

Curriculum Vitae

Simon M. Catterall
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Education

B.A in Physics (1st class honours), Oxford University, England, 1985.
 D. Phil in Theoretical Physics, Oxford University, England, 1989.

Academic Awards

Open scholarship to Christ Church, Oxford, 1983-85.
 Dixon scholarship, Christ Church, Oxford, 1985-88.
 Research Fellow, Trinity Hall, Cambridge, 1990-93.

Academic Employment

Research assistant, DAMTP, Cambridge University, 1988-90.
 Research associate, Physics Department, UIUC, Illinois, 1990-91.
 SERC Advanced Fellow, DAMTP, Cambridge University, 1991-93.
 CERN Fellow, CERN, Geneva, Switzerland, 1993-94.
 Assistant professor, Physics Department, Syracuse University, New York, 1993–1998
 Associate professor, Physics Department, Syracuse University, New York, 1999–2005
 Professor, Physics Department, Syracuse University, New York, 2006–
 Director of Graduate Studies 2010-2013
 Associate Chair 2013–

Research Interests

Lattice Field Theories for Beyond Standard Model Physics:

- Lattice Supersymmetry
- Composite Higgs models. Dynamical symmetry breaking.
- Discrete quantum gravity.

Publication highlights

- 73 peer reviewed publications with average of 28 citations per paper. 35 published talks
- 2 100+ cited papers, 12 50+ cited papers (6 are single author). One monograph (Physics Reports)
- Invited lecturer at 3 international schools.

Invited talks at international conferences

- *Non-trivial phase structure in string theories with extrinsic curvature.* At the meeting **Random Surfaces and 2d Quantum Gravity**, Barcelona, Spain June 1991.
- *Recent developments in lattice quantum gravity.* At the meeting **Lattice 95**, Melbourne, Australia, June 1995.
- *Structure of the space of triangulated manifolds.* At the workshop **New Directions in Simplicial Gravity**, Santa Fe, New Mexico, July 24-August 8 1997.
- *Lattice quantum gravity.* At the meeting **Quantum Geometry, Random Matrices, Statistical Models of Strings and Quantum Gravity** Niels Bohr Institute, Copenhagen, Denmark, November 26-28 1998.
- *Dynamics of the conformal mode in simplicial gravity.* At the workshop **Discrete Random Geometries**, Niels Bohr Institute, Copenhagen, Denmark, September 28-30 2000.
- *Exact lattice supersymmetry.* At the EU network meeting **Statistical mechanics of random manifolds**, Institute for Theoretical Physics, University of Utrecht, Utrecht, Holland, October 15-19, 2001.
- *Kähler-Dirac fermions and exact lattice supersymmetry* At the international conference **Lattice 05**, Dublin, Ireland, July 25-30, 2005.
- *Lectures on lattice supersymmetry.* At the summer school **Summer Institute 2005** Fuji-Yoshida, Japan, August 11-18, 2005.
- *Twisted Lattice Supersymmetry.* At the meeting **New developments in Lattice Field theory**, Trento, Italy, March 25-31, 2006.
- *Lattice supersymmetry.* At the workshop **From QCD to LHC** Niels Bohr Institute, Copenhagen, Denmark, July 24-30 2006.
- *Recent results in lattice supersymmetry.* At the meeting **The Many Faces of Quantum Fields** Institute for Theoretical Physics, Leiden, April 10-13 2007.
- *Introduction to Lattice Supersymmetry.* Lectures at the International Summer School **Lattice QCD and its applications**, August 2007.
- *New dynamics in lattice gauge theory.* At the workshop **Lattice gauge theory for LHC Physics**, Lawrence Livermore National Laboratory May 6-8 2008.
- *Searching for new strongly coupled dynamics in lattice gauge theory.* At the workshop **Dynamical electroweak symmetry breaking**, University of Southern Denmark, Odense, September 7-13 2008.
- *Supersymmetric lattices: theory and applications.* At the workshop **Lattice Supersymmetry and Beyond**, Niels Bohr Institute, Copenhagen, Denmark, November 22-26 2008.
- *Exact lattice supersymmetry.* At the conference **Quantum theory and symmetries 2009**, University of Kentucky, July 20-25 2009.
- *Lattice gauge theory meets string theory.* At the workshop **Numerical approaches to AdSCFT, large N and gravity**, Imperial College, London, September 28-October 2 2009.
- *Exact lattice supersymmetry.* At the workshop **Universe in a box: LHC, cosmology and lattice gauge theory** Institute for Theoretical Physics, Leiden, Holland, August 25-30 2009.

