Curriculum Vitae
Lionel Levine

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Employment

2017 – **Associate Professor**, Cornell University
2011 – 2017 **Assistant Professor**, Cornell University
2008 – 2011 **C. L. E. Moore Instructor**, Department of Mathematics, MIT

Education

2002 – 2007 **Ph.D.** in Mathematics, University of California, Berkeley
Thesis: *Limit Theorems for Internal Aggregation Models*, advised by Yuval Peres

1998 – 2002 **A.B.** in Mathematics, Harvard University

Grants and Fellowships

2015 – 2020 National Science Foundation Grant DMS-1455272 (CAREER)
2014 – 2016 Alfred P. Sloan Research Fellowship
2011 – 2014 National Science Foundation Grant DMS-1243606
2008 – 2011 National Science Foundation Postdoctoral Research Fellowship

Awards

2013 Paul R. Halmos - Lester R. Ford Award, Mathematical Association of America, *joint with Katherine Stange for the paper* "How to make the most of a shared meal"

Research Interests

Discrete probability, statistical mechanics, algebraic combinatorics.

Publications and Preprints

preprints
1. Bob Hough, Daniel C. Jerison and Lionel Levine, *Sandpiles on the square lattice.* arXiv:1703.00827
2. Lionel Levine and Ramis Movassagh, *The gap of the area-weighted Motzkin spin chain is exponentially small.* arXiv:1611.03147
3. Alexander E. Holroyd, Lionel Levine and Peter Winkler, *Abelian logic gates.* arXiv:1511.00422
4. Daniel C. Jerison, Lionel Levine and John Pike, *Mixing time and eigenvalues of the abelian sandpile Markov chain.* arXiv:1511.00666

2017
5. Lionel Levine, Wesley Pegden and Charles K. Smart, *The Apollonian structure of integer superharmonic matrices.* Annals of Math, to appear. arXiv:1309.3267
6. Elisabetta Candellero, Shirshendu Ganguly, Christopher Hoffman and Lionel Levine, *Oil and water: a two-type internal aggregation model.* Annals of Probability, to appear. arXiv:1408.0776
7. Lionel Levine and Yuval Peres, *Laplacian growth, sandpiles and scaling limits.* Bulletin of the American Mathematical Society, to appear. arXiv:1611.00411
8. Wilfried Huss, Lionel Levine and Ecaterina Sava-Huss, *Interpolating between random walk and rotor walk.* Random Structures & Algorithms, to appear. arXiv:1603.04107
9. Shirshendu Ganguly, Lionel Levine, Yuval Peres and James G. Propp, *Formation of an interface by competitive erosion.* Probability Theory and Related Fields, to appear. arXiv:1501.03584

2016 10. Benjamin Bond and Lionel Levine, *Abelian networks I. Foundations and examples.* SIAM Journal on Discrete Mathematics (2016) 30:856–874. arXiv:1309.3445

11. Benjamin Bond and Lionel Levine, *Abelian networks II. Halting on all inputs.* Selecta Mathematica (2016) 22:319–340. arXiv:1409.0169

12. Benjamin Bond and Lionel Levine, *Abelian networks III. The critical group.* Journal of Algebraic Combinatorics (2016) 43:635–663. arXiv:1409.0170

13. Laura Florescu, Lionel Levine and Yuval Peres, *The range of a rotor walk.* The American Mathematical Monthly, (2016) 123(7):627–642. arXiv:1408.5533

14. Matthew Farrell and Lionel Levine, *CoEulerian graphs.* Proceedings of the American Mathematical Society (2016) 144:2847–2860. arXiv:1502.04690

15. Matthew Farrell and Lionel Levine, *Multi-Eulerian tours of directed graphs.* Electronic Journal of Combinatorics (2016) 23:P2.21. arXiv:1509.06237

16. Lionel Levine, Mathav Murugan, Yuval Peres and Baris Ugurcan, *The divisible sandpile at critical density.* Annales Henri Poincaré (2016) 17(7):1677–1711. arXiv:1501.07258

17. Lionel Levine, Wesley Pegden and Charles K. Smart, *Apollonian structure in the abelian sandpile.* Geometric And Functional Analysis (2016) 26(1):306–336. arXiv:1208.4839

