

Curriculum Vitae
Stewart N. Ethier

Contact information:

Department of Mathematics
University of Utah
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Personal:

Place and date of birth: Milwaukee, Aug. 2, 1948. Citizenship: USA. Marital status: married.
Current annual salary: \$89,642. (Average full professor salary at Utah: \$118,800.)

Education:

B.A. 1970, University of Wisconsin–Madison, major in mathematics
M.A. 1971, University of Wisconsin–Madison, mathematics
Ph.D. 1975, University of Wisconsin–Madison, mathematics; advisor: Thomas G. Kurtz

Academic employment:

1975–79. Michigan State University, Department of Statistics and Probability, Assistant Professor
1979–84. Michigan State University, Department of Statistics and Probability, Associate Professor
1984–present. University of Utah, Department of Mathematics, Professor

Visiting positions:

1975–76. Courant Institute of Math. Sciences, New York University, Visiting Member (Sep.–Jul.)
1982. University of Wisconsin–Madison, Department of Mathematics, Honorary Fellow (Jul.–Dec.)
1983. Monash University, Department of Mathematics, Visiting Lecturer (Jan.–Aug.)
1990. Tokyo Institute of Technology, Department of Applied Physics, Guest Professor (Sep.–Dec.)
1991. University of Wisconsin–Madison, Department of Mathematics, Honorary Fellow (Jan.–Mar.)
1991. Monash University, Department of Mathematics, Visitor (Apr.–Aug.)
1997. Tokyo Institute of Technology, Department of Applied Physics, Guest Professor (Sep.–Dec.)
1998. Monash University, Department of Mathematics, Visitor (Feb.–May)
2007–08. University of Nevada, Las Vegas, Center for Gaming Research, Visiting Fellow (Dec.–Jan.)
2011–12. Yeungnam University, Department of Statistics, Visiting Professor (Jul.–Jun.)

Research interests:

Applied probability, mathematical population genetics, theory of gambling, Parrondo's paradox.

Membership:

Institute of Mathematical Statistics (since 1976).
Bernoulli Society (since 1995).
INFORMS Applied Probability Society (since 2011).

Honors:

Fellow of Institute of Mathematical Statistics. Elected in 1993 “For fundamental contributions to the theory of weak convergence and diffusions, and the development of measure-valued diffusions in population genetics.”

Fellow of the Center for Gaming Research, University of Nevada Las Vegas, 2007.

Fellow of Korean Brainpool Program, sponsored by the Korean Federation of Science and Technology Societies, 2011–12.

Books:

1. (with T. G. Kurtz) *Markov Processes: Characterization and Convergence*. Wiley Series in Probability and Mathematical Statistics. Wiley, New York, 1986. Paperback reprint, 2005. 534 pp.

2. *The Doctrine of Chances: Probabilistic Aspects of Gambling*. Probability and Its Applications Series. Springer, Berlin, 2010. 816 pp. <http://www.math.utah.edu/~ethier/DoC.html>

Books edited:

1. (with W. R. Eadington) *Optimal Play: Mathematical Studies of Games and Gambling*. Institute for the Study of Gambling and Commercial Gaming, University of Nevada, Reno, 2007. 550 pp. <http://www.math.utah.edu/~ethier/OP.html>.

2. (with J. Feng and R. H. Stockbridge) *Markov Processes and Related Topics: A Festschrift for Thomas G. Kurtz*. IMS Collections 4, Institute of Mathematical Statistics, Beachwood, OH, 2008. 324 pp.

Papers:

1. A class of degenerate diffusion processes occurring in population genetics. *Comm. Pure Appl. Math.* **29** (1976), 483–493.

2. (with M. F. Norman) Error estimate for the diffusion approximation of the Wright–Fisher model. *Proc. Natl. Acad. Sci. USA* **74** (1977), 5096–5098.

3. Differentiability preserving properties of Markov semigroups associated with one-dimensional diffusions. *Z. Wahr. verw. Gebiete* **45** (1978), 225–238.

