 1946, he published his popular "*Essays on the History of Mathematics in Russia*", the only book of its kind to appear in print at that time. For his service to the development of mathematical science, his passionate support of the mathematization of science, and his years of pedagogical work. Boris Vladimirovich Gnedenko was awarded the order of the Friendship of Nations on his 70th birthday.

## THE INTERVIEW

**Smith:** Professor Gnedenko, could we please begin by asking you tell us something about your early life?

**Gnedenko:** With great pleasure. I was born in Simbirsk, a city on the Volga River. When I was 3, the family moved to Kazan. My father hoped to study at Moscow University, but the First World War intervened, and he lost any chance of studying at the university.

**Singpurwalla:** Professor Gnedenko, did your father or mother have any influence on your development as a mathematician?

**Gnedenko:** They influenced me in different ways. My father wanted me to be a medical doctor. However, I showed interest in mathematics. At my 7th year at school, I began to study mathematics on my own, solving mathematical problems from economics books. My father encouraged me. I graduated at 15 and wanted to go to a technical institute, though I was told that I should wait for 2 years because one should be 17 to go to a university.

**Smith:** Was it unusual to finish school as young as age 15?

**Gnedenko:** Yes. I entered a private gymnasium when I was 6. This was a very good school, but I was there only for half a year. After the revolution, private schools were closed and I went to a public school, which was not very good. In 1923 we moved to Galich, because my father had been advised to

change climates for medical reasons. There I was put in the same class as my brother, who was 2 years older than me. So, I graduated 2 years earlier than usual.

**Smith:** So what did you do then?

**Gnedenko:** I went to the University of Saratov in 1927. I was given the opportunity to go there by personal permission of Lunacharsky (Anatoly Lunacharsky was Minister of Culture and Education of the USSR in the 1920s). He signed a letter to permit me to enter the university. It was not simple to get that letter. Many people at the university thought he was my uncle! The very first lectures there were wonderful for me, and were a great foundation for the future. There was a very good professor of mathematics by the name of Vladimir Goldebie. He had a big influence on the students. I graduated after 3 years study.

**Smith:** Were your studies entirely in mathematics, or did they include other subjects?

**Gnedenko:** Only in mathematics. There were lectures in psychology and philosophy as well, but these were too formal for me.

**Singpurwalla:** But mathematics is very formal too.

**Gnedenko:** Oh no! In mathematics the important thing is the ideas, and only then the formalism.

**Smith:** What did you do after the graduation?

**Gnedenko:** One of the professors from Saratov University was invited to head a department at the Ivanovo Textile Institute. He asked me to join him, and I spent 4 years there. I gave lectures to the mathematics students, who, by the way, were older than I. Once I substituted two professors who were ill. During about a month, I was lecturing every day from the early morning to the late night. There I began to solve some mathematical problems arising in the textile industry, and this stimulated my interest in mathematics.

**Singpurwalla:** I notice that your first publications were about machine failures, written at the Textile Institute.

**Gnedenko:** Yes, they concerned mathematical and statistical problems of machines operation. After 4 years, I decided to continue my education. Solving some practical problems, I found that I was close to using stochastic processes to address these questions. About that time Kolmogorov and Khinchin were giving their first lectures on the topic. In 1934 I went to Moscow for 2 months and met Kolmogorov and Khinchin. After I told Khinchin that I would like to study in Moscow, he suggested me to be his student. After half a year, Kolmogorov told me that he also wanted to take me as a student. So after that I had two advisers: Kolmogorov and Khinchin.

**Smith:** What were they like?

**Gnedenko:** Very different. Khinchin was a wonderful lecturer. His language was very literal, very exact. After 5 minutes, students could understand all his ideas. Although he did not say loud, you could follow his every word. Kolmogorov was quite different. He did not like to lecture, and presented his material in a very difficult manner. The students said that they would

not want to hear even the proof of Pythagoras' Theorem if Kolmogorov would present it! However, every week he lectured on mathematical statistics and always presented new insight. Once I went to Khinchin and complained that I could not understand more than 50% of Kolmogorov's lecture. Khinchin replied, "But that is wonderful! I could never understand more than 30%!"

**Smith:** I suppose Khinchin was older than Kolmogorov. Was Khinchin head of the department?

**Gnedenko:** Yes. Kolmogorov was professor of mathematical analysis, and gave lectures in calculus and the theory of functions as well as probability and statistics. They had a very good relationship.

