Chronicle

In memory of Gennadiy Petrovych Chistyakov (1945–2022)

Gennadiy Petrovych Chistyakov was born on May 1, 1945 in the city of Nizhyn, Chernihiv region, in the family of a military man. Then the family moved to Kharkiv, where Gennady Petrovych entered the secondary school in 1952.

In 1962, he enrolled to the Kharkiv University in the Department of Mechanics and Mathematics, and then, in the same place, the graduate school. In the 1970s, G. Chistyakov was hired as a junior researcher at the department of function theory of the Institute for Low Temperature Physics and Engineering of the National Academy of Sciences of Ukraine. In November 1971, he was called up for military service in the Soviet army, during which he defended his PhD thesis on the topic "Application of the theory of analytic functions to the study of decompositions of probability distributions." After completing his military service, G. Chistyakov returned to scientific work at Institute. In 1990 he defended his doctoral thesis "Stability of decompositions of distribution laws."

The main areas of scientific interests of G. Chistyakov during his life in Kharkiv were the stability of decompositions of probability laws, the class I_0 in the arithmetic of probability laws (in particular, a generalization of the Cramer theorem on the components of the Gaussian law), questions connected to approximation of sums of independent random variables.

The first published scientific works of G. Chistyakov were devoted to quantitative estimates of the stability of decompositions of the convolution of the

Gaussian and Poisson laws. They were included in his PhD thesis, carried out under the guidance of I.V. Ostrovskii. (Before his work, the stability of decompositions of only the Gaussian and Poisson laws were studied separately.) The result of a long-term research was an order-exact stability estimate for decompositions of the convolution of the Gaussian and Poisson laws in the uniform metric and a close-to-exact estimate in the Lévy metric. We note that he also obtained exact (in the order of magnitude) stability estimates for the decomposition of the Poisson law and the Gaussian law in the Lévy metric (for the Gaussian law, in a joint work with L.B. Golinskii).

G. Chistyakov was the first to obtain stability estimates of decompositions for a wide class of infinitely divisible laws. In the 1980s, he obtained upper and lower bounds for the stability of decompositions of the Yu.V. Linnik class of laws with entire characteristic functions whose Lévy spectral mass of some neighborhood of the origin is equal to zero. He also contributed to the study of stability of the Marcinkiewicz–Ostrovskii theorem, as well as the stability of decompositions in special functional semigroups.

At the beginning of his research career, G. Chistyakov obtained an excellent result in the classical field of arithmetic of probabilistic laws. According to the Cramer theorem, if the convolution of two probability laws is normal, then each of the two laws is also normal. Linnik and Skitovich proved a similar statement for symmetric charges of finite variation satisfying some additional conditions. G. Chistyakov managed to replace these conditions with weaker ones, which are satisfied for all probability distributions. Hence, his result generalizes both the Linnik–Skitovich theorem and the Cramer theorem.

In the fundamental problem of describing the class I_0 of infinitely divisible laws that have only infinitely divisible components with respect to convolution, G. Chistyakov obtained a bright result. Having significantly developed analytical methods by Yu.V. Linnik and I.V. Ostrovskii, he proved the validity of the following hypothesis formulated by Yu.V. Linnik: For an infinitely divisible law of the Linnik class to belong to the class I_0, it is sufficient that the characteristic function of this law be entire.

In the problem of describing of the class I_0, G. Chistyakov also owns a result containing the theorem of Yu.V. Linnik on the necessity condition for belonging to the class I_0 of an infinitely divisible law with a Gaussian component, as well as an analogue of this theorem obtained by A.E. Fryntov, in which the a priori condition was imposed on the Poisson mass near zero.

In the second half of the 1980s, G. Chistyakov addresses the question of obtaining exact error estimates in the central limit theorem and, in particular, the question posed in 1953 by A.N. Kolmogorov about the asymptotically best constants in the Berry–Esseen inequality. In 1990, he refuted one of the Kolmogorov hypotheses. Developing the research of Yu.V. Linnik, K.-G. Esseen, B.A. Rogozin, he obtained in the early 2000s exact values of the asymptotically best constants in the Berry–Esseen inequality in the most general case, that is, under minimal assumptions on random variables. These results were a consequence of a new asymptotic expansion in the central limit theorem with an error estimate

of order greater than one with respect to the Lyapunov ratio obtained by him. Close to these studies is the large work of G. Chistyakov from 1991, devoted to the approximation of n-fold convolutions by infinitely divisible laws.

First-class results are contained in the works of G. Chistyakov with his students L.B. Golinsky and S.Yu. Pergamentsev. These are quantitative estimates of the stability of the Marcinkiewicz–Ostrovskii theorem, a deep generalization of one theorem of A.M. Kagan, which in turn generalizes the classical Skitovich–Darmois theorem to the case of complex random variables and to the case when distribution functions are replaced by functions of finite variation. In joint work with Yu.I. Lyubarskii and L.A. Pastur profound results are obtained on the completeness, minimality, and Riesz basis property of systems of exponentials with random exponents in the Paley–Wiener and Bargmann–Fock spaces of entire functions.

Since the late 2000s, G. Chistyakov worked in Germany at the Bielefeld University in the scientific group "Probability Theory and Mathematical Statistics". During this time he published several major cycles of works. One of them, in a joint work with F. Götze, is devoted to limit theorems in the free probability theory. In these works, motivated by problems from the theory of random matrices, important results were obtained both on the rate of convergence of free convolutions and on the arithmetic of distributions in free probability. Another series of works, jointly with S. Bobkov and F. Götze, is devoted to the convergence of sums of random variables to the Gaussian law in the sense of entropy.

Gennadiy Petrovych died after a serious illness on December 31, 2022. Until his last days he was active in scientific work, participated in seminars and discussions with his colleagues. Gennadiy Petrovych was a wonderful person. Sociable, friendly, he was always ready to help. His memory will forever live on in the hearts of those who knew him.

Editorial board