

## CURRICULUM VITAE

**Name:** Gregory Francis Lawler

**Born:** July 14, 1955

**Education:** B.A., 1976, University of Virginia  
M.A., 1977, Princeton University  
Ph.D., 1979, Princeton University

**Major Fields of Interest:**

Probability and Stochastic Processes, Statistical Physics

**Honors and Fellowships:**

George Polya Prize, 2006  
Fellow, American Academy of Arts & Sciences, 2005  
Alfred P. Sloan Fellowship, 1986–90  
Fellow, Institute of Mathematical Statistics, 1991  
National Science Foundation Graduate Fellowship, 1976–79  
Phi Beta Kappa

**Employment:** Professor of Mathematics and Professor of Statistics, University of Chicago, 2006–  
Professor of Mathematics, Cornell University, 2001–2006  
A. Hollis Edens Professor of Mathematics, Duke University, 2001–2003  
Professor, Duke University, 1991–2001  
Associate Professor, Duke University, 1985–1991  
Assistant Professor, Duke University, 1979–1985  
Visiting Member, Courant Institute of Mathematical Sciences,  
1981–1982, 1986–87  
Visiting Associate Professor, Cornell University, 1989  
Visiting Research Scientist, University of British Columbia, 1994–1995

**Grants:** Supported by National Science Foundation Grants, 1980–1982, 1983–

**Books:**

1. *Intersections of Random Walks*, Birkhäuser, Boston (1991).
2. *Introduction to Stochastic Processes*, Chapman-Hall (1995). 2nd edition (2006).

3. (with L. Coyle) *Lectures on Contemporary Probability*, AMS Student Mathematical Library (1999).
4. *Conformally Invariant Processes in the Plane*, American Mathematical Society (2005).
5. (with V. Limic) *Random Walk: A Modern Introduction*, to be published by Cambridge University Press (2010).

**Books Edited:**

1. *School and Conference on Probability Theory*, ICTP Lecture Notes (2004).

**Articles:**

1. *A self-avoiding random walk*, Duke Mathematical Journal **47** (1980), 655-694.
2. *The probability of intersection of independent random walks in four dimensions*, Commun. Math. Phys. **86** (1982), 539-554.
3. *Weak convergence of a random walk in a random environment*, Commun. Math. Phys. **87** (1982), 81-87.
4. *A connective constant for loop-erased self-avoiding random walk*, J. Appl. Prob. **20** (1983), 264-276.
5. (with R. Vanderbei), *Markov strategies for optimal control problems indexed by a partially ordered set*, Annals of Prob. **11** (1983), 642-647.
6. *A discrete stochastic integral inequality and balanced random walk in a random environment*, Duke Mathematical Journal **50** (1983), 1261-1274.
7. *Expected hitting time for a random walk on a connected graph*, Discrete Mathematics **61** (1986), 85-92.
8. *Intersections of random walks in four dimensions II*, Comm. Math. Phys. **97** (1985), 583-594.
9. *Intersections of simple random walks*, AMS Contemporary Mathematics **41** (1985), 281-289.
10. *Gaussian behavior of loop-erased self-avoiding random walk in four dimensions*, Duke Mathematical Journal **53** (1986), 249-270.
11. *Low density estimates for a two-state random walk in random environment*, Journal of Mathematical Physics **30** (1989), 145-157.
12. *Loop-erased self-avoiding random walk and the Laplacian random walk*, Journal of Physics A. **20** (1987), 4565-4568.