I did my first mathematical work in 1935. Luzin in 1915 had posed a problem concerned with the existence of an orthogonal function system. When Khinchin went to Saratov as a visiting professor, I visited him there. He posed to me the following problem: Do there exist two characteristic functions, which agree on an interval and differ elsewhere? Khinchin believed the answer was no, but I knew something about quasi-analytic functions and thought such characteristic functions had to exist. However, I could not find an example. After 2 days we met again and Khinchin asked me, if I had solved the problem. I returned to my room and could not eat or drink. I went to sleep and woke up with the solution in my head. I had found an example of two characteristic functions, which satisfied the conditions. After this I began to study infinite divisibility.

Coming to Moscow to work with Kolmogorov, I submitted two papers on limit laws. In December 1937, I was called up to the military service, but after only 2 weeks I was arrested and put in prison for 6 months!

**Singpurwalla:** Why were you put in prison?

**Gnedenko:** Three people made a report that I was a member of a counter-revolutionary organization headed by Kolmogorov.

**Singpurwalla:** What was this organization?

**Gnedenko:** There was no such organization, however it was 1937...

**Ushakov:** It was a time when enormous numbers of honest people were arrested on absurd manufactured charges.

**Gnedenko:** In the prison, once I was interrogated for 8 days in a row practically without sleep. Eventually, I decided to write a letter to "outside". I had a pencil but no paper, so I stuck cigarette papers together and wrote two tiny notices, one to my parents and another to the public procurator. A warden helped me and sent the letters to the addressees. Both letters reached their destinations, and then my parents started working to publicize my case. After another 2 months, I was released.

**Smith:** So how long were you in prison altogether?

**Gnedenko:** Six months. When I was released, Kolmogorov and Khinchin made my rehabilitation in the department possible, in spite of the opposition of some of the faculty. At that time, many of the professors were arrested, including almost all the specialists in mechanics.

**Singpurwalla:** You said that one of the reasons you were arrested was that you were a member of a counter-revolutionary organization. Does that make you a Czarist?

**Gnedenko:** It was enough if a single person would denounce you as a counter-revolutionary. If I would confirm anything against Kolmogorov, that would have been enough to arrest him.

**Singpurwalla:** And were you a counter-revolutionary?

**Gnedenko (smiling):** Yes, naturally.

**Ushakov:** All Russians are counter-revolutionary in some sense.

**Singpurwalla:** Oh, I see: it's only a question of which revolution. . .

**Ushakov:** Probably, my translation of the last Gnedenko's speech was not good enough. I should explain Professor Gnedenko's last remark. If during these 6 months in prison, he had had agreed with a slightest accusation against Kolmogorov, it would have been enough for his arrest. And arrested people had disappeared forever. . .

**Singpurwalla:** When you went back to Moscow, was this when you started your work on extreme values?

**Gnedenko:** Yes, in 1940.

**Singpurwalla:** What got you interested?

**Gnedenko:** I was reading a paper about the strength of materials when I realized that the use of extreme values in this area should be useful. I finished my paper in 1941, before the war. It was intended for a special edition dedicated to Kolmogorov works. However, with the war starting it was not printed. In 1942 Kolmogorov suggested sending the paper to an American journal "*Annals of Mathematics*", and it was published in 1943. At that time, my country had good relationship with the United States.

**Smith:** So this was by special invitation from the American journal?

**Gnedenko:** Yes. Another of my interests started in 1936 or 1937. At that time every student had to write a paper in history or philosophy. Under Professor Yanovskaya, I wrote a 200-page manuscript on the history of mathematics in Russia. However, after I handed in the manuscript I forgot about it.

In October 1941, the Nazi troops were within 10-20 kilometers of Moscow, and all people were mobilized for fortification labor. However, I was turned down when the officers realized that I was in prison. So, I went back to my university work and wrote a paper on the law of the iterated logarithm. By this time, Moscow University had been evacuated to Ashkhabad, and afterwards to Sverdlovsk. In Sverdlovsk I began working with industry on quality control.

**Singpurwalla:** Why was the paper you mentioned above published in French?  
Why not in Russian?

**Gnedenko:** The Bulletin of Moscow University required one copy in Russian and another in French, English or German. I gave it in Russian and French. The Russian version was not published, but the French one was.