4. A limit theorem for two-locus diffusion models in population genetics. *J. Appl. Probab.* **16** (1979), 402–408.

5. Limit theorems for absorption times of genetic models. *Ann. Probab.* **7** (1979), 622–638.

6. (with T. Nagylaki) Diffusion approximations of Markov chains with two time scales and applications to population genetics. *Adv. Appl. Probab.* **12** (1980), 14–49.

7. A class of infinite-dimensional diffusions occurring in population genetics. *Indiana Univ. Math. J.* **30** (1981), 925–935.

8. (with T. G. Kurtz) The infinitely-many-neutral-alleles diffusion model. *Adv. Appl. Probab.* **13** (1981), 429–452.

9. On the definition of the house advantage. In *The Gambling Papers: Proceedings of the Fifth National Conference on Gambling and Risk Taking, Vol. XIII. Quantitative Analysis of Gambling: Stock Markets and Other Games*. W. R. Eadington, ed. Univ. of Nevada, Reno, 1982, pp. 46–67.

10. Testing for favorable numbers on a roulette wheel. *J. Amer. Statist. Assoc.* **77** (1982), 660–665.

11. (with S. Tavaré) The proportional bettor’s return on investment. *J. Appl. Probab.* **20** (1983), 563–573.

12. (with S. E. Hodge) Identity-by-descent analysis of sibship configurations. *Amer. J. Med. Genet.* **22** (1985), 263–272.

13. (with R. C. Griffiths) The infinitely-many-sites model as a measure-valued diffusion. *Ann. Probab.* **15** (1987), 515–545.

14. (with T. G. Kurtz) The infinitely-many-alleles model with selection as a measure-valued diffusion. *Springer–Verlag Lecture Notes in Biomathematics* **70** (1987), 72–86.

