

CURRICULUM VITAE

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Nationality: USA

EDUCATION:

M.S. in Physics, University of Delhi, Delhi, India
Ph.D. in Theoretical Physics, 1982, California Institute of Technology

AWARDS:

National Science Talent Scholarship, India, 70 – 75
J. Robert Oppenheimer Fellow, LANL, 85 – 88
PI, DoE Grand Challenges Award (NERSC), 88 – 91
PI, DoE Grand Challenges Award (ACL,LANL), 92 – 96
Elected Fellow of American Physical Society, 1994
Distinguished Performance Award, LANL, 1999
PI, DoE Grand Challenges Award (ACL,NERSC), 97 – 00
PI, DoE allocation at NERSC, 01 – 05
Elected Fellow of Los Alamos National Laboratory, 2006

PROFESSIONAL EXPERIENCE:

Post-doctoral fellow at Northeastern University: 1982-1985
Honorary Post-doctoral fellow at Harvard University: 1983-1986
J. Robert Oppenheimer Fellow; Los Alamos National Laboratory: 1985-1988
Guest Professor, University of Wuppertal, March-April 1987.
Staff Scientist, T-8, Los Alamos National Laboratory, 1988 -
Visiting Lecturer, Caltech, April-June, 1991.
Program Manager for High Energy Physics at LANL, 2000-
Group Leader, Elementary Particles and Field Theory (T-8), LANL, 2001-

TEACHING EXPERIENCE:

Instructor for Undergraduate Physics: CALTECH 1977-1982
Northeastern University 1982-1985
Graduate Course in Physics 229c, CALTECH Spring 1991

SERVICE : CONFERENCE/WORKSHOP ORGANIZATION

- [1] Organizer, First Workshop on MONTE CARLO RENORMALIZATION GROUP METHODS, Cornell July 1985.
(with K. G. Wilson).
- [2] Convener “Parallel Session on Lattice Gauge Theory”: 1988 DPF conference, Storrs, Connecticut (August 1988).
- [3] Convener “Parallel Session on Lattice QCD and theoretical aspects of QCD:” QUARK MATTER 88, Lennox, Massachusetts (Sept. 1988).
- [4] Member, International Advisory Committee, LATTICE 90, Tallahassee, Florida, 1990.
- [5] Director, 1994 Santa Fe Workshop, “LARGE SCALE NUMERICAL STUDIES OF QCD” July 25 - August 12, 1994
- [6] International Advisory Committee, LATTICE 97, Edinburgh, Scotland, 1997.
- [7] Scientific Director, 1997 Les Houches Summer school on “PROBING THE STANDARD MODEL OF PARTICLE INTERACTIONS”, Les Houches, France, 1997.
- [8] Member, Local Organizing Committee, LATTICE 98, Boulder, Colorado, 1998.
- [9] Director, 1998 Santa Fe Workshop, “PERTURBATIVE AND NON-PERTURBATIVE ASPECTS OF THE STANDARD MODEL”, July 27 - August 14, 1998.
- [10] Organized ROSENFEST, Oct 31-Nov 1, 1998, Santa Fe. Symposium to celebrate the 65th birthday of Peter Rosen.
- [11] Convener “Plenary session on Lattice QCD” at the APS Centennial Meeting, Atlanta, Georgia, March 20-26, 1999.
- [12] Member, International Advisory Committee, LATTICE 99, Pisa, Italy, 1999.
- [13] Convener, Session on “Quark Masses” at DPF 2000, The Ohio State University, August 2000.
- [14] Member, Local Organizing Committee, LATTICE 00, Bangalore, India, August, 2000.
- [15] Organizer, “SCALING LAWS IN PHYSICS AND BIOLOGY”, Symposium in honor of Geoffrey West, Santa Fe, Dec 2000
- [16] Principal organizer, “CONFRONTING TERRORISM -- CT2002”, Los Alamos National Laboratory, March 2002. (<http://library.lanl.gov/ccw/ct2002/>)
- [17] Director, “CONFRONTING TERRORISM -- CT2005”, Los Alamos National Laboratory, January 2005.
- [18] Organizer, “Socio-technical systems: Bridging the scales”, 26th annual CNLS conference, 14-17 August 2006. (http://cnls.lanl.gov/External/annual_conference_2006.php)
- [19] Co-organizer, “Workshop on Volunteered Geographic Information”, University of California Santa Barbara, 13-14 December, 2007, (<http://ncgia.ucsb.edu/projects/vgi/>)

SERVICES TO LOS ALAMOS NATIONAL LABORATORY

- [1] Played a significant role in the development of parallel computing at LANL. Starting with the Floating Point T200 in 1986, and then the Thinking Machines CM2 and CM5 super-computers (1989-1996), showed that for large scale scientific computing parallel computing was the way of the future.
- [2] Member, LDRD ER review committee
- [3] Member, Post-doctoral review committee
- [4] Member, Search Committee for Theoretical Division Director, LANL, 1998-1999
- [5] Member, LANL Director's Colloquium Committee, 2000 – 2002
- [6] Chair, LANL Director's Colloquium Committee, 2003-
- [7] Member, LANL Research Environment Advisory Committee, 2000-2002
- [8] Organizer, LANL Forum on International Security in the New Millenium, 2000-2006
- [9] Member, Institutional Computing Steering Committee, LANL, 2002-
- [10] Chair, LANL A-team (Science Advisory Committee to the Director), 2004-2006
- [11] Chair, LANL Energy Council 2006-

EDITORIAL APPOINTMENTS

- [1] Editor, "High Speed Computing", World Scientific, 1990-
- [2] Divisional Associate Editor, Physical Review Letters, "Particles and Fields", 2000-2002.

