

GOURAB RAY

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ACADEMIC INTERESTS

I work broadly in the field of probability theory. In particular, I am mostly excited by problems originating in statistical mechanics and mathematical physics. I also dabble in Combinatorics, Ergodic theory and Statistics from time to time.

EDUCATION AND EMPLOYMENT

- Associate Professor, University of Victoria, Canada, 2021-present.
- Assistant Professor, University of Victoria, Canada. 2017-21
- Research Associate (Postdoc): University of Cambridge, 2014-17. Mentor: Nathanael Berestycki.
- PhD. University of British Columbia, Vancouver, 2014. Advisor: Omer Angel.
- M.Stat. Indian Statistical Institute, Kolkata, India. 2010.
- B.Stat. Indian Statistical Institute, Kolkata, India. 2008.

RESEARCH GRANTS, AWARDS AND FELLOWSHIPS

Agency	Title	Grant Holders	Time period	Amount awarded per annum
NSERC	Statistical mechanics of spins, trees, random surfaces and factors of iid	Gourab Ray	2024-2028	27,000
NSERC	Universality and Conformal invariance of certain two dimensional statistical physics models	Gourab Ray	2018-2023	23,000
NSERC	ECR	Gourab Ray	2018	12,500

- Obtained a successful grant of 3000 CAD from PIMS to host a probability and dynamics seminar series at UVic. 2024-25.
- Obtained a successful grant of 5000 CAD from PIMS to host a series of distinguished special colloquiums in 2020-21. Postponed to 2021-22 due to COVID-19.
- Obtained a successful grant of 2000 CAD from PIMS to run regular probability seminar in 2020-21. Postponed to 2021-22 due to COVID-19.

¹Updated December 23, 2024

- Obtained a successful grant of 2000 CAD to host a one-day conference (to be held on May 4, 2020) in Victoria bringing together the probability community in the PIMS area. Postponed to 2021-22 due to COVID-19.
- PIMS-Europe fellowship 2019. (CAD 5000 for research visit to Paris 7).

Publications accepted or in press (in reverse chronological order)

1. Berestycki, N., Laslier, B., Ray, G., The dimer model on Riemann surfaces II: conformal invariance and scaling limit. *Prob. Math. Physics*. 2024. [DOI Link](#)
2. Berestycki, N., Laslier, B., Ray, G., The dimer model on Riemann surfaces I: Temperleyan forests. *AIHP'D, combinatorics, physics and their interaction*. 2024. [DOI link](#)
3. Angel, O., Ray, G., Spinka, Y. Uniform even subgraphs and graphical representations of Ising as factors of i.i.d. *Elec. J. Probab.* [DOI link](#). 2024.
4. Angel, O., Ray, G., Spinka, Y. A tale of two Balloons. *Probab. Theory Relat. Fields*. 185, 815–837, 2023. [DOI link](#)
5. Yu, T., Ray, G. Quantitative Russo-Seymour-Welsh for random walk on random graphs and decorrelation of UST. *Journal of Theoretical Prob.* [DOI Link](#) 2023.
6. Ray, G., Spinka, Y. Proper 3-colorings of \mathbb{Z}^2 are Bernoulli. *Ergod. Theory Dyn. Syst.* 2023. [DOI Link](#)
7. Duminil-Copin, H., Harel, M., Laslier, B., Raoufi, A., Ray, G., Logarithmic variance for the height function of square-ice. *Commun. Math. Phys.* [DOI link](#). 2022.
8. Mukherjee, R., Ray, G., On testing of parameters in Ising models. *Ann. Inst. Henri Poincaré Probab. Stat.*, 58(1): 164-187, 2022. [DOI link](#)
9. Xiao, B. Ray, G. Forests on wired trees. *ALEA, Lat. Am. J. Probab. Math. Stat.* [DOI link](#). 2022.
10. Ray, G., Spinka, Y. Finitary codings of gradient models and a new graphical representation of the six-vertex model. *Random Struct. Algorithms*. [DOI link](#). 2021.
11. Berestycki, N., Powell, E., Ray, G. $(1 + \varepsilon)$ -moments suffice to characterize the GFF. *Electron. J. Probab.* [DOI link](#). 2021.
12. Ray, G., Spinka, Y. A short proof of the discontinuity of phase transition for the random cluster model with $q > 4$. *Commun. Math. Phys.* [DOI link](#). 2020.
13. Berestycki, N., Laslier, B., Ray, G., Dimers and Imaginary geometry. *Ann. Prob.* [DOI link](#). 2020.
14. Berestycki, N., Powell, E., Ray, G., A characterization of the Gaussian free field. *Probab. Theory Relat. Fields* [DOI link](#). 2020
15. Baur, E., Miermont, M., Classification of scaling limits of uniform infinite planar quadrangulations with a boundary. *Ann. Probab.* [DOI link](#). 2019.
16. Angel, O., Ray, G., The half plane UIPT is recurrent. *Probab. Theory Relat. Fields* . [DOI link](#). 2018.
17. Berestycki, N., Laslier, B., Ray, G., Critical exponents on Fortuin-Kasteleyn weighted planar maps. *Communications in Mathematical Physics*, [DOI link](#). 2017.
18. Pete, G., Ray, G., A unimodular hyperbolic souvlaki- an appendix to “A liouville hyperbolic Souvlaki”. *Electron. J. Probab.* [DOI link](#). 2017.
19. Angel, O., Hutchcroft, T., Nachmias, A., Ray, G. Hyperbolic and parabolic unimodular random maps. *Geom. Funct. Anal.* [DOI link](#). 2017.

