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IOSIF IL'ICH GIKHMAN

(on his sixtieth birthday)

On 26 May 1978 Iosif Il'ich Gikhman, a well-known Soviet mathematician and leading specialist in probability theory and mathematical statistics, celebrated his sixtieth birthday.

Gikhman' was born in Uman'. In 1939 he graduated from the Kiev State University, after which he went on to graduate studies under the supervision of N. N. Bogolyubov. From 1941 to 1945 he was an officer in the Soviet army and took part in battles against the German invaders. While in the army, he defended his Ph.D dissertation in 1942. After demobilization Gikhman worked in Higher Educational Institutes in Kiev; from 1948 to 1966 he was a lecturer, then Professor and Head of the Department of Probability Theory of the Kiev State University. In 1965 he was elected a Corresponding-Member of the Academy of Sciences of the Ukrainian SSR. Since 1966 he has been Head of the Department of Probability Theory of the Institute of Applied Mathematics and Mechanics of the Academy of Sciences of the Ukrainian SSR in Donetsk, and has been in charge of the scientific work of the Department of Probability Theory at the Donetsk State University.

Gikhman's work has been mainly devoted to various questions of the theory of random processes and mathematical statistics. He made a very substantial contribution to the theory of stochastic differential equations, being one of the founders of this important trend in probability theory. Even in his first papers, developing ideas of Bogolyubov, Gikhman began to study the behaviour of dynamical systems under the influence of random perturbances. Generalizing the concept of a dynamical system under the influence of random perturbances, he arrived in 1947 at the definition of a stochastic differential equation. In subsequent papers he investigated existence and uniqueness conditions for solutions of stochastic differential equations, he studied their dependence on the initial data, deduced the inverse Kolmogorov equations for the transition probabilities, and justified Bogolyubov's averaging method for random processes that are solutions of stochastic differential equations. In recent years Gikhman and his pupils have begun to study certain classes of stochastic partial differential equations.

A second important topic in Gikhman's research is limit theorems for random processes. In this field he was the first to work out certain approaches that were new in principle. He proposed a general method of constructing asymptotic expansions for distributions of additive functionals of a Markov chain that converges to a continuous diffusion process (1952). He obtained the first theorems on the convergence of functionals of a sequence of sums of independent random variables for the case when the limiting process with continuous increment is discontinuous (1953), Gikhman also was the first to observe the fact that invariance is lacking in limit theorems for certain classes of additive functionals, such as the number of times a random curve intersects some domain (1957).

A number of new classes of limit theorems for random processes were obtained by Gikhman in connection with the investigation of the asymptotic properties of statistical criteria. To him is due the idea of the wide applicability of the theory of Markov processes and limit theorems for such processes to problems of mathematical statistics. His D.Sc. dissertation (1955) was devoted to this theme.

Gikhman's scientific activity has continuously been associated with teaching activity. He has trained a large number of pupils, among whom one now holds a D.Sc. and several Ph.D's. To him we owe the creation of a school of probability theory in the Ukraine. He is the author of textbooks and scientific monographs, including the three-volume *Teoriya sluchaynykh protsessov* (Theory of random processes) (in collaboration with A. V. Skorokhod), which is the most complete exposition of this theory.

Iosif Il'ich Gikhman has arrived at his sixtieth birthday in the full flower of his creative force. We wish him further success with all our hearts.

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LIST OF THE PUBLISHED WORKS OF I. I. GIKHMAN

[1] On the influence of a random process on a dynamical system, Nauchn. Zap. Kievsk. Gos. Univ. **5** (1941), 32 (in Ukrainian).

[2] On boundary transitions in dynamic systems. Nauchn. Zap. Kievsk. Gos. Univ. **5** (1941), 141–149 (in Ukrainian).

[3] On the effect of a random process on a dynamical system, Dissertation, Kievsk. Gos. Univ. (1941).

[4] On a scheme for the formation of random processes, Dokl. Akad. Nauk SSSR **58** (1947), 961–964. MR **9**–293.

[5] On some differential equations with random functions, Ukrain. Mat. Zh. **2**:3 (1950), 45–69. MR **14**–61.

[6] On the theory of differential equations of stochastic processes, Ukrain. Mat. Zh. **2**:4 (1950), 37–63. MR **14**–61.
= Amer. Math. Soc. Transl. (2) **1** (1955), 111–137. MR **17**–502.

[7] On the theory of differential equations of stochastic processes. II, Ukrain. Mat. Zh. **3** (1951), 317–339. MR **14**–1101.
= Amer. Math. Soc. Transl. (2) **1** (1955), 139–161. MR **17**–502.

