

CURRICULUM VITAE

Ramamurti Shankar

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Birth April 28, 1947, New Delhi, India

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Career Highlights

Bachelor of Technology (Electrical Engg.) Indian Institute of Technology, Madras, (1969)

Ph.D. (Theoretical Physics) University of California, Berkeley, (1974)

1974-77 Junior Fellow, Harvard Society of Fellows

1977-79 J.W. Gibbs Instructor of Physics, Yale

1979-83 Assistant Professor, Yale

1982 Spring: Visiting Associate Professor, Ecole Normale Supérieure, Paris

1982-86 A.P. Sloan Fellow

1983-88 Associate Professor, Yale

1988- Professor, Yale

1989 - Spring Visiting Professor ITP, Santa Barbara

2001- Fellow American Physical Society

2001-2007 Chairman of Physics

2004 John Randolph Huffman Professor of Physics

2005 Harwood F. Byrnes/Richard B. Sewall Teaching Prize, Yale.

2008 - Spring Visiting Professor MIT

2009- Julius Edgar Lilienfeld Prize of the American Physical Society.

2011- Spring Visiting Professor U.C. Berkeley

2013: Distinguished Alumnus Award IIT Madras.

2014: Elected to American Academy of Arts and Sciences.

2014: Simons Distinguished Visiting Scholar (Fall), KITP, Santa Barbara.

2015-2020: Distinguished Visiting Professor, IIT Madras.

Affiliations

Editorial Board, Journal of Statistical Physics 1988-90

Dannie Heineman Prize Committee 1997- and 1998

General Member, Aspen Center for Physics 98-2013

Committee of Visitors, National Science Foundation, 1999

Trustee, Aspen Center of Physics, 2004-2010

Executive Committee, Aspen Center of Physics, 2006-2010

Advisory Board, Center for Correlated Electrons and Magnetism, Augsburg, 2007-

Lilienfeld Prize Committee 2011

Advisory Board, Kavli Institute of Physics, 2010-2013

Books

Principles of Quantum Mechanics (Plenum 1980), Second Edition (Plenum 1994), Polish Edition (Springer 2006), Indian Edition (Springer-Prism Books 2007).

Basic Training in Mathematics (Plenum 1995).

Fundamentals of Physics: mechanics, relativity and thermodynamics, Yale Press 2014, Chinese translation 2017.

Fundamentals of Physics II: electromagnetism, optics and quantum mechanics, Yale Press 2016.

Quantum Field Theory and Condensed Matter-An Introduction, Cambridge Press, 2017.

PUBLICATIONS

1. Feedback Model of Systems Obeying Quantum Statistical Mechanics *J. Stat. Phys.* 14, 61, (1972).
2. Clarification of Multi-Regge Theory, *Phys. Rev.* D7, 3513, (1973).
3. Can and Does the Pomeron Occur More Than Once in a Single Process? *Nucl. Phys. B*63, (1974).
4. Role of the Pion Mass in Triple-Regge Physics, *Nucl. Phys. B*79, 126, (1974).
5. Missing Mass as an Alternative to Rapidity in the Experimental Study of Diffraction, with D.M. Chew, *Phys. Rev.* D11, 1036, (1975).
6. Electromagnetic Decay of the New Heavy Resonances at 3.1 and 3.7 GeV. with J. Borenstein, *Phys. Rev. Lett.*, 34, 752, (1975).
7. Question of Parity Violation in $e + e -$ Annihilation, with A. de Rujula and S.L. Glashow, *Phys. Rev.* D14, 752, (1976).
8. More $SO(3)$ Monopoles, *Phys. Rev.* D14, 1107, (1976).
9. Determination of the Quark Gluon Coupling Constant, *Phys. Rev.* D15, 755, (1977).
10. Application of Topology to the Study of Ordered Systems, *J. de Physique* 38, 1405, (1977).
11. S-matrix of the Supersymmetric Sigma Model, with E. Witten, *Phys. Rev.* D17, 2134, (1978).
12. The S-matrix of the Kinks of the $(\bar{\psi}\psi)^2$ Model, with E. Witten, *Nucl. Phys. B*141, 349, (1978).
13. Exact S-matrices in two-dimensional Field Theory- (Invited talk given at the APS meeting, Washington DC, April 78) YTP COO-3075-199.
14. A General Scheme for the Computation of Instanton Effects, with T. Appelquist, *Phys. Lett.* 78B, 468, (1978).
15. A General Approach to the Computation of Instanton Effects, with T. Appelquist, *Phys. Rev.* D18, 2952, (1978).
16. On Gauge Theories with Heavy Higgs Bosons, with T. Appelquist, *Nucl. Phys. B*158, 319, (1979).
17. Some Novel Features of the Gross-Neveu Model, *Phys. Lett.* 92B, 333, (1980).
18. Bohr-Sommerfeld Quantization of Pseudospin Hamiltonian, *Phys. Rev. Lett.* 45, 1088, (1980). Reprinted in *Coherent States*, Editors-J.R. Klauder and B.S. Skagerstam, *World Scientific*, Singapore.
19. PRINCIPLES OF QUANTUM MECHANICS, Plenum Press, New York (1980).
20. Solvable Models with Self-triality in Statistical Mechanics and Field Theory, *Phys. Rev. Lett.* 46, 379, (1981).
21. A Model that Acquires Integrability and $O(2N)$ Invariance at a Critical Coupling, *Phys. Lett.* 102B, 257, (1981).
22. A Simple Derivation of the Baxter Model Free Energy, *Phys. Rev. Lett.* 47, 1177, (1981).
23. Self-triality in Statistical Mechanics and Field Theory, Proceedings of the XI-Conference on Group Theoretic Methods, Istanbul, Springer Verlag (1982).
24. On the Solution of Some Vertex Models Using Factorizable S-Matrices, *J. Stat. Phys.* 29, 649 (1982).