20. Angel, O., Hutchcroft, T., Nachmias, A., Ray, G. Unimodular hyperbolic triangulations: circle packing and random walk. *Invent. math.* [DOI link](#).
21. Angel, O., Nachmias, A., Ray, G. Random Walk on Stochastic hyperbolic half planar triangulations. *Random structures and algorithms* [DOI link](#). 2016.
22. Ray, G. Geometry and percolation on half planar triangulations. *Electron. J. Probab.* [DOI link](#). 2014.
23. Angel, O., Chapuy, G., Curien, N., The local limit of unicellular maps in high genus. *Electron. Commun. Probab.* [DOI link](#). 2013.
24. Ray, G., Large unicellular maps in high genus. *Ann. Inst. H. Poincaré Probab. Statist.* [DOI link](#). 2015.
25. Angel, O., Ray, G., Classification of half planar maps. *Ann. Probab.* [DOI link](#).

Preprints

1. Butler, N., Krishnan K. K., Ray, G., Spinka, Y. On the local convergence of integer-valued Lipschitz functions on regular trees. ArXiv preprint. 2024. arXiv:2410.05542. Submitted.
2. Krishnan K. K., Ray, G. Uniqueness and CLT for the Ground State of the Disordered Monomer-Dimer Model on \mathbb{Z}^d . 2024. IMRN, revision requested. Arxiv preprint. arXiv:2406.13089. Submitted.
3. Ray, G. Double dimers on planar hyperbolic graphs via circle packing. arXiv:2406.12188. Submitted.
4. Ray, G., Spinka, Y. Characterization of amenability through stochastic domination and finitary codings. Arxiv preprint. arXiv:2304.13784. Submitted.
5. Mukherjee, M., Bhattacharya, S., Ray, G. Sharp signal detection in ferromagnetic Ising models. Preprint: arXiv:2110.02949
6. Berestycki, N., Laslier, B., Ray, G., A note on dimers and T graph. Preprint, arXiv 1610.07994. , 2019

Other publications

1. Duminil-Copin, H., Dubédat, J. Dimers, Ising models and their interaction. Technical report submitted following up a 5-Day workshop at BIRS, Nov, 2019.

