

The articles in this issue  
are dedicated to the memory of  
S. I. Zuchovitsky



**Semion Israilevich Zuchovitsky**

(to the centenary of his birth)

Semion Israilevich Zuchovitsky was born on June 17, 1908 in a little town Olkiniki, not far from Vilno (now Vilnius, Lithuania). His father, Israel Zuchovitsky, was a rabbi, and there were rabbis in many generations of Zuchovitsky family. In 1911 he got a position of a rabbi in Cherikov, Mogilev region, Belarus, and the family moved there.

S. I. studied in a heder (elementary Jewish religious school), then continued his religious study with his father and simultaneously was engaged in self-education. Israel Zuchovitsky was an outstanding scholar. He was also an exceptionally honest and wise person highly respected in Cherikov even after the October revolution. He insisted on S. I. continuing the family tradition and becoming a rabbi. They made an agreement: S. I. will continue his secular education only after the completion of his religious studies. In 1924 a respected committee of rabbis examined him, and he received "smicha" (rabbinical diploma). Afterward S. I. entered the last grade of secondary school. In one year he finished the secondary school (1925), and after this he taught for one year in the

Cherikov seven-year school. In 1926, by the advice of Naum Ilyich Akhiezer (they knew each other from Cherikov, where Akhiezer's father was a doctor), S. I. went to study in Kiev. As a rabbi's son he was denied the possibility to be a regular student. So he became an extern student at the Kiev Institute of Public Education where he studied mathematics and physics. He graduated after only a year and a half of studies. Starting from 1930, S. I. taught mathematics in the Kiev Institute of Leather Industry.

The scientific interests of S. I. were formed under the influence of N. I. Akhiezer, who at this time was already a well-known mathematician. S. I. began to work on the theory of approximations and in 1937 defended his Ph.D. thesis "About the approximation of functions on a small interval". In the dissertation he applied the S. N. Bernstein's ideas to solve the old P. L. Chebyshev's problem of the best approximation on a small interval. After the defense he became an Acting Chair of the Math. Department of the Institute of Leather Industry. He also was working at the Kiev State University and at the Institute of Mathematics of the Ukrainian Academy of Sciences. It became apparent that S. I. had an extraordinary pedagogical talent. In 1938 for the first time in the history of the Kiev State University S. I. taught the course of real analysis. Among his first students were M. A. Krasnoselsky, S. G. Krein and many others.

With his help the best real analysis book of the time by P. S. Aleksandrov and A. N. Kolmogorov was translated to Ukrainian, and later, after the war, S. I. organized the Ukrainian translation of the real analysis course by I. P. Natanson. Together with N. N. Bogolubov, he edited the Ukrainian translation of "The Course of Functional Analysis – linear operations" by Stephan Banach (1948). This was the only edition of Banach's book in the former Soviet Union.

The war with Nazi Germany started on June 22, 1941. On June 25 S. I. volunteered to join the army in spite of having the exemption from the draft as a Chairman of the Department of Mathematics. In September of 1941 his unit was surrounded in Poltava region and S. I. was taken prisoner. S. I. remembered that he had seen the Germans undressing the prisoners they suspected being Jewish and killing them on the spot. Also they had dogs trained "to smell Jews". Dogs approached S. I. too, but did not identify him as a Jew.

After two weeks in the prisoners camp not far from Kiev S. I. managed to escape by joining the column of released prisoners, under the cover of twilight (October 10, 1941). He came to his old friend professor Yurii Dmitrievich Sokolov and his wife Maria Aleksandrovna. They sheltered him at the Kiev Astronomical Observatory (to save S. I., Sokolov agreed to become the director of the observatory). During two years, risking their lives, Sokolovs were hiding S. I. there. They arranged for S. I. to have a job as an yard-keeper under a Ukrainian name Semen Ivanovich. A small group of confidants helped Sokolovs: Kalustyan family (Sokolov's neighbors), M. T. Glushko – a physics professor at the Kiev Pedagogical Institute, a yard-keeper of the observatory I. S. Polonchuk and his family (Polonchuk later was drafted and killed in the war at the end of 1943), V. H. Dolinsky (the laboratory assistant of the Leather Industry Institute). For several weeks during summer of 1943 S. I. was hiding at the place of the old worker P. L. Svyatoha.

S. I. recalled that all the time during those two years he had felt being on a death row, never knowing what to expect tomorrow. One of the many critical moments was when the German authorities received information, apparently from one of the workers at the observatory, that a Jew was hiding there. Luckily, a German officer, who was sent to investigate the matter, was not very diligent. He came to the Sokolovs and asked if it was true that there were Jews at the observatory. The Sokolovs, speaking German, convinced him that it was a mistake, and the officer left.

During these two years S. I. was reading a lot, in Russian and in French (he did not want to read anything in German).