13. *Loop-erased self-avoiding random walk in two and three dimensions*, Journal of Statistical Physics **50** (1988), 91-108.
14. (with A. Sokal), *Bounds on the  $L_2$  spectrum for Markov chains and Markov processes: a generalization of Cheeger's inequality*. Trans. Amer. Math. Soc. **309** (1988), 557-580.
15. (with J. Sylvester), *Determining resistances from boundary measurements in finite networks*, SIAM Journal on Discrete Mathematics **2** (1989), 231-239.
16. *The infinite self-avoiding walk in high dimensions*, Annals of Probability **17** (1989), 1367-1376.
17. *Intersections of random walks with random sets*, Israel Journal of Mathematics **65** (1989), 113-132.
18. *Estimates for differences and Harnack's inequality for difference operators coming from random walks with symmetric, spatially inhomogeneous increments*, Proceedings of London Mathematical Society **63** (1991), 552-568.
19. (with K. Burdzy and T. Polaski), *On the critical exponent for random walk intersections*, Journal of Statistical Physics **56** (1989), 1-12.
20. (with K. Burdzy), *Non-intersection exponents for random walk and Brownian motion. Part I: Existence and an invariance principle*, Probability Theory and Related Fields **84** (1990), 393-410.
21. (with K. Burdzy), *Non-intersection exponents for random walk and Brownian motion. Part II: Estimates and applications to a random fractal*, Annals of Probability **18** (1990), 981-1009.
22. (with J. Blum, M. Reed, and I. Shin), *The effect of cytoskeletal geometry on intracellular diffusion*, Biophysical Journal **56** (1989), 995-1005.
23. *The Edwards model and the weakly self-avoiding walk*, Journal of Physics A **23** (1990), 1467-1470.
24. (with K. Burdzy), *Rigorous exponent inequalities for random walks*, Journal of Physics A **23** (1990), L23-L28.
25. (with J. Roerdink and K. Shuler), *Diffusion in lattices with anisotropic scatterers*, Journal of Statistical Physics **59** (1990), 23-52.
26. *Intersection probabilities for random walks*, in Mathematics of Random Media, AMS Lectures in Applied Mathematics **27** (1991), 73-86.
27. (with R. Durrett and H. Kesten), *Making money from fair games*, in Random Walks, Brownian Motion and Interacting Particle Systems, Birkhäuser, Boston (1991), 255-267.
28. (with H. Kesten), *A necessary condition for making money from fair games*, Annals of Probability **20** (1992), 855-882.
29. *Problems on the geometry of random walk paths*, in Probability Models in Mathematical Physics, World Scientific (1991), 135-143.
30. *Random walks: simple and self-avoiding*, in Topics in Contemporary Probability and its Applications, J. Laurie Snell, ed., CRC (1995), 55-74.

31. (with M. Bramson and D. Griffeath), *Internal diffusion limited aggregation*, *Annals of Probability* **20** (1992), 2117-2140.
32. *Escape probabilities for slowly recurrent sets*, *Probability Theory and Related Fields* **94** (1992), 91-117.
33. *L-shapes for the logarithmic  $\eta$ -model for DLA in three dimensions*, in *Seminar on Stochastic Processes, 1991*, Birkhäuser-Boston (1992), 97–122.
34. (with T. Polaski), *Harnack inequalities and difference estimates for random walks with infinite range*, *Journal of Theoretical Probability*, **6** (1993), 781-802.
35. *On the covering time of a disc by simple random walk in two dimensions*, in *Seminar on Stochastic Processes, 1992*, Birkhäuser-Boston (1993), 189-208.
36. (with B. Duplantier, J.-F. Le Gall and T. Lyons), *The geometry of the Brownian curve*, *Bull. Sci. Math, 2<sup>e</sup> série*, **117** (1993), 91-106.
37. *A discrete analogue of a theorem of Makarov*, *Combinatorics, Probability, and Computing* **2** (1993), 181-200.
38. *Subdiffusive fluctuations for internal diffusion limited aggregation*, *Annals of Probability* **23** (1995), 71-86.
39. *The logarithmic correction for loop-erased walk in four dimensions*, in *Proceedings of the Conference in Honor of J.-P. Kahane*, special issue of *Journal of Fourier Analysis and Applications*, CRC Press (1995), 347-362.
40. *Random walks, harmonic measure, and Laplacian growth models*, in *Probability and Phase Transition*, ed. G. Grimmett, Kluwer (1994), 191-208.
41. *Recurrence and transience for a card shuffling model*, *Combinatorics, Probability, and Computing* **4** (1995), 133-142.
42. (with E. Puckette) *The disconnection exponent for simple random walk*, *Israel Journal of Mathematics* **99** (1997), 109-122.
43. *Hausdorff dimension of cut points for Brownian motion*, *Electronic Journal of Probability* **1** (1996), #2.
44. *Cut points for simple random walk*, *Electronic Journal of Probability* **1** (1996), #13
45. *The dimension of the frontier of planar Brownian motion*, *Electronic Communications in Probability* **1** (1996), 29-47.
46. *Nonintersecting planar Brownian motions*, *Mathematical Physics Electronic Journal* **1** (1995), #4.
47. *Strict concavity of the intersection exponent for Brownian motion in two and three dimensions*, *Mathematical Physics Electronic Journal* **5** (1998), #5.

