

In Memory of Boris Teodorovich Polyak

... I saw Boris for the last time at the beginning of October 2022. Boris looked unwell and left the meeting early. I called him to ask about his health a couple of days later. He shocked me with the news that he had been diagnosed with incurable stage 4 cancer. Completely devastated, I remained silent. And then Boris told me that he had lived a very interesting and fruitful life and was not afraid of an impending end.

I want to commemorate this remarkable person and his life.

We are of the same age and could have met at the school mathematic circles. We could have been same-year students at Moscow State University (MSU) since 1952, but at that time there were very specific formal requirements for an applicant's resume (nationality) that played a big role. Consequently, Boris failed the interview. He described to me what happened in detail. Many things from that time are painful memories.

Boris was among those who had to look for some technical university for higher education. He entered the Moscow Institute of Steel and Alloys. Even though Boris was not admitted to the Department of Mechanics and Mathematics (MSU), he became a true mathematician. This was a rare exception. While he studied very well at the technical university, he never stopped dreaming of being a mathematician. Fortunately, times changed by his graduation.

For two years, Boris worked at the Institute for Theoretical and Experimental Physics (ITEP), where Alexander S. Kronrod played the leading role.

Kronrod was an outstanding person and a very talented researcher and organizer. He considered himself the last student of Nikolai Nikolaevich Luzin. Sasha Kronrod started out as a pure mathematician even before the Great Patriotic War. At the beginning of the War, he volunteered for the front and was wounded twice. In 1943, Kronrod was discharged for health reasons; in 1944, he resumed his studies at the Department of Mechanics and Mathematics (MSU). He started developing the theory of bivariate functions (functions of two variables). This theory constituted the basis of his candidate's dissertation, and the degree was conferred in 1949. Soon, Kronrod left theoretical mathematics, apparently having anticipated great changes in science in the second half of the 20th century associated with the advent of new computing tools. In the 1950s, he headed an ITEP laboratory where computers were used to solve physical problems of developing atomic weapons.

Boris Polyak worked at ITEP for about two years, fully mastering cybernetics, computer science, and computational mathematics. In 1960, he entered the graduate school of the Department of Mechanics and Mathematics (MSU). We got acquainted in 1961, on our way from Pskov to Leningrad to attend the Fourth All-Union Mathematical Congress (in fact, the last one). Boris joined our university's group of friends, which included R.L. Dobrushin, F.A. Berezin, V.A. Uspensky, N.D. Vvedenskaya, R.A. Minlos, L.R. Volevich, A.A. Zaliznyak, and his wife E.V. Paducheva...

Amateur sports and hiking were part of youth culture at that time. Boris immediately took part in skiing and kayaking trips around the Moscow Region; the following year, he started hiking. In the summer of 1963, Boris and I went on a trip in the Eastern Sayan Mountains.

Since then and for many years to come, Boris went on distant hikes. One of such trips could have ended tragically. There were four participants in the journey through the Northern Urals: Nikita Vvedenskaya, Mikhail Lidov with his student, and Boris Polyak. When Boris broke his leg in the tundra, he was doomed to certain death. However, Misha Lidov displayed unbelievable courage: to rescue Polyak, he walked for twenty hours without rest, finding his way along the Ural mountains, reached a settlement, arranged a helicopter rescue operation for Boris, and found his friends, navigating from the air! This was a true act of heroism.

Boris very quickly entered the mathematical milieu. In 1966, the International Mathematical Congress was held in Moscow. Boris Polyak was appointed Secretary of the Section of Mathematical Problems of Control Systems, whose Chairman was Andrei Nikolaevich Kolmogorov. B.T. Polyak brilliantly coped with his duties.

In 1966, the Chair of Optimal Control Problems was established at the Department of Mechanics and Mathematics (MSU). To address the new demands, it was necessary to organize special courses and seminars at the Chair. A research seminar on the theory of extremum problems was organized, headed by V.M. Alexeev and V.M. Tikhomirov. A.D. Ioffe, I.V. Girsanov, and B.T. Polyak took an active part in the seminar. The paper “Extremum Problems in the Presence of Restrictions” (*USSR Computational Mathematics and Mathematical Physics*, 1965, vol. 5, no. 3, pp. 1–80) published by A.Ya. Dubovitskii and A.A. Milyutin had a great impact on the extremum theory. Alexey Alexeevich Milyutin also actively participated in the seminar. Boris Teodorovich Polyak was immediately involved in the development of numerical optimization methods. Seminar participants repeatedly requested him to carry out numerical calculations for the solutions of particular non-standard extremum problems.

In March 1968, the Letter of the 99 was signed in defense of Yesenin-Volpin, a mathematician who was forcibly committed to a psychiatric hospital in connection with his dissident activities. Boris Teodorovich Polyak was among the signatories. This letter was one of the reasons behind his dismissal from MSU. In 1971, Boris began working at the Institute of Control Sciences, the USSR Academy of Sciences, as a senior (then leading and chief) researcher. Subsequently, he became the head of a laboratory. Polyak’s research activities at the Institute were very successful. He obtained many outstanding results and was given several awards, including the Euro Gold Medal (EGM) of the Association of European Operational Research Societies (2012). Boris Polyak founded a large mathematical school. Yu.E. Nesterov, one of his students, became an internationally known expert in numerical methods and artificial intelligence.

Boris Polyak was a loyal friend and a comrade. Working at MSU, he became very friendly with Igor Vladimirovich Girsanov. In the early 1960s, Girsanov gave an excellent special course on the theory of extremum problems. In particular, the course included the Dubovitskii–Milyutin theory and was quite complex. The course was published on an offset duplicator to be given to students. Unfortunately, Girsanov perished during a trip in the summer of 1967. Boris then published his lectures in MSU Press in 1970. Boris Teodorovich also translated this book, and it was subsequently published in English. Note that a reprint of the 1970th edition appeared in 2003.

Boris Teodorovich Polyak was a close friend of Nikita Dmitrievna Vvedenskaya. She played an exceptional role in bringing together a whole generation of outstanding representatives of science and culture. People of various professions (mathematicians, linguists, physicists, historians, philologists, and even art critics) were Nikita’s friends and kith. All of them were extraordinarily substantial and profound people.

On particularly solemn occasions, Nikita invited several dozen friends. However, only about ten people gathered at Nikita’s last birthday party on October 9, 2021. By then, Nikita was in no condition to prepare the party herself, so Boris organized it. In the last six months of Nikita’s life, Boris took special care of her, visiting her almost daily.

Nikita passed away on May 6, 2022. We—seven friends—gathered to remember her on her birthday, October 9 of the same year. It was my last meeting with Boris, which I have mentioned above. In December 2022, I sent Boris my article in memory of Nikita Vvedenskaya, and Boris actively discussed it with me.

I was told that Boris showed concern for his students up till early 2023, a few days before he passed away.

The memory of Boris Teodorovich Polyak will forever remain in the hearts of those who knew him.

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