- *Introduction to Lattice Supersymmetry and its applications.* At the workshop **Lattice Gauge Theory for LHC physics**, Boston University Nov 5-7 2009.
- *Beyond Standard Model Physics on the Lattice*, presentation to the DOE panel charged with reviewing the USQCD collaboration proposal at Jefferson Laboratory, Virginia, April 30 2010.
- *Eguchi-Kawai reduction in minimal walking technicolor.* At the international workshop **Origin of mass** May 3-6 2010, University of Southern Denmark, Odense, Denmark.
- *Exact Lattice Supersymmetry and applications to AdS/CFT*, plenary talk at **Lattice 2010**, June 14-20 2010, Sardinia, Italy. To be published in Proceedings of Science.
- *Topological quantum gravity on the lattice.* At the CERN Theory Institute **Frontiers of Lattice Gauge Theory**, CERN, Switzerland, July 19 2010.
- *$N=4$ super Yang-Mills on the lattice.* At the meeting **Miami 2010**, December 14-19 2010.
- *Lattice Gauge theories for BSM physics.* At the summer school **Origins of Mass' 2011**, University of Southern Denmark, Odense, May 2-9 2011.
- *Introduction to lattice supersymmetry.* At the workshop **Strongnet** at the University of Regensburg, March 24-25 2011.
- *Introduction to Lattice Supersymmetry.* Lectures at international summer school **Lattice QCD and hadronic structure**, Dubna, Russia September 10-17 2011.
- *Four fermions interactions on the lattice*, at the workshop **Lattice meets BSM experiment** Fermilab October 14-15 2011.
- *Reduced staggered fermions: four fermion operators and beyond*, at the workshop **Origin of Mass 2012**, Nordita, Stockholm, Sweden, May 28-June 2 2012.
- *$\mathcal{N} = 4$ super Yang Mills on a lattice* at the workshop **BSM lattice meets experiment 3**, University of Boulder, Colorado, October 26-27, 2012.
- *Supersymmetric BSM physics on the lattice* at the workshop **Lattice gauge theory in the LHC era**, November 4-5 2012, TRIUMF, Vancouver, Canada.
- *$\mathcal{N} = 4$ SYM* at the conference **Strongly interacting field theories**, Theoretical Physics Institute, Friedrich-Schiller Universität, Jena, Germany, November 29-December 1, 2012.
- *New developments in lattice supersymmetry*, at the **Annual UK Theory Meeting**, 17-19 December 2012.
- *New directions in lattice gauge theory* at the **Aspen Institute of Physics**, May 27-June 16, 2013.
- *Lattice supersymmetry and beyond*, at the workshop **Non-perturbative quantum field theory: methods and applications**, DESY, Hamburg, Germany September 24-27, 2013.
- *SIGN 2014*, GSI, Darmstadt, Germany Feb 18-22, 2014.

Invited seminars (2002–)

- Niels Bohr institute, Copenhagen, Denmark, January 20 2002.
- Department of Physics, University of Wales, Swansea, UK, May 7 2002.
- Department of Physics, Edinburgh University, Edinburgh, UK, May 9, 2002.
- Department of Physics, University of Minnesota, December 2, 2002.
- Department of Physics, University of Arizona, Tucson, March 18, 2003.
- Department of Applied Mathematics and Theoretical Physics, DAMTP, Cambridge University, UK, May 14 2003.
- Department of Physics, Cornell University, Ithaca, June 2, 2003.
- Department of Physics and Institute for Nuclear Theory, University of Washington, Seattle, Jan 7, 2004.
- Department of Physics, University of Toronto, Toronto, CA, February 23, 2004.
- Department of Physics and Institute for Theoretical Physics, University of Minnesota, September 30, 2004.
- Kavli Institute for Theoretical Physics, University of California, Santa Barbara, January 18, 2005.
- Department of Physics, Harvard University, April 26, 2005.
- Division of Theoretical Physics, Department of Mathematical Sciences, University of Liverpool, June 8 2005.
- Department of Physics, Boston University, April 24 2006.
- Perimeter Institute for Theoretical Physics, Waterloo, Ontario, Canada May 4 2006.
- Brookhaven National Lab, February 2007.
- Isaac Newton Institute for Mathematical Sciences, Cambridge University, October 7 2007.
- Department of Physics, University of Wales, Swansea, October 15 2007.
- Department of Physics, Imperial College, London, October 16 2007.
- Department of Physics, University of Toronto, November 19 2007.
- Department of Physics, Boston University, October 6 2008.
- Department of Physics, University of Kentucky, October 29 2008.
- Workshop on exascale computing, SLAC, Stanford University, Dec 8-10 2008.
- Theoretical Particle Physics Group, Fermilab, May 12 2009.
- Theory group SLAC, Stanford University, November 17 2009.
- Department of Physics, University of Rochester, Rochester, November 24 2009.
- Department of Physics, Ohio State University, Columbus, Ohio, December 4 2009.
- Department of Theoretical Physics, Imperial College, London, May 25 2010.

- Department of Physics, Columbia University, New York, November 8 2010.
- Center for Particle Physics Phenomenology, University of Southern Denmark, Odense, February 2 2011.
- Department of Physics, University of Edinburgh, U.K, April 24 2011.
- Department of Physics, University of Boulder, Colorado, November 14 2011.
- KITP, University of California Santa Barbara, Feb 1 2012
- Perimeter Institute for Theoretical Physics, April 25 2012.
- Nordita, Stockholm, May 28 2012.
- Yale, February 19, 2013.
- Stony Brook, May 15, 2013.
- MIT, April 10 2014.

