János Balázs

János Balázs was born in Békéscsaba, December 29, 1919. He completed elementary and junior high school ("polgári iskola") in Békéscsaba in 1933, during the Great Depression. His father, a railroad brakeman, wanted his son to become a locomotive engineer apprentice for the Hungarian National Railroad, which would have assured him a safe and steady job. However, he was rejected because he was below the legal minimum age of 14. Thus his father allowed him to continue in school. As the top student in his junior high school class, he was admitted to the Agricultural High School of Békéscsaba with a tuition waiver and free books, and he graduated there with honors in 1937. At this school, he had excellent teachers who, beyond teaching their subjects, thought that an important part of their job was to teach logical thinking. During his work as an educator he himself followed their example.

In 1941 he graduated at the top of his class from the College for Junior High School Teachers in Szeged, where he got the Diploma of a junior high school teacher in mathematics, physics and agriculture. From 1941 through 1943 at the same institution, at the department headed by Béla Szőkefalvi-Nagy he worked as an unpaid college instructor. He was teaching recitation sections for the professor and was writing a textbook for the college. Simultaneously he was attending the university in Szeged; in 1943 he obtained the Diploma with honors, which qualified him to teach in Teachers' Training Institutes. He could support himself only by tutoring and by teaching part-time in the Junior High School of Makó and in the vocational school in Szeged. He spent a half year in the Teachers' Training Institute of Sepsiszentgyörgy as a substitute teacher.

In 1944 he had an offer for four years in the Teachers' Training Institute of Baja. However, the war interfered. He was drafted into the army and served

in the anti-aircraft artillery. He was captured by the Soviet Army on April 5, 1945, and he spent the next three and a half years as a prisoner of war in the Soviet Union.

After coming home from the prisoner of war camp in November 1948, he obtained a position as a teacher in the Lyceum and Teachers' Training Institute of Zalaegerszeg. Soon after, he was appointed Director of the Institute. In 1950, one year after the founding of the University for Chemical Industry in Veszprém, he was invited by the then head of the Department of Mathematics, László Fejes–Tóth, as a senior assistant professor ("adjunktus"). He worked there until 1952, when he was appointed as the executive secretary of the Department of Mathematics and Physics of the Hungarian Academy of Sciences, and he moved to Budapest. This position was heavy with organizational responsibility, and later he was able to use well the organizational skills, knowledge and experience which he developed in this job.

During the Hungarian uprising of 1956, he was a member of the Revolutionary Committee of the Central Office of the Hungarian Academy of Sciences.

In 1956 he began work as a researcher at the Institute for Applied Mathematics of the Hungarian Academy of Sciences. As the Scientific Secretary of this Institute from 1956 to 1966, he played an important part in shaping its role and future. The Institute had been founded in 1949 to conduct research in probability and mathematical statistics, with applications in mechanics, electrical engineering, chemical engineering and biology. It was during his years as the Scientific Secretary that the Institute underwent a major transformation. In order to unify the functions of theoretical and applied research, the mathematical scope of the institution was broadened, and more branches of theoretical mathematics were added to its mission. The departments of functional analysis, differential equations, approximation theory, geometry, algebra and complex function theory were founded. This transition created the present-day Mathematical Research Institute of the Hungarian Academy of Sciences.

From 1968, for two years he was the Director of the Computing Center of the Hungarian Academy of Sciences. He negotiated the purchase of the first modern mainframe computer for the Hungarian Academy of Sciences, a CDC 3300 which was bought from the United States. He also oversaw the installation of the computer and the related construction required by the sensitive equipment. The difficult installation task was made even more complicated by strict external constraints. It had to be carried out in a medieval building in the Castle District of Buda, and every move required the prior approval of the historic preservation authorities. As the result of his efforts, modern computer science was introduced into the scientific life of Hungary.

After leaving the Computing Center, he spent one year as an engineering and scientific advisor at the Industrial Management Institute of the Ministry for Metal and Machine Industry.

From 1971 until his retirement, he worked at Eötvös Loránd University as a Scientific Advisor (research position, equivalent to academic rank of full professor), first at the Department of Numerical and Computational Mathematics and then at the Department of Numerical Analysis, after its foundation.

Always, he was an active participant in the public and organizational aspects of his profession. He shaped not only the institutions in which he worked, but also the entire profession of mathematics. He was the Scientific Secretary of the János Bolyai Mathematical Society from 1956 to 1964. From 1956 to 1960 he served as an outside consultant to the Mathematics Committee of the Hungarian Academy of Sciences, and then from 1960 to 1968 he served as the Secretary of this committee. Also, for six years he was a member of the Mathematics Committee of the Scientific Qualification Board, which was in charge of granting Candidate of Science and Doctor of Science degrees. While he was the Scientific Secretary of the Mathematical Research Institute and simultaneously the Scientific Secretary of the János Bolyai Mathematical Society, he organized the Second Hungarian Mathematical Congress, in 1960. This conference was especially significant because, for the first time after the war, participants from western countries came to a Hungarian scientific conference, and they came in large numbers.