48. *Multifractal nature of two dimensional simple random walk paths*, *Random Walks and Discrete Potential Theory* M. Picardello and W. Woess, ed., Cambridge U. Press (1999).
49. *A lower bound on the growth exponent for loop-erased walk in two dimensions*, *ESAIM: Probability and Statistics* **3** (1999), 1-21.
50. *Loop-erased walks intersect infinitely often in four dimensions*, *Electronic Communications in Probability* **3** (1998), 35-42.
51. (with E. Puckette) *The intersection exponent for simple random walk*, *Combinatorics, Probability, and Computing* **9** (2000), 441–464.
52. *Loop-erased random walk*, in *Perplexing Problems in Probability: Festschrift in Honor of Harry Kesten*, M. Bramson and R. Durrett, ed., Birkhäuser-Boston, (1999), 197-217.
53. *Geometric and fractal properties of Brownian motion and random walk paths in two and three dimensions*, *Bolyai Mathematical Society Studies* **9** (1999), 219–258.
54. (with W. Werner) *Intersection exponents for planar Brownian motion*, *Annals of Probability* **27** (1999), 1601–1642.
55. (with W. Werner) *Universality for conformally invariant intersection exponents*, *J. European Math. Soc.* **2** (2000), 291–328.
56. *Strict concavity of the half plane intersection exponent for planar Brownian motion*, *Electronic Journal of Probability* **5** (2000), paper no. 8,
57. *Cut times for Brownian motion and random walk*, *Paul Erdős and his Mathematics I*, Bolyai Society Mathematical Studies 11 (2002), 411–421.
58. (with O. Schramm and W. Werner), *Values of Brownian intersection exponents I: half-plane exponents*, *Acta Math.* **187** (2001), 237–273.
59. (with O. Schramm and W. Werner), *Values of Brownian intersection exponents II: plane exponents*, *Acta Math.* **187** (2001), 275–308.
60. (with O. Schramm and W. Werner), *Values of Brownian intersection exponents III: two-sided exponents*, *Ann. Inst. Henri Poincaré.* **38** (2002), 109–123.
61. (with O. Schramm and W. Werner), *Analyticity of intersection exponents for planar Brownian motion*, *Acta Math.* **189** (2002), 179 – 201.
62. (with O. Schramm and W. Werner), *The dimension of the Brownian frontier is 4/3*, *Math. Res. Let.* **8** (2001), 401–411.
63. (with O. Schramm and W. Werner), *Sharp estimates for Brownian non-intersection probabilities*, in *In and Out of Equilibrium*, V. Sidoravicius, ed., Birkhäuser (2002), 113–131.
64. (with O. Schramm and W. Werner) *One arm exponent for critical 2D-percolation*, *Electronic J. of Probability* (2002), paper no. 7.

