SCIENTIFIC ACTIVITY

SLAVA RYCHKOV continued to develop the rigorous theory of tensor network renormalization group (jointly with Tom Kennedy). The aim of this project is to establish rigorous existence of lattice renormalization group fixed points corresponding to the critical points of the Ising model in two dimensions and, in a longer term, in three dimensions. He has also worked on the classification problem of perturbative renormalization group fixed points in multi-scalar theories, on conformal perturbation theory corrections in exact diagonalization computations, and on the theory of dipolar ferromagnets furnishing an example of scale without conformal invariance. He prepared for publication his IHES lecture notes on the Random Field Ising Model and a review of the recent developments in the numerical conformal bootstrap.

Slava RYCHKOV

Theoretical Physics,
Permanent Professor since 2017.

AWARDS

New Horizons Prize in Physics (2014)
Institut Universitaire de France, junior member (2012-2017)
Grand prix Mergier-Bourdeix, Académie des sciences de Paris (2019)

Editor of:
SciPost Physics

PUBLICATIONS

Lectures on the Random Field Ising Model. From Parisi-Sourlas Supersymmetry to Dimensional Reduction
SpringerBriefs in Physics (2023), preprint arXiv:2303.09654.

With T. Kennedy
Tensor Renormalization Group at Low Temperatures: Discontinuity Fixed Point
Preprint arXiv:2210.06669, Ann. Henri Poincaré **25** (2023), 773-841.

With S. Pal and J. Qiao
Twist Accumulation in Conformal Field Theory. A Rigorous Approach to the Lightcone Bootstrap
Commun. Math. Phys. **402** (2023) 3, 2169-2214, preprint arXiv:2212.04893.

With J. Rong
Classifying Irreducible Fixed Points of Five Scalar Fields in Perturbation Theory
Preprint arXiv:2306.09419.

With B. Lao
3D Ising CFT and Exact Diagonalization on Icosahedron: the Power of Conformal Perturbation Theory
SciPost Phys. **15** (2023), 243, preprint arXiv:2307.02540.

With A. Gimenez-Grau and Y. Nakayama
Scale Without Conformal Invariance in Dipolar Ferromagnets
Preprint arXiv:2309.02514.

With N. Su
New Developments in the Numerical Conformal Bootstrap
Preprint arXiv:2311.15844.

INVITED LECTURES

France

Commémoration du centenaire de la naissance de Louis Michel (1923-1999), IHES, Bures-sur-Yvette (May 15) ***Louis Michel and the Renormalization Group*** (conference)

Journée thématique autour de la renormalisation, École polytechnique, Palaiseau (June 12) ***Real-Space Renormalization of Lattice Models Using Tensor Networks*** (conference)

Germany

String Theory Seminar, DESY, Hamburg (October 16) ***Interacting Fixed Points Without Conformal Invariance - Dipolar Ferromagnets*** (seminar)

Israel

Physics Colloquium, Ben-Gurion University of the Negev, Beer-Sheva (April 4) ***Conformal Field Theory of the 3D Ising Model*** (video symposium)

Italy

The Interdisciplinary Contribution of Giorgio Parisi to Theoretical Physics, Sapienza, Università di Roma (February 2) ***Random Magnetic Fields, Supersymmetry, and Negative Dimensions*** (symposium)

Universality in Condensed Matter and Statistical Mechanics, Università degli Studi Roma Tre (February 6-8) ***Towards the Critical Point of 2d Ising Model with Tensor Network Renormalization Group*** (conference)

Spain

Quantum Information Theory - Tensor Networks, Instituto de Ciencias Matemáticas, Madrid (March 6-10) ***Simple Rigorous Results for Tensor Network Renormalization Group with Infinite Bond Dimension*** (conference)

United Kingdom

Department of Mathematics Colloquium, King's College London (November 30) ***Conformal Field Theory of the 3D Ising Model*** (symposium)

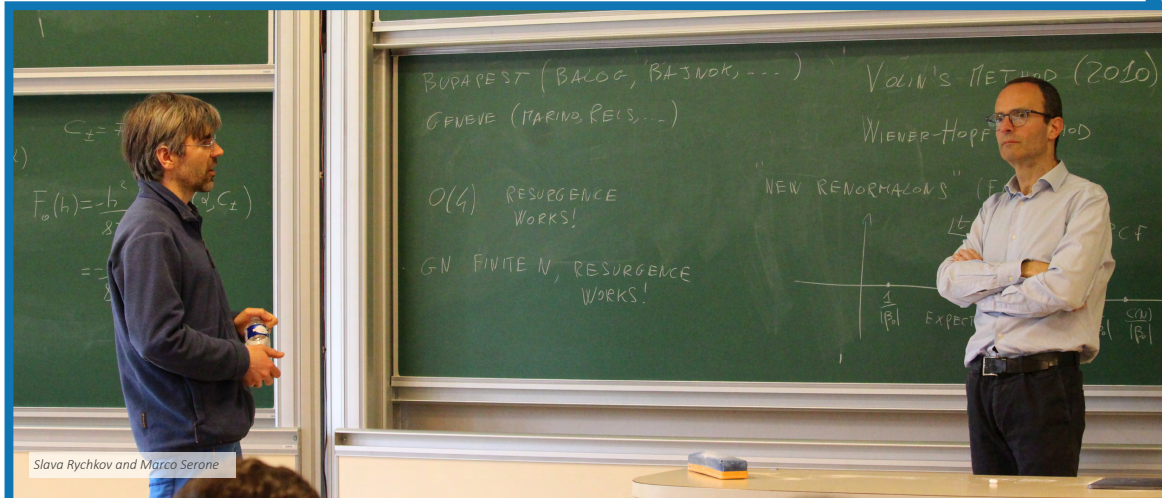
United States

High Energy Theory Seminar, Princeton University (September 8) ***Interacting Fixed Points Without Conformal Invariance*** (seminar)

Enrico Fermi Institute Colloquium, The University of Chicago (October 30) ***Conformal Bootstrap - From Polyakov to Our Days*** (symposium)

Particle Theory Seminar, The University of Chicago (November 1) ***Interacting Fixed Points Without Conformal Invariance - Dipolar Ferromagnets*** (seminar)

Fuzzy Sphere Meets Bootstrap, Simons Center on Geometry and Physics, Stony Brook University (November 6-8) ***3D Ising CFT and Exact Diagonalization on Icosahedron*** (conference)



Slava Rychkov and Marco Serone