PUBLICATIONS IN ELEMENTARY PARTICLE PHYSICS

- [1] Beyond Leading Order QCD Perturbative Corrections to the Pion Form;
(with R.D. Field, S. Otto and L. Chang).
Nucl. Phys. **B186** (1981) 429.
- [2] Optimized Perturbation Theory: The Pion Form Factor.
Proceeding of the Conference on Perturbative QCD at Florida State University, Tallahassee; 1981, American Institute of Physics 1981.
- [3] Hadron Spectrum, Spontaneous Breaking of $Z(3)$ and Fake Loops in Lattice $SU(3)$;
(with A. Patel).
Phys. Lett. **124B** (1983) 94.
- [4] Calculation of the Hadron Masses in Lattice QCD
(with A. Patel).
Nucl. Phys. **B226** (1983) 152.
- [5] Exotic Mesons in Lattice QCD;
(with A. Patel and F. Fucito).
Phys. Lett. **131B** (1983) 169.
- [6] Extended Operators for Mesons in Lattice QCD;
(with A. Patel).
Phys. Lett. **131B** (1983) 425.
- [7] String Tension, Glueball Masses and Finite Size Effects in Lattice $SU(3)$;
(with A. Patel).
Phys. Lett. **138B** (1984) 294.
- [8] An Improved Renormalization Group Transformation in 4-Dimensions;
(with R. Cordery and M.A. Novotny).
Phys. Lett. **128B** (1983) 425.
- [9] Weak Transitions in Lattice QCD;
(with R.C. Brower, M.B. Gavela and G. Maturana).
Phys. Rev. Lett. **53** (1984) 1318.
- [10] Monte Carlo Renormalization Group for $SU(2)$ Lattice Gauge Theory;
(with R. Cordery, M. Novotny and A. Patel).
Phys. Rev. Lett. **53** (1984) 527.
- [11] Monte Carlo Renormalization Group Improved Action for $SU(2)$ Lattice Gauge Theory;
(with A. Patel).
Phys. Rev. Lett. **53** (1984) 531.
- [12] Monte Carlo Renormalization Group for $SU(3)$ Lattice Gauge Theory;
(with A. Patel, G. Guralnik, T. Warnock and C. Zemach).
Phys. Rev. Lett. **53** (1984) 1721.
- [13] Monte Carlo Renormalization Group Analysis of $SU(2)$ and $SU(3)$ Gauge Theories;
(with A. Patel).
Proceedings of the Argonne National Laboratory Workshop on Gauge Theory on a Lattice;
Argonne 1984.

- [14] The Nature of the Transition in $d = 4$ U(1) Lattice Gauge Theory;
(with R. Cordery and M. Novotny).
Phys. Lett. **172B** (1986) 86. Longer version NUB #2654; 1984.
- [15] One Loop Lattice Vacuum Energy;
(with G. Kilcup and S. Sharpe).
Phys. Lett. **147B** (1984) 339.
- [16] Monte Carlo Renormalization Group Investigations of SU(2) Lattice Gauge Theory;
(with A. Patel).
Nucl. Phys. **B251** [FS13] (1985) 789.
- [17] The Non-perturbative Beta-function for the SU(2) Lattice Gauge Theory;
(with S. Otto and A. Patel).
Phys. Lett. **159B** (1985) 143.
- [18] The Non-perturbative Beta-function for the SU(3) Lattice Gauge Theory;
(with G. Guralnik, A. Patel, T. Warnock and C. Zemach).
Phys. Lett. **161B** (1985) 352.
- [19] Improved Monte Carlo Renormalization Group:
Proceedings of the Tallahassee Conference on Lattice Gauge Theory, World Scientific Publishing (1985).
- [20] Solving QCD Using Monte Carlo Renormalization Group Method;
(with A. Patel),
Proceedings of APS Division of Particles and Fields Meeting; Santa Fe, New Mexico; 1984.
World Scientific Publishing (1985).
- [21] The SU(2) Deconfinement Temperature on a BCT Lattice;
(with W. Celmaster, E. Kovacs and F. Green).
Phys. Rev. **D33** (1986) 3022.
- [22] The Deconfinement Transition and MCRG;
(with G. Guralnik, A. Patel, C. Zemach and T. Warnock).
Proceedings of Conference on Quark Confinement and Liberation: University of California, Berkeley; World Scientific, 1985.
- [23] Epsilon Beyond the Naive Mass Spectrum;
(with G. Kilcup, S. Sharpe, G. Guralnik, A. Patel and T. Warnock).
Phys. Lett. **164B** (1985) 347.
- [24] Monte Carlo Renormalization Group: A Review.
Lattice Gauge Theory 85, Plenum Press 1986.
- [25] An Improved Estimate of Scalar Glueball Mass;
(with G. Guralnik, G. Kilcup, A. Patel, S. Sharpe).
Phys. Rev. Lett. **57** (1986) 1288.
- [26] Improved Actions, Redundant Operators and Scaling in Lattice SU(3);
(with A. Patel).
Phys. Lett. **183B** (1987) 193.

- [27] Weak Interaction Matrix Elements with Staggered Fermions I: Theory and a Trial Run;
(with G. Guralnik, G. Kilcup, A. Patel, and S. Sharpe).
Nucl. Phys. **B286** (1987) 253.
- [28] Clear Evidence for a First Order Chiral Transition in QCD;
(with G. Guralnik, G. Kilcup, A. Patel and S. Sharpe).
Phys. Rev. Lett. **57** (1986) 2621.
- [29] The Hadron Spectrum on a $18^3 \times 42$ lattice ;
(with G. Guralnik, G. Kilcup, A. Patel, S. Sharpe and T. Warnock).
Phys. Rev. **D36** (1987) 2813.
- [30] More on the first order chiral symmetry transition in QCD.
*Proceedings of the Brookhave Conference
Lattice Gauge Theory 1986*, Plenum Press 1987.
- [31] $\frac{\epsilon'}{\epsilon}$ from the lattice;
(with G. Guralnik, G. Kilcup, A. Patel, S. Sharpe).
Phys. Lett. **192B** (1987) 149.
- [32] Food for Thought: Five Lectures on Lattice Gauge Theory.
*Lectures at China Center of Advanced Science and Technology Symposium/Workshop on
Lattice Gauge Theory Using Parallel Processors*, Gordon and Breach, 1987.
- [33] Introduction to Lattice Gauge Theory.
TASI 87, Santa Fe. World Scientific 1988.
- [34] Exploring Hadron Masses in Lattice QCD with Light Quarks and an Improved Fermion Action.
(with Ph. de Forcrand, S. Güsken, K.-H. Mutter, A. Patel, K. Schilling, and R. Sommer)
Phys. Lett. **200B** (1988) 143.
- [35] On The Finite Temperature Transition in QCD.
(with G. Guralnik, G. Kilcup, A. Patel, S. Sharpe).
Phys. Lett. **201B** (1988) 503.
- [36] The Hybrid Monte Carlo algorithm and the Chiral Transition.
Field Theory on the Lattice, Seillac, France, Sept. 1987, *Nucl. Phys.* **BProc. Supp.** **4**
(1988) 562.
- [37] The β -function for pure gauge SU(3).
(with G. Kilcup, A. Patel and S. Sharpe)
Phys. Lett. **211B** (1988) 132.
- [38] Tuning the Hybrid Monte Carlo Algorithm.
(with G. Kilcup and S. Sharpe)
Phys. Rev. **D38** (1988) 1278.
- [39] The finite temperature transition for QCD with heavy quarks.
(with G. Kilcup and S. Sharpe)
Phys. Rev. **D38** (1988) 1288.