65. *An introduction to the stochastic Loewner evolution*, in *Random Walks and Geometry*, V. Kaimonovich, ed., de Gruyter (2004), 261–293.
66. (with O. Schramm and W. Werner), *Conformal invariance of planar loop-erased random walk and uniform spanning trees*, Annals of Probab. **32** (2004), 939–995.
67. (with O. Schramm and W. Werner) *On the scaling limit of planar self-avoiding walk*, in *Proceedings of the Conference on Fractal Geometry and Applications: A Jubilee of Benoit Mandelbrot*, M. Lapidus and M. van Frankenhuijsen, Vol. 2, ed., Amer. Math. Soc. (2004), 339–364.
68. *Conformal invariance, universality, and the dimension of the Brownian frontier*, Proc. International Congress of Mathematicians, Vol. III, Higher Education Press (2002), 63–72.
69. *Conformally invariant processes in the plane*, in *School and Conference on Probability Theory*, ICTP Lecture Notes **17**, G. Lawler, ed. (2004), 305–351.
70. (with O. Schramm and W. Werner) *Conformal restriction: the chordal case*, J. Amer. Math. Soc. **16** (2003), 917–955.
71. (with W. Werner) *The Brownian loop soup*, Probab. Theor. Rel. Fields **128** (2004), 565–588.
72. *The restriction property for conformally covariant measures*, to appear in proceedings of XIV International Congress on Mathematical Physics.
73. (with V. Limic) *The Beurling estimate for a class of random walks*, Electron. J. Probab **9** (2004), 846–861.
74. (with E. Binder, R. Pemantle, H. Wilf) *Irreducible compositions and the first return to the origin of a random walk*, Séminaire Lotharingien de Combinatoire **50** (2004) #B50h.
75. *Internal set theory and infinitesimal random walks* in *Diffusion, Quantum Theory, and Radically Elementary Mathematics*, W, Faris, ed., Princeton University Press (2006), 157–181.
76. (with J. A. Trujillo Ferreras) *Random walk loop soup*, Trans. Amer. Math. Soc. **359** (2007), 767–787.
77. *Stochastic Loewner evolution*, in *Encyclopedia of Mathematical Physics*, Elsevier (2006).
78. (with M. Kozdron), *Estimates of random walk exit probabilities and application to loop-erased walk*, Electron. Journal of Probability **10** (2005), paper no. 44.
79. *The Laplacian- $b$  random walk and the Schramm-Loewner evolution*, Illinois J Math **50** (2006) 701–746
80. (with J. Lind), *Two-sided  $SLE_{8/3}$  and the infinite self-avoiding polygon*, in *Universality and Renormalization: From Stochastic Evolution to Renormalization of Quantum Fields*, I. Binder, D. Kreimer, ed., Amer. Math. Soc. (2007), 249–280.
81. (with M. Kozdron), *The configurational measure on mutually avoiding SLE paths*, in *Universality and Renormalization: From Stochastic Evolution to Renormalization of Quantum Fields*, I. Binder, D. Kreimer, ed., Amer. Math. Soc. (2007), 199–224 .

82. *Multifractal analysis of the reverse flow for SLE*, in *Fractal Geometry and Stochastics IV*, C. Brandt, P. Mörters, & M. Zähle, ed., Birkhäuser (2009), 73–107.
83. *Schramm-Loewner evolution*, in *Statistical Mechanics*, S. Sheffield and T. Spencer, ed., IAS/Park City Mathematical Series, AMS (2009), 231–295.
84. *Conformal invariance and 2 – d statistical physics*, Bulletin of the AMS **46** (2009), 35–54.
85. *Partition functions, loop measures, and versions of SLE*, J. Stat. Phys. **134** (2009), 813–837.
86. (with H. Narayanan), *Mixing times and  $l_1$  bounds for oblivious routing in 2009 Proceedings of the Fifth Workshop on Analytic Algorithmics and Combinatorics (ANALCO)*, 66–74.
87. *A note on the Brownian loop measure*, preprint.
88. (with S. Sheffield), *The natural parametrization for the Schramm-Loewner evolution*, preprint.
89. (with F. Johansson) *Optimal Hölder exponent for the SLE path*, preprint.
90. (with H. Narayanan and S. Lalley), *A geometric interpretation of half-plane capacity*, to appear in *Electr. Comm. Probab.*
91. (with F. Johansson) *Almost sure multifractal spectrum for the tip of an SLE curve*, preprint.

#### Book Reviews:

1. *Random Walks, Brownian Motion, and Interacting Particle Systems, A Festschrift in Honor of Frank Spitzer*, ed. R. Durrett and H. Kesten, in *Metrika* **41** (1994) 254–255.
2. *Aspects and Applications of Random Walk*, by G. Weiss, in *SIAM Review* **37** (1995) 470–471.
3. *The Self-Avoiding Walk*, by N. Madras and G. Slade, in *Annals of Probability* **27** (1999) 606–609.

