



## **PREFACE: DYNAMICAL SYSTEMS, ERGODIC THEORY AND MATHEMATICAL PHYSICS, PART I**

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AND ALEXANDER J. ZASLAVSKI

This special issue on Dynamical Systems, Ergodic Theory and Mathematical Physics is dedicated to Professor Yakov Sinai on the occasion of his 85th birthday.

Yakov Sinai is an outstanding Russian-American mathematician, who made fundamental contributions to dynamical systems, mathematical and statistical physics, probability theory, and mathematical fluid dynamics. He received his bachelor's and master's degrees from Moscow State University. In 1960 he earned his Ph.D., also from Moscow State under the supervision of Andrey Kolmogorov. From 1960 to 1971 Yakov Sinai was a researcher in the Laboratory of Probabilistic and Statistical Methods at Moscow State University. In 1971 he accepted a position as senior researcher at the Landau Institute for Theoretical Physics, while continuing to teach at Moscow State, where he became a professor in 1981. Since 1993 Yakov Sinai has been a professor of mathematics at Princeton University, while maintaining his position at the Landau Institute. For the 1997-98 academic year, he was the Thomas Jones Professor at Princeton, and in 2005, the Moore Distinguished Scholar at the California Institute of Technology.

In 2002 Yakov Sinai won the Nemmers Prize for his revolutionizing work on dynamical systems, statistical mechanics, probability theory, and statistical physics. In 2013 he received the Leroy P. Steele Prize for Lifetime Achievement. In 2014 the Norwegian Academy of Science and Letters awarded him the Abel Prize for his contributions to dynamical systems, ergodic theory and mathematical physics. Other awards won by Professor Sinai include the Boltzmann Medal (1986), the Dannie Heineman Prize for Mathematical Physics (1990), the Dirac Prize (1992), the Wolf Prize in Mathematics (1997), the Lagrange Prize (2008) and the Henri Poincaré Prize (2009). He is a member of the United States National Academy of Sciences, the Russian Academy of Sciences, and the Hungarian Academy of Sciences. He is an honorary member of the London Mathematical Society (1992) and, in 2012, he became a fellow of the American Mathematical Society. Yakov Sinai has been elected an honorary member of the American Academy of Arts and Sciences (1983), the Brazilian Academy of Sciences (2000), the Academia Europaea, the Polish Academy of Sciences, and the Royal Society of London. He holds honorary degrees from the Budapest University of Technology and Economics, the Hebrew University of Jerusalem, Warwick University, and Warsaw University.

Professor Sinai has authored more than 250 papers and books and has overseen more than 50 PhD students. He spoke four times at the International Congress of Mathematicians. In 2000 he was a plenary speaker at the First Latin American Congress in Mathematics.

In part I of this special issue, we present papers authored by a selected group of well-recognized experts in the areas of dynamical systems, ergodic theory and

mathematical physics. The papers collected here have been contributed by former students, collaborators, friends, and colleagues of Yakov Sinai, who have been influenced by his research. Part I of the special issue contains ten papers contributed by researchers in dynamical systems, ergodic theory and mathematical physics from Brazil, Canada, France, Germany, Great Britain, Poland, Russia, Switzerland, Ukraine, and the USA.

These papers cover a wide spectrum of important problems and topics of current research interest in dynamical systems, ergodic theory and mathematical physics, including hyperbolic polygonal billiards, invariant graphs and spectral type of Schrödinger operators, Anderson localization in stationary ensembles of quasiperiodic operators, local limit theorems for random walks in a random environment on a strip, proof of the strong Scott conjecture for Chandrasekhar atoms, Möbius orthogonality in density for zero entropy dynamical systems, the method of parameter exclusion, random matrices arising in deep neural networks, the universality of the incompressible Euler equation on compact manifolds, and the generalization error of the minimum-norm solutions for over-parameterized neural networks.

Therefore we feel that this special issue will be highly important for many mathematicians and applied scientists, who are interested in recent developments in dynamical systems, ergodic theory and mathematical physics, as well as in their numerous applications.

Svetlana Jitomirskaya, Dong Li, Simeon Reich and Alexander J. Zaslavski, Editors

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