INVITED TALKS

- Journées Cartes, Saclay, France, June 20-21, 2013.
- Work-shop on random trees and planar graphs, Banff International research station, 2014. ([Video link](#))
- Hyperbolic random maps: An overview. Journées Cartes, IHES, France, December 9 2014.
- Random planar structures work-shop, Isaac Newton Institute, Cambridge, April 2015.
- Stochastic Processes and their applications (random map session), July, 2015.
- Hyperbolic and parabolic random maps, 9th World Congress of Probability and Statistics at Toronto, random map session, 2016.
- Northwest Probability seminar, Washington, USA, 2017. ([Video link](#))
- CIRM, workshop on random graphs, Luminy, Marseille, 2018. ([Video link](#))
- Probability seminar, University of British Columbia, 2018.
- ICSAA conference, Bielefeld, invited session, 2018.

- Probability seminar, University of Washington, 2018.
- Probability seminar, University of British Columbia, 2018.
- Probability seminar, IHES, 2018.
- Probability seminar, University Paris-Diderot, 2019.
- IMS, China . Invited session on Gaussian free field in July 7-10, Dalian, China. Unable to attend for visa issues.
- Probability seminar, ISI, Kolkata, 2019.
- Probability and random matrix seminar, Harvard, 2020.
- Probability seminar, University of Pennsylvania, 2020 (Cancelled due to Covid).
- Probability seminar, University of Washington, 2020 (Cancelled due to Covid).
- Invited zoom lecture in the lecture series “Quantum matter meets math”. More information at this [link](#).
- Mini-Course on “Universality of dimers via Imaginary geometry” in ICTS, Bangalore 2021. Delivered online. [Video Link](#)
- Dynamics seminar at U of Texas. Feb 2021. [Video link](#).
- AMS special session in probability and combinatorics, March 2021.
- *Percolation Today* online seminar. (two 40 min sessions). Joint with Spinka, Y. (Jan 2022) [Video link](#).
- Probability seminar, ISI Kolkata. May 2022.
- Probability seminar, U Minnesota. September, 2022.
- Probability seminar, Cornell University. January 2023.
- Mini-course in ICTS, Bangalore, 2023. (Declined because of family constraint)
- Interface between classical and Quantum statistical mechanics, Sau Paolo, August, 2023.
- Mini-Course on ‘Random walks, electrical networks and circle packing’. Summer school: Escuela Conjunta de Dinámica, Combinatoria y Probabilidad (DCP) San Luis Potosi, Mexico. July 2024.
- Invited lightning talk on Workshop: ‘Frontiers of Statistical Mechanics and Theoretical Computer Science’. BIRS, August, 2024.
- Probability seminar. Seattle, Jan 2025 (upcoming).

Seleted talks by co-authors

- Dimers and Imaginary geometry. [Survey Talk](#) by N. Berestycki at JIPS.
- Dimers on Riemann surfaces. [Talk](#) by N. Berestycki at BIRS.
- Short proof of Discontinuity of phase transition for the planar random cluster model for $q > 4$. [Talk](#) by Yinon Spinka at BIRS.
- A tale of Two Balloons. [Talk](#) by Yinon Spinka at Seminário Brasileiro de Probabilidade. [Talk](#) by Omer Angel (BMS/IMS Schramm Lecture.)
- Uniform even subgraphs and graphical representations of Ising as factors of i.i.d. [Talk](#) by Omer Angel at FPSAC, 2022.

SERVICE AND PROFESSIONAL ACTIVITIES

Departmental committees and responsibilities

- Hiring plan committee. 2024.
- Tenure and promotion committee 2021-present.
- Graduate committee, 2021-present.
- Department colloquium chair. 2021-22.
- Graduate committee, 2020-21.
- Department colloquium chair. 2020-21.
- Library representative, 2019-2020.
- Colloquium chair, 2019-2020.