2015 18. Lionel Levine, *Threshold state and a conjecture of Poghosyan, Poghosyan, Priezzhev and Ruelle.* Communications in Mathematical Physics (2015) 335(2):1003–1017 arXiv:1402.3283

19. Louis J. Billera, Lionel Levine and Karola Mészáros, *How to decompose a permutation into a pair of labeled Dyck paths by playing a game.* Proceedings of the American Mathematical Society (2015) 143:1865–1873. arXiv:1306.6744

2014 20. Lionel Levine and Yuval Peres, *The looping constant of $\mathbb{Z}^d$.* Random Structures & Algorithms (2014) 45:1–13 arXiv:1106.2226

21. David Jerison, Lionel Levine and Scott Sheffield, *Internal DLA and the Gaussian free field.* Duke Mathematical Journal (2014) 163(2):267–308 arXiv:1101.0596

22. Laura Florescu, Shirshendu Ganguly, Lionel Levine and Yuval Peres, *Escape rates for rotor walks in $\mathbb{Z}^d$.* SIAM Journal on Discrete Mathematics (2014) 28(1):323–334. arXiv:1301.3521

23. David Jerison, Lionel Levine, and Scott Sheffield. *Internal DLA for cylinders*, in *Advances in Analysis: The Legacy of Elias M. Stein* (2014): 189. arXiv:1310.5063

2013 24. Lionel Levine, Scott Sheffield and Katherine E. Stange, *A duality principle for selection games.* Proceedings of the American Mathematical Society (2013) 141(12):4349–4356. arXiv:1110.2712

25. David Jerison, Lionel Levine and Scott Sheffield, *Internal DLA in higher dimensions.* Electronic Journal of Probability (2013) 18(98):1–14. arXiv:1012.3453

26. Tobias Friedrich and Lionel Levine, *Fast simulation of large-scale growth models.* Random Structures & Algorithms (2013) 42:185–213. arXiv:1006.1003

27. Christopher J. Hillar, Lionel Levine and Darren Rhea, *Equations solvable by radicals in a uniquely divisible group.* Bulletin of the London Mathematical Society (2013) 45:61–79. arXiv:1004.5239

2012 28. David Jerison, Lionel Levine and Scott Sheffield, *Logarithmic fluctuations for internal DLA.* Journal of the American Mathematical Society (2012) 25:271–301. arXiv:1010.2483

29. Lionel Levine and Katherine E. Stange, *How to make the most of a shared meal: plan the last bite first.* American Mathematical Monthly (2012) 119:550–565. arXiv:1104.0961

30. Giuliano Giacaglia, Lionel Levine, James Propp and Linda Zayas-Palmer. *Local-to-global principles for the hitting sequence of a rotor walk.* Electronic Journal of Combinatorics (2012) 19:P5. arXiv:1107.4442

2011 31. Lionel Levine, *Sandpile groups and spanning trees of directed line graphs.* Journal of Combinatorial Theory A (2011) 118:350–364. arXiv:0906.2809

32. Lionel Levine, *Parallel chip-firing on the complete graph: devil's staircase and Poincaré rotation number.* Ergodic Theory and Dynamical Systems (2011) 31:891–910 arXiv:0811.2800

2010 33. Anne Fey, Lionel Levine and David B. Wilson, *Driving sandpiles to criticality and beyond.* Physical Review Letters (2010) 104:145703. arXiv:0912.3206

34. Anne Fey, Lionel Levine and David B. Wilson, *The approach to criticality in sandpiles.* Physical Review E (2010) 82:031121. arXiv:1001.3401

35. Anne Fey, Lionel Levine and Yuval Peres, *Growth rates and explosions in sandpiles.* Journal of Statistical Physics (2010) 138:143–159. arXiv:0901.3805

36. Lionel Levine and Yuval Peres, *Scaling limits for internal aggregation models with multiple sources.* Journal d'Analyse Mathématique (2010) 111:151–219. arXiv:0712.3378

