



PREFACE: ANALYSIS AND PDE

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This special issue on Analysis and PDE is dedicated to the memory of Professor Louis Nirenberg.

Louis Nirenberg was an outstanding Canadian-American mathematician who worked in the fields of partial differential equations and geometric analysis. Many of his contributions are fundamental, such as his strong maximum principle for second-order parabolic partial differential equations and the Newlander-Nirenberg theorem in complex geometry.

Louis Nirenberg was born in Hamilton, Ontario and attended Baron Byng High School and McGill University, completing his BSc in both mathematics and physics in 1945. He was invited to enter the graduate school of the Courant Institute of Mathematical Sciences at New York University and obtained his doctorate in mathematics in 1949, under the direction of James Stoker. In his doctoral work, he solved the “Weyl problem” in differential geometry, which had been a well-known open problem since 1916. Following his doctorate, he became a professor at the Courant Institute, where he remained for the rest of his career. He was the advisor of 45 PhD students, including Walter Craig, Peter B. Gilkey, Djairo Guedes de Figueiredo, Sergiu Klainerman, YanYan Li, Chang-Shou Lin, Wei-Ming Ni, Martin Schechter, and Gabriella Tarantello, and published over 170 papers with a number of coauthors, including notable collaborations with Henri Berestycki, Haim Brezis, Luis Caffarelli, and Yanyan Li, among many others.

Nirenberg’s work was widely recognized, including the following awards and honors: Bôcher Memorial Prize (1959), Elected member of the American Academy of Arts and Sciences (1965), Elected member of the United States National Academy of Sciences (1969), Crafoord Prize (1982), Jeffery-Williams Prize (1987), Elected member of the American Philosophical Society (1987), Steele Prize for Lifetime Achievement (1994), National Medal of Science (1995), Chern Medal (2010), Steele Prize for Seminal Contribution to Research (2014), with Luis Caffarelli and Robert Kohn, for their article on the Navier-Stokes equations, and the Abel Prize (2015).

In this special issue we present papers authored by a selected group of experts in the areas of Analysis and PDE. Most of the papers collected here have been contributed by former students, collaborators, friends and colleagues of Louis Nirenberg, who were influenced by his scientific work. The special issue contains twenty papers contributed by researchers in Analysis and PDE from Belgium, Brazil, Burkina Faso, Canada, France, Germany, Greece, Hong Kong, India, Israel, Italy, Japan, Portugal, Spain, Tunisia, and the USA. These papers cover a wide spectrum of important problems and topics of current research interest, including optimal control of measures induced by stochastic differential equations on UMD Banach spaces,

nonlinear Robin problems with locally defined reaction, derived heat trace asymptotics for the De Rham and Dolbeault complexes, nonlinear differential equations in a Banach subspace of continuous functions, the existence of weak solutions for an unsteady rotational Smagorinsky model, a strong maximum principle and a compact support principle for the infinity Laplacian, invariant cones for linear elliptic systems with gradient coupling, extremal solutions of quasilinear elliptic variational inequalities in exterior domains, nonnegative solutions of the porous medium equation with continuous lateral boundary data, fractional Sobolev spaces of symmetric functions and applications to Hamiltonian elliptic systems, Pollicott-Ruelle resolvent and Sobolev regularity, a class of forced active scalar equations with small diffusive parameters, condition spectrum of Toeplitz operators, existence of renormalized solutions to nonlinear elliptic anisotropic equations with variable exponents and L^∞ -data, surjectivity, zeros and fixed points of some semilinear mappings in normed spaces, reverse Hölder inequalities for log-Lipschitz functions, linking and the Leray-Schauder index, subdifferential and optimality conditions for convex set functions, the solvability of some systems of integro-differential equations with anomalous diffusion in higher dimensions, and the turnpike phenomenon and its stability for discrete-time optimal control problems.

Therefore we feel that this special issue will be highly important for many mathematicians, who are interested in recent developments in analysis and PDE, as well as in their numerous applications.

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