

CURRICULUM VITAE

PROKHOROV ANDREI

CURRENT POSITION

2024–2025 Postdoctoral scholar at the University of
Chicago

RESEARCH INTERESTS

Applications of Riemann-Hilbert problems in probability theory and differential equations.

SERVICE

- 12/2024 Organizer of the special session "**Discrete and continuous integrable systems: geometry analysis and applications**" at the Joint meeting of NZMS, AustMS and AMS, December 9-13, 2024, University of Auckland, New Zealand.
- 06/2022 Organizer of the **Summer School on Random Matrices**, University of Michigan, Ann Arbor, June 13-24, 2022. Other organizers: Jinho Baik, Raj Nadakuditi.
- 06/2024 Organizer of the **Summer School on Random Matrices**, University of Michigan, Ann Arbor, June 17-28, 2024. Other organizers: Jinho Baik, Raj Nadakuditi.
- 09/2022 Organizer of the conference, "**The charm of integrability - Honoring the scientific contributions of Alexander Its on the occasion of his 70th birthday**" University of Bristol, UK, September 12-16, 2022. Other organizers: Tamara Grava, Thomas Bothner, Ken McLaughlin.
- 09/2020–06/2024 Organizer of the **seminar on integrable systems and random matrix theory** at the University of Michigan. Other organizers: Ahmad Barhoumi, Guilherme Silva, Jinho Baik, Peter Miller.

- 09/2020–12/2020 Mentor of the undergraduate research project "[Unraveling the patterns of Painlevé zeros](#)" in the Laboratory of Geometry.
Other mentors: Jörn Zimmerling, Elizabeth Collins - Woodfin, Benjamin Krakoff.
Students: Hexin Cui, Wenhao Deng, Xiaoqi Peng
- 05/2021–06/2021 Mentor of the REU project "[Computing The Constant In The Left-tail Asymptotic Of Maximum Eigenvalue Distribution Of Finite GUE](#)".
Other mentor: Fred Adams.
Student: Xiaoqi Peng.
- 05/2023–06/2023 Mentor of the REU project "[Small \$x\$ asymptotics for special function solutions of Painlevé-III equation](#)".
Student: Hao Pan.
Preprint: [arXiv:2407.04852](#)
- Guest editor of "[Special Issue on Evolution Equations, Exactly Solvable Models and Random Matrices in honor of Alexander Its' 70th birthday](#)"
- Referee:

Annales Henri Poincaré
Communications in Mathematical Physics
Nonlinearity
Proceedings of the American Mathematical Society
SIAM Journal on Mathematical Analysis
Letters in Mathematical Physics
- American Mathematical Society Graduate Student Chapter at Indiana University-Purdue University Indianapolis (<https://sites.google.com/iu.edu/amsiupui>)

09/2017–06/2018 President
09/2016–06/2017 Vice-President
09/2015–06/2016 Secretary

TEACHING EXPERIENCE

- 01/2024–08/2024 Teaching Math 471 (Introduction to Numerical Methods) at University of Michigan, Ann Arbor.
- 01/2023–05/2023 Teaching Math 354 (Fourier analysis and its applications) at University of Michigan, Ann Arbor.
- 09/2022–12/2022 Teaching Math 454 (Boundary value problems for partial differential equations) at University of Michigan, Ann Arbor.

- 01/2019–05/2021 Teaching Math 216 (Introduction to differential equations)
at University of Michigan, Ann Arbor.
- 09/2019–12/2019 Teaching Math 115 (Calculus I)
at University of Michigan, Ann Arbor.
- 01/2019–05/2019 Teaching Math 15400 (Trigonometry)
at Indiana University-Purdue University Indianapolis.
- 09/2018–12/2018 Teaching Math 15300 (College Algebra)
at Indiana University-Purdue University Indianapolis.
- 09/2018–12/2018 Teaching Math 11000 (Fundamentals of Algebra)
at Indiana University-Purdue University Indianapolis.
- 09/2017–05/2018 Teaching Math M118 (Finite Mathematics)
at Indiana University-Purdue University Indianapolis.
- 05/2017–06/2017 Teaching Math 51000 (Vector Calculus)
at Indiana University-Purdue University Indianapolis.
- 08/2016–12/2016 Teaching Math 17100 (Multidimensional Mathematics)
at Indiana University-Purdue University Indianapolis.

