

Curriculum Vitae of Ewain Gwynne

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Employment

Associate professor, University of Chicago	Sep. 2020—Present
Clay research fellow Four year appointment.	Jul. 2019—Jul. 2023
Trinity College, Cambridge junior research fellow Four year appointment.	Jul. 2018—Present
Herchel Smith postdoctoral fellow Department of Pure Mathematics and Mathematical Statistics, University of Cambridge.	Aug. 2018—Jul. 2019
Microsoft Research theory group intern, Redmond WA Mentored by Sébastien Bubeck and David Wilson.	Jun. 2015—Aug. 2015

Education

Ph.D., Mathematics Massachusetts Institute of Technology Adviser: Scott Sheffield	Sep. 2013—Jun. 2018
B.A., Mathematics & Mathematical Methods in the Social Sciences Northwestern University Honors in Mathematics, Summa Cum Laude	Sep. 2009—Jun. 2013

Research interests

Probability theory, including statistical mechanics, Schramm-Loewner evolution, random planar maps, Liouville quantum gravity, random walk in random environment.

Articles

Articles published or accepted for publication

1. **Geodesic networks in Liouville quantum gravity surfaces.** *Probability and Mathematical Physics*. arXiv:2010.11260
2. **Tightness of supercritical Liouville first passage percolation** (with Jian Ding). *Journal of the European Mathematical Society*. arXiv:2005.13576
3. **Mating of trees for random planar maps and Liouville quantum gravity: a survey** (with Nina Holden and Xin Sun). *Panoramas et Syntheses*. arXiv:1910.04713
4. **The dimension of the boundary of a Liouville quantum gravity metric ball.** *Communications in Mathematical Physics*. arXiv:1909.08588
5. **Random surfaces and Liouville quantum gravity.** *Notices of the American Mathematical Society*. arXiv:1908.05573
6. **KPZ formulas for the Liouville quantum gravity metric** (with Josh Pfeffer). *Transactions of the American Mathematical Society*. arXiv:1905.11790
7. **Joint scaling limit of site percolation on random triangulations in the metric and peanosphere sense** (with Nina Holden and Xin Sun). *Electronic Journal of Probability*. arXiv:1905.06757

8. **Conformal covariance of the Liouville quantum gravity metric for $\gamma \in (0, 2)$** (with Jason Miller). *Annales de l'Institut Henri Poincaré*. arXiv:1905.00384
9. **Existence and uniqueness of the Liouville quantum gravity metric for $\gamma \in (0, 2)$** (with Jason Miller). *Inventiones Mathematicae*. arXiv:1905.00383
10. **Confluence of geodesics in Liouville quantum gravity for $\gamma \in (0, 2)$** (with Jason Miller). *Annals of Probability*. arXiv:1905.00381
11. **Weak LQG metrics and Liouville first passage percolation** (with Julien Dubédat, Hugo Falconet, Josh Pfeffer, and Xin Sun). *Probability theory and related fields*. arXiv:1905.00380
12. **Local metrics of the Gaussian free field** (with Jason Miller). *Annales de l'Institut Fourier*. arXiv:1905.00379
13. **Bounds for distances and geodesic dimension in Liouville first passage percolation** (with Josh Pfeffer). *Electronic Communications in Probability*. arXiv:1903.09561
14. **Liouville quantum gravity surfaces with boundary as matings of trees** (with Morris Ang). *Annales de l'Institut Henri Poincaré*. arXiv:1903.09120
15. **Liouville quantum gravity with matter central charge in $(1, 25)$: a probabilistic approach** (with Nina Holden, Josh Pfeffer, and Guillaume Remy). *Communications in Mathematical Physics*. arXiv:1903.09111
16. **External diffusion limited aggregation on a spanning-tree-weighted random planar map** (with Josh Pfeffer). *Annals of Probability*. arXiv:1901.06860
17. **Conformal invariance of CLE_κ on the Riemann sphere for $\kappa \in (4, 8)$** (with Jason Miller and Wei Qian). *International Math Research Notices*. arXiv:1811.00514
18. **The Tutte embedding of the Poisson-Voronoi tessellation of the Brownian disk converges to $\sqrt{8/3}$ -Liouville quantum gravity** (with Jason Miller and Scott Sheffield). *Communications in Mathematical Physics*. arXiv:1809.02091
19. **Harmonic functions on mated-CRT maps** (with Jason Miller and Scott Sheffield). *Electronic Journal of Probability*. arXiv:1807.07511
20. **Anomalous diffusion of random walk on random planar maps** (with Tom Hutchcroft). *Probability theory and related fields*. arXiv:1807.01512
21. **The fractal dimension of Liouville quantum gravity: universality, monotonicity, and bounds** (with Jian Ding). *Communications in Mathematical Physics*. arXiv:1807.01072
22. **Connectivity properties of the adjacency graph of SLE_κ bubbles for $\kappa \in (4, 8)$** (with Josh Pfeffer). *Annals of Probability*. arxiv:1803.04923
23. **Random walk on random planar maps: spectral dimension, resistance, and displacement** (with Jason Miller). *Annals of Probability*. arxiv:1711.00836
24. **A mating-of-trees approach for graph distances in random planar maps** (with Nina Holden and Xin Sun). *Probability Theory and Related Fields*. arxiv:1711.00723
25. **The Tutte embedding of the mated-CRT map converges to Liouville quantum gravity** (with Jason Miller and Scott Sheffield). *Annals of Probability*. arxiv:1705.11161
26. **Convergence of percolation on uniform quadrangulations with boundary to SLE_6 on $\sqrt{8/3}$ -Liouville quantum gravity** (with Jason Miller). *Asterisque*. arxiv:1701.05175
27. **Characterizations of SLE_κ for $\kappa \in (4, 8)$ on Liouville quantum gravity** (with Jason Miller). *Asterisque*. arxiv:1701.05174
28. **Convergence of the free Boltzmann quadrangulation with simple boundary to the Brownian disk** (with Jason Miller). *Annales de l'Institut Henri Poincaré*. arxiv:1701.05173

