



OPERATOR THEORY, PARTIAL DIFFERENTIAL EQUATIONS AND APPLICATIONS

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This special issue on Operator Theory, Partial Differential Equations and Applications is dedicated to the memory of Professor Ciprian Foias.

Ciprian Foias was an outstanding and influential Romanian-American mathematician who made fundamental contributions to both operator theory and partial differential equations. He received his doctorate from the University of Bucharest in 1962, under the supervision of Miron Nicolescu. He taught at his alma mater (1954–1958) and at the Mathematics Institute of the Romanian Academy (1958–1978). After defecting, he claimed political asylum in France and was a visiting professor at Paris-Sud University. He held positions at Indiana University (1979–2000) and Texas A&M University (2000–2016), ultimately with the title of Distinguished Professor at both institutions.

Consonant with the title of this journal, the work of Professor Foias was both pure and applied. He collaborated with economists, engineers and physicists, as well as with mathematicians. Together with Sz-Nagy, he proved the celebrated commutant lifting theorem which resulted in important contributions to control theory. His papers with Colojoara on generalized spectral operators, and with Apostol and Voiculescu on quasitriangular operators had a profound effect on operator theory. There are two seminal papers with Prodi on the Navier-Stokes equations. One developed the concept of statistical solutions, forming the foundation for the rigorous treatment of turbulence. The other introduced the notion of determining modes, which led to estimates with Constantin and Temam on the dimension of the global attractor and inspired recent work on data assimilation by nudging. Also with Temam is the paper giving the spectral characterization of the Gevrey norm. Professor Foias authored or co-authored over 500 papers, 11 books and is listed as an ISI highly cited researcher. His influence continues through the 19 PhD students he directed.

Professor Foias received a number of well-deserved honors for his work. He was an invited speaker at the International Congress of Mathematicians, twice: in 1970 in Nice, France, and in 1978, in Helsinki, Finland. In 1995 he was awarded the Norbert Wiener Prize in Applied Mathematics, and in 2000 the Bela Szökefalvi-Nagy Memorial Medal from the University of Szeged. He was given honorary degrees from the University of Timisoara in Romania, and from the Vrije Universiteit in Amsterdam. Professor Foias continues to be honored by prizes and lectures in his name: the Ciprian Foias Prize in Operator Theory from the American Mathematical Society, the Ciprian Foias Prize to students at Indiana University, and the Foias Lecture Series at Texas A&M.

In this special issue we present papers authored by a selected group of experts in the areas of operator theory, PDEs and their applications. The papers collected

here have been contributed by collaborators, friends, former PhD students and colleagues of Professor Foias. The special issue contains twenty-one papers contributed by researchers from Brazil, Canada, France, Israel, Italy, the Netherlands, Russia, Ukraine, United Kingdom, and the USA. We refer the reader to the article, Ciprian Ilie Foias 1933–2020, in the Notices of the American Mathematical Society for personal reflections on Ciprian by many contributors to this special issue as well as by others who were influenced by his work and friendship.

These papers cover a wide spectrum of important problems and topics of current research interest, including de Branges spaces, time-frequency representation of nonstationary signals, series of free R-diagonal random variables, saturation of turbulent flow by suspended particles, space and time analyticity for inviscid equations of fluid dynamics, a determining form for the 2D Rayleigh-Benard problem, probabilistic kernel support vector machines, the computation of wandering points on the global attractor by means of symmetry-breaking perturbations, Nernst-Planck-Navier-Stokes systems near equilibrium, spectral structure of solutions to the Navier-Stokes equations with constant energy and enstrophy, optimal time averages in non-autonomous nonlinear dynamical systems, Toeplitz operators, criticality of the Navier-Stokes regularity problem, the inviscid limit problem for the Navier-Stokes equations, a variational approach to the Navier-Stokes equations, optimal minimax bounds for time and ensemble averages for the incompressible Navier-Stokes equations, Hilbertian approximation of monotone operators, spectrum and analytic functional calculus in real and quaternionic frameworks, a K -theory problem about threshold commutants mod normed ideals, turnpike properties for discrete-time optimal control problems with a Lyapunov function, and a negative minimum modulus theorem and surjectivity of ultradifferential operators.

Therefore, we feel that this special issue will be highly important for many mathematicians and applied scientists, who are interested in recent developments in operator theory and partial differential equations, as well as in its numerous applications.

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