

DMITRY CHELKAK – CURRICULUM VITAE

• **General:**

- Name: Dmitry Chelkak
- Birthday/place: Jan 1979/St. Petersburg (former Leningrad, USSR)
- Citizenship: Russian Federation
- Family status: married, two children: Aleksandra (2006), Mikhail (2017)
- Languages: Russian (native), English (fluent), French (intermediate)
- E-mail address: `dmitry.chelkak@ens.fr`, `dchelkak@pdmi.ras.ru`
- Postal address: Département de Mathématiques et Applications  
École Normale Supérieure, 45 rue d’Ulm  
F-75230 Paris Cedex 05

• **Employment:**

- 2016/17–2021/22 : professor, ENS-MHI Chair, École Normale Supérieure (Paris)
- 2015/16 : visiting professor, University of Geneva
- 2014/15 : senior fellow, Institute for Theoretical Studies, ETH Zürich
- 2009 – ... : [on leave since 2014] senior researcher, Mathematical Analysis Laboratory at St. Petersburg Department of Steklov Institute (PDMI RAS)
- 2010–2014 : senior researcher, Chebyshev Lab at St. Petersburg University (SPbSU)
- 2006/07 : senior research assistant, University of Geneva
- 2004–2010 : docent (associate professor), Dept. of Mathematical Analysis at SPbSU

• **Education:**

- Dec 2003: PhD (PDMI RAS, St. Petersburg, co-advisors: P. Kargaev & E. Korotyaev)  
*“Inverse problem for the 1D harmonic oscillator perturbed by a potential”*
- 2000 – 2003: PhD student (SPbSU & Potsdam University, Germany)
- 1995 – 2000: St. Petersburg University (SPbSU), *diploma cum laude*

• **Awards:**

- 2014: Salem Prize
- 2008: Pierre Deligne Contest Award (research scholarship for 2009–2011)
- 2004: “Young Mathematician” Prize of the St. Petersburg Math. Society
- 1995: Gold Medal of IMO (36th Int. Math. Olympiad of school students, Toronto)

• **Selected Talks:**

- ICM2018 (International Congress of Mathematicians, Rio de Janeiro, August 2018):  
*“Planar Ising model at criticality: state-of-the-art and perspectives”*  
(invited, “Analysis and Operator Algebras” & “Probability and Statistics” sections)
- ICMP2018 (International Congress on Mathematical Physics, Montreal, July 2018):  
*“Tau-functions à la Dubédat and cylindrical events in the double-dimer model”*  
(invited, “Equilibrium Statistical Mechanics” session)
- SPA2017 (Stochastic Processes and Their Applications, Moscow, July 2017):  
*“2D Ising model: correlations, interfaces and a priori estimates”* (plenary)
- ECM2016 (European Congress of Mathematics, Berlin, July 2016):  
*“2D Ising model: correlations via boundary value problems”*  
(invited, “Applied Mathematics and Probability” section)

- **Research Interests:** interplay of Complex Analysis, Probability & Mathematical Physics  
[ notably planar Ising and bipartite dimer models, discrete holomorphicity and SLE/CLEs ]

• **Administrative Activity and Other Services:**

- *Chebyshev Lab at SPbSU* (established in Dec 2010 under the ‘megagrant’ program of the Russian Federation Government, project leader: Prof. Stanislav Smirnov):  
*Spring 2011: vice head, Fall 2011: acting head.*
- Summer School “*St. Petersburg School in Probability and Statistical Physics – 2012*” (two weeks, 150+ participants), member of the Organizing Committee;
- 2009–2014: member of the St. Petersburg Mathematical Society Council;
- reviewer for a number of mathematical and physical journals.

• **Research grants:**

- Paris 2019–2022: member of the ANR-18-CE40-0033 project DIMERS (Paris–Lyon)
- St. Petersburg 2010–2014: principal member of the ‘megagrant’ 11.G34.31.0026 of the Russian Federation Government (~1M\$ per year, project leader: S. Smirnov).
- St. Petersburg 2008–2012: several starting grants: MK-4306.2008.1, MK-7656.2010.1, Pierre Deligne Contest Award (research scholarship for 2009-2011).