29. **Chordal SLE₆ explorations of a quantum disk** (with Jason Miller). *Electronic Journal of Probability*. arxiv:1701.05172
30. **Convergence of the self-avoiding walk on random quadrangulations to SLE_{8/3} on $\sqrt{8/3}$ -Liouville quantum gravity** (with Jason Miller). *Annales de l'ENS*. arxiv:1608.00956
31. **Metric gluing of Brownian and $\sqrt{8/3}$ -Liouville quantum gravity surfaces** (with Jason Miller). *Annals of Probability*. arxiv:1608.00955
32. **Scaling limit of the uniform infinite half-plane quadrangulation in the Gromov-Hausdorff-Prokhorov-uniform topology** (with Jason Miller). *Electronic Journal of Probability*. arxiv:1608.00954
33. **A distance exponent for Liouville quantum gravity** (with Nina Holden and Xin Sun). *Probability Theory and Related Fields*. arxiv:1606.01214
34. **Active spanning trees with bending energy on planar maps and SLE-decorated Liouville quantum gravity for $\kappa > 8$** (with Adrien Kassel, Jason Miller, and David Wilson). *Communications in Mathematical Physics*. arxiv:1603.09722
35. **Dimension transformation formula for conformal maps into the complement of an SLE curve** (with Nina Holden and Jason Miller). *Probability theory and related fields*. arxiv:1603.05161
36. **An almost sure KPZ relation for SLE and Brownian motion** (with Nina Holden and Jason Miller). *Annals of Probability*. arxiv:1512.01223
37. **Brownian motion correlation in the Peanosphere for $\kappa > 8$** (with Nina Holden, Jason Miller, and Xin Sun). *Annales de l'Institut Henri Poincaré*. arxiv:1510.04687
38. **Scaling limits for the critical Fortuin-Kasteleyn model on a random planar map II: local estimates and empty reduced word exponent** (with Xin Sun). *Electronic Journal of Probability*. arxiv:1505.03375
39. **Scaling limits for the critical Fortuin-Kasteleyn model on a random planar map I: cone times** (with Cheng Mao and Xin Sun). *Annales de l'Institut Henri Poincaré*. arxiv:1502.00546
40. **Almost sure multifractal spectrum of SLE** (with Jason Miller and Xin Sun). *Duke Mathematical Journal*. arxiv:1412.8764