- [40] Comparison of update algorithms for pure gauge SU(3).
(with G. Kilcup, A. Patel, S. Sharpe and P. de Forcrand)
Mod. Phys. Lett. **A3** (1988) 1367.
- [41] An improved fermion action from block diagonalization.
(with S. Güsken, K-H. Mütter, A. Patel, R. Sommer, and K. Schilling)
Nucl. Phys. **B314** (1989) 63.
- [42] Simulating QCD with dynamical Wilson and Staggered fermions.
1988 International Symposium LATTICE 88, Fermilab, Sept. 1988, *Nucl. Phys. B (Proc. Suppl.)* **9** (1989) 473.
- [43] QCD with dynamical Wilson fermions.
(with C. Baillie, G. Guralnik, G. Kilcup, A. Patel and S. Sharpe)
Phys. Rev. **D40** (1989) 2072.
- [44] Sea quarks and the hadron spectrum.
(with Apoorva Patel, Gregory W. Kilcup, Stephen R. Sharpe)
Phys. Lett. **225B** (1989) 398.
- [45] Lattice calculation of the Kaon B-parameter.
(with Gregory W. Kilcup, Apoorva Patel, Stephen R. Sharpe)
Phys. Rev. Lett. **64** (1990) 25.
- [46] QCD spectrum from the lattice.
HADRON 89, Ajaccio, France.
Edited by F. Binon et.al., Editions Frontieres 1989, page337
- [47] The Renormalization Group and lattice QCD.
Lectures at Sixth TASI in Elementary Particle Physics, Boulder, Colorado, June 1989.
From Actions to Answers, World Scientific 1990.
- [48] Hadron spectrum from the lattice.
Plenary talk at LATTICE 89, Capri, Italy
Nucl. Phys. B (Proc. Suppl.) **17** (1990) 70.
- [49] Lattice Calculation of Electroweak Amplitudes;
(with C. Bernard, R. Gupta, G. Kilcup and A. Soni)
Int. Jour. of Supercomputer Applications, Vol. 4, Number 3, p. 61
- [50] Exploring glueball wavefunctions on the lattice.
(with C. Baillie, G.W. Kilcup, Apoorva Patel, Stephen R. Sharpe)
Phys. Rev. **D43** (1991) 2301.
- [51] QCD with dynamical Wilson fermions.
LATTICE 90, Tallahassee, Florida.
Nucl. Phys. B (Proc. Suppl.) **20** (1991) 385.
- [52] The quenched spectrum with Staggered fermions.
(with G. Guralnik, G.W. Kilcup, Stephen R. Sharpe)
Phys. Rev. **D43** (1991) 2003.

- [53] A calculation of the pion's quark distribution amplitude in lattice QCD with dynamical fermions.
(with D. Daniel and D. Richards)
Phys. Rev. **D43** (1991) 3715.
- [54] QCD with dynamical Wilson fermions II.
(with C. Baillie, R. Brickner, G. Kilcup, A. Patel and S. Sharpe)
Phys. Rev. **D44** (1991) 3272.
- [55] Lattice calculation of the $I = 2$ pion scattering length.
(with G. Kilcup and S. Sharpe)
Nucl. Phys. **B383** (1992) 309.
- [56] Phenomenology with Wilson fermions using smeared sources.
(with D. Daniel, G. Kilcup, A. Patel and S. Sharpe)
Phys. Rev. **D46** (1992) 3130.
- [57] The Kaon B parameter with Wilson fermions.
(with D. Daniel, G. Kilcup, A. Patel and S. Sharpe)
Phys. Rev. **D47** (1993) 5113.
- [58] Matrix Elements with Wilson fermions.
LATTICE 91, Tsukuba, Japan.
Nucl. Phys. **B (Proc. Suppl.) 26** (1992) 337.
- [59] Scaling, the Renormalization Group and Improved Lattice Actions.
One chapter in the book “**Quantum Fields on the Computer**”, Ed. M. Creutz, World Scientific, 1992.
- [60] Meson form-factors and wave-functions with Wilson Fermions
(with D. Daniel and J. Grandy)
LATTICE 92, Amsterdam, The Netherlands.
Nucl. Phys. **B (Proc. Suppl.) 30** (1993) 419.
- [61] $I = 2$ pion scattering amplitude with Wilson Fermions.
(with A. Patel and S. Sharpe)
Phys. Rev. **D48** (1993) 388.
- [62] Bethe-Salpeter amplitudes and density correlations for mesons with Wilson fermions.
(with D. Daniel and J. Grandy)
Phys. Rev. **D48** (1993) 3330.
- [63] Calculations of hadronic matrix elements using lattice QCD.
1993 Mardi Gras Conference on “High Performance Computing and its applications in the Physical Sciences”, World Scientific, 1994.
- [64] Semi-leptonic form-factors of heavy-light mesons from lattice QCD.
(with T. Bhattacharya and D. Daniel)
hep-lat/9310007
- [65] A pot-pourri of results in QCD from large lattice simulations on the CM5.
(with T. Bhattacharya)
LATTICE 93, Dallas, Texas.
Nucl. Phys. **B (Proc. Suppl.) 34** (1994) 341.