15. The probability of winning the VFL Grand Final. *Function* **11** (1987), 73–79.

16. Improving on bold play at craps. *Operations Research* **35** (1987), 814–819.
17. (with T. Nagylaki) Diffusion approximations of Markov chains with two time scales and applications to population genetics, II. *Adv. Appl. Probab.* **20** (1988), 525–545.
18. The proportional bettor’s fortune. In *Gambling Research: Proceedings of the Seventh International Conference on Gambling and Risk Taking* **4**. W. R. Eadington, ed. Univ. of Nevada, Reno, 1988, pp. 375–383.
19. (with T. Nagylaki) Diffusion approximations of the two-locus Wright–Fisher model. *J. Math. Biol.* **27** (1989), 17–28.
20. The infinitely-many-neutral-alleles diffusion model with ages. *Adv. Appl. Probab.* **22** (1990), 1–24.
21. The distribution of the frequencies of age-ordered alleles in a diffusion model. *Adv. Appl. Probab.* **22** (1990), 519–532.
22. (with R. C. Griffiths) The neutral two-locus model as a measure-valued diffusion. *Adv. Appl. Probab.* **22** (1990), 773–786.
23. (with R. C. Griffiths) On the two-locus sampling distribution. *J. Math. Biol.* **29** (1990), 131–159.
24. (with R. C. Griffiths) Harmonic measure for random genetic drift. In *Diffusion Processes and Related Problems in Analysis* **1**. M. A. Pinsky, ed. Birkhäuser, Boston, 1990, pp. 73–81.
25. (with T. G. Kurtz) On the stationary distribution of the neutral diffusion model in population genetics. *Ann. Appl. Probab.* **2** (1992), 24–35.
26. Equivalence of two descriptions of the ages of alleles. *J. Appl. Probab.* **29** (1992), 185–189.
27. (with W. J. Ewens, R. C. Griffiths, S. A. Wilcox, and J. A. M. Graves) Statistical analysis of in situ hybridization data: derivation and use of the zmax test. *Genomics* **12** (1992), 675–682.
28. Eigenstructure of the infinitely-many-neutral-alleles diffusion model. *J. Appl. Probab.* **29** (1992), 487–498.
29. (with R. C. Griffiths) The transition function of a measure-valued branching diffusion with immigration. In *Stochastic Processes: A Festschrift in Honour of Gopinath Kallianpur*. S. Cambanis, J. K. Ghosh, R. L. Karandikar, and P. K. Sen, eds. Springer–Verlag, New York, 1993, pp. 71–79.
30. (with T. G. Kurtz) Fleming–Viot processes in population genetics. *SIAM J. Control Optim.* **31** (1993), 345–386.
31. (with R. C. Griffiths) The transition function of a Fleming–Viot process. *Ann. Probab.* **21** (1993), 1571–1590.
32. (with T. Shiga) Neutral allelic genealogy. In *Measure-Valued Processes, Stochastic Partial Differential Equations, and Interacting Systems*. D. A. Dawson, ed. CRM Proceedings and Lecture Notes, American Mathematical Society, Providence, 1994, pp. 89–97.
33. (with T. G. Kurtz) Convergence to Fleming–Viot processes in the weak atomic topology. *Stochastic Processes Appl.* **54** (1994), 1–27.
34. (with S. M. Krone) Comparing Fleming–Viot and Dawson–Watanabe processes. *Stochastic Processes Appl.* **60** (1995), 171–190.
35. A gambling system and a Markov chain. *Ann. Appl. Probab.* **6** (1996), 1248–1259.
36. On the normal-selection model. In *Progress in Population Genetics and Human Evolution*. P. Donnelly and S. Tavaré, eds. IMA Volumes in Math. and its Appl. **87**. Springer, New York, 1997, pp. 309–320.
37. (with T. G. Kurtz) Coupling and ergodic theorems for Fleming–Viot processes. *Ann. Probab.* **26** (1998), 533–561.
38. An optional stopping theorem for nonadapted martingales. *Statistics & Probab. Letters* **39** (1998), 283–288.
39. Thackeray and the Belgian progression. *Math. Scientist* **24** (1999), 1–23.
40. Analysis of a gambling system. In *Finding the Edge: Mathematical Analysis of Casino Games*. O. Vancura, W. R. Eadington, and J. A. Cornelius, eds. Univ. of Nevada, Reno, 2000, pp. 3–18.
41. (with A. D. Barbour and R. C. Griffiths) A transition function expansion for a diffusion model with selection. *Ann. Appl. Probab.* **10** (2000), 123–162.
42. (with T. Shiga) A Fleming–Viot process with unbounded selection. *J. Math. Kyoto Univ.* **40** (2000), 337–361.