Articles posted to the arXiv

41. **Introduction to the Liouville quantum gravity metric** (with Jian Ding and Julien Dubédat). 2021. arXiv:2109.01252
42. **The critical Liouville quantum gravity metric induces the Euclidean topology** (with Jian Ding). 2021. arXiv:2108.12067
43. **Up-to-constants comparison of Liouville first passage percolation and Liouville quantum gravity** (with Jian Ding). 2021. arXiv:2108.12060
44. **Regularity and confluence of geodesics for the supercritical Liouville quantum gravity metric** (with Jian Ding). 2021. arXiv:2104.06502
45. **Geodesics and metric ball boundaries in Liouville quantum gravity** (with Josh Pfeffer and Scott Sheffield). 2020. arXiv:2010.07889
46. **The distance exponent for Liouville first passage percolation is positive** (with Jian Ding and Avelio Sepúlveda). 2020. arXiv:2005.13570
47. **Random walks on mated-CRT planar maps and Liouville Brownian motion** (with Nathanael Berestycki). 2020. arXiv:2003.10320
48. **An invariance principle for ergodic scale-free random environments** (with Jason Miller and Scott Sheffield). 2018. arXiv:1807.07515

49. **Joint scaling limit of a bipolar-oriented triangulation and its dual in the peanosphere sense** (with Nina Holden and Xin Sun). 2016. arxiv:1603.01194
50. **Scaling limits for the critical Fortuin-Kasteleyn model on a random planar map III: finite volume case** (with Xin Sun). 2015. arxiv:1510.06346
51. **Asymptotic behavior of the Eden model with positively homogeneous edge weights** (with Sébastien Bubeck). 2015. arxiv:1508.05140

Articles written as an undergraduate

52. **On Beckner's Inequality for Gaussian Measures** (with Elton Hsu). *Elemente der Mathematik*.
53. **Functional Inequalities for Gaussian and Log-Concave Probability Measures**. Undergraduate Thesis, advised by Elton Hsu. *Northwestern University Undergraduate Research Journal*.
54. **On a Quaternionic Analogue of the Cross Ratio** (with Matvei Libine). *Advances in Applied Clifford Algebras*. arxiv:1112.0612
55. **The Poisson Integral Formula and Representations of $SU(1,1)$** . *Rose-Hulman Undergraduate Math Journal*.

Teaching

1. **Teaching at Chicago** Spring 2021
I taught an undergraduate course on Markov chains, martingales, and Brownian motion.
2. **Supervisions for Trinity college** 2018-2019
I supervised pairs of students for Metric and Topological spaces and Analysis II in Michaelmas term, 2018; Complex Analysis in Lent term, 2019; and revisions for Part 1B (second year) courses in Easter term, 2019.
3. **MIT Teaching Assistant** 2016-2018
I taught recitations for 18.03 (ordinary differential equations) in Spring 2016 and for 18.022 (multivariable calculus) in Fall 2016. I was a grader for 18.615 (intro to stochastic processes) in each of Spring 2017 and Spring 2018.
4. **Northwestern University undergraduate teaching assistant** 2011-2013
I taught discussion sections for four sections of integral calculus, one section of single variable differential calculus, and one section of multivariable differential calculus.
5. **Tutor.com online math tutor** 2010-2013

Mentoring / Supervising

1. **UChicago REU** 2021
I mentored two students, Rouchuan Xu and Yuyang Feng, and helped organize the REU probability group.
2. **Master's student** 2020 - 2021
I supervised a student, Wanli Cheng, for Chicago's Master of Science Program in the Physical Sciences. Wanli did reading under my supervision for the 2020-2021 academic year and I suggested his thesis topic.
3. **Undergraduate student research projects** 2019
I supervised two undergraduate students, Robert Koirala and Kaidi Xhang, working on a summer research project. I suggested the research problem and met with them regularly to discuss their progress, answer questions, and offer suggestions.
4. **Mentor for directed Reading Program** 2014, 2017
I mentored an MIT undergraduate student studying probability during MIT's Independent Activities Period (the month of January).

Departmental service

1. **University of Chicago department committees** 2020-present
Colloquium committee, graduate admissions committee.
2. **Integration Bee co-organizer** 2014-2017
I was a co-organizer for the MIT integration bee, an event where undergraduate students compete to evaluate integrals and win prizes, in 2014, 2016, and 2017. I also contributed integrals in 2014-2018.

Professional service

1. **Random Geometry and Statistical Physics** online seminar, co-organizer 2020-2021
2. **Reviewer for academic journals**
Annales de l'Institut Henri Poincaré, Communications in Mathematical Physics, Electronic Journal of Probability, Probability theory and related fields, Proceedings of the London Mathematical Society, Annals of Math, Forum of Math: Pi, Duke Math Journal, etc.