- [66] Geometric measurement of topological susceptibility on large lattices.
(with J. Grandy)
LATTICE 93, Dallas, Texas
Nucl. Phys. B (Proc. Suppl.) **34** (1994) 164.
- [67] Matrix Elements of the Singlet Axial Current in the Proton.
(with J. Mandula)
Phys. Rev. D **50** (1994) 6931.
e-print arXiv:hep-lat/9402018
- [68] Semi-leptonic form-factors from lattice QCD
(with T. Bhattacharya)
Proceedings of The Albuquerque Meeting, 8th meeting of the Division of Particles and Fields of the American Physical Society.
Ed. Sally Seidel, World Scientific, 1995.
- [69] Chiral limit of QCD.
LATTICE 94, Bielefeld, Germany.
Nucl. Phys. B (Proc. Suppl.) **42** (1995) 85.
- [70] Phenomenology from 100 large lattices
(with T. Bhattacharya)
LATTICE 94, Bielefeld, Germany.
Nucl. Phys. B (Proc. Suppl.) **42** (1995) 935.
- [71] Topological density and Instantons on the lattice.
(with J. Grandy)
LATTICE 94, Bielefeld, Germany.
Nucl. Phys. B (Proc. Suppl.) **42** (1995) 246.
e-print arXiv:hep-lat/9501009
- [72] Hadron Spectrum with Wilson Fermions
(with T. Bhattacharya, G. Kilcup, and S. Sharpe)
Phys. Rev. D **53** (1996) 6486.
e-print arXiv:hep-lat/9512021
- [73] Decay Constants with Wilson Fermions at $\beta = 6.0$
(with T. Bhattacharya)
Phys. Rev. D **54** (1996) 1155.
e-print arXiv:hep-lat/9510044
- [74] Testing the chiral behavior of the hadron spectrum.
(with T. Bhattacharya and S. Sharpe)
LATTICE 95, Melbourne, Australia.
Nucl. Phys. B (Proc. Suppl.) **47** (1996) 549.
e-print arXiv:hep-lat/9512005
- [75] Lattice analysis of semi-leptonic form factors.
(with T. Bhattacharya)
LATTICE 95, Melbourne, Australia.
Nucl. Phys. B (Proc. Suppl.) **47** (1996) 481.
e-print arXiv:hep-lat/9512007

- [76] Status report on weak matrix element calculations.
(with T. Bhattacharya)
LATTICE 95, Melbourne, Australia.
Nucl. Phys. B (Proc. Suppl.) **47** (1996) 473.
e-print arXiv:hep-lat/9512006
- [77] Matrix elements of 4-fermion operators and B-parameters with Wilson Fermions
(with T. Bhattacharya and S. Sharpe)
Phys. Rev. D **55** (1997) 4036.
e-print arXiv:hep-lat/9611023
- [78] Comparison of Inversion Algorithms for Wilson Fermions on the CM5.
(with T. Bhattacharya, and G. Kilcup)
e-print arXiv:hep-lat/9605029
Los Alamos Preprint Number LA-UR-96-1115.
- [79] Light Quark Masses from Lattice QCD.
(with T. Bhattacharya)
Phys. Rev. D **55** (1997) 7203.
e-print arXiv:hep-lat/9605039.
- [80] The Extraction of Light Quark Masses From Sum Rule Analyses of Axial and Vector Current Ward Identities
(with T. Bhattacharya and K. Maltman)
Phys. Rev. D **57** (1998) 5455.
e-print arXiv:hep-ph/9703455
- [81] Light quark masses and the CP violation parameter ϵ'/ϵ
(with T. Bhattacharya)
Nucl. Phys. B (Proc. Suppl.) **53** (1997) 292.
e-Print arXiv:hep-lat/9609046
- [82] Staggered fermion matrix elements using smeared operators
(with G. Kilcup and S. Sharpe)
Phys. Rev. D **57** (1997) 1654.
e-Print arXiv:hep-lat/9707006.
- [83] B-parameters of 4-fermion operators from lattice QCD
Nucl. Phys. B (Proc. Suppl.) **63A-C** (1998) 278.
e-print arXiv:hep-lat/9710090.
- [84] Advances in the determination of Quark Masses
(with T. Bhattacharya)
Nucl. Phys. B (Proc. Suppl.) **63A-C** (1998) 95.
e-print arXiv:hep-lat/9710095
- [85] Quark Masses, B-parameters, and CP violation parameters ϵ and ϵ'/ϵ
International Conference Orbis Scientiae 1997 II *Physics of Mass*, Pages 177-194, Miami Beach, Florida, December, 1997. Edited by B. Kursunoglu, S. Mintz, A. Perlmutter, Plenum Press, 1998.
e-print arXiv:hep-ph/9801412.

- [86] B Meson Decay Constants From NRQCD.
(with A. Ali Khan, T. Bhattacharya, S. Collins, C. Davies, C. Morningstar, J. Shigemitsu, J. Sloan)
Phys. Lett. **427B** (1998) 132
e-Print arXiv:hep-lat/9801038
- [87] Introduction to Lattice QCD.
LXVIII Les Houches Summer School *Probing the Standard Model of Particle Interactions*, July 28 - Sept 5, 1997, Eds. R. Gupta, A. Morel, E. de Rafael and F. David, North-Holland, 1999.
e-Print arXiv:hep-lat/9807028
- [88] Wilson versus Clover fermions: A case for improvement
Lattice 98, Nucl. Phys. B (Proc. Suppl.) **73** (1999) 321
e-Print arXiv:hep-lat/9810016.
- [89] Non-perturbative Renormalization Constants using Ward Identities
(with T. Bhattacharya, S. Chandrasekharan, W. Lee, and S. Sharpe)
Lattice 98, Nucl. Phys. B (Proc. Suppl.) **73** (1999) 276
e-Print arXiv:hep-lat/9810018.
- [90] Non-perturbative Renormalization Constants using Ward Identities
(with T. Bhattacharya, S. Chandrasekharan, W. Lee, S. Sharpe)
Phys. Lett. **461B** (1999) 79
e-Print arXiv:hep-lat/9904011
- [91] Heavy-light Mesons and Baryons with b Quarks.
(with A. Ali Khan, T. Bhattacharya, S. Collins, C. Davies, C. Morningstar, J. Shigemitsu, J. Sloan)
Phys. Rev. **D62** (2000) 054505
e-Print arXiv:hep-lat/9912034
- [92] General Physics Motivations for Numerical Simulations of Quantum Field Theory
Parallel Computing **25** (1999) 1199.
e-Print arXiv:hep-lat/9905027
- [93] LATTICE QCD
Core lectures at the VIII Mexican School “Particles and Fields”, Oaxaca de Juárez, November 20th – 28th 1998, Eds. J.C. DÓlivo, G.L. Castro, and M. Mondragon,
AIP Conference Proceedings 490, 1999.
- [94] Spectrum of Mesons and Baryons with b Quarks
LATTICE 99, June 1999, Pisa, Italy
Nucl. Phys. B (Proc. Suppl.) **83-84** (2000) 295
e-Print arXiv:hep-lat/9910035
- [95] Order a improved renormalization constants
(with T. Bhattacharya, W. Lee, and S. Sharpe)
LATTICE 99, June 1999, Pisa, Italy
Nucl. Phys. B (Proc. Suppl.) **83-84** (2000) 851
e-Print arXiv:hep-lat/9909115