[8] On some applications of the method of superior functions to problems of surface theory, Summaries of papers, Sci. Session Kievsk. Gos. Univ. Sect. Math. (1951), 3–4 (in Ukrainian).

[9] On a criterion of fit for discrete random variables, Dopovidi Akad. Nauk Ukrain. RSR, **1952**, no. 1, 7–9 (in Ukrainian). MR **15**–724.

[10] On an empirical distribution function in the case of data grouping, Dokl. Akad. Nauk SSSR **82** (1952), 837–840. MR **13**–666.
= Select. Transl. Math., Statist. and Probability, **1**, 77–81, Inst. Math. Statist. and Amer. Math. Soc., Providence, R.I., 1961. MR **22** # 7211.

[11] On a theorem of N. N. Bogolyubov, Ukrain. Mat. Zh. **4** (1952), 215–219. MR **17**–738.

[12] On a refinement of the law of large numbers, Dokl. Akad. Nauk SSSR, **91**:4 (1953), 715–718.

[13] On some non-parametric problems of statistics, Summaries of papers, Ninth Sci. Session Kievsk. Gos. Univ. Sect. Math. (1952).

[14] On an asymptotic theory for the sums of small random terms, Trudy Inst. Mat. i Mekh. Akad. Nauk Uzbek. SSR, **1952**, no. 10, part 1, 36–43.

[15] Some remarks on Kolmogorov's goodness-to-fit criterion, Dokl. Akad. Nauk SSSR **91** (1953), 715–718. MR **15**–452.

[16] On a theorem of A. N. Kolmogorov, Mat. Sb. Kievsk. Gos. Univ. **12**:7 (1953), 75–94. MR **17**–1096.

[17] Some limit theorems for conditional distributions, Dokl. Akad. Nauk SSSR **91** (1953), 1003–1006. MR **15**–445.

[18] On some limit theorems for conditional distributions and on problems of mathematical statistics connected with them, Ukrain. Mat. Zh. **5** (1953), 413–433. MR **15**–722.
= Select Transl. Math. Statist. and Probability, **2**, 5–26, Amer. Math. Soc., Providence, R.I., 1962. MR **27** # 789.

[19] Markov processes in problems of mathematical statistics, Ukrain. Mat. Zh. **6** (1954), 28–36. MR **17**–980.

[20] Development of probability theory in Ukraine, Pratsy Kyyivs'k. Univ. Prirodn. Nauk. **1954**, 54–94 (with B. V. Gnedenko). (in Ukrainian).

[21] On a question in the theory of the ω^2-criterion of compatibility, Mat. Zb. Kievsk. Gos. Univ. **1954**, no. 5, 51–60 (in Ukrainian).

[22] Markov processes and some problems of mathematical statistics, D. Sc. dissertation, Kiev 1955.

[23] Development of probability theory in Ukraine, Ist.-Mat. Issled. **1956**, no. 9, 477–536 (with B. V. Gnedenko).

[24] Asymptotic properties of certain statistics similar to X^2, Teor. Veroyatnost. i Primenen. **1** (1956), 344–348. MR **18**–945.

[25] Non-parametric methods of statistics, Proc. Third All-Union Mat. Congr., vol. 3 (1956), 320–334 (with B. V. Gnedenko and N. V. Smirnov).

[26] Some boundary theorems for the number of intersections of the boundary of a given domain by a random function, Nauchn. Zap. Kievsk. Gos. Univ. **16**, Mat. Sb. Kievsk. Gos. Univ. **1957**, no. 10, 149–164 (in Ukrainian).

[27] On a non-parametric criterion of comparison of k samples, Teor. Veroyatnost. i Primenen. **2** (1957), 380–384. MR **19**–993.

[28] Asymptotic partitions of the number of intersections of a random function with the boundary of a given domain, Vestnik Kievsk. Gos. Univ. **1**, Ser. Astronom. Mat. Mekh., **1958**, no. 1, 24–46 (in Ukrainian).