The liberation came on November 6, 1943, when the Red Army entered Kiev. For many years S. I. and M. T. Glushko were celebrating the 6-th of November at Sokolov's home. Later, after immigrating to Israel in 1975, S. I. added the names of Yurii Dmitrievich Sokolov and Maria Aleksandrovna Sokolov to the list of "the righteous of the world" in Yad VaShem, the Holocaust memorial in Jerusalem.

From December of 1943 to September of 1949 S. I. was teaching at the Kiev State University. His lectures were very clear, concise and accessible, and his ability to captivate the audience and establish the warm relationship with the students left a deep impression on many of his students. For many years his lectures were remembered with great warmth by Yu. M. Berezansky, Yu. L. Daletzky, G. I. Katz, V. S. Korolyuk, V. S. Mikhalevich, A. V. Skorokhod, P. S. Sobolevsky and others.

In 1951 S. I. defended the Doctor of Science dissertation "Some aspects of the Chebyshev approximation" at the Institute of Mathematics, Ukrainian Academy of Science. It was difficult time for Jewish scientists, and the support of N. N. Bogolubov was very essential. One of the most important results of the dissertation was the construction of the algorithm for the best approximation of a system of inconsistent linear equations. As it became clear later, this method is very similar to the well-known Dantzig's Simplex Method, discovered approximately at the same time. S. I. extended his algorithm to the solution of a system of linear inequalities and to the problem of Chebyshev's approximation of a continuous function on a compact set. Using the works of M. G. Krein on the connection between the Chebyshev's approximation problem and the L-problem of moments, S. I. gave the complete and beautiful construction of the classical theory of Chebyshev's approximation on the compact set, including the problems of existence, uniqueness and the characterization of the best approximation. The joint with M. G. Krein article "Notes on one possible generalization of A. Haar's and A. N. Kolmogorov's theorem" was the beginning of S. I.'s research on the Chebyshev's approximations in Hilbert and Banach spaces. These works were continued in his Doctoral Dissertation and in joint works with S. B. Stechkin, G. I. Eskin, R. A. Polyak and M. E. Primak, and others.

From 1947 to 1952 S. I. was a professor at the Kiev Pedagogical Institute. Anti-Semitism was on the rise, and in spite of the successful defense of Doctoral Dissertation, in 1952 S. I. was fired. He was forced to leave Kiev. At the initiative of his former student Stella Sergeevna Kalinovskaya, in 1953 S. I. was invited to work in the Lutsk Pedagogical Institute.

From 1953 to 1957 S. I. was the Chairman of the Department of Mathematics there. Here his outstanding qualities as organizer and administrator became evident. With his arrival the Lutsk Pedagogical Institute experienced the upsurge in the mathematical life.

S. I. revitalized the teaching process in the Mathematics Department, organized a seminar on the theory of approximation (the seminar continues to this day). He attracted to the department a number of capable persons, in particular, V. K. Dzyadyk in spite of the strong resistance of the administration. His main "fault" was that he did not die in the camp for war prisoners, knew some foreign languages, could speak German. These were the reasons for him to be departed after graduation from the University of Dnieperpetrovsk to one of the remotest Volyn countries where he was teaching mathematics and German at a secondary school. Being an excellent mathematician, he prepared a lot of pupils for the mathematical competitions. This made it possible to contact the lecturers of the Lutsk Pedagogical Institute where he called S. I.'s attention to himself. S. I. began to plead with Lutsk Party administration for giving to V. K. Dzyadyk the assistant position at the institute. And he gained his ends. V. K. was admitted to there. Within four years he succeeded in taking both candidate's and doctor's degrees in mathematics.

Some later he was elected by a member of Ukrainian Academy of Sciences. Today we know V. K. Dzyadyk as one of the greatest authorities in the approximation theory.

The Lutsk period was very fruitful in S. I. research work. Not a few of his remarkable disciples and followers such as V. K. Dzyadyk, S. S. Kalinovskaya, G. I. Eskin, V. I. Gorbachuk, O. I. Stepanetz, I. O. Shevchuk, P. V. Zaderey, A. S. Romanyuk, A. S. Serdyuk and others, are related directly or indirectly to the mathematical school started by S. I. Zuchovitsky at the Lutsk Pedagogical Institute.

In 1958 S. I. is again working in Kiev, first in the Kiev Institute of the Food Industry, and later in the Kiev Pedagogical Institute. At that time the article of the renowned Swiss mathematician E. Stiefel was published and it had a very strong influence on the future course of S. I. scientific research. In this work Stiefel had shown that the Zuchovitsky's algorithm and the algorithm of the well-known Belgian mathematician Valle-Pussen coincide correspondingly with the direct and the dual problems of the Dantzig's Simplex Method. S. I. rewrote his algorithms for the Chebyshev's approximation, using a more efficient technique of Jordan eliminations, which was used in the Simplex method. But most importantly, he decided to switch to applied mathematics, working on problems related to economics, operation research and game theory. His scientific work got a fresh start.