Research visits

- Sabbatical leave January 1 1998 - April 30 1998 at the Theory Division, Los Alamos National Laboratory, Los Alamos, New Mexico.
- Sabbatical leave January 1 2002 - July 30 2002, Niels Bohr Institute, Copenhagen, Denmark.
- Sabbatical leave January 5 - February 10 2005 to attend KITP program on 'Modern Challenges for Lattice Field Theory'
- Sabbatical leave January - April 2006. Spent on research in Syracuse.
- Isaac Newton Fellowship October 2007, Cambridge University, UK.
- Visiting professor, Center for Particle Physics Phenomenology, University of Southern Denmark, Odense, Denmark, Feb-June 2011.
- KITP fellow at program *Novel numerical methods in strongly coupled field theories and gravity*, January 28-February 12 2012.

Distinctions and Other Work

- Member of the Scientific Program Committee for the **USQCD** collaboration 2009 onwards.
- Member of Scientific Talks committee, **USQCD** 2013–
- Member of external hiring committee for **Center for Particle Physics Phenomenology**, CP3-Origins, University of Southern Denmark.
- Referee for the international journals **Nuclear Physics B**, **Journal of High Energy Physics JHEP**, **Physics Letters B**, **Physical Review D** and **Physical Review Letters**
- Referee and panelist for DOE and NSF grant proposals.
- Referee for UK, Canadian and Israeli research councils.

- Member of the DOE panel charged with developing a plan for future exascale computing in US High energy physics.
- Guest editor for a special edition of the International Journal of Modern Physics C – **Web Technologies for Physics Education**.
- Member of the international advisory committee for the meeting *Dynamical Electroweak Symmetry Breaking* Odense, Denmark, September 2008.
- Organized and edited proceedings of the annual **MRST** meeting in theoretical particle physics, held in Syracuse May 13-15 1997.
- Organized the meeting *Bal Fest*, December 3 2011, Syracuse University.
- Co-organizer of the Aspen institute program **Lattice Gauge Theory in the LHC era**, May 26-June 16 2013.
- Co-organizer of interdisciplinary workshop *Lattice gauge theory and condensed matter physics* Spring 2014.
- Co-organizer of the KITP program **Lattice for LHC physics and beyond**, University of Santa Barbara, Fall 2015.

Publications

1. *Parity violating vacuum currents on the random lattice*, S.M.Catterall, J.F.Wheater **Phys. Lett. B213 (1988)**.
2. *Extrinsic curvature in dynamically triangulated random surfaces*, S.M.Catterall **Phys. Lett. B220 (1989) 207**.
3. *Testing conformal invariance in Z_N models*, S.M.Catterall, **Phys. Lett. B231 (1989) 141**.
4. *Numerical studies of field theories on random lattices*, S. Catterall, D.Phil Thesis, Oxford University (1988).
5. *Scaling in dynamical random surfaces*, S.M.Catterall **Phys. Lett. B243, 121 (1990)**.
6. *Further investigations of the crumpling transition in dynamical random surfaces*, C. Baillie, S.M.Catterall, D.Johnston, **Nucl. Phys. B348 (1991) 543**.
7. *Langevin algorithms for spin models*, S.M.Catterall, I.T.Drummond, R.R.Horgan, **Phys. Lett. B254, 177, (1991)**.
8. *Crumpling on dynamical ϕ^3 graphs*, S.M.Catterall, R.Renken, J.B Kogut, **Nucl. Phys. B366, 647, (1991)**.
9. *Scaling behaviour of the Ising model coupled to 2d quantum gravity*, S.M.Catterall, R.L.Renken, J.B.Kogut, **Phys. Rev. D45 (1992) 2957**.
10. *Stochastic simulation of quantum mechanics*, S.M.Catterall, I.T.Drummond and R.R.Horgan, **J. Phys. A24 (1991) 4081**.
11. *Monte Carlo study of a $c = 0$ matrix model*, S.M.Catterall, J.B.Kogut, and R.L.Renken, **Phys. Lett. B264, 75, (1991)**.