- [96] Fixed point pure gauge action with $b = \sqrt{3}$ RGT.
(with T. Bhattacharya, and W. Lee)
LATTICE 99, June 1999, Pisa, Italy
Nucl. Phys. B (Proc. Suppl.) **83-84** (2000) 860
e-Print arXiv:hep-lat/9910046
- [97] Prospects of calculating ϵ_K and ϵ' from lattice QCD
KAON 99, Eds. J.L. Rosner and B. D. Winstein, University of Chicago Press, 2001.
e-Print arXiv:hep-lat/9908440
- [98] Non-perturbative improvement of bilinears in unquenched QCD.
(with T. Bhattacharya, W. Lee, and S. Sharpe)
LATTICE 99, June 1999, Pisa, Italy
Nucl. Phys. B (Proc. Suppl.) **83-84** (2000) 902
e-Print arXiv:hep-lat/9909092
- [99] Order a improved renormalization constants
(with Tanmoy Bhattacharya, Weonjong Lee, Stephen Sharpe)
Phys. Rev. D **63** (2001) 074505
e-Print arXiv:hep-lat/0009038
- [100] Light quark masses: A status report at DPF 2000
(with K. Maltman)
DPF 2000, The Ohio State University, Columbus.
Int.J.Mod.Phys. A **16S1B** (2001) 591
e-Print arXiv:hep-ph/0101132
- [101] Improvement and Renormalization Constants in $O(a)$ Improved Lattice QCD
(with T. Bhattacharya, W. Lee, and S. Sharpe)
LATTICE 2000
Nucl. Phys. B (Proc. Suppl.) **94** (2001) 599
e-Print arXiv:hep-lat/0101007
- [102] Renormalization Constants using Quark States in Fixed Gauge
(with T. Bhattacharya and W. Lee)
LATTICE 2000
Nucl. Phys. B (Proc. Suppl.) **94** (2001) 595
e-Print arXiv:hep-lat/0106007
- [103] Scaling behavior of improvement and renormalization constants
(with T. Bhattacharya, W. Lee, and S. Sharpe)
LATTICE 2001. Nucl. Phys. B (Proc. Suppl.) **106** (2002) 789
e-Print arXiv:hep-lat/0111001
- [104] Renormalization Constants using Quark States in Landau Gauge
(with T. Bhattacharya and W. Lee)
LATTICE 2001. Nucl. Phys. B (Proc. Suppl.) **106** (2002) 786
e-Print arXiv:hep-lat/0111002
- [105] Weak matrix elements for CP violation
(with T. Bhattacharya, W. Lee, and S. Sharpe)
LATTICE 2001. Nucl. Phys. B (Proc. Suppl.) **106** (2002) 311
e-Print arXiv:hep-lat/0111004

- [106] Progress report on the staggered epsilon'/epsilon project
(with T. Bhattacharya, G.T. Fleming, G. Kilcup, W. Lee, S. Sharpe)
LATTICE 2002. Nucl. Phys. B (Proc. Suppl.) **119** (2003) 428
e-Print arXiv:hep-lat/0208050
- [107] Status of B_K from Lattice QCD
The CKM matrix and the Unitarity Triangle, CERN 2002.
e-Print arXiv:hep-lat/0303010
- [108] Simulating a fundamental Theory of Nature
Proceedings of "The Monte Carlo Method in Physical Sciences", Los Alamos, June 2003.
Ed. J. Gubernatis, AIP Conference Proceedings, Volume 690, Pages 110-122.
- [109] Estimates of Light Quark Masses from Lattice QCD and QCD Sum rules
Proceedings of the 2nd CKM Unitarity Triangle Workshop, 5-9 April 2003, IPPP Durham,
UK (eConf C0304052).
e-Print arXiv:hep-ph/0311033
- [110] Improved bilinears in unquenched lattice QCD
(with Tanmoy Bhattacharya, Weonjong Lee, Stephen R. Sharpe, Jackson M. S. Wu)
Lattice 2003. Nucl. Phys. B (Proc. Suppl.) **129&130** (2004) 441
e-Print arXiv:hep-lat/0309087
- [111] Calculating weak matrix elements using HYP staggered fermions
(with T. Bhattacharya, G.T. Fleming, G. Kilcup, W. Lee, S. Sharpe)
Lattice 2003. Nucl. Phys. B (Proc. Suppl.) **129&130** (2004) 257
e-Print arXiv:hep-lat/0309105
- [112] Testing improved staggered fermions with m_s and B_K
(with Weonjong Lee, Tanmoy Bhattacharya, George T. Fleming, Gregory Kilcup, Stephen
R. Sharpe)
Phys. Rev. D **71** (2005) 094501.
e-Print arXiv:hep-lat/0409047
- [113] Calculating ϵ'/ϵ using HYP staggered fermions
(with Tanmoy Bhattacharya, George T. Fleming, Greg Kilcup, Weonjong Lee, Stephen
Sharpe)
Lattice 2004. Nucl. Phys. B (Proc. Suppl.) **140** (2005) 369.
e-Print arXiv:hep-lat/0409046
- [114] Phenomenology using Lattice QCD
Proceedings of PASCOS 2004 (Nath Festschrift), Boston, September 2004. World Scientific
2005.
e-Print arXiv:hep-lat/0502005
- [115] Towards a chiral gauge theory by deconstruction in AdS5
(with Tanmoy Bhattacharya, Matthew R. Martin, Yuri Shirman, Csaba Csaki, John Tern-
ing
Proceedings of Science LAT2005 (2005) 136
e-Print arXiv:hep-lat/0510073