#### Ph.D. Dissertations Supervised:

Damon Scott, *A non-integral dimensional random walk* (1986)

Thomas Polaski, *Estimates for differences and Harnack's inequality for functions harmonic with respect to random walk* (1991).

Emily Puckette, *Critical exponents for intersections of random walks in dimensions between 1 and 2* (1994).

Elizabeth Brooks, *Probabilistic methods for hyperbolic partial differential equations* (1996), (co-advisor with M. Reed).

Chad Fargason, *The percolation dimension of Brownian motion in three dimensions* (1998).

Mary Beth Fisher, *Variance reduction for stochastic differential equations applied to bond pricing problems* (1998).

Christian Beneš, *On some problems concerning planar random walks* (2004).

Michael Kozdron, *Simple random walk excursion measure in the plane* (2004).

José Antonio Trujillo Ferraras, *The random walk loop soup and the expected area of the Brownian loop in the plane* (2005).

John Thacker, *Properties of Brownian motion and random walk loop soups* (2006)

Brigitta Vermesi, *Intersection exponents for random walks on cylinders* (2006).

Robert Masson, *Growth exponent for planar loop-erased random walk* (2008) (co-advisor with Steven Lalley).

### **Editorial Boards:**

Journal of AMS, editor, 2009–

Bulletin of AMS, associate editor, 2009–

Annals of Probability, editor-in-chief, 2006–2008

Electronic Journal of Probability, co-founder and co-editor, 1995–1999; associate editor, 2004–2005.

Annals of Probability, associate editor, 1991–1996

Combinatorics, Probability, and Computing, associate editor 1991–

Annals of Applied Probability, associate editor, 1997–1999

### **Recent Invited Presentations:**

XI CLAPEM, Naiguatá, Venezuela, November, 2009.

Colloquium, University of Illinois, Champaign-Urbana, September, 2009.

Colloquium, Michigan State University, September, 2009.

Oded Schramm Memorial Conference, Microsoft, August, 2009.

PIMS conference on Random Walk and Random Environment, University of British Columbia, June, 2009

Colloquium, Institut de Physique Théorique, Saclay, May, 2009

Frontier Probability Days, University of Utah, March, 2009

Mathematical physics seminar, University of Arizona, March, 2009

Colloquium, University of Auckland, New Zealand, December, 2008

7th Australia - New Zealand Mathematics Convention, Christchurch, New Zealand, December, 2008

Distinguished visitor colloquium, University of Massachusetts, September, 2008

Fractal Geometry and Stochastics, Greifswald, Germany, September, 2008

Workshop on *SLE* and workshop on Laplacian growth, Centre de Recherches Mathématiques, Montreal, August, 2008

Mini-Course, ICTP, Trieste, July, 2008

Banff International Research Station, June, 2008

Colloquium, Wayne State University, March, 2008

Colloquium, Marseille, March, 2008

Current Events Bulletin, American Mathematical Society, San Diego, January, 2008

Colloquium, Australian National University, Canberra, December, 2007

Mini-course, Summer School in Mathematical Physics, Canberra, December, 2007

Colloquium, University of Geneva, September, 2007.

Probability seminar, Marseille, 2007.

Short course, IAS/Park City Institute on Statistical Mechanics, Park City, Utah, July, 2007

Statistical Mechanics Conference, Rutgers, May 2007.

Colloquium, Courant Institute, April, 2007.

Ellis Kolchin Memorial Lecture, Columbia University, April, 2007.

Random Shapes Workshop, IPAM, UCLA, March, 2007

Distinguished Lectures, University of Wisconsin, March, 2007.

Colloquium, University of Illinois at Chicago, February, 2007.

10th anniversary PIMS lecturer, University of Washington, November, 2006.

Tutorial, Midwestern Probability Conference, Northwestern University, October, 2006.

Kavli Institute of Theoretical Physics, University of California at Santa Barbara, September, 2006.

Medallion lecture, IMS meeting, Rio de Janeiro, August, 2006.

Probability seminar, Kyoto University, June, 2006.

Mini-course, Kyushu University, June, 2006.