12. *String susceptibility at the crumpling transition*, S.M.Catterall, J.B.Kogut and R.L.Renken, **Phys. Lett.** **B279 (1992) 53**.
13. *Slave equations for spin models*, S.M.Catterall, I.T.Drummond, R.R.Horgan, **Phys. Lett.** **B284 (1992) 351**.
14. *Numerical Study of $c > 1$ matter coupled to quantum gravity*, S.M.Catterall, R.L.Renken, and J.B.Kogut, **Phys. Lett** **B292, 277 (1992)**.
15. *Three dimensional quantum gravity coupled to Ising matter*, S. M. Catterall, J. B. Kogut and R.L. Renken, **Nucl. Phys.** **B389 (1993) 601**.
16. *On the nonrelativistic approach to heavy quark systems*, S.M. Catterall, F.R. Devlin, I.T. Drummond and R.R. Horgan, **Phys. Lett.** **B300 (1993) 393**.
17. *The XY model on a dynamical random lattice*, S. M. Catterall, R. L. Renken and J. B. Kogut, **Nucl. Phys.** **B408 (1993) [FS] 427**.
18. *Three dimensional quantum gravity coupled to gauge fields*, R. Renken S. Catterall and J. Kogut, **Nucl. Phys.** **B422 (1994) 677**.
19. *Radial excitations in NRQCD*, S. Catterall, F. Devlin, I. Drummond and R. Horgan, **Phys. Lett.** **B321 (1994) 246**.
20. *Phase structure of four dimensional simplicial quantum gravity*, S. Catterall, J. Kogut and R. Renken, **Phys. Lett.** **B328 (1994) 277**.
21. *Is there an exponential bound in four dimensional simplicial gravity ?*, S. Catterall, J. Kogut and R. Renken, **Phys. Rev. Lett** **72 (1994) 4062**.
22. *Simulations of dynamically triangulated gravity – an algorithm for arbitrary dimension*, S. Catterall, **Computer Physics Communications** **87 (1995) 409**.
23. *Entropy and the approach to the thermodynamic limit in 3d simplicial gravity*, S. Catterall, R. Renken and J. Kogut, **Phys. Lett.** **B342 (1995) 53**.
24. *Nonperturbative RG flows in 2d gravity*, R. Renken, S. Catterall and J. Kogut, **Phys. Lett.** **B345 (1995) 422**.
25. *Scaling and the Fractal Geometry of 2d Quantum Gravity*, M. Bowick, S. Catterall, V. John and G. Thorleifsson, **Phys. Lett.** **B354 (1995) 58**.
26. *Baby Universes in 4d Dynamical Triangulation*, S. Catterall, G. Thorleifsson, J. Kogut and R. Renken, **Phys. Lett.** **B366 (1996) 72**.
27. *A Real Space Renormalization Group for Random Surfaces*, G. Thorleifsson and S. Catterall, **Nucl. Phys.** **B461 (1996) 350**.
28. *Singular Vertices and the Triangulation Space of the D-sphere*, S. Catterall, G. Thorleifsson, J. Kogut and R. Renken, **Nucl. Phys.** **B468 (1996) 263**.
29. *The Flat Phase of Crystalline Membranes*, M. Bowick, S. Catterall M. Falcioni, G. Thorleifsson and K. Anagnostopoulos, **J. Phys. I France** **(1996) 1321**.
30. *Minimal Dynamical Triangulations of Random Surfaces*, M. Bowick, S. Catterall and G. Thorleifsson, **Phys. Lett.** **B391 (1997) 305**.

31. *The use of Information Technologies in the Teaching of Science for the 21st Century*, S. Catterall, M. Goldberg, E. Lipson, A. Middleton and G. Vidali, **Int. Journal of Modern Physics C Vol 8 No. 1 (1997) 49.**
32. *Java Simulations for Physics Education*, S. Warner, S. Catterall and E. Lipson, **Concurrency: Practice and Experience, Vol 9 (1997).**
33. *Singular Structure in 4d Simplicial Gravity*, S. Catterall, **Phys. Lett. B416 (1998) 274.**
34. *Monte Carlo Renormalization Group Study of gauged RP^2 spin models in two dimensions*, S. Catterall, M. Hasenbusch, R. Horgan and R. Renken, **Phys. Rev. D58 (1998) 510**
35. *The Phase Diagram of 3D Dynamical Triangulation*, S. Catterall, R. Renken and J. Kogut, **Nucl. Phys. B523 (1998) 274.**
36. *Simulation of 3D triangulations with boundary*, S. Warner, S. Catterall and R. Renken, **Phys. Lett. B542 (1998) 266.**
37. *Monte Carlo Renormalization of 2D Simplicial Quantum Gravity Coupled to Gaussian Matter*, S. Catterall, E. Gregory and G. Thorleifsson, **Nucl. Phys. B541 (1999) 289.**
38. *The conformal mode in simplicial gravity*, S. Catterall and E. Mottola, **Phys. Lett. B467 (1999) 29.**
39. *Phase diagram of four-dimensional dynamical triangulations with a boundary*, S. Warner and S. Catterall, **Phys. Lett. B493 (2000) 389.**
40. *Ising model on a fluctuating disk*, S. McGuire, S. Catterall, M. Bowick and S. Warner, **Nucl. Phys. B614 (2001) 467.**
41. *A lattice path integral for supersymmetric quantum mechanics*, S. Catterall and E. Gregory, **Phys. Lett. B487 (2000) 349.**
42. *Exact lattice supersymmetry: the 2D $N=2$ Wess-Zumino model*, S. Catterall and S. Karamov, **Phys. Rev. D65 (2002) 94501.**
43. *Testing a Fourier Accelerated Hybrid Monte Carlo Algorithm*, S. Catterall and S. Karamov, **Phys. Lett. B528 (2002) 301.**
44. *Lattice Supersymmetry and Topological Field Theory*, S. Catterall, **JHEP0305 (2003) 038.**
45. *Stripes from (noncommutative) stars*, S. Catterall and J. Ambjørn, **Phys. Lett. B549 (2002) 253.**
46. *A lattice study of the two-dimensional Wess Zumino model*, S. Catterall and S. Karamov, **Phys. Rev. D68 (2003) 014503.**
47. *Lattice sigma models with exact supersymmetry*, S. Catterall and S. Ghadab, **JHEP 0405 (2004) 044.**
48. *A geometrical approach to $N=2$ super Yang-Mills theory on the two dimensional lattice*, S. Catterall **JHEP 0411 (2004) 006.**
49. *Lattice formulation of $\mathcal{N} = 4$ super Yang Mills theory*, hep-lat/0503036, **JHEP 0506 (2005) 027**
50. *Twisted supersymmetric sigma model on the lattice*, S. Catterall and S. Ghadab, **JHEP 0610 (2006) 063**
51. *Simulations of $\mathcal{N} = 2$ super Yang-Mills theory in two dimensions*, Simon Catterall **JHEP 0603 (2006) 032**