**Singpurwalla:** Besides Russian and English, do you also speak French?

**Gnedenko:** I thought my French is better than my English.

**Singpurwalla:** And German?

**Gnedenko:** About the same as French.

**Singpurwalla:** Can I ask you more about Kolmogorov? He was trained in Germany, wasn't he?

**Gnedenko:** He was in Germany for a short time, in Gottingen. Then he went to France and met Maurice Frechet. He said that he had two teachers in probability, Khinchin and Frechet.

**Singpurwalla:** And where was Khinchin trained, in Russia?

**Gnedenko:** Only in Russia. He was a student of Luzin, and his early work was on the theory of functions.

**Smith:** We have talked about your work in infinite divisibility and extreme values. At what stage did you complete your doctorate?

**Gnedenko:** In 1941, my work on infinitely divisible distributions. At the thesis defense, my opponents were Bernstein, Kolmogorov and Khinchin.

**Singpurwalla:** Who had the biggest influence on your scientific life?

**Gnedenko:** I think four professors. First, Boev, whom I worked with in Ivanovo. Second, Goldebier. But most of all. Khinchin and Kolmogorov.

**Singpurwalla:** What about your book with Kolmogorov? Did you have a long scientific relationship with him?

**Gnedenko:** It was not only a scientific relationship. We were also friends. Kolmogorov proposed that I address him on a first-name basis. All my life, after 1934, I was close to Kolmogorov. After being in prison, I lived for some weeks in Kolmogorov's home. Then I began thinking about the book. I discussed it with Kolmogorov, but started writing it only in 1945, when I moved to the Ukraine.

**Smith:** So it was originally your idea to write the book?

**Gnedenko:** Kolmogorov read my manuscript and supplemented it.

**Smith:** But you initiated it?

**Gnedenko:** I prepared the plan and a first draft. However, many good ideas in it were due to Kolmogorov.

**Singpurwalla:** Professor Gnedenko, you were talking about your students. Who were the best of them?

**Gnedenko:** In 1945 I left Moscow for the Ukraine. I spent 4 years in Lvov, and 11 in Kiev. There I got students interested in mathematical statistics. In Kiev I had some very good students, Skorokhod, Korolyuk. Kovalenko and many others.

**Smith:** Who were the best from this period?

**Gnedenko:** I think I started the probability school in the Ukraine. I wanted to give the same emphasis to statistics, but young people prefer probability. I think this is wrong. Mathematical statistics is very important.

**Singpurwalla:** For me too, for all of us! But let me come back to the question: who is your best students?

**Gnedenko (laughing):** No one was best! Now my scientific grandson, Sylvestrov, a student of Skorokhod, has a great interest in problems of mathematical statistics. He organized laboratory in computational statistics.

**Singpurwalla:** Where is he?

**Gnedenko:** In Kiev. I think the best of my students were Skorokhod, Kovalenko, and Domas Szasz. There was also a wonderful mathematician from Egypt, Hossain Fahid.

**Smith:** Tell us about your well-known textbook "*Theory of Probability*".

**Gnedenko:** I started working on my textbook in 1946. It was published in 1949 in Moscow and Kiev. The second edition was published in 1954, and afterwards there were many editions in different countries.

**Smith:** I think there is now a sixth edition?

**Gnedenko:** The sixth edition is only in Russian, not in English<sup>6</sup>. This edition is revised. There is an essay on history of the probability theory, and some new scientific material.

In 1944, I met Professor Yanovskaya again, and she advised me to publish my manuscript on history.

**Smith:** This is the one you wrote back in 1937?

**Gnedenko:** Yes. It was "*History of Mathematics in Russia*" – a small book of 200 pages.

In Kiev I begin a seminar on queuing theory with both theoretical and applied directions. I began writing the first book on queuing theory, and later took Kovalenko as co-author.

**Smith:** so with this book, as with the one with Kolmogorov, you wrote the first version?

**Gnedenko:** Yes, but I think that now Kovalenko has more expertise in these field than I am. From 1957, I worked with engineers to organize a computer center in the Ukrainian Academy. This is now a big center of cybernetics.

**Singpurwalla:** Professor Gnedenko, have you had a lot of administrative responsibility?

**Gnedenko:** I don't like administration.

**Singpurwalla:** But you have done a lot of it?

**Gnedenko:** For many years I was director of the Institute of Mathematics of the Ukrainian Academy of Sciences.

**Singpurwalla:** And now you are the Chair of the Department of Probability Theory in Moscow University? Is that an administrative position?