Mini-course, RDEES/ESI Educational Workshop on Discrete Probability, Erwin Schrödinger Institute, Vienna, March, 2006

Colloquium, probability seminar, and analysis seminar, UCLA, February, 2006

Colloquium, Northwestern University, January, 2006

Colloquium and analysis seminar, University of North Carolina, January, 2006

Conference on Percolation and SLE, Fields Institute, Toronto, September, 2005.

Frontiers of Applied Mathematics, Carnegie-Mellon University, September, 2005.

Conference on Self-Similarity, Toulouse, France, June, 2005.

Erwin Schrödinger Institute, Vienna, June, 2005.

Lessons from Low Dimensions—Aspects of Conformal Field Theory, Department of Physics, Bonn University, April, 2005.

Duncan Lectures, Department of Applied Mathematics, Johns Hopkins University, March-April, 2005.

Colloquium, Institute of Statistics and Decision Sciences, Duke University, November, 2004.

New Directions in Probability, Fields Institute, Toronto, August, 2004.

Analysis, Probability, and Logic, a conference in honor of Edward Nelson, Vancouver, BC, June, 2004.

Summer school course, Pacific Institute of Mathematical Sciences, UBC, Vancouver, BC, May-June, 2004.

91st Statistical Mechanics Meeting, Rutgers University, May, 2004.

Integrable Systems, Analysis, and Probability Seminar, Duke University, April, 2004.

Colloquium, University of Virginia, March, 2004.

Analysis seminar, University of Pennsylvania, March, 2004.

Percolation, Particle Systems, and Random Media, Santiago, Chile, January 2004.

Invited hour address, AMS meeting, Phoenix, January 2004.

Colloquium, University of Rochester, November 2003.

Colloquium, University of Arizona, November 2003.

Rothschild Visiting Professor Lecture, Isaac Newton Institute of Mathematical Sciences, Cambridge, UK, August 2003.

Stochastic Analysis Seminar, University of Oxford, August 2003.

Invited lecture, International Congress on Mathematical Physics, Lisbon, Portugal, July 2003.

Invited lecture, NATO workshop on Conformal Invariance and Random Spatial Processes, Edinburgh, UK, July 2003.

Mini-course, NATO Advanced Study Institute, Edinburgh, UK July 2003.

Barrett Lectures, University of Tennessee, April 2003.

Rees Distinguished Lecture Series, University of Delaware, March, 2003.

Physics Colloquium, Ecole Normale Supérieure, Paris, January 2003

Mini-course, Institut Henri Poincaré, Paris, January 2003

Probability Seminar, Université Paul Sabatier, Toulouse, France, January 2003

Probability Seminar, Stanford University, December 2002.

Conference on Stochastic Processes (in honor of Richard Isaac), November 2002.

Mathematics Colloquium, University of Chicago, November 2002.

Invited lecture, International Congress of Mathematicians, Beijing, China, August 2002.

Mini-course, 6th Brazilian School of Probability, Ubatuba, Brazil, August 2002.

Workshop on Discrete Probability, Eurandom, Eindhoven, Netherlands, June 2002.

Short course and conference talk, School and Conference on Probability Theory, ICTP, Trieste, May 2002.

Joint Brandeis-Harvard-MIT-Northeastern Colloquium, March, 2002.

Probability Seminar, Uppsala University, November 2001.

Mathematical Physics Seminar, University of Helsinki, November, 2001.

Analysis Seminar, KTH, Stockholm, October, 2001

Analysis Seminar, Uppsala University, October, 2001.

Colloquium and Probability/Analysis Seminar, Gothenburg, Sweden, October, 2001.

Mini-course, Mittag-Leffler Institute, Djursholm, Sweden, September - October, 2001.

Workshop on Mathematical Physics, Mambucaba, Brazil, August, 2001.

Workshop on Random Walks, Erwin Schrödinger Institute, Vienna, Austria, June, 2001.

Workshop on Percolation and Conformally Invariant Processes, MSRI, Berkeley, May, 2001.

Mathematical Physics Seminar, Georgia Tech, March, 2001.

Colloquium, Iowa State University, March, 2001.

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