REFEREED PUBLICATIONS

- A. Barhoumi, O. Lisovyy, P. D. Miller, and A. Prokhorov. “Painlevé-III Monodromy Maps Under the $D_6 \rightarrow D_8$ Confluence and Applications to the Large-Parameter Asymptotics of Rational Solutions”. In: *Symmetry, Integrability and Geometry: Methods and Applications* (Mar. 2024). ISSN: 1815-0659. URL: <http://dx.doi.org/10.3842/SIGMA.2024.019>
- J. Baik, A. Prokhorov, and G. L. F. Silva. “Differential equations for the KPZ and periodic KPZ fixed points”. In: *Comm. Math. Phys.* 401.2 (2023), pp. 1753–1806. ISSN: 0010-3616,1432-0916. MR: [4610285](https://doi.org/10.1007/s00220-023-04683-z). URL: <https://doi.org/10.1007/s00220-023-04683-z>
- E. C. Bailey, S. Bettin, G. Blower, J. B. Conrey, A. Prokhorov, M. O. Rubinstein, and N. C. Snaith. “Mixed moments of characteristic polynomials of random unitary matrices”. In: *J. Math. Phys.* 60.8 (2019), pp. 083509, 26. ISSN: 0022-2488,1089-7658. MR: [3995715](https://doi.org/10.1063/1.5092780). URL: <https://doi.org/10.1063/1.5092780>
- T. Bothner, A. Its, and A. Prokhorov. “On the analysis of incomplete spectra in random matrix theory through an extension of the Jimbo-Miwa-Ueno differential”. In: *Adv. Math.* 345 (2019), pp. 483–551. ISSN: 0001-8708,1090-2082. MR: [3899969](https://doi.org/10.1016/j.aim.2019.01.025). URL: <https://doi.org/10.1016/j.aim.2019.01.025>
- A. R. Its, O. Lisovyy, and A. Prokhorov. “Monodromy dependence and connection formulae for isomonodromic tau functions”. In: *Duke Math. J.* 167.7 (2018), pp. 1347–1432. ISSN: 0012-7094,1547-7398. MR: [3799701](https://doi.org/10.1215/00127094-2017-0055). URL: <https://doi.org/10.1215/00127094-2017-0055>

- A. Its and A. Prokhorov. “Connection problem for the tau-function of the sine-Gordon reduction of Painlevé-III equation via the Riemann-Hilbert approach”. In: *Int. Math. Res. Not. IMRN* 22 (2016), pp. 6856–6883. ISSN: 1073-7928,1687-0247. MR: [3632069](#). URL: <https://doi.org/10.1093/imrn/rnv375>
- A. O. Prokhorov and N. D. Filonov. “The Maxwell operator with periodic coefficients in a cylinder”. In: *Algebra i Analiz* 29.6 (2017), pp. 182–196. ISSN: 0234-0852. MR: [3723815](#). URL: <https://doi.org/10.1090/spmj/1524>
- A. Prokhorov and N. Filonov. “Regularity of electromagnetic fields in convex domains”. In: *J. Math. Sci. (N.Y.)* 210.6 (2015), pp. 793–813. ISSN: 1072-3374,1573-8795. MR: [3407793](#). URL: <https://doi.org/10.1007/s10958-015-2591-2>

NON-REFEREED PUBLICATIONS AND PREPRINTS

- H. Desiraju, P. Ghosal, and A. Prokhorov. *Proof of Zamolodchikov conjecture for semi-classical conformal blocks on torus*. 2024. arXiv: [2407.05839](#) [[math-ph](#)]
- H. Pan and A. Prokhorov. *Small x asymptotics for special function solutions of Painlevé III equation*. 2024. arXiv: [2407.04852](#) [[math.CA](#)]
- H. Desiraju, A. R. Its, and A. Prokhorov. *Nonlinear steepest descent on a torus: A case study of the Landau-Lifshitz equation*. 2024. arXiv: [2405.17662](#) [[math.AP](#)]
- A. Its and A. Prokhorov. *On $\beta = 6$ Tracy-Widom distribution and the second Calogero-Painlevé system*. 2020. arXiv: [2010.06733](#) [[nlin.SI](#)]
- A. R. Its and A. Prokhorov. “On some Hamiltonian properties of the isomonodromic tau functions”. In: *Rev. Math. Phys.* 30.7 (2018), pp. 1840008, 38. ISSN: 0129-055X,1793-6659. MR: [3833049](#). URL: <https://doi.org/10.1142/S0129055X18400081>

THESIS

- A. Prokhorov. *Connection Problem for Painleve Tau Functions*. Thesis (Ph.D.)—Purdue University. ProQuest LLC, Ann Arbor, MI, 2019, p. 112. ISBN: 979-8379-67239-3. MR: [4625528](#). URL: <http://dx.doi.org/10.7912/rygf-2h27>

EDUCATION

- 2019 PhD, Department of Mathematical Sciences at Indiana University-Purdue University Indianapolis.
Dissertation: "Connection problem for Painlevé tau functions".
Advisor: Alexander Its.
- 2014 Master of Physics, St. Petersburg State University.
Thesis: "Regularity of electromagnetic fields in convex domains".
Advisor: Nikolai Filonov.