**Gnedenko:** Not much. I prefer scientific work, lecturing and writing. I enjoy working with students. I have had over a hundred doctoral students, of whom 30 are professors in my country and abroad, and seven of them have the title of Academician. They include Skorokhod, Korolyuk, Mikhalevich, Grigelionis, Kovalenko and Yustchenko.

**Smith:** Professor Gnedenko, in 1960 you moved from Kiev to Moscow. Several years later you published a famous monograph on reliability with Belyaev and Solovyeu. How did you start working with them?

**Gnedenko:** In Kiev I was working with a group of engineers on medical diagnosis by computer. We had one case in which a heart-lung monitoring computer system failed and the patient died. After that I became interested in problems of reliability. In 1959 Belyaev came from Moscow to visit me.

**Singpurwalla:** Was Belyaev your pupil?

**Gnedenko:** No, he was Kolmogorov's. In August 1960 I moved to Moscow, and in 1963 we began writing our book "*Mathematical Methods in Reliability Theory*".

**Smith:** Yourself and Belyaev?

**Gnedenko:** And Solovyeu.

**Singpurwalla:** Was Solovyeu your pupil?

**Gnedenko:** No, he was a student of Gelfond, a good specialist in complex analysis and number theory. In 1964 we finished the first draft, and in 1965 it was published in Russian. From 1961 to 1968 I was working on queuing theory and reliability theory. In 1968 I shifted my interest to limit theorems for sums of a random number of random variables. This was motivated by problems in physics, economics and reliability. I first solved a practical problem and then solved theoretical problems. For me, that is the usual way.

**Singpurwalla:** You mean, solve a practical problem first and then develop the theory?

**Gnedenko:** Yes. After this, about 1981, my interest turned to the history of probability. I wrote a little brochure on the subject.

**Smith:** Professor Gnedenko, you are still very active and writing a number of books. Could you tell us about some of the others?

**Gnedenko:** For the past several years I have written one book a year.

<sup>6</sup> The 6th edition was translated by I. Ushakov and published in 1997 by Gordon and Breach Science Publication.

**Singpurwalla:** For how many hours do you work every day?

**Gnedenko:** Now, very few. About four hours a day.

**Singpurwalla:** I see your son disagrees with you. (Laughter.) He says more than four.

**Dimitri Gnedenko:** From five or six in the morning, and during the whole day, he is thinking or writing.

**Gnedenko:** This year, I wrote a new book for students. It is about what a mathematician is. At the beginning, I discussed the place of mathematics in our life. The second chapter gave some examples of mathematical problems with simplified solutions. The third chapter is about applications of mathematics. At the end, I discuss history of science, philosophical aspects, and methodology of teaching. Without creativity, good teaching is impossible. This year I have also written a short book for school children on mathematics and life.

**Smith:** What are your plans for future books?

**Gnedenko:** I have big plans. More than I am capable to complete, I am afraid. Now I am working on three books. The first is about limit distributions for the sum of a random number of random variables. However, there are some unsolved problems. The manuscript is half completed, though I hope to finish it this year. The second book on reliability will be written with Ushakov<sup>7</sup>. Let me explain why such a book is needed. The book "*Mathematical Methods in Reliability Theory*" was written not for engineers. It is a mathematical book and too difficult for engineers.

**Smith:** So the book with Ushakov will be more elementary?

**Gnedenko:** Yes. More elementary and more practical. The style of each chapter would be like this: it begins with description of the problem, focusing on its practical aspects, and then we are going to give the solution of the mathematical problem almost without proofs and, finally, discuss the practical applications. After this I present a mathematical supplement.

The third book is also begun, and I want to finish it quickly. It is a textbook on random processes with contributions from Belyaev, Dimitrov and Yanev from Bulgaria, and myself.

I have plans for two more books. The first is a book of memoirs of my life.

**Singpurwalla:** So, perhaps we should not be conducting this interview and should wait for the memoirs?

**Gnedenko:** In my life I have met many remarkable people. I worked in Moscow with many outstanding mathematicians, almost all of who are now dead. It is necessary to conserve memories about these people.