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- [116] Scaling behavior of discretization errors in renormalization and improvement constants
(with Tanmoy Bhattacharya, Weonjong Lee, Stephen Sharpe)
Phys. Rev. **D73** (2006) 114507
e-Print arXiv:hep-lat/0509160
- [117] Improved bilinears in lattice QCD with non-degenerate quarks
(with Tanmoy Bhattacharya, Weonjong Lee, Stephen R. Sharpe, and Jackson Wu)
Phys. Rev. **D73** (2006) 034504
e-Print arXiv:hep-lat/0511014
- [117] Toward a precise determination of T_c with 2+1 Flavor of Quarks
(with Carleton Detar for the HotQCD collaboration)
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PUBLICATIONS IN STATISTICAL MECHANICS

- [S1] Monte Carlo Estimates of the Mass Gap of the O(2) and O(3) Spin Models in 1+1 Dimensions; (with G.C. Fox, O. Martin and S. Otto).
Nucl. Phys. **B205** [FS5] (1982) 188.
- [S2] Massgap and Scaling in the O(3) Sigma Model in 1+1 Dimension.
CALT-68-1010, and in Ph.D. Thesis (1982).
- [S3] Monte Carlo Renormalized Hamiltonian;
(with R. Cordery)
Phys. Lett. **105A** (1984) 415.
- [S4] Clear Evidence of Redundant Operators in Monte Carlo Studies of the Ising Model;
(with R. Shankar).
Phys. Rev. **B32** (1985) 6084.
- [S5] Dealing with Truncation in Monte Carlo Renormalization Group Calculations;
(with R. Shankar and G. Murthy).
Phys. Rev. Lett. **55** (1985) 1812.
- [S6] Open Problems in Monte Carlo Renormalization Group: Application to Critical Phenomena.
Proceedings of the 31st Annual Conference on Magnetism and Magnetic Materials, Baltimore 1986, *J. of App. Phy.* **61**, #8 (1987) 3605.
- [S7] The phase transition in the 2 - d XY model.
(with J. DeLapp, G.C. Fox, C. Baillie, J. Apostolakis)
Phys. Rev. Lett. **61** (1988) 1996.
- [S8] Critical behavior of the 2-d XY model.
(with C. Baillie)
Phys. Rev. **B45** (1992) 2883.
- [S9] Monte Carlo Renormalization Group studies of the 3-d Ising Model.
(with C. Baillie, K. A. Hawick and G. S. Pawley)
Phys. Rev. **B45** (1992) 10438.
- [S10] Two-temperature non-equilibrium Ising models: Critical behavior and universality.
(with P. Tamayo and F. J. Alexander)
Phys. Rev. **E50** (1994) 3474.
- [S11] Critical Exponents of the 3-D Ising Model.
(with P. Tamayo)
Int. J. Mod. Phys. **7** (1996), 305-319.
e-print arXiv:cond-mat/9601048.
- [S12] Behavior of the finite-sized, three-dimensional, Ising model near the critical point.
(with G. Baker, Jr.)
Computer Simulation Studies in Condensed Matter Physics IX, Eds. D.P.Landau, K.K. Mon, H.B. Schüttler, Springer Proceedings in Physics **82**, Pages 162-166.

PUBLICATIONS IN COMPUTATIONAL SCIENCE

- [C1] Nearest Neighbor Concurrent Processor;
(with E. Benedictis, E. Brooks, G. C. Fox, O. Martin, S. Otto).
CALT-68-867, (1981).
- [C2] QCD with dynamical fermions on the Connection Machine;
(with C.F. Baillie, R.G. Brickner, L. Johnsson).
Proceedings of “Supercomputing 89”, Reno, Nevada (ACM Press, New York, 1989)
- [C3] QCD on the Connection Machine.
Proceedings of “Large Scale computing in the 21st Century”, Cape Cod, Oct. 1990. Ed.
Jill P. Mesirov, SIAM 1991
- [C4] Prospects of Solving Grand Challenge Problems.
Proceedings of the workshop on “*Debugging and Performance Tuning for Parallel Computing Systems: Toward a unified Environment*”, Cape Cod, Oct 3-5, 1994. Ed. Ann Hayes
and Margret Simmons.

PUBLICATIONS IN COMPUTATIONAL BIOLOGY

- [B1] Timing the Ancestor of the HIV-1 Pandemic Strains
(with T. Bhattacharya, F. Gao, B. Hahn, A. Lapedes, B. Korber, M. Mauldoon, J. Theiler, S. Wolensky)
Science, **288** (2000) 1789.
- [B2] Search for the origin of HIV and AIDS
(with T. Bhattacharya, F. Gao, B. Hahn, A. Lapedes, B. Korber, M. Mauldoon, J. Theiler, S. Wolensky)
Science, **289** (2000) 1140.

PUBLICATIONS AND INVITED TALKS IN PUBLIC HEALTH

See my website <http://t8web.lanl.gov/people/rajan/AIDS-india/>

- [PH1] The HIV/AIDS Pandemic in India is Real
<http://t8web.lanl.gov/people/rajan/AIDS-india/MYWORK/summary.3.99.html>
- [PH2] Dilemmas in the care of patients with AIDS in India
<http://t8web.lanl.gov/people/rajan/AIDS-india/MYWORK/dilemma.3.99.html>
A abridged version published in "Issues in Medical Ethics", vol VIII No. 2, April-June, 2000.
- [PH3] HIV/AIDS Poses a Threat to India: A Global Perspective
<http://t8web.lanl.gov/people/rajan/AIDS-india/MYWORK/issues.9.99.html>
- [PH4] Health care in India in light of HIV/AIDS and the role of the West
Published in e-forum AIDS-INDIA at <http://groups.yahoo.com/group/AIDS-INDIA/>
<http://t8web.lanl.gov/people/rajan/AIDS-india/MYWORK/healthINDIA.1.00.html>
- [PH5] Thoughts on whether there should be isolated or common wards for HIV+ patients
<http://t8web.lanl.gov/people/rajan/AIDS-india/MYWORK/HIVwards.1.00.html>
- [PH6] On the HIV Beat in Bombay
<http://t8web.lanl.gov/people/rajan/AIDS-india/MYWORK/beatbombay.2.00.html>
- [PH7] Issues of Blood Safety in India
<http://t8web.lanl.gov/people/rajan/AIDS-india/MYWORK/blood.6.00.html>
- [PH8] We need to talk about condoms: A plea to Christian Organizations in India to break their silence
<http://t8web.lanl.gov/people/rajan/AIDS-india/MYWORK/christian.html>
- [PH9] Risk Factors and Societal Response to HIV/AIDS in India
<http://t8web.lanl.gov/people/rajan/AIDS-india/MYWORK/hivindia2001.html>
- [PH10] The need for a holistic approach to social intervention
<http://t8web.lanl.gov/people/rajan/AIDS-india/MYWORK/designing.html>
- [PH11] Contagion and Stability
Participant in a simulated Health Scenario organized by the U.S. Army War College, Carlisle, Pennsylvania, May 2001.
- [PH12] Response to HIV/AIDS – A Universal Policy. My thoughts on what a national policy on controlling HIV/AIDS should be.
<http://t8web.lanl.gov/people/rajan/AIDS-india/MYWORK/hivpolicy.html>
- [PH13] BEING A GOOD ROLE MODEL". A talk to parents and teachers in India on the importance of setting a good example.
<http://t8web.lanl.gov/people/rajan/AIDS-india/MYWORK/rolemodel.html>
- [PH14] Students as agents of change: tackling societal problems in India
Invited talk at "AIDS-in-India". Conference organized by IHO and the Harvard School of Public Health, Dec 7, 2001
- [PH15] Developing partnerships for improving health in India
Invited talk at "Health and Security". A workshop organized by CBACI, 18 June 2002, Geneva
- [PH16] Reaching kids by being a kid: HIV/AIDS intervention
Invited talk at "UNIDOS 2002" New Mexico Department of Health, Las Cruces, NM