Talks

1. ICM sectional lecture, Moscow Jul. 2022
2. Probability and Mathematical Physics ICM satellite conference, Helsinki. Jun. 2022
3. CIRM Random geometry conference. Jan. 2022
4. Simons Center conference on *Probability, integrability, and conformal invariance* Aug. 2021
5. Expository talk for Trinity college, Cambridge alumni (online). Jan. 2021
6. Oberseminar Stochastik at University of Bonn (online). Dec. 2020
7. University of Bristol probability seminar (online). Nov. 2020
8. AMS Sectional meeting (originally at Penn State, now online). Oct. 2020
9. Bernoulli-IMS One World Symposium, "Models in Physics" session (online) Aug. 2020
10. University of Bath probability seminar (online). Apr. 2020
11. Cambridge mathematical physics seminar. Mar. 2020
12. Wharton (UPenn) statistics seminar. Jan. 2020
13. Northwestern University colloquium. Dec. 2019
14. University of Chicago colloquium. Dec. 2019
15. University of Chicago probability seminar. Dec. 2019
16. *Heat Kernels, Stochastic Processes and Functional Inequalities* conference at Oberwolfach. Nov. 2019
17. EPFL probability seminar. Oct. 2019
18. Princeton University probability seminar. Sep. 2019
19. Penn/Temple probability seminar. Sep. 2019
20. Stochastic Processes and their Applications conference, Northwestern University. Jul. 2019
21. *Probability and quantum field theory* conference, Porquerolle, France. Jun. 2019
22. University of Cambridge probability seminar. May. 2019

23. Vienna probability seminar.	Mar. 2019
24. Warwick probability seminar.	Feb. 2019
25. Amir Dembo birthday conference, Stanford.	Dec. 2018
26. Imperial College London stochastic analysis seminar.	Oct. 2018
27. Columbia University probability seminar.	Oct. 2018
28. Random Geometry followup workshop at the Isaac Newton Institute.	July 2018
29. IST Austria Summer School in Probability and Mathematical Physics.	June 2018
30. University of Chicago proseminar in probability.	Mar. 2018
31. Stony Brook University analysis seminar.	Mar. 2018
32. Brown University graduate student conference.	Feb. 2018
33. Penn/Temple probability seminar.	Feb. 2018
34. Tel Aviv University probability seminar.	Dec. 2017
35. Oberwolfach seminar: <i>Scaling limits of random planar maps and Liouville quantum gravity.</i>	Oct. 2017
36. Zurich graduate student probability seminar.	Oct. 2017
37. Zurich probability seminar.	Oct. 2017
38. Princeton University topics in probability seminar.	Sep. 2017
39. <i>Stochastic Analysis: Geometry of Random Processes</i> workshop at Oberwolfach.	May 2017
40. Brown university discrete math seminar.	Apr. 2017
41. AMS sectional meeting at Indiana University.	Apr. 2017
42. <i>SLE, GFF, and LQG in NYC</i> workshop at Columbia University.	Mar. 2017
43. Cornell probability seminar.	Feb. 2017
44. <i>Recent developments in SLE</i> conference at the Institut Mittag-Leffler.	Jun. 2016
45. MIT probability seminar.	Feb. 2016
46. University of Chicago probability seminar.	Jan. 2016
47. Michigan State University probability seminar.	Nov. 2015
48. Northwestern University analysis seminar.	Oct. 2015
49. Microsoft Research, Redmond, WA.	Aug. 2015
50. <i>Conformally invariant scaling limits</i> conference at the Isaac Newton Institute.	Jan. 2015
51. MIT Pure Math graduate seminar.	Nov. 2014
52. MIT Pure Math graduate seminar.	Feb. 2014

Awards

1. David G. Kendall Award	2021
2. Rollo Davidson Prize	2020
3. Clay research fellowship	2019
4. Johnson Prize for a paper written by an MIT graduate student	2018
5. NSF postdoctoral fellowship (declined)	2018
6. MIT Presidential Fellowship	2013
7. National Defense Science and Engineering Graduate Fellowship (NDSEG)	2013
8. Putnam Exam Honorable Mention (ranked 49th)	2013
9. Robert R. Welland Prize for Achievement in Mathematics by a Northwestern University Senior	2013
10. Phi Beta Kappa Prize	2013
11. Fletcher Undergraduate Research Prize	2012
12. Oliver Marcy Scholarship	2012
13. Barry M. Goldwater Scholarship	2012