**Smith:** I am sure it is a book that many people will be very interested to read.

**Gnedenko:** The second book I plan is for school children "*A Journey to the Terra Mathematica*". The third is a textbook on mathematical statistics. I want to give an informal description of the methods. Here in the U.S.A., there are many good books, but they are too formal, with a lot of theoretical results without application. I think a practical book should also give an idea of the mathematical conception.

**Singpurwalla:** You have written many books. What is the motivation for writing so many books?

**Gnedenko:** I do not now what to answer.

**Singpurwalla:** Do you like writing books?

**Gnedenko:** I write quickly, and it is a pleasure for me.

**Singpurwalla:** Do you use a word processor or computer?

**Gnedenko:** No, no I use a typewriter.

**Singpurwalla:** Do you write one draft or many?

**Gnedenko:** Usually, one draft.

**Singpurwalla:** One draft only? No errors in the first draft?

**Gnedenko:** It is necessary first to think and only then to write.

There is another reason why I write so many books. On January 1<sup>st</sup>, I will be 80 years old. Eighty is not a good age to delay anything for tomorrow. I have some ideas, I have to express them. Without this I cannot rest.

**Singpurwalla:** Professor Gnedenko, in Moscow you have an institute<sup>8</sup> where a number of applied statisticians and probabilists collaborate with engineers. Can you say something about the interaction between engineers and mathematicians? Is it good? Is it active?

**Gnedenko:** In 1961, after my return to Moscow, some engineers and I organized a seminar on reliability at Moscow University. In a year that seminar became very popular and a number of engineers attended it. The Council of the seminar included two engineers, Sorin and Shor, and a very good economist, Shukhgalter. All three are dead now.

It was a very successful seminar with 800 participants, including engineers, academicians and mathematicians. Many people came from other cities for public consultations, we gave cycles of lectures for engineers. However, the last 5 years, the Gorbachev's years, were very bad for the seminar.

**Singpurwalla:** Why?

**Gnedenko:** Now the interest in quality control and reliability is low. Now I think our industry works only at 60% efficiency. The volume of production is the priority, and quality and reliability are not asked about. This is very bad.

**Singpurwalla:** Professor Gnedenko, you said that you met a lot of mathematicians in your life. Did you meet de Finetti?

<sup>7</sup> Probabilistic Reliability Engineering by B.V.Gnedenko and I.A. Ushakov. John Wiley & Sons, New York, 1995

<sup>8</sup> Singpurwalla means Moscow Consulting Center on Reliability and Quality (the so-called "Chamber of Reliability").



**Gnedenko:** Yes, in Italy. I remember him with a great pleasure. We had a discussion about subjective probability.

**Singpurwalla:** And what do you think of it?

**Gnedenko:** I think he was wrong. Science must not be personalized. Science must be objective. Personality is very important for the development of science, but science itself must be objective. I had many discussions about this subject with de Finetti, and with Professor Savage. He was very learned and modest. I think de Finetti and Savage were most important in that area.

**Smith:** De Finetti's books on the theory of probability were translated into English; were they translated into Russian?

**Gnedenko:** No.

**Singpurwalla:** Professor Gnedenko, since you have objection against subjective probability, you must have objection against Bayesian statistics also?

**Gnedenko:** I think every method has its possibilities and its limitations.

**Singpurwalla:** I agree.

**Gnedenko:** And the Bayes method has limitations. But in practice, dealing with serious problems, we should try all possible methods. I think the Bayes method has good possibilities and this method must be developed, but it is not the only one.

**Singpurwalla:** So you think that the Bayesian methods with objective probability are acceptable, but Bayesian methods with subjective probability are not?

**Gnedenko:** It is always necessary to state the assumptions. Subjective probabilities, if necessary, can be made objective.

**Singpurwalla:** Are there Bayesians in the Soviet Union? Belyaev has been writing Bayesian papers.

**Gnedenko:** Yes. Many Russian statisticians use Bayesian methods. It is impossible not to use them. These methods are important.

**Singpurwalla:** Have you used them?

**Gnedenko:** Yes. I have given my students Bayesian lectures.

**Singpurwalla:** I'd like to make a comment. When we started this interview, you said that your father wanted you to be a doctor, but you became a mathematician. Your son is a mathematician. Did you advise him to be mathematician?

**Gnedenko:** He understands applications in psychology very well. It is impossible to do good work in mathematics without applications.