• **Students supervised:**

- *ÉNS Paris*:
  - \* Post-docs: Sanjay Ramassamy (2018/19); Mikhail Basok (2021/22);
  - \* PhD: Rémy Mahfouf, Yijun Wan (both 2018/19–2021/22);
  - \* master: Hugo Falconet (P6, 2017), Chengyang Shao (ENS-Tsinghua exchange program, 2017), Rémy Mahfouf (P11, 2018), Yijun Wan (P6, 2018);
- *Université de Genève*:
  - \* PhD: Marianna Russkikh (2014/15–2018/19, joint supervision with S. Smirnov);
- *Saint-Petersburg State University*:
  - \* master: Sergey Matveenko (2009), Alexey Vorotov (2010), Pavel Lepekhin (2011).

• **Selected papers:**

- Dmitry Chelkak, Benoît Laslier, Marianna Russkikh, Bipartite dimer model: p-embeddings and Lorentz-minimal surfaces. [arXiv:2109.06272](https://arxiv.org/abs/2109.06272)
- Dmitry Chelkak, Ising model and s-embeddings of planar graphs, [arXiv:2006.14559](https://arxiv.org/abs/2006.14559)
- Mikhail Basok, Dmitry Chelkak, Tau-functions à la Dubédat and probabilities of cylindrical events for double-dimers and CLE(4), *J. Eur. Math. Soc. (JEMS)*, 23 (2021), no. 8, 2787–2832.
- Dmitry Chelkak, Robust discrete complex analysis: a toolbox, *Ann. Probab.* 44 (2016), no. 1, 628–683.
- Dmitry Chelkak, Clément Hongler, Konstantin Izyurov, Conformal invariance of spin correlations in the planar Ising model, *Ann. Math.* 181 (2015), no. 3, 1087–1138.
- Dmitry Chelkak, Stanislav Smirnov, Universality in the 2D Ising model and conformal invariance of fermionic observables, *Invent. Math.*, 189 (2012), no. 3, 515–580.
- Dmitri Chelkak, Pavel Kargaev, Evgeni Korotyaev, Inverse problem for harmonic oscillator perturbed by potential: characterization. *Comm. Math. Phys.* 249 (2004), no. 1, 133–196.

• **Teaching experience:**

- **High-school level (1995–2000):** teaching and organization duties in ‘mathematical circles’, from local to all-Russia events and Russian IMO team training schools.
- **Saint-Petersburg University (2004 – 2010):**  
Extensive teaching:  $(6+) \times 90$ min per week on average, both lectures and TA sessions  
*Standard curriculum:* ‘Mathematical Analysis – I, II, III’ (basic calculus, several variables, complex variable, measure theory, Fourier analysis, functional analysis);  
*Advanced courses:* ‘Inverse Sturm–Liouville problem’, ‘Extensions of symmetric operators’, ‘Spectral theory of self-adjoint operators’;  
*Honors courses (advanced group of 2nd year students):* ‘Divergent series and prime numbers’, ‘Intro to entire functions’, ‘Intro to smooth manifolds’, ‘Intro to fractals’.
- **Université de Genève (2015/16):** ‘Brownian motion and stochastic calculus’ (part of a one-year SwissMAP master class in planar statistical physics).
- **ÉNS Paris (2016/17 – 2021/22):**  
‘Processus stochastiques’ (M1 level): discrete time martingales (optional stopping, inequalities, convergence), Markov chains, intro to the Brownian motion;  
‘Topologie et calcul différentiel’ (L3 level): general topology, basic notions of functional analysis, calculus and differential equations in Banach spaces.

