Robin Pemantle
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University of Pennsylvania
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Philadelphia, PA 19104
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CURRICULUM VITAE

Born: June 12, 1963, Walnut Creek, CA. U.S. citizen.

Education:

Ph.D. in probability theory under the supervision of Persi Diaconis (Harvard) from the Massachusetts Institute of Technology in August, 1988.

B.A. in pure mathematics from the University of California at Berkeley in June, 1984.

Professional experience:

June 2003 - present: Merriam Term Professor of Mathematics at the University of Pennsylvania.

September 1999 - September 2003: Professor of Mathematics at the Ohio State University.

September 1991 - August 1999: Assistant / Associate (1994) / Full (1998) Professor of Mathematics at the University of Wisconsin-Madison.

September 1990 - December 1991: Andreotti Assistant Professor of Mathematics and N.S.F. Postdoctoral Fellow at Oregon State University.

September 1989 - September 1990: N.S.F. postdoctoral fellow and M.S.I. postdoctoral research fellow in the department of mathematics at Cornell University and the Mathematical Sciences Institute.

June 1988 - September 1989: N.S.F. postdoctoral fellow in the department of statistics at the University of California at Berkeley.

Honors and awards:

Institute of Mathematical Statistics Fellow, elected 2001

Romnes Fellowship awarded 1997 ($50,000 in flexible funds)

Presidential Faculty Fellowship awarded 1993 ($500,000 in flexible funds; the PFF program was a part of the former PYI program)

Sloan Foundation Fellowship awarded 1993.

Rollo Davidson Prize, awarded 1993.

Lilly Teaching Fellowship awarded 1993.

N.S.F. postdoctoral fellowship awarded 1988.

N.S.F. graduate fellowship awarded 1984.

Top five in the William Lowell Putnam Math Competition, 1981.

Doctoral dissertations supervised

Manuel Lladser (OSU, 2003, presently Assistant Professor of Applied Mathematics and University of Colorado in Boulder)

Grants

Continuous N.S.F. support since graduate school (DMS-0603821, DMS-0103635, DMS-9803249, DMS-9353149, DMS-9300191, plus see above)

Research interests:

Probability theory:

Random walks, urn schemes and reinforcement schemes;

Tree-indexed process, branching processes, any probability model involving trees;

Discrete potential theory, particle systems, percolation, mixing rates Markov chains, pathwise properties of Brownian motion.

Combinatorics:

Asymptotics of multivariable generating functions, optimization, enumerative combinatorics, spanning trees of graphs.

Recent invited talks:

Yale Statistics Colloquium January, 2008

Columbia Probability Seminar February, 2008

IDA-CCR colloquium, Princeton February, 2008

Princeton Discrete Math Seminar February, 2008

Analysis of Algorithms conference, Brazil April, 2008

University of Delaware Probability Seminar April, 2008

Courant Institute Probability Seminar May, 2008

AMS Prob. and Stat Mech. session, Vancouver October, 2008

Harvard Statistics Colloquium November, 2008

Univeristy of Utah Probability Seminar February, 2009

MIT Probability Seminar February, 2009

Brown Geometry-Topology seminar April, 2009

CRM Random Spatial Processes workshop, Montreal May, 2009

Cornell summer school speaker (6 lectures) July, 2009

References

[1] Pemantle, R. (1988). Phase transition in reinforced random walk and RWRE on trees. *Ann. Probab.* **16** 1229 - 1241.

[2] Pemantle, R. (1989). Randomization time for the overhand shuffle. *J. Theor. Prob.* **2** 37 - 49.

[3] Pemantle, R. (1990). Nonconvergence to unstable points in urn models and stochastic approximations. *Ann. Probab.* **18** 698 - 712.

[4] Pemantle, R. (1990). A time-dependent version of Polya's urn. *Jour. Theor. Prob.* **3** 627 - 637.

[5] Fill, J. and Pemantle, R. (1993). Oriented percolation, first-passage percolation and covering times for Richardson's model on the n-cube. *Ann. Appl. Prob.* **3** 593 - 629.

[6] Pemantle, R. (1990). Vertex-reinforced random walk. *Prob. Theor. and Rel. Fields* **92** 117 - 136.