The first important achievement in this area was a joint work of S. I. with his students and close collaborators R. A. Polyak and M. E. Primak, where the algorithm for solving the convex programming problem in the finite dimensional space was constructed. This work contains a new idea which made it possible to modify the gradients method to ensure the convergence of the algorithm. The similar idea was independently proposed by Dutch mathematician G. Zoitendeik. In subsequent works S. I. Zuchovitsky, R. A. Polyak and M. E. Primak constructed algorithms for the solution of the problem of the rational Chebyshev's approximation, convex programming in a Hilbert space and numerical methods of finding the equilibrium points of concave games. S. I. Zuchovitsky, R. A. Polyak and M. E. Primak were working also on the interesting applied problems: an algorithm for the solution of the details unification problem, mathematical models and methods for the solution of the urban planning problems, etc.

With the help of his student L. I. Avdeeva, S. I. wrote a monograph "Linear and Non-linear Programming". It is one of the best books on the linear and nonlinear programming which combines high mathematical standards and strict rigor with the exceptional simplicity, brevity and clarity. The book became very popular in the Soviet Union, where it was published twice. It was translated into English, German and Bulgarian. With his another student I. A. Radchik, S. I. wrote a monograph "Mathematical Methods of the Network Planning". It was a book on a relatively new subject at the time. It also was very successful and was translated into German in the East Germany (two editions) and into Czech.

One of the important initiatives of S. I. was the establishment of the Mathematical Programming Seminar at Kiev House of Science and Technology. First of all, it was an active and productive scientific seminar which attracted many Kiev mathematicians. But also it gave the opportunity for many young mathematicians to start scientific research without being accepted to the graduate studies at the university. S. I. organized university level mathematical courses for engineers there and succeeded to attract many of the leading Kiev mathematicians (Yu. Daletzky, M. Gorbachuk, V. Gorbachuk, G. Katz, B. Korenblum, L. Nizhnik, and others) to teach these courses. He always remembered that he had been forced to be an extern. For many bright graduates of technological and pedagogical institutes these courses gave the possibility to improve and enrich their mathematical education and opened the opportunity for them to become mathematicians. After S. I. left Kiev this program was run for many years by Boris Khatset.

In 1965 S. I. moved to Moscow, where he was invited to organize the Department of Applied Mathematics at the Moscow Institute of Construction Engineering (MISI). S. I. took the job with great enthusiasm. He started many new courses at the department, organized a scientific seminar, hired many actively working applied mathematicians. The MISI Department of Applied mathematics began to gain recognition in Moscow. S. I. continued the connection with the Kiev Mathematical Programming seminar which now was lead by Roman Polyak and Matvey Primak.

Soon S. I. initiated and accomplished a new wonderful project: in 1968 he organized the All-Union Winter School on Mathematical Programming in Drogobych. The Winter school was a great success. 180 mathematicians from all the Soviet Union came. Encouraged by this S. I. started to organize the Winter Schools in Drogobych every year. All together he organized 8 Winter Schools from 1968 to 1974, and each following school was larger and more successful then the previous. S. I. organized the publication of the Proceedings of the Winter Schools. He mobilized leading mathematicians to serve as referees for the papers submitted for the publication to ensure the high quality of the Proceedings. Looking back it's really amazing what a difference one person can make. The ideas of all these original projects belong to S. I., and their realization was done single-handedly by S. I. with the help of his graduate students, mainly R. Polyak and M. Primak. The Drogobych Schools ceased to exist after S. I. left the Soviet Union.

In the beginning of 1975 S. I.'s wife, Asya Haritonovna, passed away. It was a very hard blow.

In the Fall of 1975 S. I. immigrated to Israel. S. I. was able to teach from the first year of his arrival because his Hebrew was fluent. He was one of the handful of the new immigrant from the Soviet Union who knew Hebrew (Professor Motzkin and his wife Naomi were stunned by his perfect Hebrew when they met him in Moscow in 1966 during the International Mathematical Congress). S. I. was teaching at the Hebrew University of Jerusalem in the Department of Applied Mathematics and in the Department of Statistics, and at Beer-Sheva University in the Department of Mathematics. Lectures of S. I. in Israel were very successful and attracted a record number of students. Following the old tradition S. I. organized a seminar in applied mathematics at Beer-Sheva University which also was a success.

S. I. taught in Israel for 10 years until the age of 80. It was a remarkable achievement.

In 2001 the Zuchovitsky scholarship for graduate students was established at the Hebrew University of Jerusalem.

Semion Israilevich Zuchovitsky considered his immigration to Israel as the realization of his dreams. He died in Jerusalem on December 2, 1994. He was a remarkable person and mathematician who left a deep mark in the lives of his students and the people close to him.

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