• **Research-oriented mini-courses:**

- *Saint-Petersburg (2008–2014):* ‘SLE (Schramm-Loewner evolution)’ (2008), ‘Dimers on planar graphs and GFF’ (2008, 2011), ‘Intro to the conformal invariance of lattice models’ (2010), ‘Random walk in domino world’ (2014);
- *Tel-Aviv University (2009):* ‘Conformal invariance in the 2D Ising model’;
- *YEP Workshop ‘Two-dimensional statistical mechanics’, Eindhoven (2012):* ‘Discrete complex analysis on the microscopic level: conformal invariants without conformal invariance’;
- *Moscow Independent University (2013):* ‘Spin correlations in the 2D Ising model’, Dubna summer school (2013): ‘Planar random walks and their limits: SRW, LERW and SAW’;
- *ETH Zürich (2014/15):* reading group ‘Conformal invariance of spin correlations in the planar Ising model’; mini-course ‘Ising correlations and orthogonal polynomials’;
- *Winter School in Mathematical Physics at Les Diablerets (2018), Virginia Integrable Probability Summer School (2019):* ‘Planar Ising model: from combinatorics to CFT and s-embeddings’.

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• **Research statement:**

short version: [https://www.pdmi.ras.ru/~dchelkak/Chelkak\\_Research\\_2021\(short\).pdf](https://www.pdmi.ras.ru/~dchelkak/Chelkak_Research_2021(short).pdf)

long version: [https://www.pdmi.ras.ru/~dchelkak/Chelkak\\_Research\\_2021.pdf](https://www.pdmi.ras.ru/~dchelkak/Chelkak_Research_2021.pdf)

• **Teaching statement:**

[https://www.pdmi.ras.ru/~dchelkak/Chelkak\\_Teaching\\_2021.pdf](https://www.pdmi.ras.ru/~dchelkak/Chelkak_Teaching_2021.pdf)

• **Recent preprints:**

- [1] Dmitry Chelkak, Benoît Laslier, Marianna Russkikh, Bipartite dimer model: p-embeddings and Lorentz-minimal surfaces. [arXiv:2109.06272](#)
- [2] Dmitry Chelkak, Konstantin Izyurov, Rémy Mahfouf, Universality of spin correlations in the Ising model on isoradial graphs. [arXiv:2104.12858](#)
- [3] Dmitry Chelkak, Clément Hongler, Konstantin Izyurov, Correlations of primary fields in the critical planar Ising model. [arXiv:2103.10263](#)
- [4] Dmitry Chelkak, Ising model and s-embeddings of planar graphs. [arXiv:2006.14559](#)
- [5] Dmitry Chelkak, Sanjay Ramassamy, Fluctuations in the Aztec diamonds via a Lorentz-minimal surface. [arXiv:2002.07540](#)
- [6] Dmitry Chelkak, Benoît Laslier, Marianna Russkikh, Dimer model and holomorphic functions on t-embeddings of planar graphs. [arXiv:2001.11871](#)
- [7] Dmitry Chelkak, Clément Hongler, Rémy Mahfouf, Magnetization in the zig-zag layered Ising model and orthogonal polynomials. [arXiv:1904.09168](#)