[7] Pemantle, R. (1991). When are touchpoints limits for generalized Polya urns? *Proc. AMS* **113** 235 - 243.

[8] Pemantle, R. and Peres, Y. (1995). Critical RWRE on trees and tree-indexed random walks. *Ann. Probab.* **23** 105 - 140.

[9] Pemantle, R. (1991). Choosing a spanning tree for the integer lattice uniformly. *Ann. Probab.* **19** 1559 - 1574.

[10] Pemantle, R. and Lyons, R. (1992). Random walk in a random environment and first-passage percolation on trees. *Ann. Probab.* **20** 125 - 136.

[11] Pemantle, R., Propp, J. and Ullman, D. (1992). On tensor powers of integer programs. *SIAM J. Disc. Math.* **5** 127 - 143.

[12] Pemantle, R. (1992). Automorphism-invariant measures on trees. *Ann. Probab.* **20** 1549 - 1566.

[13] Pemantle, R. (1992). The contact process on trees. *Ann. Probab.* **20** 2089 - 2116.

[14] Pemantle, R. and Penrose, M. (1992). On path integrals for the high-dimensional Brownian bridge. *J. Comput. Appl. Math.* **44** 381 - 390.

[15] Burton, R. and Pemantle, R. (1993). Local characteristics, entropy and limit theorems for uniform spanning trees and domino tilings via transfer-impedances. *Ann. Prob.* **21** 1329 - 1371.

[16] Pemantle, R. (1993). Critical RWRE on trees of exponential growth. *Proc. Sem. Stoch. Pro. 1992, Burdzy and Bass, editors*, 221 - 240.

[17] Pemantle, R. and Peres, Y. (1994). Planar first-passage times are not tight. In: Probability and Phase Transition, G. Grimmett Editor, 261 - 264. Kluwer: Boston.

[18] Pemantle, R. and Peres, Y. (1994). Domination between trees and application to an explosion problem. *Ann. Probab.* **22** 180 - 194.

[19] Pemantle, R. (1994). A shuffle that mixes sets of any fixed size much faster than it mixes the whole deck. *Rand. Struct. Alg.* **9** 609 - 625.

[20] Pemantle, R. (1994). Uniform random spanning trees. In: *Topics in contemporary probability and its applications*, J. L. Snell, editor, pages 1 - 54. CRC Press: Boca Raton.

[21] Pemantle, R. (1995). Tree-indexed processes. *Stat. Sci.* **5** 200 - 213.

[22] Pemantle, R. and Peres, Y. (1995). Galton-Watson trees with the same mean have the same polar sets. *Ann. Probab.* **23** 1102 - 1124.

[23] Benjamini, I., Pemantle, R. and Peres, Y. (1995). Martin capacity for Markov chains. *Ann. Probab.* **23** 1332 - 1346.

[24] Lyons, R., Pemantle, R. and Peres, Y. (1995). A conceptual proof of the Kesten-Stigum theorem. *Ann. Probab.* **23** 1125 - 1138.

[25] Diaconis, P., Holmes, S., Janson, S., Lalley, S. and Pemantle, R. (1995). Metrics on compositions and coincidences among renewal processes. In: Random Discrete Structures, 81 - 101, *IMA Vol. Math. Appl.* **76**. Springer: New York.

[26] Lyons, R., Pemantle, R. and Peres, Y. (1995). Ergodic Theory on Galton Watson trees: Speed of random walk and dimension of harmonic measure on Galton-Watson trees. *Ergodic Theory and Dynamical Systems* **15** 593 - 619.

[27] Pemantle, R. (1996). The probability that Brownian motion almost covers a line. *Ann. IHP, Prob. and Stat.* **33** 147 - 165.

[28] Pemantle, R. (1996). Maximum variation of total risk. *Stat. Prob. Letters* **28** pages 285 - 289.

[29] Benjamini, I., Pemantle, R. and Peres, Y. (1996). Random walks in varying dimensions. *J. Theor. Prob.* **9** 231 - 244.

[30] Lyons, R., Pemantle, R. and Peres, Y. (1996). Random walks on the Lamplighter group. *Ann. Probab.* **24** 1993 - 2006.

[31] Pemantle, R. and Peres, Y. (1996). On which graphs are all random walks in random environments transient? In: Random Discrete Structures, 207 - 211, *IMA Vol. Math. Appl.* **76**. Springer: New York.