[29] A limit theorem for the maxima in a sequence of random variables in a Markov chain, Teor. Veroyatn. i Primenen. **3** (1958), 166–172. MR **20** # 2792.
[30] Some theorems on empirical functions of a partition, Vestnik Kievsk. Gos. Univ. **1**, Ser. Astronom. Mat. Mekh., **1958**, no. 2, 13–29 (in Ukrainian).
[31] On the question of the number of intersections of a random function with the boundary of a given domain, Proc. All-Union Conf. Theory Prob. and Math. Statist. (Erevan 1958), Izdat. Akad. Nauk Armyan. SSR, Erevan 1960, 247–262. MR **32** # 3126.
[32] Mathematical statistics, In: *Matematika v SSSR za 40 let* (Forty years of mathematics in the USSR), Vol. 1 (1958), 797–808 (with N. V. Gnedenko).
[33] Boris Vladimirovich Gnedenko, Uspekhi Mat. Nauk. **17**:4 (1962), 191–200 (with A. N. Kolmogorov and V. S. Korolyuk).
[34] Markov chains, in: *Ukrayins'ka radyans'ka entsyklopediya* (Ukrainian Soviet Encyclopaedia), vol. 8 (1962).
[35] Markov processes, *Ukrains'ka radyans'ka entsyklopediya* (Ukrainian Soviet encyclopaedia), vol. 8 (1962).
[36] *Otsenki parametrov sluchainykh velichin.* (Estimates of the parameters of random variables), Obshch. Znanie KDNTI' 1964, 1–40.
[37] Differential equations with random functions, Winter School on Probability Theory and Math. Statistics, Uzhgorod 1964. Izdat. Akad. Nauk Ukrain. SSR, Kiev, 1964, 41–86. MR **31** # 6037.
[38] *Vvedenie v teorii sluchainykh protsessov*, Nauka, Moscow 1965 (with A. V. Skorokhod). MR **33** # 6689.
Translation: Introduction to the theory of random processes, Saunders, Philadelphia–London–Toronto 1969. MR **40** # 932.
[39] On the stability of solutions of stochastic differential equations, Ukrainsk. Mat. Zh. **17**:6 (1965), 3–21. MR **43** # 6996.
[40] On the stability of solutions of stochastic differential equations, In: *Predeh'nye teoremy i statisticheskie vyvody* (Limit theorems and statistical deductions), Izdat. Fan., Tashkent 1966. MR **40** # 944.
= Selected transl. math. statistics and probability, Amer. Math. Soc., Providence, R.I., vol. **12** (1973), 125–154.
[41] On the densities of probability measures in function spaces, Uspekhi Mat. Nauk **21**:6 (1966), 83–152 (with A. V. Skorokhod). MR **34** # 3609.
= Russian Math. Surveys **21**:6 (1966), 83–156.
[42] Stochastic differential equations, Abstracts and Communications Sci. Conf. Donetsk. Gos. Univ, Donetsk 1960, 189–190.
[43] On the spectrum of high-frequency noise in electron-hole junctions, *Poluprovodnikovaya tekhnika i mikroelectronika* (Semiconductor techniques and microelectronics) part 2, Akad. Nauk Ukrain. SSR 1967, 54–66 (with A. S. Taratuta and M. I. Yadrenko).
[44] Some limit theorems for stochastic differential equations, *Matematicheskaya fizika* (Mathematical physics), part 4, Naukova Dumka, Kiev, 1968, 28–33.
[45] *Stokhasticheskie differentsial'nye uravneniya,* Izdat. Naukova Dumka, Kiev 1968 (with A. V. Skorokhod). MR **41** # 7777.
Translation: Stochastic differential equations, Springer–Verlag, Berlin–Heidelberg–New York 1972. MR **49** # 11625.
[46] Convergence to Markov processes, Ukrain. Mat. Zh. **21** (1969), 316–324. MR **39** # 6384.
[47] On the mean number of "methane-spark" explosions, Proc. Cybernetics Seminar (Donetsk Branch), **1969**, no. 1, 51–65.

[48] *Osnovye ponvatiya teorii veroyatnosti* (Principal concepts of probability theory), Donetsk. Gos. Univ., Donetsk 1970, 1–52.

[49] Stochastic differential equations and limit theorems. Proc. Sixth Math. Summer School, Probability Theory and Math. Statist. (Katsiveli 1968), Akad. Nauk Ukrain. SSR Inst. Mat., Kiev 1969. MR **42** # 8582.

[50] On the weak compactness of the set of measures corresponding to solutions of stochastic differential equations, Mathematical Physics, no. 7, Izdat. Naukova Dumka, Kiev 1970, 49–65. MR **42** # 4146.

[51] The statistical theory of non-linear systems with discontinuous trajectories, Proc. Fifth Internat. Conf. Non-linear Oscillations (Kiev 1969) Vol. 1; Analytic methods in the theory of non-linear oscillations, Izdat. Inst. Mat. Akad. Nauk Ukrain. SSR Kiev, 1970, 193–205. MR **48** # 9844.

