

**Slava RYCHKOV**

Theoretical Physicist,
Permanent Professor since 2017.

SCIENTIFIC ACTIVITY

SLAVA RYCHKOV is dedicating much of his time to the theory of tensor network renormalization group (jointly with Tom Kennedy and his PhD student Nikolay Ebel). 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, to begin with in two dimensions. He also studied critical points of frustrated antiferromagnets using the conformal bootstrap (jointly with Marten Reehorst, Benoit Sirois and Balt van Rees). In the realm of fixed points of multifermion theories with long-range interactions, he established the existence of (almost)-scaling operators (jointly with Alessandro Giuliani, Vieri Mastropietro, and Giuseppe Scola).

AWARDS

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

Editor of:
SciPost Physics

PUBLICATIONS

With J. Rong
Classifying Irreducible Fixed Points of Five Scalar Fields in Perturbation Theory
SciPost Phys. 16 (2024) 040, Preprint arXiv:2306.09419.

With A. Gimenez-Grau and Y. Nakayama
Scale Without Conformal Invariance in Dipolar Ferromagnets
Phys.Rev.B 110 (2024) 024421, Preprint arXiv:2309.02514.

With N. Su
New Developments in the Numerical Conformal Bootstrap
Rev.Mod.Phys. 96 (2024) 045004, Preprint arXiv:2311.15844.

With A. Giuliani, V. Mastropietro and G. Scola
Non-Trivial Fixed Point of a ψ^4_d Fermionic Theory, II. Anomalous Exponent and Scaling Operators
Preprint arXiv:2404.14904.

With M. Reehorst, B. Sirois and B. van Rees
Bootstrapping Frustrated Magnets: the Fate of the Chiral $O(N) \times O(2)$ Universality Class
Preprint arXiv:2405.19411.

With N. Ebel and T. Kennedy
Rotations, Negative Eigenvalues, and Newton Method in Tensor Network Renormalization Group
Preprint arXiv:2408.10312.

With N. Ebel and T. Kennedy
Transfer Matrix and Lattice Dilatation Operator for High-Quality Fixed Points in Tensor Network Renormalization Group
Preprint arXiv:2409.13012.

Denmark

Niels Bohr Institute, Copenhagen (November 21) *Analyzing 3D Conformal Field Theories on $S^2 \times R$: Icosahedron, Fuzzy Sphere, and Conformal Perturbation Theory* (seminar)

France

Probability & Analysis Seminar, IHES, Bures-sur-Yvette (September 13) *Real-Space Renormalization of 2D Lattice Models with Tensor Networks* (seminar)

Greece

Lectures at School on Field theory and applications in HEP, Aristotle University of Thessaloniki (June 10) *Introduction to Conformal Field Theory* (5 lectures)

Italy

$O(N) \times O(2)$ model - the tale of disappearing fixed points, Università di Pisa (February 19) *50 + ϵ Years of Conformal Bootstrap* (conference)

Joint ICTP/SISSA/UniTs High Energy Theory seminar, Trieste (February 28) *$O(N) \times O(2)$ Model from 3D to 4D - the Tale of Disappearing Fixed Points* (seminar)

Japan

High Energy Physics in the Quantum Era, KEK, Tsukuba, Japan (December 3) *Conformal Field Theories on $S^2 \times R$: Condensed Matter Regulators And Conformal Perturbation Theory* (conference)

Institute for Solid State Physics, Tokyo University, (December 12) *Newton Method Search for Fixed Points in Tensor Network Renormalization Group* (seminar)

KEK-Theory Workshop 2024, KEK, Tsukuba (December 13) *Some Rigorous and Numerical Results for Renormalization Groups of Tensor Networks* (conference)

United Kingdom

Theoretical Physics Colloquium, Department of Applied Mathematics and Theoretical Physics, Cambridge University, (May 8) *Conformal Field Theory of the 3D Ising Model* (colloquium)

United States

Conformal bootstrap, Kavli Institute for Theoretical Physics Santa Barbara (April 4) *Correlated Gapless Quantum Matter* (workshop)

**Switzerland**

Physics Department Seminar, École polytechnique fédérale de Lausanne (September 26) *Newton Method and Lattice Dilatation Operator in Tensor Network Renormalization Group* (seminar)

Modern Trends in Theoretical Physics - Riccardo Rattazzi 60 Fest, École polytechnique fédérale de Lausanne (October 7) *About Bootstraps and Other Things* (seminar)

Mathematics Department Seminar, École polytechnique fédérale de Lausanne (October 8) *Introduction to Renormalization Group of Tensor Networks* (seminar)