[32] Pemantle, R., Peres, Y. and Shapiro, J. (1996). The trace of spatial Brownian motion is capacity-equivalent to the unit square. *P.T.R.F.* **106** 379 - 399.

[33] Lyons, R., Pemantle, R. and Peres, Y. (1996). Biased random walks on Galton-Watson trees. *P.T.R.F.* **106** 249 - 264.

[34] Barlow, M., Pemantle, R. and Perkins, E. (1997). Diffusion limited aggregation on a homogeneous tree. *Prob. Th. Rel. Fields* **107** 1 - 60.

[35] Pemantle, R. (1997). Sharpness of second moment criteria for branching and tree-indexed processes. In: *Classical and modern branching processes*, 257 - 262, *IMA Vol. Math. Appl.* **84**. Springer: New York.

[36] Lyons, R., Pemantle, R. and Peres, Y. (1997). Unsolved problems concerning random walks on trees. In: *Classical and modern branching processes*, 223 - 237, *IMA Vol. Math. Appl.* **84**. Springer: New York.

[37] Lyons, R., Pemantle, R. and Peres, Y. (1997). A conceptual proof of the Kesten-Stigum Theorem for multi-type branching processes. In: *Classical and modern branching processes*, 181 - 186, *IMA Vol. Math. Appl.* **84**. Springer: New York.

[38] Bishop, C., Jones, P., Pemantle, R. and Peres, Y. (1997). Brownian frontier has dimension greater than 1. *J. Func. Anal.* **43** 309 - 336.

[39] Hwang, J. and Pemantle, R. (1997). Evaluators of estimates of statistical significance under a class of proper loss functions. *Statistics and Decisions* **15** 103 - 128.

[40] Chayes, L., Pemantle, R. and Peres, Y. (1997). No directed fractal percolation in zero area. *J. Stat. Phys.* **88** 1353 - 1362.

[41] Pemantle, R. and Volkov, S. (1998). Markov chains in a field of traps. *J. Theor. Prob.* **11** 561 - 569.

[42] Häggström, O. and Pemantle, R. (1998). First passage percolation and a model for competing spatial growth. *J. Appl. Prob.* **35** 683 - 692.

[43] Adelman, O., Burdzy, K. and Pemantle, R. (1998). Sets avoided by Brownian motion. *Ann. Prob.* **26** 429 - 464.

[44] Benjamini, I., Pemantle, R. and Peres, Y. (1998). Unpredictable paths and percolation. *Ann. Probab.* **26** 1198 - 1211.

[45] Lyons, R., Pemantle, R. and Peres, Y. (1999). Resistance bounds for first-passage percolation and maximum flow. *J. Comb. Theor. A* **86** 158 - 168.

[46] Häggström, O. and Pemantle, R. (1999). On near-critical and dynamical percolation in the tree case. *Rand. Struc. Alg.* **15** 311 - 318.

[47] Pemantle, R. and Volkov, S. (1999). Vertex-reinforced random walk on Z has finite range. *Ann. Probab.* **27** 1368 - 1388.

[48] Pemantle, R. and Steif, J. (1999). Robust phase transitions for Heisenberg and other models on general trees. *Ann. Probab.* **27** 876 - 912.

[49] Pemantle, R. and Rosenthal, J. (1999). Moment conditions for a sequence with negative drift to be uniformly bounded in L^r. *Stoch. Pro. Appl.* **82**, 143 - 155.

[50] Khoshnevisan, D. and Pemantle, R. (2000). Sojourn times of Brownian sheet. *Period. Math. Hungar.* **41**, 187–194

[51] Pemantle, R. (2000). Toward a theory of negative dependence. *J. Stat. Phys.* **41** 1371–1390.

[52] Pemantle, R. and Peres, Y. (2000). Non-amenable products are not treeable. *Israel J. Math.* **118** 147–155.

[53] Pemantle, R. (2000). Generating functions with high order poles are nearly polynomial. In: *Mathematics and Computer Science: Algorithms, trees, combinatorics and probabilities.*, 305–321. Birkhäuser: Basel.

