

Curriculum Vitae

Simon M. Catterall
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Birth

April 1, 1964, Wigston, Leicester, England.

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
Full professor, Physics Department, Syracuse University, New York, 2006–

Research Interests

Lattice Field Theories for Beyond Standard Model Physics:

- Discrete quantum gravity
- Lattice Supersymmetry
- Near conformal gauge theories and technicolor models

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 **Lattice 05**, Dublin, Ireland, July 25-30, 2005.
- *Lectures on lattice supersymmetry* at the workshop **Summer Institute 2005** Fuji-Yoshida, Japan, August 11-18, 2005.
- *Twisted Lattice Supersymmetry* given at **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**, 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.
- *Minimal walking technicolor on the lattice* at the Institute for Theoretical Physics, Leiden, Holland, August 25-30 2009.

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.
- Theoretical Particle Physics Group, Fermilab, May 12 2009.

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.

Distinctions and Other Work

- 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 for DOE grant proposals. 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* to be held Odense, Denmark, September 2008.
- Organized and edited proceedings of the annual **MRST** meeting in theoretical particle physics, held in Syracuse May 13-15 1997.

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. D** **45** (1992) 2957.
10. *Stochastic simulation of quantum mechanics*, S.M.Catterall, I.T.Drummond and R.R.Horgan, **J. Phys. A** **24** (1991) 4081.
11. *Monte Carlo study of a $c = 0$ matrix model*, S.M.Catterall, J.B.Kogut, and R.L.Renken, **Phys. Lett. B** **264**, 75, (1991).
12. *String susceptibility at the crumpling transition*, S.M.Catterall, J.B.Kogut and R.L.Renken, **Phys. Lett. B** **279** (1992) 53.
13. *Slave equations for spin models*, S.M.Catterall, I.T.Drummond, R.R.Horgan, **Phys. Lett. B** **284** (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 B** **292**, 277 (1992).
15. *Three dimensional quantum gravity coupled to Ising matter*, S. M. Catterall, J. B. Kogut and R.L. Renken, **Nucl. Phys. B** **389** (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. B** **300** (1993) 393.
17. *The XY model on a dynamical random lattice*, S. M. Catterall, R. L. Renken and J. B. Kogut, **Nucl. Phys. B** **408** (1993) [FS] 427.
18. *Three dimensional quantum gravity coupled to gauge fields*, R. Renken S. Catterall and J. Kogut, **Nucl. Phys. B** **422** (1994) 677.
19. *Radial excitations in NRQCD*, S. Catterall, F. Devlin, I. Drummond and R. Horgan, **Phys. Lett. B** **321** (1994) 246.
20. *Phase structure of four dimensional simplicial quantum gravity*, S. Catterall, J. Kogut and R. Renken, **Phys. Lett. B** **328** (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. B** **342** (1995) 53.
24. *Nonperturbative RG flows in 2d gravity*, R. Renken, S. Catterall and J. Kogut, **Phys. Lett. B** **345** (1995) 422.
25. *Scaling and the Fractal Geometry of 2d Quantum Gravity*, M. Bowick, S. Catterall, V. John and G. Thorleifsson, **Phys. Lett. B** **354** (1995) 58.
26. *Baby Universes in 4d Dynamical Triangulation*, S. Catterall, G. Thorleifsson, J. Kogut and R. Renken, **Phys. Lett. B** **366** (1996) 72.
27. *A Real Space Renormalization Group for Random Surfaces*, G. Thorleifsson and S. Catterall, **Nucl. Phys. B** **461** (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, invited review for **Physics Reports**, arXiv:0903.4881, in press.

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 08, July 28 2007, **PoS (2007)**.

Grants

- Co PI on DOE grant *High Energy Particle Theory* \$290,000 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 (2000).
- 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 five years (1995).
- 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).

Referees

- John Kogut, Dept. of Energy, Div. of High Energy Physics, Washington, D.C 20585 (email: john.kogut@science.doe.gov)
- David B. Kaplan, University of Washington, Dept. of Physics, PO Box 351560, Seattle, WA 98195-1560 (email: dbkaplan@phys.washington.edu)
- Poul Damgaard, Niels Bohr Institute, University of Copenhagen, Blegdamsvej 17, DK-2100, Copenhagen, Denmark (email: phdamg@nbi.dk)

Teaching Experience

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 at SU – **PHY312** *Relativity and Cosmology*, enrollment 14 students.
2003 Fall semester at SU – **PHY211** *General Physics I*, enrollment 180 students.
2003 Spring semester at SU – **PHY567** *Introduction to Quantum Mechanics*, enrollment 8 students.
2002 Fall semester at SU – **PHY211** *General Physics I*, enrollment 230 students.
2001 Fall semester at SU – **PHY307/607** *Science and Computers*, enrollment 25 students.
2001 Spring semester at SU – **PHY567** *Introduction to Quantum Mechanics*, enrollment 6 students.
2000 Fall semester at SU – **PHY307/607** *Science and Computers*, enrollment 28 students.
2000 Spring semester at SU – **PHY567** *Introduction to Quantum Mechanics*, enrollment 5 students.
1999 Fall semester at SU – **PHY307/607** *Science and Computers*, enrollment 30 students.
1999 Spring semester at SU – **PHY312** *Relativity and Cosmology*, enrollment 18 students.
1998 Fall semester at SU – **PHY307/607** *Science and Computers*, enrollment 32 students.
1997 Fall semester at SU – **PHY307/607** *Science and Computers*, enrollment 15 students.
1996 Spring semester at SU – co-taught **PHY106** *Science for the 21st Century*, enrollment 270 students
1996 Fall semester at SU – **PHY307/607** *Science and Computers*, enrollment 9 students
1996 Spring semester at SU – co-taught **PHY106** *Science for the 21st Century*, enrollment 275 students.
1995 Fall semester at SU – co-taught **PHY105** *Science for the 21st Century*, enrollment 280 students.
1995 Spring semester at SU – 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/>)

Graduate Students

Eric Gregory PhD 1999.

Scott McGuire PhD 2001

Sergey Karamov PhD 2003

Sofiane Ghadab - PhD 2006.

Joe Schneible - expected graduation summer 2009

Anosh Joseph - jointly with Prof. Balachandran.