- [PH17] Why has the number 4 million HIV+ failed to elicit the required response in India?
<http://t8web.lanl.gov/people/rajan/AIDS-india/MYWORK/documentation.html>
- [PH18] Five questions on HIV/AIDS in India following the National Parliamentarians Forum, July 2003
<http://t8web.lanl.gov/people/rajan/AIDS-india/MYWORK/fivequestions.html>
- [PH19] Should commercial sex be designated sex work or prostitution in the era of HIV/AIDS?
<http://t8web.lanl.gov/people/rajan/AIDS-india/MYWORK/sex-work.html>
- [PH20] Thoughts on the workshop “Land, Community and Governance” organized in Udaipur by Seva-Mandir during 12-13 September, 2003. Published in the Seva-Mandir Newsletter, Volume October 2003 - March 2004.
<http://t8web.lanl.gov/people/rajan/AIDS-india/MYWORK/SM03conf.html>
- [PH21] Risky Sex, Addictions, and Communicable Diseases in India: Implications for Health, Development and Security.
Published as a special monograph (Number 9 in the series on Health and Security) by Chemical and Biological Arms Control Institute, Washington D.C., September 2004
http://t8web.lanl.gov/people/rajan/AIDS-india/MYWORK/Gupta_HIV_India.pdf
- [PH22] “Teen Freedoms, Sexual Health, and Making the Right Choices”
Keynote address at “UNIDOS 2004” New Mexico Department of Health, Las Cruces, NM, October 2004.
- [PH23] “HIV/AIDS and the Future of the Poor, Illiterate and Marginalized Populations”
Plenary talk at the International Symposium “The future of Life and the Future of Our Civilization”, Frankfurt, May 2005. Proceedings Pages 379-400, Ed. Vladimir Burdyuzha, Springer, 2006. Also available at
http://t8web.lanl.gov/people/rajan/AIDS-india/MYWORK/HIV_poor_future.pdf
- [PH24] “HIV/AIDS, a thermometer for the Future of the Poor: India a case study”
Colloquium at the Morrison Institute, Stanford University, January 2006.
- [PH25] “Teen Freedoms, Sexual Health, and Making the Right Choices”
Keynote address at “UNIDOS 2006” New Mexico Department of Health, Las Cruces, NM, November 2006.
- [PH26] “HIV, Empowerment, and how concerned people can contribute”
Invited talk at “The Feminine Epidemic: Global Intersections of Women and HIV/AIDS”
A conference presented by the Student Global AIDS Campaign at University of Chicago, 26 May 2007. (LAUR-07-3557)
http://t8web.lanl.gov/people/rajan/Gupta_HIV_SW.pdf

**MAJOR REVIEW TALKS AND SUMMER SCHOOL LECTURES IN
HIGH ENERGY PHYSICS AND COMPUTATIONAL PHYSICS**

- [1] Monte Carlo Renormalization Group in Lattice Gauge Theories.
APS Spring Meeting, Baltimore, Maryland; 1985.
- [2] Monte Carlo Renormalization Group: A Review.
Plenary talk at the *International Conference on Lattice Gauge Theories*. Wuppertal, West Germany; 1985.
- [3] Open Problems in Monte Carlo Renormalization Group: Application to Critical Phenomena.
31st Annual Conference on Magnetism and Magnetic Materials, Baltimore Maryland, 1986.
- [4] Food for Thought: Five Lectures on Lattice Gauge Theories.
1st CCAST Symposium/Workshop on Lattice Gauge Theory Using Parallel Computers, Beijing, Peoples Republic of China, 1987.
- [5] Introduction to Lattice Gauge Theory.
Lectures at the Fourth TASI in Elementary Particle Physics, Santa Fe, New Mexico, July 1987.
- [6] The Renormalization Group and lattice QCD.
Lectures at Sixth TASI in Elementary Particle Physics, Boulder, Colorado, June 1989.
- [7] The finite temperature transition in QCD and the equation of state near T_c .
QUARK MATTER 88, Lennox, Massachusetts (Sept. 1988).
- [8] Status of Lattice QCD (Core lectures).
1989 U.K. Summer Institute in Theoretical Physics, Durham, U.K., August 1989.
- [9] Hadron spectrum from the lattice.
Plenary talk at *International Symposium on Lattice Field Theory, LATTICE89*, Capri, Italy, 1989
Nucl. Phys. B (Proc. Suppl.) **17** (1990) 70.
- [10] QCD spectrum from the lattice.
Plenary talk at *HADRON 89*, Ajaccio, France.
Edited by F. Binon et.al., Editions Frontieres 1989, page337
- [11] Scaling, the Renormalization Group and Improved Lattice Actions.
One chapter in the book **“Quantum Fields on the Computer”**, Ed. M. Creutz, World Scientific, 1992.
- [12] Calculations of matrix elements using lattice QCD.
Mardi Gras '93 Conference *High Performance Computing and its Applications in the Physical Sciences*, Ed Dana Browne, World Scientific 1994.
- [13] Standard Model Phenomenology from the Lattice. Six core lectures at the *XXXIV Cracow Summer School*, Zakopane, Poland, June 1994.
- [14] Chiral limit of QCD.
Plenary talk at the *International Symposium on Lattice Field Theory, LATTICE 88*, Bielefeld, Germany.
Nucl. Phys. B (Proc. Suppl.) **42** (1995) 85.