37. Lionel Levine and James Propp, *What is a sandpile?* Notices of the American Mathematical Society (2010) 57:976–979.

38. Wouter Kager and Lionel Levine, *Rotor-router aggregation on the layered square lattice.* Electronic Journal of Combinatorics (2010) 17:R152. arXiv:1003.4017

39. Wouter Kager and Lionel Levine, *Diamond aggregation.* Mathematical Proceedings of the Cambridge Philosophical Society (2010) 149:351–372. arXiv:0905.1361

2009 40. Lionel Levine and Yuval Peres, *Strong spherical asymptotics for rotor-router aggregation and the divisible sandpile.* Potential Analysis (2009) 30:1–27. arXiv:0704.0688

41. Itamar Landau and Lionel Levine, *The rotor-router model on regular trees.* Journal of Combinatorial Theory A (2009) 116:421–433. arXiv:0705.1562

42. Lionel Levine, *The sandpile group of a tree.* European Journal of Combinatorics (2009) 30:1026–1035. arXiv:math/0703868

2008 43. Alexander E. Holroyd, Lionel Levine, Karola Meszaros, Yuval Peres, James Propp and David B. Wilson, *Chip-firing and rotor-routing on directed graphs*, in "In and Out of Equilibrium 2," Progress in Probability vol. 60, 331–364. arXiv:0801.3306

44. Lionel Levine and Yuval Peres, *Spherical asymptotics for the rotor-router model in $\mathbb{Z}^d$.* Indiana University Mathematics Journal (2008) 57:431–450. arXiv:math/0503251

2007 45. Christopher J. Hillar and Lionel Levine, *Polynomial recurrences and cyclic resultants.* Proceedings of the American Mathematical Society (2007) **135**:1607–1618. arXiv:math/0411414

2006 46. Lionel Levine, *Fractal sequences and restricted Nim.* Ars Combinatoria (2006) **80**:113–127. arXiv:math/0409408

Selected talks

2017 July Mathematical Congress of the Americas, Special sesson on probability, Montreal
Apr. Georgia Tech combinatorics seminar
Jan. "Action now" wandering seminar, Tel Aviv University

2016 Nov. Northwest Probability Seminar, Microsoft Research, Redmond, WA
Nov. Berkeley probability seminar
Oct. AMS sectional meeting, Special session on chip-firing and divisors on graphs, Minneapolis
July PROMYS alumni lecture, Boston Univeristy
Apr. Math Awareness Public Lecture, Cornell
Apr. Finger Lakes Probability Seminar, Cornell
Jan. CIRM workshop on nonequlibrium statistical physics, Marseilles, France

2015 Nov. BIRS Workshop on sandpile groups, Oaxaca, Mexico
Oct. CIB Conference on statistical physics on transitive graphs, EPFL Lausanne, Switzerland
Aug. MAA Centennial, Invited session on "Arithmetic of Spheres"
May Sherman Lecture & Conference, Indiana University
Apr. Harvard random matrix and statistical physics seminar
Apr. ICERM workshop on limit shapes, Providence, RI
Apr. Annual seminar on stochastic processes, University of Delaware
Feb. Triangle Lectures in Combinatorics, University of North Carolina
2014 Dec. Tufts mathematics colloquium
Nov. IMPA Workshop on First-Passage Percolation, Rio de Janeiro, Brazil
June CIRM Conference on Random Media, Marseille, France
May MIT probability seminar
Apr. NYU probability and mathematical physics seminar
Apr. University of Arizona mathematics colloquium
Mar. Cornell probability and CS theory (joint seminar)
2013 Oct. Midwest Probability Colloquium, Northwestern University
Aug. Mathematical Congress of the Americas, special session on applied combinatorics
May University of Chicago probability and statistical physics seminar
Jan. Cornell applied mathematics colloquium
2012 Dec. Tel Aviv University mathematics colloquium
Dec. Weizmann Institute geometric functional analysis and probability seminar
Apr. University of Connecticut mathematics colloquium
Apr. MIT combinatorics seminar
Feb. Berkeley probability seminar
Jan. MSRI program on random spatial processes
2011 Nov. 80^{th} birthday conference in honor of Harry Kesten, Cornell University
Nov. Stanford probability seminar
Oct. University of Michigan combinatorics seminar
Oct. MIT CRIBB (Computational Research In Boston and Beyond) seminar
May Southeastern Probability Conference, Duke University
Mar. MSRI workshop on free boundary problems, Berkeley, CA
Jan. University of British Columbia mathematics colloquium
2010 Aug. Formal Power Series and Algebraic Combinatorics (FPSAC'10), San Francisco, CA
Feb. IMPA probability seminar, Rio de Janeiro, Brazil
Jan. University of Washington / PIMS mathematics colloquium
2009 Oct. Dartmouth computer science colloquium
Jul. 27th Brazilian Colloquium of Mathematics, Rio de Janeiro
Jun. Workshop in PDE and potential theory, KTH Stockholm
May CRM Workshop on new directions in random spatial processes, Montreal
2008 Aug. CRM Workshop on Laplacian growth and related topics, Montreal
2007 Oct. International symposium on stochastic large scale interacting systems, Fukuoka, Japan
Sep. Workshop on sandpile models and related fields, Eindhoven, Netherlands