52. *A critique of the link approach to lattice supersymmetry*, F. Bruckmann, S. Catterall and M. de Kok, **Phys.Rev.D75:045016,2007**.
53. *On the restoration of supersymmetry in twisted two dimensional lattice Yang Mills theory* S. Catterall, **JHEP 0704:015,2007**.
54. *Minimal walking on the lattice* Simon Catterall, Francesco Sannino, **Phys.Rev.D76:034504,2007**.
55. *Towards lattice simulation of the gauge theory duals to black holes and hot strings*, Simon Catterall, Toby Wiseman, **JHEP 0712:104,2007**
56. *From Twisted Supersymmetry to Orbifold Lattices*, Simon Catterall, **JHEP 01 (2008) 048**
57. *Lattice Actions for Yang-Mills Quantum Mechanics with Exact Supersymmetry*, Simon Catterall, Anosh Joseph, **arXiv:0712.3074 [hep-lat]**, accepted for publication **Phys.Rev.D77:094504,2008**
58. *Black hole thermodynamics from simulations of Yang-Mills theory*, S. Catterall and T. Wiseman, **Phys. Rev. D78:041502,2008**
59. *Phase diagram of $SU(2)$ with two flavors of adjoint quarks*, S. Catterall, F. Sannino, J. Giedt and J. Schneible, **JHEP 0811:009,2008**
60. *Lattice super Yang-Mills using domain wall fermions in the chiral limit*, J. Giedt, R. Brower, S. Catterall, G. Fleming and P. Vranas, **arXiv:0810.5746, Phys.Rev.D79: 025015,2009**.
61. *First results from simulations of supersymmetric lattices*, S. Catterall, **arXiv:0811.1203, JHEP 0901:040,2009**
62. *Anti-de Sitter space from supersymmetric gauge theory*, arXiv:0812.2901.
63. *Exact Lattice Supersymmetry*, S. Catterall, D. B. Kaplan and M. Unsal, **Physics Reports 1598 71 2009**.
64. *Probes of nearly conformal behavior in lattice simulations of minimal walking technicolor* Simon Catterall, Joel Giedt, Francesco Sannino, Joe Schneible, arXiv:0910.4387.
65. *Extracting black hole physics from the lattice*, S. Catterall and T. Wiseman, arXiv:0909.4947, **JHEP 1004:077 2010**.
66. *de Sitter gravity from lattice gauge theory*, S. Catterall, D. Ferrante and A. Nicholson, **Eur.Phys.J. Plus (2012) 127**. arXiv:0912.5525
67. *Thermal phases of D1-branes on a circle from lattice super Yang-Mills*, S. Catterall, A. Joseph and T. Wiseman, **JHEP 1012 022 (2010)**, arXiv:1008.4964
68. *Realization of Center Symmetry in Two Adjoint Flavor Large- N Yang-Mills* S. Catterall, R. Galvez and M. Unsal, **JHEP 1008, 010 (2010)**, arXiv:1006.2469
69. *First Results from Lattice Simulation of the PWMM*, S. Catterall and G. van Anders, **JHEP 1009, 088 (2010)**, arXiv:1003.4952
70. *Topological gravity on the lattice*, S. Catterall, **JHEP 1007, 066 (2010)**, arXiv:1003.5202
71. *Perturbative renormalization of lattice $N=4$ super Yang-Mills*, S. Catterall, E. Dzienkowski, J. Giedt, A. Joseph and R. Wells, **JHEP 1104 (2011) 074**.
72. *An object oriented code for simulation of super Yang-Mills theories*, S. Catterall and A. Joseph, **Computer Physics Communications 183 (2012) 1336**, arXiv:1108.1503.

73. *MCRG for Minimal Walking Technicolor*, S. Catterall, L. Keegan, L. Del Debbio and J. Giedt, **Phys. Rev. D** **85** (2012) **094501**, arXiv:1108.3794.
74. *Gauge non-abelian NJL model on a lattice*, S. Catterall, R. Galvez, J. Hubisz, D. Mehta and A. Vernaala, **Phys. Rev. D** **86** (2012) **034502** arXiv:arXiv:1112.1855.
75. *On the sign problem in 2d lattice super Yang-Mills*, S. Catterall, R. Galvez, D. Mehta and A. Joseph, **JHEP** **1201:108** (2012)
76. *Phase structure of lattice $\mathcal{N} = 4$ super Yang-Mills theory*, S. Catterall, P. Damgaard, T. Degrand, R. Galvez and D. Mehta, arXiv:1209:5285, **JHEP** **1211** (2012) **072**.
77. *Four fermion interactions in non-abelian gauge theory*, S. Catterall and A. Veernala, arXiv:1303.6187, **Phys. Rev. D** **87**(2013) **114507**
78. *Twisted supersymmetries in lattice $\mathcal{N} = 4$ Yang-Mills theory*, S. Catterall, J. Giedt and A. Joseph, arXiv:1306.3891, **JHEP** **1310:166** (2013)
79. *Dynamical Gauge Symmetry breaking in strongly coupled lattice theories*, S. Catterall and A. Veernala, arXiv:1306.5668, **Phys. Rev. D** **88** (2013) **114510**
80. *A Complete Lattice Technicolor Model*, S. Catterall and A. Veernala, **arXiv:1401.0457**.
81. *Report of the Snowmass 2013 Scientific Computing Frontier working on lattice field theory - Lattice field theory for the Energy and Intensity Frontiers: Scientific Goals and Computing Needs*, S. Catterall et al. **arXiv:1310.6087**
82. *Lattice Gauge Theories at the Energy Frontier*, S. Catterall et al. USQCD white paper, **arXiv:1309.120**.

