

## **In memory of Béla Gyires**

**(March 29, 1909 – August 26, 2001)**

Hungarian mathematicians lost their doyen and friend, Béla Gyires, in August 2001. He was active in mathematics even in his last year, he made a short remark on a problem of matrix theory, more precisely on van der Waerden's conjecture about permanents [106]. It is not much of a surprise for us that he was a member of the Hungarian Academy of Sciences and received the greatest award in research and science of the Hungarian Government. We have to note, that he was always involved in daily work, lectures, writing papers and so on, and he never paid much attention to titles and decorations. Gyires was born in Zagreb, the capital city of Croatia, at that time belonging to the Kingdom of Hungary. After the First World War his family left Zagreb and came to Debrecen, Hungary. He completed his studies in Debrecen and Budapest and graduated from the University of Budapest. In 1941 he took his doctor's degree. It was a good choice of Gyires and also of the University of Debrecen (Lajos Kossuth University) that after the Second World War he came back to Debrecen, where he was working at the university for the rest of his life. He was an excellent mathematician and one of the best in the applications of mathematics. He devoted his life to university teaching and research. Professor Béla Gyires was an excellent lecturer, he had always a lot of students and many of them became teachers in secondary schools, university teachers and professors.

His teaching and research had an impact not only on the University of Debrecen and Hungarian mathematics, but even on international scientific life. He published more than one hundred technical papers, one book, and numerous reports. He retired when he was seventy, but he never left the University of Debrecen. He was awarded the professor emeritus title but in reality he was working as a full professor until his last days.

His research interests covered a wide range. Here we can list only a few major points.

1. Works in the theory of matrices, where he got a lot of results on classical problems [2–7, 9, 11–15, 17, 21, 52, 83, 92, 99].

2. In the theory of permanents and van der Waerden's conjecture he worked from the sixties. In this field his most famous result is the elementary proof of the fact that the permanent of a doubly stochastic matrix is greater than or equal to  $n!/n^n$ . In this field he published the following papers: [38, 41, 54, 57, 61, 62, 67, 82, 87, 92, 98, 102–106].

3. The main and most important topics of his activity were probability theory and mathematical statistics. In these fields we have to mention here the following:

3.1. Matrix theory of extrapolation and Toeplitz matrices. He developed the theory of stationary matrix-valued stochastic processes. In this theory block Toeplitz matrices generated by matrix-valued functions play an important role. He generalized some results due to Szegő, to Helson and to Lowdenslager. His results were cited in the survey papers of H. Widom (*Advanced Mathematics* **13** (1974), 284–322; **21** (1976), 1–29).

3.2. In his paper (*Eine Verallgemeinerung des zentralen Grenzwertsatzes*, [24]) he proves an interesting result in central limit theory for a sequence  $\zeta_n = \xi_1 + \dots + \xi_n$ , where  $\xi_k = \theta_{\eta_{k-1}, \eta_k}^{(k)}$ , with the random variables  $\theta_{h,j}^{(k)}$  which are mutually independent and  $\eta_n$  is a Markov chain (with states  $1, \dots, p$ ). Gyires shows that if the chain is ergodic and the conditional distributions of  $\xi_k$  under the conditions  $\eta$  have zero mean and finite second moments, and a condition of Lindeberg type is satisfied then  $\zeta_n$  has a limit Gaussian distribution. His papers in this field are [8, 20, 24, 56, 58, 91].

3.3. Professor Gyires was the first mathematician who systematically investigated limit distributions of linear order statistics [43]. He proved limit theorems for independent and for dependent random variables, as well. He also introduced doubly ordered linear rank statistics [75]. He considered the following form of linear rank statistics:  $S_{n,m} = \sum_{j=1}^m f_j(X_{R(X_j)}^{(j)})$ , where the  $X_i$  are independent and identically distributed, and the rank of  $X_i$  is denoted by  $R(X_i)$ . He proves that  $S_{n,m}$  converges weakly. He also discussed approximations of two sample methods. His papers in this field are the following: [39, 43–45, 47, 51, 53, 59, 68, 71, 75, 76].

3.4. One of his main results which is known all over the world is related to constant regression of polynomial statistics on linear statistics. In this field he started with the paper [46]. He continued investigations made by Linnik and Zinger. His results concerning characterization by polynomial statistics are mentioned in the well-known book of Lukács and Laha (Applications of Characteristic Functions, Griffin's Statistical Monographs and Course, 1964). His results are mentioned also in the books of the Russian mathematicians Ju. Linnik and V. Zolotarev. Gyires considers in [55] the quadratic statistic

$$Q = \sum_{j=1}^n \sum_{k=1}^n a_{jk} \xi_j \xi_k,$$

with real coefficients. If the random variables  $\xi_i$  are independent and identically distributed, then under some restrictions the characteristic function is an entire function having the form  $f(z) = \exp(\varphi(z))$ , where  $\varphi$  is also given. We mention here the papers in this field [46, 48, 55, 60, 64, 66, 70, 72, 85, 100].

3.5. Professor Gyires developed a systematic investigation of the decomposability of distribution functions. His main results can be found in his very nice book [101]. He shows that if  $G(z, x)$  is a stochastic kernel, i.e., for each  $x$ ,  $G(\cdot, x)$  is a distribution function, and for each  $z$ ,  $G(z, \cdot)$  is measurable, then under some conditions  $F = \int G(z, x) dH(x)$  is a mixture. His approach consists of defining a metric on a convex set of distributions. Here, we mention his papers in this field [73, 77, 78, 81, 84, 88, 93, 101].

4. As an applied mathematician Béla Gyires was the best student of Károly Jordán. His first work was an interesting solution of some problems in insurance mathematics. Later, in the fifties he was involved in several problems of biological, computational and engineering type. He was interested not only in problems that were currently investigated in Debrecen, but in those of other Hungarian mathematical centres too. We mention here his papers [1, 10, 33, 34, 42, 89, 94].

5. Gyires was director of the Mathematical Institute of the university for more than 15 years. He founded the Computing Centre. He introduced the teaching of computer science and information technology. He was active in organizing teaching and research and he published some papers in this field [16, 27, 28, 36, 40].

6. Béla Gyires was very much interested in the history of Hungarian mathematics, and he studied the work of Rados, Rényi, Jordán, Dienes, Barna, and even that of the Hungarian researchers in natural sciences (see the papers [31, 35, 37, 49, 50, 86, 96, 97]).

Professor Gyires has been awarded many prizes and distinctions, and he was member of several scientific societies. He was member of the Biometric Society, the Bernoulli Society, and the International Statistical Institute. At the University of Debrecen, he was the chairman of a department, the director of the Institute of Mathematics, the dean of the Faculty of Sciences, Honoris Causa Doctor of the University. He was also chairman of the John von Neumann Computer Society, and member of many committees of the Hungarian Academy of Sciences and of universities.

We shall preserve the memory of our teacher and of a great mathematician.

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