

Preface

It is a pleasure and honor to dedicate this issue of the *Journal of Statistical Physics* to David Ruelle and Yasha Sinai, two of the leading contributors to our subject, as well as to many other fields of science. David and Yasha were both born in 1935, David in Belgium and Yasha in Russia (then the Soviet Union), and their sixty-fifth birthdays were celebrated jointly at the Statistical Mechanics Conference held at Rutgers University in December 2000.

This joint celebration, as well as their joint receipt of the Dannie Heineman Prize for Mathematical Physics and the Boltzmann Medal for Statistical Mechanics (in addition to the many individual prizes they received), is not accidental. It is an expression of how much their contributions have complemented each other in building the edifice of these disciplines. Remarkably, despite these close connections, and even though their names are linked via the well known SRB (Sinai–Ruelle–Bowen) measures, their only joint paper is an expository note. This was presented by Ruelle on the occasion of accepting the Boltzmann Medal for both of them at the IUPAP (International Union and Pure and Applied Physics) Conference on Statistical Physics in Boston in 1986. (The Soviet authorities did not give Sinai permission to attend that meeting.) I quote briefly from Ruelle’s remarks on that occasion: “In the course of my scientific wanderings I have visited several of the regions which lie across physics and mathematics: equilibrium statistical mechanics, ergodic theory, differential dynamics, and a few more. Each of these regions is like a valley, large or small, with its own character and its towering peaks of learnedness which are the local experts. Going from one valley to another, the landscape and the people change, the experts are different. Yet, I have found that in these various regions across physics and mathematics which I visited, Yasha Sinai was part of the landscape and had made fundamental contributions.” When I showed this to Yasha his response was: “I would say exactly the same thing about David.”

I am not as poetic as David, but I do admire them both and offer here a brief summary of some of their achievements to date:

(1) Ruelle is a founder of the modern mathematical formulation of statistical mechanics: he provided a rigorous framework for the study of phase transitions, including the celebrated Dobrushin–Lanford–Ruelle (DLR) characterization of Gibbs measures, and gave the first proof of a phase transition for a continuum system with short range interactions. Ruelle is also a leading figure in the theory of dynamical systems and has discovered deep connections between the onset of turbulence and the appearance of strange attractors. His books, *Rigorous Statistical Mechanics* and *Thermodynamic Formalism*, have defined the field; *Chance and Chaos* is the best nontechnical account of these subjects.

(2) Sinai is the leading figure in the theory of chaotic dynamical systems. He has made deep and original discoveries in statistical mechanics, ergodic theory, dynamical systems, probability theory and mathematical physics. He is the originator of ideas that cut across these fields, illuminating problems in physics and mathematics ranging from phase transitions to hydrodynamics. Starting with his contributions to the Kolmogorov–Sinai entropy of dynamical systems, he developed the notion of Markov partitions and discovered deep connections between dynamical systems and Gibbs measures.

Ruelle and Sinai are still going strong in their indirect collaboration, as evidenced by the articles opening this volume, and they do sometimes get together, as seen in the photographs reproduced here. It has been and continues to be my good fortune to be friends with both David and Yasha and their spouses. I am sure that I speak not only for myself but also for the contributors to this volume, for all members of the statistical mechanics, mathematical physics, and dynamical systems communities, and for the legion of their friends and admirers who are not in these communities, in wishing David and Yasha many many more productive, happy and healthy years: David with Janine and Yasha with Lena. We love you and we need your guidance.

Joel L. Lebowitz, Editor