Published Talks

1. *Crumpling in fluid random surfaces*, S.M.Catterall, Proceedings of the international workshop LATTICE 89, **Nucl. Phys. B, Proceedings Suppl.** **17**(1990).
2. *Continuum limits for lattice strings*, S. Catterall, Proceedings of the international workshop LATTICE 90, **Nucl. Phys. B, Proceedings Suppl.** **20** (1991) **716**.
3. *Numerical studies of field theories coupled to 2d quantum gravity*, S.M.Catterall, J.B.Kogut, R.L.Renken, Invited talk at the international workshop ‘Random Surfaces and 2d Quantum Gravity’, **Nucl. Phys. B, Proceedings Suppl.** **25A** (1992).
4. *Quenched hadron spectrum using Wilson and $O(a)$ improved fermion actions at $\beta = 6.2$* , UKQCD collaboration (1992), Proceedings of the international workshop LATTICE 91, **Nucl. Phys. B, Proceedings Suppl.** **26** (1992) **211**.
5. *Ising models coupled to Two and Three Dimensional Quantum Gravity*, Proceedings of the international workshop LATTICE 92, **Nucl. Phys. B, Proceedings Suppl.** **30** (1993) **775**.
6. *Simulations of simplicial quantum gravity*, S. Catterall, Proceedings of the international workshop LATTICE 93, **Nucl. Phys. B Proceedings Suppl.** **34** (1994) **733**.
7. *Excited states in NRQCD*, S. Catterall, F. Devlin, I. Drummond and R. Horgan, Proceedings of the international workshop LATTICE 93, **Nucl. Phys. B, Proceedings Suppl.** **34** (1994) **431**.
8. *Dynamical triangulations and 4d Gravity*, S. Catterall, Proceedings of the 2nd IMACS international conference in computational physics (1993) World Scientific Publishing.

9. *Recent Results in Numerical Quantum Gravity* invited plenary talk at the International Workshop LATTICE 95, Melbourne, Australia **Nucl. Phys. B Proceedings Suppl** **47 (1996) 59**.
10. *Simplicial Quantum Gravity in Dimension Greater than Two*, Proceedings of the international workshop LATTICE 96, **Nucl. Phys. B, Proceedings Suppl. (1997)**
11. *The Flat phase of Fixed-Connectivity Membranes*, M. Bowick, S. Catterall, M. Falcioni, G. Thorleifsson and K. Anagnostopoulos, to appear in the proceedings of LATTICE 96, **Nucl. Phys. B53 Proceedings Suppl. (1997) 746**, St. Louis, July 1996.
12. *Blocking Dynamical Triangulations with Matter*, E. Gregory, S. Catterall and G. Thorleifsson, **Nucl. Phys. B53 Proceedings Suppl. (1997) 763**.
13. *Simulating Crystalline Membranes*, G. Thorleifsson, M. Bowick, S. Catterall, M. Falcioni and K. Anagnostopoulos, Proceedings of the International Conference on Multi-scale Phenomena and Simulations, Bielefeld, Germany, September 30 1996.
14. *Monte Carlo Renormalization Group Study of Gauged RP^2 spin models in two dimensions*, S. Catterall, M. Hasenbusch, R. Horgan and R. Renken, Proceedings of the international workshop LATTICE 97, **Nucl. Phys. Proc. Suppl. (1997)**
15. *Conformal Mode Dynamics and Simplicial Gravity*, S. Catterall, E. Mottola and T. Bhattacharya, **Nucl. Phys. proc. Suppl. 73 (1999) 792**.
16. *Anisotropic Membranes*, M. Bowick, S. Catterall, S. Warner, G. Thorleifsson and M. Falcioni, **Nucl. Phys. B Proceedings Suppl. 73 (1999) 804**.
17. *Conformal mode in Simplicial Gravity*, S. Catterall and E. Mottola, Proceedings of the international workshop LATTICE 99, Pisa, Italy, **Nucl. Phys. B. Proceedings Suppl 83 (2000) 748**.
18. *A Two-Dimensional Lattice Model with Exact Supersymmetry*, S. Catterall, **Nucl. Phys. B Proc. Suppl. 106 (2002) 935**.
19. *Exact Lattice Supersymmetry from TQFT*, S. Catterall, **Nucl. Phys. B Proc. Suppl. (2004)**
20. *Lattice supersymmetry via Twisting*, S. Catterall, **Nucl. Phys. B Proc. Suppl. (2005)**
21. *Twisting, Kähler-Dirac Fermions and lattice SUSY*. Talk at the workshop **Modern Challenges in Lattice Field theory**, Kavli Institute for Theoretical Physics, UCSB, January 2005.
22. *Twisting, Kähler-Dirac Fermions and exact lattice supersymmetry*, **Nucl. Phys. B Proc. Suppl. (2006)** in press.
23. *Lectures in lattice supersymmetry* at the **Summer Institute 2005** Fuji-Yoshida, Japan, August 11-18 2005.
24. *Gauge-gravity duality – Super Yang-Mills Quantum Mechanics*. At LATTICE 07, July 28 2007, **PoS (2007)**.
25. *Exact lattice supersymmetry*, LATTICE 09, Beijing, China, July 2009 PoS(LAT2009)216.
26. *Three dimensional lattice gravity as supersymmetric Yang-Mills theory*, S. Catterall, arXiv:1010.4240 **Lattice 2010**, Sardinia, Italy.
27. *MCRG Minimal Walking Technicolor*, S. Catterall, L. Del Debbio, J. Giedt and L. Keegan, arXiv:1010.5909, **Lattice 2010**, Sardinia, Italy.