- [15] The chiral behavior of quenched and unquenched QCD.
International workshop *Lattice QCD and the Structure of matter, Present and Future*, Cartona, Italy, Feb 7- 11, 1995.
- [16] Common trends in multigrid and renormalization group methods.
International conference *Multiscale Phenomena*, Eilat, Israel, Feb 20-24, 1995.
- [17] Status report on weak matrix element calculations.
International Symposium on Lattice Field Theory, LATTICE95, Melbourne, Australia.
Nucl. Phys. B (Proc. Suppl.) **47** (1996) 473.
- [18] Critical Exponents of the 3-D Ising Model.
US-Japan Bilateral Seminar, Maui, August 1995.
Int. J. Mod. Phys. **7** (1996), 305-319, cond-mat/9601048.
- [19] Quark masses from lattice QCD.
International symposium on “*Multiscale Phenomena and their simulation*”, Bielefeld, Germany, 1996.
- [20] Light quark masses.
1997 Joint April APS/AAPT meeting, Washington D.C., April, 1997.
- [21] Advances in the determination of Quark Masses
Nucl. Phys. B (Proc. Suppl.) **63A-C** (1998) 95.
Plenary talk at *International Symposium on Lattice Field Theory, LATTICE 97*, Edinburgh, U.K..
Los Alamos Preprint Number LA-UR-97-4355.
- [22] Introduction to Lattice QCD.
Core lectures at the LXVIII Les Houches Summer School *Probing the Standard Model of Particle Interactions*, July 28 - Sept 5, 1997, Eds. R. Gupta, A. Morel, E. de Rafael and F. David, North-Holland, 1999.
- [23] Quark Masses, B-parameters, and CP violation parameters ϵ and ϵ'/ϵ
Review talk given at CPMASS 1997, Portugal.
- [24] Quark Masses, B-parameters, and CP violation parameters ϵ and ϵ'/ϵ
in *Physics of Mass* Proceedings of an International Conference on Orbis Scientiae 1997 II, Miami Beach, Florida, December 12–15, 1997. Edited by B. Kursunoglu, S. Mintz, A. Perlmutter, Plenum Press, 1998.
- [25] General Physics Motivations for Numerical Simulations of Quantum Field Theory
Parallel Computing **25** (1999) 1199.
- [26] Prospects of calculating ϵ_K and ϵ' from lattice QCD
KAON 99, Eds. J.L. Rosner and B. D. Winstein, University of Chicago Press, 2001.
- [27] LATTICE QCD
Core lectures at the VIII Mexican School “Particles and Fields”, Oaxaca de Juárez, November 20th – 28th 1998, Eds. J.C. DÓlivo, G.L. Castro, and M. Mondragon,
AIP Conference Proceedings 490, 1999.
- [28] “Light quark masses: A status report”, Review at DPF 2000, The Ohio State University (with K. Maltman)
Int.J.Mod.Phys. **A16S1B** (2001) 591
- [29] Status of B_K from Lattice QCD
Review at the first CKM Unitarity Triangle Workshop, CERN Geneva, 2002

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- [30] When will High Performance Computing become a mature tool to think with?
International Workshop on “*Science on Cluster Computers*”,
WE-Heraeus-Seminar, Bad Honnef, Germany, August 22 - 24, 2002.
<http://www.theorie.physik.uni-wuppertal.de/Cluster2002/talks.phtml>
Los Alamos Preprint Number LA-UR-02-6733
 - [31] Light Quark Masses from Lattice QCD and QCD Sumrules
Review at the second CKM Unitarity Triangle Workshop, Durham U.K, 2003
 - [32] Simulating a Fundamental Theory of Nature
Plenary Talk at “The Monte Carlo Method in Physical Sciences”, Los Alamos, June 2003
AIP Conference Proceedings, Volume 690, Pages 110-122.
 - [33] Phenomenology using Lattice QCD
Proceedings of PASCOS 2004 (Nath Festschrift), Boston, September 2004. World Scientific
2005.

PUBLICATIONS AND INVITED TALKS IN EDUCATION

- [E1] Strategic Research at Los Alamos
(with D. Watkins)
Los Alamos Science, Volume Number 28 “Celebrating 60 years”, 2003.
- [E2] Education: A Key to Development: Lessons from India
Plenary talk at the International Conference *Models of Universities in the Arab World*,
Beirut, Lebanon, 23-24 October 2003.
http://t8web.lanl.gov/people/rajan/AIDS-india/MYWORK/education_India_Arab.pdf

PUBLICATIONS AND INVITED TALKS IN INFORMATION SCIENCE

- [IS1] Gupta, R., “Mapping the global energy system using Google Earth, Wikis, and Open Sources”, Interlab 2007 Workshop, Los Alamos, October 1-3, 2007. (<http://www.lanl.gov/interlab/>)■
- [IS2] Gupta, R., “Volunteered Information: part of a toolkit to address complex global challenges”, Workshop on Volunteered Geographic Information, University of California Santa Barbara, 13-14 December, 2007, (<http://ncgia.ucsb.edu/projects/vgi/>)
- [IS3] Gupta, R., “Mapping, monitoring and modeling the Global Energy System”, Workshop on Volunteered Geographic Information, University of California Santa Barbara, 13-14 December, 2007, (<http://ncgia.ucsb.edu/projects/vgi/>)

MAJOR INVITED TALKS ON ENERGY SECURITY

- [1] Will there be enough energy for all in the 21st century?
Los Alamos National Laboratory Frontiers of Science Lectures, April-May 2006
- [2] The future of Energy Security in the 21st century.
American Physical Society, DNP Annual Meeting, Nashville, Oct 2006
- [3] The future of Energy Security in the 21st century.
American Physical Society, SESAPS Annual Meeting, Williamsburg, Nov 2006