[54] Pemantle, R., Peres, Y., Pitman, J. and Yor, M. (2000). Where did the Brownian particle go? *Elec. J. Prob* **6**, paper 10, 22 pages.

[55] Häggström, O. and Pemantle, R. (2000). Absence of mutual unbounded growth for almost all parameter values in the two-type Richardson model. *Stoch. Pro. Appl.* **90**, 207–222.

[56] Pemantle, R. and Stacey, A. (2001). The branching random walk and contact process on Galton–Watson and non–homogeneous trees. *Ann. Probab.* **29**, 1563–1590.

[57] Levin, D., Pemantle, R. and Peres, Y. (2001). A phase transition in random coin tossing. *Ann. Probab.* **29**, 1637–1669.

[58] Pemantle, R. and Wilson, M. (2002). Asymptotics of multivariate sequences, part I: smooth points of the singular variety. *JCT A* **97**, 129–161.

[59] Cohn, H., Pemantle, R., Propp, J. (2002). Generating a random sink-free orientation in quadratic time. *Elec. J. Comb.* **9**(1), paper R10.

[60] Limic, V. and Pemantle, R. (2003). More rigorous results on the Kauffman-Levin model of evolution. *Ann. Probab.* **32**, 2149–2178.

[61] Pemantle, R. and Wilson, M. (2004). Asymptotics of multivariate sequences, part II: Multiple points of the singular variety. *Comb. Prob. Comput.* **13**, 735–761.

[62] Pemantle, R. and Skyrms, B. (2004). Time to absorption in discounted reinforcement models. *Stoch. Proc. Appl.* **109**, 1–12.

[63] Corteel, S., Louchard, G. and Pemantle, R. (2006). Common intervals in permutations. *Disc. Math. Theor. Comp. Sci.* **8** 189–214. Extended abstract appeared in *Mathematics and Computer Science III*, (M. Drmota, P. Flajolet, D. Gardy and B. Gittenberger, Editors) pages 3–14, (2004).

[64] Bender, E., Lawler, G., Pemantle, R. and Wilf, H. (2004). Irreducible compositions and the first return to the origin of a random walk. *Seminaire Loth.* **50** paper B50h, 12 pages.

[65] Hitczenko, P. and Pemantle, R. (2004). Central limit theorem for the size of the range of a renewal process. *Stat. Prob. Let.* **72**, 249–264.

[66] Baryshnikov, Y. and Pemantle, R. (2004). Convolutions of inverse linear functions via multivariate residues. *Preprint, 42 pages.*

[67] Pemantle, R. (2005). Poor performance of random random number generators. *J. Algorithms* **54**, 72–81.

[68] Pemantle, R. (2005). A probabilistic model for the degree of the cancellation polynomial in Gosper's Algorithm. *J. Algorithms* **54**, 58–71.

[69] Balogh, J. and Pemantle, R. (2007). The Klee-Minty random edge chain moves with linear speed. *Rand. Struct. Alg.* **30**, 464–483.

[70] Pemantle, R. and Peres, Y. (2007). The critical Ising model on trees, concave recursions and nonlinear capacity. *Ann. Probab., to appear, 28 pages.*

[71] Pemantle, R. and Peres, Y. (2007). When does a set intersect the set of Brownian double points? *Ann. Probab.* **35**, 2044–2062.

[72] Pemantle, R. and Schneider, C. (2007). When is $0.999\ldots$ equal to 1? *Amer. Math. Monthly* **114**, 344–350.

[73] Pemantle, R. (2007). A survey of random processes with reinforcement. *Probability Surveys* **4** 1–79.

[74] Pemantle, R. and Wilson, M. (2008). Twenty combinatorial examples of asymptotics derived from multivariate generating functions. *SIAM Review, vol. 50, 199–272.*

[75] Pemantle, R. (2008). Search cost for a nearly optimal path in a binary tree. *Preprint, 14 pages.*

[76] Argiento, R., Pemantle, R., Skyrms, B. and Volkov, S. (2009). Learning to signal: analysis of a micro-level reinforcement model. *Stoch. Proc. Appl.* **119**, 373–390.

