# DAMIR ZYAMOVICH AROV
# (TO 80th BIRTHDAY ANNIVERSARY



On the 29th of June, 2014, it became 80 to an outstanding Ukrainian mathematician Damir Zyamovich Arov who made fundamental contributions to various branches of contemporary mathematics. He was born in Kyiv, in a teacher's family. After graduating from the Odessa State University (1957), D.Z. worked for two years as a teacher of secondary school. All his subsequent activities were associated with the Odessa Pedagogical Institute (today the South-Ukrainian National Pedagogical University), where he grew from a post-graduate student to professor and department head.

Damir Zyamovich put his hand to scientific research as far back as he was a student of the Odessa University, under the direction of A.A. Bobrov who guided his graduate work in 1956–1957. They had two joint works on the probability theory. Arov's master thesis on the information theory, where the idea was suggested to apply his notion of entropy to characterize the degree of mixing of dynamical systems, was noted by A.N. Kolmogorov.

The post-graduate education was guided by V.P. Potapov. The first Arov's thesis presented in 1964 dealt with the calculation of entropy of automorphisms of compact commutative groups (multi-dimensional case) and topological similarity of the automorphisms. An active participation of D.Z. Arov in Potapov's seminars of the sixties stimulated the turn of Arov's interests to the dissipative system theory, the $J$-inner matrix-valued functions, and related continuation problems.

At the same time, D.Z. Arov attended Krein's lectures and Krein's seminars which were the center of mathematical life in Odessa. Among the seminars' subjects, a significant place belonged to problems of scattering theory, harmonic analysis of non-selfadjoint

operators, and spectral theory of a string. D.Z. Arov was highly impressed by the M.G. Krein regular discussions of the new results of B. Sz.-Nagy and C. Foias on the theory of non-selfadjoint operators and, quite new for that time, the Lax-Phillips approach to scattering theory. The interest of both D.Z. Arov and V.M. Adamyan (Krein's post-graduate student) gave the start for their collaboration lasting for many years. They generalized the Lax-Phillips scattering scheme and considered connection of this generalized scheme with standard scattering theory, with Nagy-Foias work on the unitary dilations and characteristic function of a contraction, with optimal prediction of weak stationary stochastic processes.

This led D.Z. Arov and V.M. Adamyan to investigation of special groups of unitary operators called the unitary couplings of semi-unitary operators. In an attempt to understand the couplings theory and its connection with stationary processes, they arrived at the problem known as Nehari one and found the solvability criterion for it. When M.G. Krein was acquainted with the criterion, he emphasized that in either case, a lot of classical and new problems, including the Caratheodory-Fejer, Schur, and Nevanlinna-Pick ones can be added to the problem mentioned above. Starting from 1967, D.Z. Arov, V.M. Adamyan, and M.G. Krein obtained a number of important exhaustive results in this direction. This theory became a mathematical foundation for the $H_\infty$-control method in the optimal control theory.

In the Doctor of Science thesis "Linear stationary passive systems theory with losses" (1986), the well known Darlington's method of realization of ideal finite linear electrical networks with minimal losses was extended to non-rational scattering matrices and used in the solution of an inverse problem for canonical differential systems and Feller-Krein strings with losses and in the development of a general theory of passive scattering systems with losses. The generalized Schur and Caratheodory problems were formulated and studied. The class of right regular J-inner matrix functions was introduced and investigated (for a special $J$ such are the classes of resolvent matrices of generalized Schur and Caratheodory problems in the completely indeterminate case). These results were later developed by D.Z. in his joint works with M.A. Kaashoek and D. Pik, J. Rovnyak, M. Nudelman and S. Saprikin (the latter two were post-graduate students of D.Z.), O.J. Staffans and M. Kurula. With the last two D.Z. were developing for more than 10 years a new state/signal systems theory.

The thesis results on the J-inner matrix functions and their applications o generalized interpolation problem and inverse problems for canonical differential systems, as well as the theory of de Branges spaces, were developed for the subsequent 20 years in D.Z.'s joint work with H. Dym, with applications to interpolation and extension problems for matrix functions, inverse problems for integral and differential systems and optimal prediction problems for stochastic processes. This collaboration has been summarized in two joint monographs, "J-contractive matrix valued functions and related topics" (2008) and "Bitangential direct and inverse problems for systems of integral and differential equations" (2012).

D.Z. Arov is not only a brilliant mathematician who has solved a lot of difficult problems, initiated a number of directions, and found a deep connection between them, he has also a personality with his own opinion on everything. If he starts something, and at first sight this seems to be misleading, be sure that the end of the story will be successful. His personality possesses a high-order attraction potential. He is well educated, and any conversation with him brings pleasure. As ever, today he has a big store of interesting, still unsolved problems and a vast reserve of creative energy. We wish him health, happiness and all the best for many years in order to be able to solve the problems, hidden in his store.

*Editorial Board*