• **Accepted/published:**

- [8] Mikhail Basok, Dmitry Chelkak, Tau-functions à la Dubédat and probabilities of cylindrical events for double-dimers and  $CLE(4)$ , *J. Eur. Math. Soc. (JEMS)*, 23 (2021), no. 8, 2787–2832.
- [9] Dmitry Chelkak, Yijun Wan, On the convergence of massive loop-erased random walks to massive SLE(2) curves. *Electron. J. Probab.*, 26 (2021), paper no. 54, 1–35.
- [10] Dmitry Chelkak, Planar Ising model at criticality: state-of-the-art and perspectives. In *Proceedings of the International Congress of Mathematicians 2018 (ICM 2018)*, Vol. 3, pages 2789–2816. World Scientific Publishing Company Inc., 2019
- [11] Dmitry Chelkak, 2D Ising model: correlation functions at criticality via Riemann-type boundary value problems. In *European Congress of Mathematics: Berlin, 18-22 July, 2016*, pages 235–256. European Mathematical Society, Zürich, 2018.
- [12] Dmitry Chelkak, David Cimasoni, Adrien Kassel, Revisiting the combinatorics of the 2D Ising model, *Ann. Inst. Henri Poincaré D* 4 (2017), no. 3, 309–385.
- [13] Dmitry Chelkak, Robust discrete complex analysis: a toolbox, *Ann. Probab.* 44 (2016), no. 1, 628–683.
- [14] Dmitry Chelkak, Hugo Duminil-Copin, Clément Hongler, Crossing probabilities in topological rectangles for the critical planar FK Ising model, *Electron. J. Probab.*, 21 (2016), paper no. 5, 1–28.
- [15] Dmitry Chelkak, Clément Hongler, Konstantin Izyurov, Conformal invariance of spin correlations in the planar Ising model, *Ann. Math.* 181 (2015), no. 3, 1087–1138.
- [16] Dmitry Chelkak, Hugo Duminil-Copin, Clément Hongler, Antti Kemppainen, Stanislav Smirnov, Convergence of Ising interfaces to Schramm’s SLE curves, *C. R. Acad. Sci. Paris, Ser. I* 352 (2014), 157–161.
- [17] Dmitry Chelkak, Konstantin Izyurov, Holomorphic spinor observables in the critical Ising model, *Comm. Math. Phys.* 322 (2013), no. 2, 303–332.

DMITRY CHELKAK – LIST OF PUBLICATIONS (CONTINUED)

- [18] Dmitry Chelkak, Stanislav Smirnov, Universality in the 2D Ising model and conformal invariance of fermionic observables, *Invent. Math.*, 189 (2012), no. 3, 515–580.
  - [19] Dmitry Chelkak, Stanislav Smirnov, Discrete complex analysis on isoradial graphs, *Advances in Mathematics*, 228 (2011), no. 3, 1590–1630.
  - [20] An application of the fixed point theorem to the inverse Sturm-Liouville problem. Chelkak, D.: *Записки научных семинаров ПОМИ*, 370 (2009), 203–218.  
English translation: *J. Math. Sci.* 166 (2010), no. 1, 118–126.
  - [21] Обратная задача Штурма-Лиувилля со смешанными краевыми условиями, Е. Л. Коротяев, Д. С. Челкак: *Алгебра и анализ*, 21 (2009), no. 5, 114–137.  
English translation: The inverse Sturm–Liouville problem with mixed boundary conditions. *St. Petersburg Math. J.* 21 (2010), no. 5, 761–778.
  - [22] Weyl-Titchmarsh functions of vector-valued Sturm–Liouville operators on the unit interval. Chelkak, D.; Korotyaev, E.: *Journal of Functional Analysis* 257 (2009), 1546–1588.
  - [23] The inverse problem for perturbed harmonic oscillator on the half-line with a Dirichlet boundary condition. Chelkak, D.; Korotyaev, E.: *Ann. Henri Poincaré* 8 (2007), no. 6, 1115–1150.
  - [24] Parametrization of the isospectral set for the vector-valued Sturm-Liouville problem. Chelkak, D.; Korotyaev, E.: *Journal of Functional Analysis* 241 (2006), 359–373.
  - [25] Spectral estimates for Schrodinger operator with periodic matrix potential on the real line. Chelkak, D.; Korotyaev, E.: *Int. Math. Res. Not.*, 2006, Article ID 60314, 1–41.
  - [26] Inverse problem for harmonic oscillator perturbed by potential, characterization. Chelkak, D.; Kargaev, P.; Korotyaev, E.: *Comm. Math. Phys.* 249 (2004), no. 1, 133–196.
  - [27] Inverse problem for harmonic oscillator perturbed by potential. Chelkak, D.; Kargaev, P.; Korotyaev, E.: Inverse problems and spectral theory, 93–102, *Cont. Math.* 348, AMS, Providence, RI, 2004.
  - [28] Асимптотика спектральных данных гармонического осциллятора, возмущенного потенциалом с конечной энергией. Д. С. Челкак: *Зап. Науч. Сем. ПОМИ* 303 (2003) 223–271. English translation: Asymptotics of spectral data of a harmonic oscillator perturbed by a potential. *J. Math. Sci.* 129 (2005), no. 4, 4053–4082.
  - [29] Аппроксимация в пространстве спектральных данных возмущенного гармонического осциллятора. Д. С. Челкак: *Проблемы Мат. Анализа* 26 (2003) 287–300.  
English translation: Approximation in the space of spectral data of a perturbed harmonic oscillator. *J. Math. Sci.* 117 (2003), no. 3, 4260–4269.
  - [30] An inverse problem for an harmonic oscillator perturbed by potential: uniqueness. Chelkak, D.; Kargaev, P.; Korotyaev, E.: *Lett. Math. Phys.* 64 (2003), no. 1, 7–21.
- **Unpublished preprints:**
- [31] Dmitry Chelkak, Alexander Glazman, Stanislav Smirnov, Discrete stress-energy tensor in the loop  $O(n)$  model. [arXiv:1604.06339](https://arxiv.org/abs/1604.06339)
  - [32] Inverse vector-valued Sturm-Liouville problem. I. Uniqueness theorem. Dmitry Chelkak, Sergey Matveenko, [arXiv:1312.3621](https://arxiv.org/abs/1312.3621).
  - [33] Inverse spectral analysis for finite matrix-valued Jacobi operators. J. Bruning, D. Chelkak, E. Korotyaev, [arXiv:math/0607809](https://arxiv.org/abs/math/0607809).