[52] Limit theorems of the theory of probability, *Istoriya otechestvennoi matematiki* (History of Soviet mathematics), Vol. 4, bt. 2, Naukova Dumka, Kiev, 1970, 13–29.

[53] On the weak convergence of measures corresponding to random processes to a Markov measure, Congrès Internat. des Mathématiciens, Nice 1970, 138–139.

[54] *Teoriya sluchainykh protsessov* vol. 1, Nauka, Moscow 1971 (with A. V. Skorokhod). MR **49** # 6287.
Translation: The theory of stochastic processes. I, Springer–Verlag, Berlin–Heidelberg–New York 1974. MR **49** # 11603.

[55] Some models of random fluctuations, *Vychisl. Prikl. Mat.* (Kiev) **14** (1971), 36–47 (with A. S. Taratuta and M. I. Yadrenko). MR **46** # 10152.

[56] *Vvedenie v teoriyu mery* (Introduction to measure theory), Donetsk Gos. Univ 1971.

[57] On random events, *U sviti matematyky* (In the world of Mathematics), no. 3, Kiev 1971, 27–48 (in Ukrainian).

[58] Application of the methods of probability theory and mathematical statistics to the solution of problems of scheduling, All-Union Sci.-Tech. Conf. Application of probability theory and mathematical statistics in the national economy, Abstracts of papers, Kishenev 1972 (with V. V. Baklan and Yu. N. Lin'kov).

[59] Some results of the study of stochastic differential equations, Theory of random processes, no. 1 (with I. I. Kadyrova), Naukova Dumka, Kiev 1973, 51–68. MR **52** # 1280.
= Theory of stochastic processes, no. 1, Wiley & Sons, New York–Toronto 1973, 58–76. MR **50** # 3286.

[60] Limit theorems for sums of infinitely small random terms, Internat. Conf. on Probability Theory and Mathematical Statistics, Abstracts of papers, vol. 1, Vil'nius, 1973.

[61] *Teoriya sluchainykh protsessov*, vol. 2, Nauka, Moscow 1973 (with A. V. Skorokhod). MR **49** # 6288.
Translation: The theory of stochastic processes. II, Springer–Verlag, Berlin–Heidelberg–New York 1975. MR **51** # 11656.

[62] *Teoriya martingalov i ee primeneniya* (Theory of martingales and its application), Donetsk. Gos. Univ., 1973.

[63] Limit theorems for sequences of arrays of random variables, Theory of random processes, No. 2, Naukova Dumka, Kiev, 1974, 37–47. MR **51** # 14208.

[64] The representation of continuous random processes by means of processes with independent increments, Theory of random processes, no. 3, 22–30. Naukova Dumka, Kiev, 1973. MR **51** # 9188.

[65] Difference martingales of two arguments, Proc. School and Seminar on the Theory of Random Processes (Druskininkai 1974), Part I, Vil'nius 1975, 35–69. MR **53** # 14648.
[66] Two types of stochastic integrals with respect to martingale measures on the plane, Dopovidi Akad. Nauk Ukrain. RSR Ser. A, **1975**, no. 11, 963–966 (with T. E. Pyasetska). MR **53** #9375.
[67] Stochastic integrals with respect to difference martingales on the plane, DEP VINITI, No. 1427–75, 1975 (with T. E. Pyasetska).
[68] *Teoriya sluchainykh protsessov* (Theory of random processes), Vol. 3, Nauka, Moscow, 1975 (with A. V. Skorokhod).
[69] Quadratically integrable difference martingales of two arguments, Teor. Veroyatn. i Mat. Stat. (Kiev), **15** (1976), 21–30.
[70] *Upravlyaemye sluchainye protsessy* (Controlled random processes) Naukova Dumka, Kiev, 1977 (with A. V. Skorokhod).
[71] Controlled stochastic differential equations without charge, *Teoriya sluchainykh protsessov* (Theory of random processes), Naukova Dumka, Kiev, 1977, no. 5. 14–21. (with A. P. Gatun).
[72] On the existence of solutions of a class of stochastic partial differential equations, Dopovidi Akad. Nauk Ukrain. RSR, **1977**, no. 5, 389–390 (with T. E. Pyasetska).
[73] On the existence of solutions of a class of stochastic equations containing white noise, DEP VINITI, No. 1056–77, 1977, (with T. E. Pyasetska).
[74] On a class of systems of stochastic differential equations of hyperbolic type containing two-parameter white noise, Second Conf. on Probability Theory and Math. Statist., Vil'nius 1977. Vol. 1, 98–99.

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