28. *Twisted lattice supersymmetry and applications to AdS/CFT*, S. Catterall, arXiv:1010.6224, Plenary talk at **Lattice 2010**, Sardinia, Italy.
29. *Gauge theory duals of black hole - black string transitions of gravitational theories on a circle*, S. Catterall, A. Joseph and T. Wiseman, arXiv:1009.0529, talk at **Quantum theory and symmetries**, Lexington, Kentucky, July 24 2009.
30. *Supersymmetric lattices*. Plenary talk at **Quantum theory and symmetries 2009**, Lexington, Kentucky, July 24 2009.
31. *On the sign problem in SUSY Yang-Mills*, S. Catterall, R. Galvez and D. Mehta, parallel talk at **Lattice 2011**, Squaw Valley, CA. PoSLATTICE2011 (2011) 064.
32. *Supersymmetric gauge theories on the lattice: Pfaffian phases and the Neuberger problem*, S. Catterall, R. Galvez, Anosh Joseph and D. Mehta, parallel talk at **Lattice2011**, Squaw Valley, CA. PoSLATTICE2011 (2011) 078.
33. *Four fermion operators and the search for BSM physics*, S. Catterall, parallel talk at Lattice 2012, Cairns, Australia, PoSLATTICE2012 023.
34. *Higgsing gauge symmetries using reduced staggered fermions* S. Catterall and A. Veernala, parallel talk at Lattice 2013, submitted to Proceedings of Science.
35. *Eigenvalue spectrum of $N=4$ Yang-Mills*, S. Catterall and D. Weir, parallel talk at Lattice 2013, submitted to Proceedings of Science.

Grants

- PI on DOE grant *Theoretical Particle Physics and Cosmology*, \$750,000 over 3 years.
- PI on SciDac 3 DOE grant *Searching for Physics Beyond the Standard Model: Strongly Coupled Field Theories at the Intensity and Energy Frontiers*, \$ 168,000 over 3 years.
- PI on DOE grant *High Energy Particle Theory* \$355,000 per annum for three years (2010-2013).
- Co PI on DOE grant *High Energy Particle Theory* \$240,000 per annum for three years (2007-2009).
- Co PI on DOE grant *High Energy Particle Theory* \$270,000 per annum for three years (2004-2006).
- PI on DOE grant *Beowulf Class Computer for High Energy Theory*, \$70,000 (2001).
- Co-PI on DOE grant *High Energy Particle Theory*, \$340,000 per annum for three years (2001-2003).
- Co-P.I on NSF Supercomputer Grant *Investigations of a Tubular phase in Anisotropic self-avoiding membranes*, 30,000 hours awarded (1998).
- Co-P.I on NSF Supercomputer Grant *Simulations of Anisotropic Membranes*, 50,000 hours awarded (1997).
- Co-PI on NSF grant *Integration of Information Age Networking and Parallel Supercomputer Simulations into University General Science and K-12 Curricula* \$930,000 (1995).
- Co-PI on NSF grant *Information Technology in the Service of Science Education*, \$200,000 (1995).
- Co-PI on DOE grant *High Energy Particle Theory*, \$340,000 per annum for for five years (1995-2000).
- Co-PI on NATO Collaborative Research Grant *Spin and Matrix Models*, \$6,000 for two years (1995).

- Member of EU funded network *Random Geometries* (total grant awarded \$150,000) (1993).
- Co-PI on NATO Collaborative Research Grant *Random Surfaces and Lattice Gravity*, \$3,000 (1992).
- P.I on SERC Research Grant *Discrete Strings and Lattice Gravity*, \$15,000 (1991).