He got his education as a mathematician at the best scientific school of the time, the University of Szeged. There he had the privilege to learn mathematics from Frédéric Riesz, who shaped the foundations of real and functional analysis in the twentieth century, and such other outstanding mathematicians as Béla Szőkefalvi–Nagy, Gyula Szőkefalvi–Nagy, Béla Kerékjártó, László Rédei, and he learned physics from Ágoston Budó. This beginning defined his viewpoint and his scientific career. From these professors he learned the state of the art in mathematics, and he learned how to pose problems in mathematics, how to look for solutions, and how the results of mathematics can be used.

While in Szeged, he had started to work on his Ph.D. dissertation in algebra, under Rédei, when the war intervened. The events of the coming years made it impossible for him to complete this dissertation. Later, in 1960, he obtained the higher degree of Candidate of Mathematical Science, by virtue of which he also received a university Ph.D.

It was in 1954, while working at the Academy of Sciences, that he began work toward the degree of Candidate of Mathematical Science. His advisor was Paul Turán. Under Turán's influence, he started to deal with approximation, specifically with the theory of interpolation. The series of articles "Notes on

Interpolation [1, 3, 6, 10, 12]" written jointly with Turán is one of the works of greatest influence in this area. One of several topics which they discussed was lacunary (Birkhoff) interpolation. In particular, they studied closely $(0, 2)$ interpolation, the construction of polynomials which simultaneously interpolate a function and its second derivative, which is of immediate interest in the theory of differential equations of Liouville type. Using as nodes the roots of integrals of the Legendre polynomials, they obtained basic results about the existence, uniqueness and convergence of this interpolation procedure. Furthermore they proved a sharp inequality for these polynomials. Other mathematicians joined in these investigations, both in Hungary and abroad, publishing articles in Hungarian and foreign mathematical journals. This topic is still under intensive investigation today.

There are also other important results published in the same series of articles on the convergence of approximation processes on infinite intervals [10], and also on the approximation of the Fourier transform [12]. János Balázs started the investigation of weighted lacunary interpolation processes [9], also discussing the question of stability in these procedures. He also proved a very interesting inequality for the Hermite polynomials, the sharpness of which cannot be improved [8]. These results also have a big echo even today.

Many thoughts and ideas of his have not been published in his works. Many of these ideas are referenced in the works of others. One can see in the list of references of many articles, "Private communication from J. Balázs." For example, he proposed a procedure for interpolation by rational functions, and József Szabados, Gábor Somorjai and Tamás Hermann obtained nice results based on it. Other of his ideas are seen in the works of his many students, and some of these ideas have been thus indirectly transmitted all around the world. As an example, at his suggestion and with his advice, one of his students, Y. E. Muneer, developed a method for obtaining good simultaneous approximation of a function and several of its derivatives by an interpolating polynomial and its corresponding derivatives. This work, with both theoretical and practical implications, opened an entire new area of contemporary approximation theory. Those who have been heavily influenced by this work include József Szabados, Péter Vértesi, and Katherine Balázs, Theodore Kilgore (Auburn), Jürgen Prestin and Manfred Tasche (Rostock) and their students, Giuseppe Mastroianni (Potenza) and his students, and Arun Varma (Gainesville). As the late Géza Freud, then head of the Department of Approximation Theory in the Mathematical Research Institute, once put it, "János, you are the most philanthropic mathematician that I know. You give topics to everybody."

He recognized very early the significance of spline functions in the theory of approximation and numerical mathematics and initiated the research on spline

functions in Hungary by calling the attention of several of his students to this area and also to the applications of spline functions in the numerical solutions of differential equations.

His interest in mathematics has always been multidirectional. His work in discrete geometry provided the breakthrough on a well-known problem of László Fejes-Tóth [22].

He has always emphasized the importance of the applications of mathematics. He himself has applied mathematics to different and distant areas of life. He published several joint articles with Károly Seitz in which algebraic methods were used to handle problems in chemical engineering. In a project for the Research Institute for Industrial Furnace Design and Technology, he and the physicist László Brájer jointly provided mathematical and physical modeling of the physical processes inside of smelting furnaces. He also has been very interested and involved in mathematical modeling for economics and finance. At the request of the Hungarian National Bank, he worked out an optimal method for the repayment of commercial loans. In another project for the Bank, he used operations research and spline approximation methods to give quarterly estimates for cash on hand needed to meet the net volume of salary payments in the country, ensuring that not too much money was kept out of circulation to meet this periodically recurring need. These results were published in joint articles with finance and banking experts in a financial journal [16, 17].

As a teacher, he has taught at almost every type of educational institution in Hungary, from junior high schools to the major universities of the country. Always, he has conducted the teaching and educating of the young with great enthusiasm and expertise. He held lectures regularly at Eötvös Loránd University and at the University of Veszprém. He has designed and taught elective courses at the graduate level, introducing the students to the current level of research. He has been the advisor for numerous students for the Diploma dissertation.

He has helped many in starting their scientific careers: seven have written their Ph.D. dissertations under his guidance. Five have received the degree of Candidate of Mathematical Science under his official guidance. Always having been very generous with topics, ideas and encouragement, he also has acted as a consultant and mentor for six more mathematicians on their path toward the candidate degree.

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