WORK EXPERIENCE

- 2021–2024 **NSF Postdoctoral Fellow** based at the University of Michigan, Ann Arbor
- 09/2021–12/2021 Postdoctoral fellow, Mathematical Sciences Research Institute, Berkeley.
- 09/2019–06/2021 Postdoctoral Assistant Professor, Department of Mathematics, University of Michigan, Ann Arbor.
- 01/2017– Researcher, Saint-Petersburg State University.
- 02/2014–06/2014 Researcher, Saint-Petersburg State University.
- 09/2013–10/2013 Researcher, Saint-Petersburg State University.
- 09/2011–12/2012 Research Assistant at the **Chebyshev Laboratory** at the Saint-Petersburg State University.

HONORS/AWARDS

- First Year Fellowship from School of Science, IUPUI, 2014.
- Outstanding Advanced Mathematics Graduate Student, IUPUI, 2016.
- Charalambos D. Aliprantis Prize, IUPUI, 2017. (This scholarship is awarded to mathematics graduate students who exemplify outstanding scholastic achievements as well as leadership qualities.)
- Yuri Abramovich Memorial Scholarship, IUPUI, 2018. (This scholarship supports continuing undergraduate and graduate students who have a keen interest in the study of mathematics, who demonstrate academic excellence, especially in mathematics courses beyond the sophomore level and who show promise for a career in mathematics.)
- Outstanding Advanced Mathematics Graduate Student, IUPUI, 2019.
- **NSF Postdoctoral Fellowship**, 2021-2024

RESEARCH PRESENTATIONS

- Talk at the IUPUI AMS student chapter "[Semiclassical analysis of conformal blocks on the torus.](#)", May 17, 2024.
- AMS Spring Central Sectional Meeting, University of Cincinnati, Cincinnati, OH, April 15-16, 2023. Talk: "[Large time asymptotic for solutions of Landau-Lifshitz equation using Riemann-Hilbert approach](#)"
- AMS Joint Mathematics Meeting, Boston, January 4-7, 2023. Talk: "[Asymptotical properties of rational solutions of Painlevé-III \(\$D_6\$ \) equation and application to modulated bi-orthogonal polynomials.](#)"
- [Midwestern Workshop on Asymptotic Analysis](#), Purdue University Fort Wayne, October 7-9, 2022.
Talk: "Monodromy Map under the Confluence $\text{PIII}(D_6) \rightarrow \text{PIII}(D_8)$ ".
- [The Twelfth IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory](#), University of Georgia, Athens, GA, USA, March 30 - April 1st, 2022.
Talk: "Large parameter asymptotic of rational solutions of Painlevé III (D_6) equation near zero".
- AMS Spring Central Virtual Sectional Meeting, March 26-27, 2022.
Talk: "[Integrable systems governing KPZ fixed points](#)".
- Michigan State University, Mathematical Physics seminar, November 9th, 2021
Talk: "On $\beta = 6$ Tracy-Widom distribution and the second Calogero-Painlevé system"
- Mathematical Sciences Research Institute Seminar, December 3rd, 2021
Talk: "[Integrable structure for the Multitime distribution of TASEP](#)"
- Mathematical Sciences Research Institute Mini Course, September 2nd, 2021
Talk: "[Riemann-Hilbert problems application in the random matrix theory](#)"
- [Asymptotic methods in Mathematical Physics](#), Conference dedicated to the memory of V. S. Buslaev, EIMI, Saint-Petersburg, June 20th - 22nd, 2021
Talk: "Integrable structure for the multipoint distribution of TASEP".
- [Integrable systems in Geometry and Mathematical Physics](#), Conference in memory of Boris Dubrovin, SISSA, Trieste, June 28th - July 2nd, 2021
Virtual 3 minute talk: "Large parameter asymptotics of rational solutions of Painlevé III equation near zero".
- IU Analysis seminar, Bloomington, March 17th, 2021
Virtual talk: "Behavior of rational solutions of Painlevé III equation near zero".