DMITRY CHELKAK – CONFERENCE TALKS

- *2022 (as scheduled in 2021):*
  - “Probability and Mathematical Physics”, Helsinki (ICM2022 satellite);
- *2020:*
  - Oberwolfach mini-workshop “Dimers, Ising and Spanning Trees”, online;
  - “Fractals and Related Fields IV”, online;
  - “Statistical Mechanics, Integrable Systems and Probability – 2020”, online;
  - “Inhomogeneous Random Systems”, Institut Henri Poincaré, Paris;
- *2019:*
  - BIRS Workshop “Dimers, Ising Model, and their Interactions”, Banff;
  - “Probability and quantum field theory: discrete models, CFT, SLE and constructive aspects”, Porquerolles;
  - Virginia Integrable Probability Summer School, Charlottesville (mini-course);
  - “Preharmonic functions and boundaries”, Tour;
- *2018:*
  - “États de la recherche SMF : mécanique statistique”, Institut Henri Poincaré, Paris;
  - ICM2018 (International Congress of Mathematicians), Rio de Janeiro (invited talk at the “Analysis and Operator Algebras” & “Probability and Statistics” sections);
  - ICMP2018 (International Congress on Mathematical Physics), Montreal (invited talk at the “Equilibrium Statistical Mechanics” session);
  - “Inhomogeneous Random Systems”, Institut Henri Poincaré, Paris;
  - 8ème Séminaire Itzykson, IHÉS, Bures-sur-Yvette;
  - Winter School in Mathematical Physics at Les Diablerets (mini-course);
- *2017:*
  - SPA-2017 (39th Conference on Stochastic Processes and Their Applications), Moscow;
  - Les probabilités de demain, l’édition 2017, IHÉS, Bures-sur-Yvette;
- *2016:*
  - IESC Workshop “Quantum integrable systems, conformal field theories and stochastic processes”, Cargèse;
  - INFN Workshop “Condensed Matter and Critical Phenomena”, Frascati;
  - 7th European Congress of Mathematics, Berlin (invited talk, “Applied Mathematics and Probability” section);
  - “8th St. Petersburg Conference in Spectral Theory”, St. Petersburg;
  - “25th St. Petersburg Summer Meeting in Mathematical Analysis: Tribute to Victor Havin, 1933-2015”, St. Petersburg;
  - “Inhomogeneous Random Systems”, Institut Henri Poincaré, Paris;
- *2015:*
  - Genève–Grenoble–Lyon Probability Day, Grenoble;
  - 2015 Fields Medal Symposium “Complex Analysis meets Statistical Physics” in honour of Stanislav Smirnov, Toronto;
  - 2015 Charles River Lectures on Probability Theory and Related Topics, Cambridge(MA);
  - Oberwolfach Workshop “Discrete Differential Geometry”, Oberwolfach;
  - “Topics in Low-Dimensional Statistical Mechanics”, Les Diablerets;
  - INI Workshop “Conformally Invariant Scaling Limits”, Cambridge(UK);
- *2014:*
  - Hypathie seminar, Marseille;
  - ITS Science Colloquium, Zurich;
  - BIRS Workshop “Probability on Trees and Planar Graphs”, Banff;
  - MAC2 Workshop “Two-Dimensional Random Critical Models”, Paris;
  - “6th St. Petersburg Conference in Spectral Theory”, St. Petersburg;