[77] Holroyd, A. Pemantle, R., Peres, Y., and Schramm, O. (2008). Poisson matching. *Ann. IHP, 36 pages, to appear.*

[78] Baryshnikov, Y., Brady, W., Bressler, A. and Pemantle, R. (2009). Two-dimensional quantum random walk. *Preprint, 35 pages.*

[79] Croot, E., Granville, A., Pemantle, R. and Tetali, P. (2008). Sharp transitions in making squares. *Preprint, 37 pages.*

[80] Baryshnikov, Y. and Pemantle, R. (2008). Asymptotics of multivariate sequences, part III: quadratic points. *Preprint, 79 pages.*

[81] Pemantle, R. and Wilf, H. (2009). Couting nondecreasing integer sequences lying below a barrier. Preprint, 8 pages.

CONFERENCE PROCEEDINGS AND SOCIAL SCIENCE PAPERS

[82] Skyrms, B. and Pemantle, R. (2000). A dynamic model of social network formation. *Proc. NAS* **97** 9340–9346.

[83] Pemantle, R. and Skyrms, B. (2003). Network formation by reinforcement learning: the long and the medium run. *Math. Soc. Sci.* **48**, 315–327.

[84] Kakade, S., Kearns, M., Ortiz, L., Pemantle, R. and Suri, S. (2004). The economics of social networks. In: *Proceedings of NIPS, 2004.*

[85] Skyrms, B. and Pemantle, R. (2004). Learning to network. In: *The Place of Probability in Science*, ed. Ellery Eells and James Fetzer. Open Court.

[86] Pemantle, R. and Ward, M. (2006). Exploring the average values of Boolean functions via asymptotics and experimentation. In: *The Proceedings of the Third Workshop on Analytic Algorithmic and Combinatorics (ANALCO'06)* 253–262.

[87] Bressler, A. and Pemantle, R. (2007). Quantum random walk in one dimension via generating functions. In: *DMTCS Proceedings, 2007 Conference on Analysis of Algorithms. Extended Abstract, 11 pages.*

[88] Croot, E., Granville, A., Pemantle, R. and Tetali, P. (2008). Running time predictions for factoring algorithms. In: *Algorithmic Number Theory (Lecture Notes in Computer Science vol. 5011)*. Springer: Berlin.

[89] Pemantle, R. and Wilson, M. (2009). Asymptotic expansions of oscillatory integrals with complex phase. *Preprint, 18 pages.*

[90] Bressler, A., Greenwood, T., Pemantle, R. and Petkovsek, M. (2009). Quantum random walk on the integer lattice: examples and phenomena. *Preprint, 17 pages.*

Teaching experience:

Graduate level:

Year-long graduate probability course, Penn yearly 2004-2009; U.W. Madison, 1992 and 1997.

Probability topics course, Penn 2005; Madison, 1993, 1998.

Reading course in computational algebraic geometry, Penn 2005, 2006.

Seminar in computational algebraic geometry, OSU 2001.

Asymptotics of multivariate generating functions, Penn 2006, 2009; Stanford (visiting) 1999, OSU 2002.

Undergraduate level:

Math for prospective elementary teachers (Wisconsin's Math 130-131-1323), 1992-1998. For five years I worked on rennovating this sequence so as to teach problem-solving and verbal skills in addition to the remedial skills already taught. During part of this time (Fall 1995) I was involved in a project to incorporate some similar material into Wisconsin's pre-calculus course (Math 112). In Spring 2002 I ran a pilot version of problem-solving geometry for pre-service teachers at Ohio State (Math 106). In Autumn 2002 I ran the pilot for the companion problem-solving course in arithmetic (Math 105).

Calculus: Second semester calculus (Math 114) Penn 2004, 2005, 2008.

Probability theory, pre-calculus, trigonometry (OSU, Madison).

Game theory (independent study).

Elementary level:

Taught math enrichment to children of ages 10-13 at Black Pine Circle School during the years 1980-1984.

Experimental:

OSU Math 151A (calculus problem-solving curriculum), 2000

Experimental version of Wisconsin Math 112 (pre-calculus), 1995.

Experimental versions of courses for elementary school teachers, 1993, 2002.

Taught a course in knot theory in the Summer Institute in Mathematics, Berkeley, 1991.

The SMI is a program for minority students at the college level who are interested in careers in mathematics.

Taught experimental courses in differential equations and in probability theory to students in the Experimental Study Group at M.I.T. in 1987-88.