Organizer or co-organizer for:

- World Congress in Probability and Statistics, invited session on random growth models, Toronto, July 11–15, 2016.
- Cornell Probability Summer School, 2013 and 2014.
- AIM workshop on generalizations of chip-firing and the critical group, July 8–12, 2013.
- Workshop on sandpiles and number theory, October 27–28, 2012.
- Special session on Laplacian growth, AMS/MAA joint mathematics meetings, Jan. 2011.
- Cornell probability seminar (2012–)
- MIT probability seminar (2008–2011)

Teaching

2017	Spring	Graduate Probability II (MATH 6720) at Cornell
2017	Spring	Undergraduate Stohastic Processes (MATH 4740) at Cornell
2016	Spring	Mathematics and Politics (MATH 1340) at Cornell
2015	Spring	Undergraduate Stochastic Processes (MATH 4740) at Cornell
2014	Fall	Graduate Probability (MATH 6710) at Cornell
2014	Spring	Undergraduate Stochastic Processes (MATH 4740) at Cornell
2013	Spring	Undergraduate Stochastic Processes (MATH 4740) at Cornell
2012	Fall	Laplacian Growth (MATH 7770, graduate topics class in probability) at Cornell
2011	Spring	Algebraic Combinatorics (18.312) at MIT

Mentoring and Outreach

2017	Supervising senior thesis research for Cornell math major Boyao Li. Boyao's thesis topic: *The vector-valued martingale invariance principle*
2016	PROMYS alumni lecture, Boston University, July 6, 2016. Math Awareness Public Lecture, April 29, 2016. Presented on *making the most of a shared meal* to the Cornell Math Club. Sponsored Cornell math major Zhi Low's entry in the UChicago Trading Competition.
2015	Mentored high school students Karthik Karnik and Mikaeel Yunus in the PROMYS program, and sponsored them for the Siemens and JSHS competitions.
2014	Supervised senior thesis research for Cornell undergraduate Matthew Farrell. Matt's thesis title: *The halting problem for chip-firing on finite directed graphs* Presented on *making the most of a shared meal* in MATH 1600: Totally Awesome Math. Supervised research for Cornell undergraduates Young Jun Song and Matt Weatherly.
2013	Presented on game theory to PROMYS students and alumni, Boston University. Supervised senior thesis research for Cornell undergraduate Diwakar Raisingh. Diwakar's thesis title: *Toward an axiomatic characterization of the smash sum* Presented on *the sandpile group of a graph* at the Cornell Math Club. Presented on *primes in Pascal's triangle* in MATH 1600: Totally Awesome Math.
2012	Presented on *patterns in coin-flipping* to an audience of secondary school teachers. Contributed mathematical art to MSRI's Wild Beauty outreach event.
2011	Presented on *primes in Pascal's triangle* at the Boston Math Circle. Co-mentored high school student Ziv Scully in MIT's PRIMES program.
2009–2011	Mentored MIT undergraduates Joshua Alman, Ben Bond, Giuliano Giacaglia, Neil Gurram, Damien Jiang, Aviva Siegel and Linda Zayas-Palmer in the UROP program.