DMITRY CHELKAK – CONFERENCE TALKS ETC (CONTINUED)

- *2013*:
  - “Russian-Chinese Seminar on Asymptotic Methods in Probability Theory and Mathematical Statistics”, St. Petersburg;
  - “Conformal geometry” program at SCGP, Stony Brook;
  - “Two-Dimensional Statistical Mechanics”, Les Diablerets;
- *2012*:
  - Oberwolfach Workshop “Scaling Limits in Models of Statistical Mechanics”, Oberwolfach;
  - Oberwolfach Workshop “Discrete Differential Geometry”, Oberwolfach;
  - “Conformal Invariance, Discrete Holomorphicity and Integrability”, Helsinki;
  - “Statistical Mechanics and Conformal Invariance”, Berkeley;
  - YEP Workshop ‘Two-dimensional statistical mechanics’, Eindhoven (mini-course);
  - MIAN-PDMI Winter Workshop “Probability and Functional Analysis”, Moscow;
- *2011*:
  - “Random Processes, Conformal Field Theory and Integrable Systems”, Moscow;
  - “Geometry Days in Novosibirsk, 2011”, Novosibirsk;
  - “3rd St. Petersburg Conference in Spectral Theory”, St. Petersburg;
  - “3rd Northern Triangular Seminar”, St. Petersburg;
  - “Complex analysis and spectral problems” term at the CRM, Barcelona;
  - “Globus” Seminar, Moscow;
- *2010*:
  - “73rd Annual Meeting of the Institute of Mathematical Statistics”, Gothenburg (invited session “Scaling limits and conformal invariance”);
  - “Conformal Structures and Dynamics” (CODY-2010), Seillac;
- *2009*:
  - “Conformal Structures and Dynamics” (CODY-2009), Będlewo;
  - “Conference in Spectral Theory dedicated to the memory of M.Sh.Birman”, St. Petersburg;
  - “33rd Conference on Stochastic Processes and Their Applications”, Berlin (invited special session “Schramm-Loewner Evolution”);
  - “Globus” Seminar, Moscow;
- *2008*:
  - “Geometry and Integrability”, Obergurgl;
  - “Differential equations, Function spaces, Approximation theory” dedicated to the 100th anniversary of the birthday of S.L.Sobolev, Novosibirsk;
  - Oberwolfach-Leibniz-Fellowship at the MFO, Oberwolfach;
  - “17th St. Petersburg meeting in Mathematical Analysis”, St. Petersburg;
  - “3rd La Pietra School in Probability”, Firenze;
  - ESF Conference “Operator Theory, Analysis and Mathematical Physics”, Będlewo;
  - Oberwolfach Workshop “Stochastic Analysis”, Oberwolfach;
- *2007*:
  - Bilateral French-Russian Seminar “Asymptotic methods in spectral theory and applications”, St. Petersburg;
- *2005*:
  - “Wave motion” term at the Mittag-Leffler Institute, Djursholm;
  - Workshop “Mathematical models of nanostructures: spectral problems and scattering properties”, Berlin;
- *2003*:
  - Workshop “Spectral problems for Schrödinger-type operators II”, Berlin;
  - “12th St. Petersburg Meeting in Mathematical Analysis”, St. Petersburg.