- [Bernoulli-IMS One World Symposium](#), Virtually, August 24th - 28th, 2020.
Talk: “ On $\beta = 6$ Tracy-Widom distribution and the second Calogero-Painlevé system. ”.
- [Junior Integrable Probability Seminar](#), Virtually, July 9th, 2020.
Talk: “ Integrable structure behind the multitime KPZ fixed point distribution. ”.
- Workshop “[Complex analysis in mathematical physics and applications](#)”, Isaac Newton Institute for Mathematical Studies, Cambridge, UK, October 28th - November 1st, 2019.
Poster: “Asymptotic of solution of three-component Painlevé II equation”.
- Forty-Seventh Annual Mathematics Conference “Differential Equations and Dynamical Systems and their Applications”, Miami University, Oxford, OH, USA, September 20 - 21, 2019.
Talk: “Connection problem for Painlevé tau functions.”.
- Workshop “[Painlevé equations in the Midwest](#)”, University of Michigan, Ann Arbor, MI, USA, August 23 - 24, 2019.
Talk: “Asymptotic of solution of three-component Painlevé II equation”.
- [The Eleventh IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory](#), University of Georgia, Athens, GA, USA, April 17 - 19, 2019.
Talk: “Asymptotic of 3-component Painlevé-II equation”.
- [AMS Fall Central Sectional Meeting](#), University of Michigan, Ann Arbor, October 20-21, 2018.
Talk: “On some Hamiltonian properties of isomonodromic tau functions”.
- [Midwestern Workshop on Asymptotic Analysis](#), IU, Bloomington, October 5-7, 2018.
Poster: “On some Hamiltonian properties of isomonodromic tau functions”.
- Workshop “[Tau Functions of Integrable Systems and Their Applications](#)”, BIRS, Banff, Canada, September 2-7, 2018.
Talk: “On some Hamiltonian properties of isomonodromic tau functions”.
- Invited speaker at the probability seminar at University of Virginia, Charlottesville, October 25, 2017.
Talk: “Limiting distribution of smallest eigenvalue of thinned complex Wishart matrices”
- [Midwestern Workshop on Asymptotic Analysis](#), IUPUI, Indianapolis, October 6-8, 2017.
Poster: “The smallest eigenvalue distribution of incomplete Laguerre Unitary Ensemble” .
- [School on Dyson-Schwinger equations, topological expansions, and random matrices](#), Columbia University, New York, August 28 - September 1, 2017.

Poster: “The smallest eigenvalue distribution of incomplete Laguerre Unitary Ensemble” .

- Graduate Summer School on Random Matrices at PCMI, Utah, Park city, June 25 - July 15, 2017.

Poster: “The smallest eigenvalue distribution of incomplete Laguerre Unitary Ensemble” .

- School on “Quantum integrable systems, conformal field theories and stochastic processes” , Institut d’Études Scientifiques de Cargèse, Cargèse, France, September 12-23, 2016.

Talk “Asymptotics of tau-function for Painlevé equations”.

- Workshop “Moduli spaces, integrable systems, and topological recursions” , CRM, Montréal, Canada, January 9-13, 2016.

Talk “Connection problem for the isomonodromic tau-function of the Sine-Gordon reduction of Painlevé-III equation”.

- Workshop “Asymptotics in integrable systems, random matrices and random processes and universality” .

In honour of Percy Deift’s 70th birthday.

CRM, Montréal, Canada, June 7-11, 2015.

Poster “Connection problem for the tau-function of the Sine-Gordon reduction of Painlevé-III equation via the Riemann-Hilbert approach”.

- 6th St. Petersburg Conference in Spectral Theory,

dedicated to the memory of M. Sh. Birman.

Russia, St. Petersburg, July, 3-8, 2014.

Talk “Regularity of electromagnetic fields in nonsmooth domains”.

- Crimean International Mathematical Conference.

Ukraine, Crimea, Sudak, September 22 - October 4, 2013.

Talk “Regularity of electromagnetic fields in nonsmooth domains”.

- Annual International Conference “Days on Diffraction” .

Russia, St. Petersburg, May, 27-31, 2013.

Talk “On absolute continuity of spectrum of the periodic Maxwell operator in a cylinder.”

- The Twenty Third Crimean Autumn Mathematical School-Symposium.

Ukraine, Crimea, Laspi-Batiliman, September, 17-29, 2012.

Talk “The Maxwell operator in the waveguide with periodic coefficients”.