Other professional services

- Reviewer for applications for PIMS postdoc competition, 2022-24.
- Served as a chair in a PhD defence on June, 2018 and June 2024 at UVic.
- Participated in *Strategic planning: Research Retreat*. organized by Faculty of Science, June, 2021.
- Reviewed grant proposal for Israel Science Foundation (ISF).
- Reviewed Habilitation proposal, University of Vienna.

Conference organizational committees

- Co-organized the ‘Discrete probability’ session at the CMS winter meet, 2024.
- Dimers day (a weeklong workshop), joint organizer (with N. Berestycki and B. Laslier), Cambridge, UK. 2016.
- 5 Day workshop on “Dimers, Ising models and their interaction”, BIRS, 2019. (Joint organizer with Hugo Duminil-Copin and Julien Dubedat.) [Link](#).
- Jointly organizing (with Y. Ting and A. Quas), “Victoria probability day”, a one-day probability conference on May 4, 2020 to be held at UVic. Postponed to 2021-22 due to COVID-19. [Link](#).
- Joint organizer of OOPS session given by Nina Holden (online open probability school) (with UBC faculty). Online zoom lecture series in probability theory and related areas. Summer 2020.
- Chair of the organization committee of Pacific Rim Congress 2021- Probability Theory Session (other committee members: Akira Sakai, Gordon Slade and Lung-Chi Chen). Changed to a PIMS workshop held online Dec 6-9, 2021. [Link](#).
- Regular colloquium and probability seminar organizer at UVic for 2020-present.

Reviews for journals, book reviews, published commentaries

- Refereed articles for Annals of Probability, AIHP-D (Combinatorics, Physics and their Interactions), Combinatorial Theory, Electronic Journal of Probability, Probability theory and related fields, Journal of the AMS, Inventiones Mathematicae, Discrete and Computational geometry, Communications in Mathematical physics, Canadian J. Math., Annales scientifiques de l'École normale supérieure, Proceedings of London Mathematical Society, Probability and Mathematical physics.
- Invited to review a book proposal for *De Gruyter series in Probability and Stochastics*.
- Written reviews for articles in MathScinet.

Outreach

- Serving as a judge in 'Honours fest', an event for undergraduate students at UVic. May 2025.
- I am jointly organizing jointly a series "Women in math" at UVic. The first talk has already occurred ([Link](#)) and the second talk by Lily Reeves is upcoming on March 4.
- Along with regular colloquiums I have co-organized a Colloquium series for "*Math from multicultural perspective*" jointly with the *Equity, diversity and inclusion* committee.
- Delivering a seminar in the monthly seminar series *Imagining* organized by the *Association for women in Mathematics* in UVic, intended for high school girls. November, 2022.

TEACHING EXPERIENCE

Courses taught

Over the years I have taught various courses which include Math 100 (First year Calculus), Math 204 (Vector calculus and intro to ODE), Math 236 (Intro to Real Analysis), Math 352 (Intro to probability), Math 451 (Advanced Probability), Math 452 (Stochastic processes).

Graduate students supervised

- Tingzhou Yu (Masters) Sept 2019-Aug 2021
- Ben Xiao (Masters) Sept 2020-Aug 2022
- Yakov Shklarov. (Masters, Joint with Anthony Quas). September 2021 -2023.
- Nathaniel Butler. (Masters) January 2022-present.
- Swarnadeep Bagchi (PhD), September 2023-present.

Postdocs mentored

- Kesav Krishnan. September 2023-present.

Undergraduate students supervised

- Kurt MacKay (Fall 2018). Research project.
- Ben MacVicar (Fall 2019). Research project.
- Ben Xiao (Winter 2020). Directed studies.
- Nathaniel Butler (Fall 2019). Directed studies.
- Xuchen Wu. (Fall 2020). Research project.
- Alexandra Deane (Summer, 2021). SURA summer research project.
- Shannon Ogden (Summer 2021). Directed studies.
- Gabriele Crudele (Summer 2023). SURA summer research project.
- Abil Nurgaliev (Summer 2024). Summer research project.