Teaching Experience

2013 Fall semester – —bf PHY307 *Science and Computers*, enrollment 21 students.
 2013 Spring semester – **PHY312** *General Relativity and Cosmology*, enrollment 15 students.
 Recipient of Physics department teaching award for this class Spring 2013.
 2012 Fall semester – **PHY211** *General Physics I*, co-taught with Lisa Manning, enrollment 215 students.
 2012 Spring semester – **PHY312** *Relativity and Cosmology*, enrollment 18 students.
 2011 Fall semester – **PHY880** *Quantum Field Theory II*, enrollment 11 students.
 2010 Fall semester – **PHY600** *Computational Physics*, enrollment 19 students.
 2010 Spring semester – **PHY641** *Advanced Electrodynamics*, enrollment 18 students.
 2009 Fall semester – **PHY451** *Problems in Contemporary Physics* enrollment 4 students.
 2009 Spring semester – **PHY312** *Relativity and Cosmology* enrollment 17 students.
 2008 Fall semester – **PHY307** *Science and Computers* enrollment 17 students.
 2008 Spring semester – **PHY102** *Major Concepts of Physics* enrollment 148 students.
 2007 Fall semester – **PHY307** *Science and Computers* enrollment 12 students.
 2007 Spring semester – **PHY308** *Science and Computers II* enrollment 12 students.
 2006 Fall semester – **PHY307** *Science and Computers* enrollment 11 students.
 2006 Spring semester - on leave.
 2005 Fall semester – **PHY211** *General Physics I*, enrollment 190 students.
 2004 Fall semester – **PHY880** *Topics in Computational Physics*, enrollment 10 students.
 2004 Spring semester – **PHY312** *Relativity and Cosmology*, enrollment 14 students.
 2003 Fall semester – **PHY211** *General Physics I*, enrollment 180 students.
 2003 Spring semester – **PHY567** *Introduction to Quantum Mechanics*, enrollment 8 students.
 2002 Fall semester – **PHY211** *General Physics I*, enrollment 230 students.
 2001 Fall semester – **PHY307/607** *Science and Computers*, enrollment 25 students.
 2001 Spring semester – **PHY567** *Introduction to Quantum Mechanics*, enrollment 6 students.
 2000 Fall semester – **PHY307/607** *Science and Computers*, enrollment 28 students.
 2000 Spring semester – **PHY567** *Introduction to Quantum Mechanics*, enrollment 5 students.
 1999 Fall semester – **PHY307/607** *Science and Computers*, enrollment 30 students.
 1999 Spring semester – **PHY312** *Relativity and Cosmology*, enrollment 18 students.
 1998 Fall semester – **PHY307/607** *Science and Computers*, enrollment 32 students.
 1997 Fall semester – **PHY307/607** *Science and Computers*, enrollment 15 students.
 1996 Spring semester – co-taught **PHY106** *Science for the 21st Century*, enrollment 270 students
 1996 Fall semester – **PHY307/607** *Science and Computers*, enrollment 9 students
 1996 Spring semester – co-taught **PHY106** *Science for the 21st Century*, enrollment 275 students.
 1995 Fall semester – co-taught **PHY105** *Science for the 21st Century*, enrollment 280 students.
 1995 Spring semester – co-taught **PHY106** *Science for the 21st Century*, enrollment 260 students.
 1988-90 Supervisor Parts IA, IB, II and III Applied Mathematics Tripos Cambridge University, England.
 1989-90 Director of Studies in Mathematics, Robinson College, Cambridge University.
 1985-87 Supervisor *Mathematical Methods for Physicists*, Oxford University.

Innovations in teaching and education

- Designed a Web-based module *Mind and Machine* devoted to the brain, neural networks and the prospects for artificial intelligence. Incorporates text, images, movie and simulation-on-demand. First

used in Spring semester 1995 as part of **PHY106**(see <http://www.phy.syr.edu/courses/modules/MM>). Support provided in part by NSF grant for curriculum development (see grants).

- Co-PI on NSF grant to develop electronic textbook to illustrate use of simulation in selected topics in science (see grants). Collaboration between Physics and Engineering at Syracuse, and their opposites at Cornell (see <http://simscience.org>). Particular responsibility for *Membranes* section which makes extensive use of Java applets to illustrate topics ranging from soap bubbles to string theory. Has been used in local schools.
- Developed new course *Science and Computers* **PHY307/607** which uses series of computer based labs built with Java technology to teach the physics of chaos and fractals. First given in Fall semester 1997 (see <http://www.phy.syr.edu/courses/PHY307.00Fall>)
- Redesigned **PHY307/8** to teach a variety of topics in computational physics using Python as a programming tool. First used in Fall 2006 (see <http://www.phy.syr.edu/courses/PHY307.07Fall>)
- Redesigned the introductory quantum mechanics course **PHY567** to utilize computational methods for treating quantum systems. First given Spring 2000 (see <http://www.phy.syr.edu/courses/PHY567.00Spring>)
- Developed new graduate course **PHY880** *Topics in Computational Physics* offering an introduction to the use of Monte Carlo methods for studying a variety of physical system. Example C++ codes written and comprehensive set of notes (pdf format) developed. First given Fall 2004. (see <http://www.phy.syr.edu/courses/CompPhysics/>)
- Developed a new course *Computational Physics* **PHY600** aimed at teaching the tools and techniques of computer simulation in research to graduate students. C++ labs and online lecture material developed. Formal course proposal submitted Fall 2010.

Graduate Students

Eric Gregory PhD 1999.

Scott McGuire PhD 2001

Sergey Karamov PhD 2003

Sofiane Ghadab - PhD 2006.

Joe Schneible - PhD 2009

Anosh Joseph - PhD 2011

Aarti Vernaala - 4th year student.