**Singpurwalla:** So, Dimitri, maybe you can answer this question. Did your father have an influence on you?

**Dimitri Gnedenko:** Yes, of course.

**Singpurwalla:** And does he continue to have an influence?

**Dimitri Gnedenko:** Yes. He was my first and most important teacher. But I had others of course. Professor Solovyev in probability theory and Professor Zhuravlev in mechanics. But first and foremost is my father.

**Singpurwalla:** Have you and your father written a paper together?

**Dimitri Gnedenko:** Yes, we have some articles written together, and we plan further articles and books.

**Singpurwalla:** On reliability?

**Dimitri Gnedenko:** Not only on reliability.

**Singpurwalla:** If you write a book on reliability, make sure it is Bayesian!

**Smith:** How would you view the present state of statistics in the Soviet Union?

**Gnedenko:** There are good statisticians. Kagan was very good, but he is now in the U.S.A. Zhurbenko worked in statistics, in time series, but he is more of a probabilist than a statistician. There are many others, for example Orlov.

**Smith:** What about Chibisov? He is well known in the West.

**Gnedenko:** But his work is closer to probability. Statistics is secondary for him.

**Smith:** Is there much applied statistics in the Soviet Union?

**Gnedenko:** I don't know good applied statisticians. However, without statistics it is impossible to make progress in demography, in experimental science, in industry, in economics and so on.

**Smith:** Professor Gnedenko, we would like to thank you for talking to us. We hope you enjoy your visit to the United States.

**Singpurwalla:** Well, Professor Gnedenko and Dimitri, thank you for making your time available. We hope you like Washington.

**Gnedenko:** Thank you very much.

## POSTSCRIPT

**The following material has been provided by Professor Igor Ushakov, who has been a personal friend of Gnedenko over the last 30 years and has assisted him in many activities of the Committee of Standards of the USSR.**

Professor Gnedenko is not only an outstanding mathematician and excellent teacher, he is also an energetic participant in different kinds of public activities. I would like to say a few words about aspects of his personality that have not been covered in the interview.

In the early sixties, Professor Gnedenko established a program of seminars in reliability at the Moscow State University. It brought together people from academia and industry that were working on different aspects of reliability and quality control, and gave birth to many a specialist in reliability in the USSR. Later on, he and Ya.M. Sorin established the Consulting Center in Reliability and Quality Control at the State Committee of Standards. That Center located at the Moscow Polytechnic Museum, a traditional center of enlightenment and intelligentsia.

Gnedenko became the Scientific Head of the Center. He attracted for collaboration tens of Doctors of Sciences and Professors, who gave everyday consultations on practical reliability problems for engineers and presented weekly cycles of lectures on Reliability Theory. That Center – a unique Public Consulting Center – had been existing more than a quarter of century. Doubtless, that Center gave a birth to what we are calling now as “the Soviet School on Reliability”. просуществовал более четверти века. Namely, Gnedenko was the person who had an ability to join applied mathematicians and engineers into a common

This Center has been in operation for more than a quarter of a century, and was responsible for developing what one may call the Soviet School of Reliability.

Professor Gnedenko's scientific generosity is reflected in the fact that he has been an adviser to more than 100 Ph.D.'s, many of whom have become members of the All-Union and Republican Academies of Sciences.

An incident not known to a wide circle of people, and briefly touched upon in the interview, pertains to the episode of his imprisonment. Neither Gnedenko nor Kolmogorov talked about it. I have known about this side of Boris Vladimirovich life from his wife, Natalya Konstantinovna. Telling me the story, she added: "Igor, please never say this to anybody, because Boris and Andrei don't like to advertise this and show the public their deep feelings for each other." Now Gnedenko told about that time himself.

Gnedenko is a real representative of the Russian intelligentsia. He reads a lot of fine literature, and knows much poetry. In his library, you can find a great number of art albums with reproductions from all over the world art museums. He does not like the modern art but he is very tolerant to those who do. This tolerance is one of his main virtues. His collection of musical recordings is tremendous. He likes "classical classics": Bach, Mozart, Beethoven, Tchaikovsky, and Rachmaninoff. There is also a collection of Orthodox Russian Church liturgy. And of course splendid Russian romances.

Professor Gnedenko is an excellent storyteller: soft spoken and artistic. At the same time, he also possesses a wonderful ability to listen to others. All that makes a relationship with him comfortable and simple for anybody. A combination of scientific renown and human qualities makes Professor Gnedenko one of the foremost academicians of recent time.

Photo below: Gnedenko in Washington