43. (with T. Shiga) A Fleming–Viot process with unbounded selection, II. In *Markov Processes and Controlled Markov Chains*. Z. Hou, J. A. Filar, A. Chen, eds. Kluwer, 2001, pp. 303–320.
44. (with D. Khoshnevisan) Bounds on gambler’s ruin probabilities in terms of moments. *Methodology Comput. Appl. Probab.* **4** (2002), 55–68.
45. (with S. Wang) A generalized likelihood ratio test to identify differentially expressed genes from microarray data. *Bioinformatics* **20** (2004), 100–104.
46. The Kelly system maximizes median fortune. *J. Appl. Probab.* **41** (2004), 1230–1236.
47. (with D. A. Levin) On the fundamental theorem of card counting with application to the game of trente et quarante. *Adv. in Appl. Probab.* **37** (2005), 90–107.
48. Comment: “Basic strategy for card counters.” In *Optimal Play: Mathematical Studies of Games and Gambling*. S. N. Ethier and W. R. Eadington, eds. Institute for the Study of Gambling and Commercial Gaming, Univ. of Nevada, Reno, 2007, pp. 67–71.
49. Faro: From soda to hock. In *Optimal Play: Mathematical Studies of Games and Gambling*. S. N. Ethier and W. R. Eadington, eds. Institute for the Study of Gambling and Commercial Gaming, Univ. of Nevada, Reno, 2007, pp. 225–235.
50. A Bayesian analysis of the shooter’s hand at craps. In *Optimal Play: Mathematical Studies of Games and Gambling*. S. N. Ethier and W. R. Eadington, eds. Institute for the Study of Gambling and Commercial Gaming, Univ. of Nevada, Reno, 2007, pp. 311–322.
51. Markov chains and Parrondo’s paradox. In *Optimal Play: Mathematical Studies of Games and Gambling*. S. N. Ethier and W. R. Eadington, eds. Institute for the Study of Gambling and Commercial Gaming, Univ. of Nevada, Reno, 2007, pp. 493–506.
52. Optimal play at subfair compound games. In *Optimal Play: Mathematical Studies of Games and Gambling*. S. N. Ethier and W. R. Eadington, eds. Institute for the Study of Gambling and Commercial Gaming, Univ. of Nevada, Reno, 2007, pp. 525–540.
53. Absorption time distribution for an asymmetric random walk. In *Markov Processes and Related Topics: A Festschrift for Thomas G. Kurtz*. S. N. Ethier, J. Feng, and R. H. Stockbridge, eds. IMS Collections **4**, Institute of Mathematical Statistics, Beachwood, OH, 2008, pp. 31–40.
54. (with M. Estafanous) The duration of play in games of chance with win-or-lose outcomes and general payoffs. *Math. Scientist* **34** (2009), 99–106.
55. (with J. Lee) Limit theorems for Parrondo’s paradox. *Electron. J. Probab.* **14** (2009), 1827–1862. <http://arxiv.org/abs/0902.2368>.
56. (with J. Lee) A Markovian slot machine and Parrondo’s paradox. *Ann. Appl. Probab.* **20** (2010), 1098–1125. <http://arxiv.org/abs/0906.0792>.
57. (with F. M. Hoppe) A world record in Atlantic City and the length of the shooter’s hand at craps. *Math. Intelligencer* **32-4** (2010), 44–48. <http://arxiv.org/abs/0906.1545>.
58. (with J. Lee) A discrete dynamical system for the greedy strategy at collective Parrondo games. *Dynamical Systems* **26** (2011) 410–424. <http://arxiv.org/abs/1011.1773>.
59. (with J. Lee) Parrondo’s paradox via redistribution of wealth. *Electron. J. Probab.* **17-20** (2012) 1–21. <http://arxiv.org/abs/1109.4454>.
60. (with J. Lee) Parrondo games with spatial dependence. *Fluct. Noise Lett.* **11-1250004** (2012) 1–22. <http://arxiv.org/abs/1202.2609>.
61. (with J. Lee) Parrondo games with spatial dependence, II. *Fluct. Noise Lett.* **11-1250030** (2012) 1–18. <http://arxiv.org/abs/1206.6195>.
62. (with J. Lee) Parrondo games with spatial dependence and a related spin system. <http://arxiv.org/abs/1203.0818>.
63. (with J. Lee) Parrondo games with spatial dependence and a related spin system, II. <http://arxiv.org/abs/1206.6567>.
64. Counting toroidal binary arrays. <http://arxiv.org/abs/1301.2352>.

All papers were refereed except 9, 14, 18, and 48.

All joint works used alphabetical ordering of authors except papers 27 and 45 and edited book 1.

Non-research articles:

1. Contributor to “Tributes to the International Conference on Gambling and Risk-Taking.” *UNLV Gaming Research & Review J.* **16** (2012), 43–44.

Grants:

National Science Foundation: 15 years during 1978–95.
Simons Foundation: 2011–16.

Invited lecture series:

“Stochastic models in population genetics,” Tokyo Institute of Technology, December 1997

Invited conference talks:

AMS Special Session on Probability Theory Inspired by Applications (New York) April 1979
IMS session on Markov Processes and Population Genetics (East Lansing) June 1979
Second Midwest Probability Colloquium (Evanston) October 1980
U.S.–Japan Seminar on Stochastic Methods in Biology (Nagoya, Japan) July 1985
AMS Special Session on Random Fields, Random Measures and Applications (Logan) October 1986
Internat. Workshop on Diffusion Approximations and Related Topics (Laxenburg, Austria) June 1987
IMS session on Probability Applicable to Biology (Madison) May 1988
AMS Special Session on Markov Processes and Stochastic Analysis (Louisville) January 1990
Symp. on Stochastic Models in the Physical and Biological Sciences (Lake Yamanaka, Japan) Nov. 1990
Workshop on Superprocesses and Interacting Systems (Montréal, Canada) October 1992
AMS Special Session on Stochastic Processes in Population Genetics (Salt Lake City) April 1993
Workshop on Approx. and Numerical Methods Related to Diffusion Processes (Pittsburgh) Oct. 1993
IMA Workshop on Mathematical Population Genetics (Minneapolis) January 1994
Conference on Measure-Valued Branching and Superprocesses (Ramat Gan, Israel) May 1995
AMS–IMU Special Session on Probability (Jerusalem, Israel) May 1995
ORSA/TIMS Applied Probability Conference; session on gambling and finance (Atlanta) June 1995
Conference on Branching Processes (Oberwolfach, Germany) December 1995
Symposium on Stochastic Processes in Biology (Yokohama, Japan) January 1997
Workshop on Stochastics in Population Genetics and Tree Reconst. (Frankfurt, Germany) Nov. 1997
Workshop on Interactive Measure-Valued Processes (Toronto, Canada) March 1999
Internat. Workshop on Markov Processes and Controlled Markov Chains (Changsha, China) Aug. 1999
Spring Probability Meeting (Tokyo, Japan) March 2005
Cincinnati Symposium on Probability Theory and Applications (Cincinnati) March 2009
Sixth Korean Mathematical Society Probability Workshop (Seoul, South Korea) June 2012

Contributed conference talks:

AMS Annual Meeting (Washington, D.C.) January 1975
CBMS–NSF Conference (Athens, GA) December 1977
CBMS–NSF Conference (Missoula) June 1979
AMS Annual Meeting (San Antonio) January 1980
AMS Meeting (Reno) April 1981
Fifth National Conference on Gambling (Stateline) October 1981
Sixth National Conference on Gambling and Risk Taking (Atlantic City) December 1984
MAA Meeting, Intermountain Section (Ogden) April 1985
Seventh International Conference on Gambling and Risk Taking (Reno) August 1987
Twenty-fifth Anniversary Conference for Van Vleck Hall (Madison) May 1988
Workshop on Infinite-Dimensional Markov Processes (Ithaca) May 1989
18th Conference on Stochastic Processes and their Applications (Madison) June 1989

Conference on Diffusion Processes and Related Topics in Analysis (Evanston) October 1989
 Workshop on Stochastic Systems (Canberra, Australia) May 1991
 Seminar on Stochastic Processes (Seattle) March 1992
 Ninth International Conference on Gambling and Risk Taking (Las Vegas) June 1994
 MAA Meeting, Intermountain Section (Pocatello) April 1995
 MAA Meeting, Intermountain Section (Logan) April 1997
 Wisconsin Mathematics Ph.D. Centennial Conference (Madison) May 1997
 10th International Conference on Gambling and Risk Taking (Montréal, Canada) June 1997
 11th International Conference on Gambling and Risk Taking (Las Vegas) June 2000
 12th International Conference on Gambling and Risk Taking (Vancouver, Canada) May 2003
 MAA Meeting, Intermountain Section (Pocatello) March 2005
 13th International Conference on Gambling and Risk Taking (Stateline) May 2006 (3 talks)
 Markov Processes and Related Topics (Madison) July 2006
 MAA Meeting, Intermountain Section (Salt Lake City) March 2007
 14th International Conference on Gambling and Risk Taking (Stateline) May 2009 (2 talks)
 Eighth World Congress in Probability and Statistics (Istanbul, Turkey) July 2012

Ph.D. students:

Gilles Blum (1982) “Limit theorems for discrete parameter random evolutions,” Michigan State University
 Ming He (1993) “Generators, metric structures, and approximations for measure-valued stochastic processes,” University of Utah

Masters students:

Craig Johnson (1997) “Simulation of the Belgian progression and Oscar’s system,” University of Utah
 Song Wang (2003) “A generalized likelihood ratio test to identify differentially expressed genes from microarray data,” University of Utah
 Hilary Goss (2010) “Statistical methods in network intrusion detection,” University of Utah
 Carlos Gamez (2010) “Analysis of chemin-de-fer with no replacement,” University of Utah
 Julie Billings (2010) “Fold or raise all-in at one-card poker,” University of Utah
 Sung Chan Choi (2011) “Counterterrorism analysis using cooperative game theory,” University of Utah

REU students:

Stephen Jensen (2001) “Optimal drawing strategy for Deuces Wild video poker,” University of Utah

Classes taught since 2005: (four courses per year except 2011–12 sabbatical year)

Summer 2005 class: REU program (Mathematics of Games of Chance)
 Fall 2005 class: Math 5010 (Introduction to Probability)
 Spring 2006 classes: Math 5030 (Actuarial Mathematics), Math 5080 (Statistical Inference I)
 Fall 2006 classes: Math 5040 (Stochastic Processes and Simulation I), Math 6010 (Linear Models)
 Spring 2007 classes: Math 5050 (Stochastic Processes and Simulation II), Math 6020 (Multilinear Models)
 Fall 2007 classes: Math 5010 (Introduction to Probability), Math 6040 (Mathematical Probability)
 Spring 2008 classes: Math 5030 (Actuarial Mathematics), Math 6070 (Mathematical Statistics)
 Fall 2008 classes: Math 5010 (Introduction to Probability), Math 5080 (Statistical Inference I)
 Spring 2009 classes: Math 5030 (Actuarial Mathematics), Math 5750 (Game Theory)
 Fall 2009 classes: Math 5040 (Stochastic Proc. and Simulation I), Math 6040 (Mathematical Probability)
 Spring 2010 classes: Math 5050 (Stochastic Proc. and Simulation II), Math 5080 (Statistical Inference I)
 Fall 2010 classes: Math 5010 (Introduction to Probability), Math 6010 (Linear Models)
 Spring 2011 classes: Math 5750 (Game Theory), Math 6020 (Multilinear Models)
 Spring 2012 class: Dept. of Statistics, Yeungnam University, (graduate level) Stochastic Models
 Fall 2012 classes: Math 5010 (Intro. to Probability), Math 5040 (Stochastic Proc. and Simulation I)

Spring 2013 classes: Math 5050 (Stochastic Proc. and Simulation II), Math 5750 (Game Theory)

Service:

Associate Editor for *Annals of Applied Probability*, 1991–96.

Associate Editor for *IMS Collections*, 2008–present.

Reviewer for *Mathematical Reviews*. (40 reviews since 1983.)

Refereeing since 2008. (2008: *J. Appl. Probab.*, *Statist. Probab. Lett.*, *Theoret. Population Biol.* 2009: *J. Appl. Probab.* (2), *Stoch. Processes Appl.* 2010: *Statist. Probab. Lett.* 2011: *J. Appl. Probab.*, *Amer. Math. Monthly*, *Internat. Gambling Studies*. 2012: *Euro. J. Finance*, *Stoch. Processes Appl.*, *Phys. Lett. A*, *Electron. J. Probab.*)

Co-organizer, Special Session on Stochastic Processes in Population Genetics, Salt Lake City AMS meeting, April 1993.

Local organizer, Third International Probability Symposium, Park City, July 1997.

Co-organizer, Special Session on Ergodic Theory of Stochastic Processes, Salt Lake City AMS meeting, September 1999.

Co-organizer, Markov Processes and Related Topics, A conference in honor of Tom Kurtz on his 65th birthday, Madison, July 2006.

Member of NSF–CBMS conference review panel, Washington, D.C., June 1993, June 1996.

University of Utah Academic Senate, 2002–04.

University Humanities Area Committee, 2006–09.

University Statistics Committee, track representative for Mathematics, 2006–present.

Organizer and principal lecturer, University of Utah summer REU program, “Mathematics of Games of Chance,” 2005.

Department of Mathematics Executive Committee, 1989–90, 2003–04.