25. Self-triality of the Ashkin-Teller Model, *Phys. Rev. Lett.* 50, 787, (1983).
26. Solution of a Factorizable S-Matrix and an Asymmetric Eight-vertex Model, with M. Doria, *J. Stat. Phys.* 33, 695 (1983).
27. Response to a comment by de Felicio and Libero, regarding ref. 25; *Phys. Rev. Lett.* 51, 2230, (1983).
28. Solvable Analog to Quantum Chromodynamics, *Phys. Rev. Lett.* 53, 2363, (1984).
29. Commensurate-incommensurate and disordering transitions in an exactly solved model of uniaxial adsorbates, with M. Kardar, *J. Phys. C18*, L5 (1985).
30. New Commensurate-incommensurate and disordering transitions in an exactly solved model of adsorbed layers, with M. Kardar, *Phys. Rev. B31*, 1525, (1985).
31. Statistical behaviour in deterministic quantum systems with few degrees of freedom, with R.V. Jensen, *Phys. Rev. Lett.* 54, 1879 (1985).
32. Possible tests and improvements for blockspin Monte Carlo studies, with G. Murthy, *Phys. Rev. Lett.* 54, 1110, (1985).
33. Ashkin-Teller and Gross-Neveu Models: New Results and Relations, *Phys. Rev. Lett.* 55, 453, (1985).
34. Tests for Monte Carlo Renormalization Studies on Ising Models, with G. Murthy, *J. Stat. Phys.* 42, 275, (1985).
35. Redundant Operators for Ising Spins, with G. Murthy, *Phys. Rev. B32*, 5851 (1985).
36. Dealing with Truncation in Monte Carlo Renormalization Group Calculations, with G. Murthy and R. Gupta, *Phys. Rev. Lett.* 55, 1812, (1985).
37. Clear Evidence of Redundant Operators in the Monte Carlo Study of the $d = 2$ Ising Model, with R. Gupta, in *Rapid Communications Phys. Rev. B32*, 6084 (1985).
38. Truncation Errors in Monte Carlo Renormalization Group - A Comparative Study, *Phys. Rev. B33*, 6515, (1986).
39. Solvable Case of a Spin-1 Model in a Magnetic Field, *Phys. Lett. A 117*, 365, (1986).
40. Frustrated Nearest-Neighbor $d=2$ Ising Model: Exact Results; with G. Murthy, *Phys. Rev. B35, Rapid Communications*, 3671, (1987).
41. Nearest Neighbor Frustrated Random-Bond Model in $d=2$: Some Exact Results; with G. Murthy, *Phys. Rev. B36*, 536, (1987).
42. Exact Critical Behavior of a Random-Bond Two- dimensional Ising Model, *Phys. Rev. Lett.* 58, 2466, (1987).
43. Superconductivity of Itinerant Electrons Coupled to Spin Chains, with Subir Sachdev, *Phys. Rev. B38*, 826, (1988). Also to be reprinted in *Interacting Electrons in reduced Dimensions*, Plenum, New York, 1990.
44. What is the Lowest Spin for Which Neel Order is Possible in the $D = 2$ Heisenberg Model?; with G. Murthy, *Phys. Lett. A137*, 2652, (1989).
45. Spin 1/2 Antiferromagnetic XXZ Chain : New Results and Insights, with R.R.P Singh and M.E.Fisher, *Phys.Rev. B 39*, 2652, (1989).
46. Hole Motion in Quantum Antiferromagnets: New Approach and Exact Results; *Phys.Rev.Lett*; 63, 203, (1989) .
47. The $\theta = \pi$ Sigma Model is Massless; with N. Read, *Nucl.Phys. B.330* , 433, 1990.
48. Holes in a Quantum Antiferromagnet : A Formalism and Some Exact Results, *Nucl. Phys.B130* , 433, (1990).
49. Statistical Mechanics of Random Systems : *IXth International Conference on Mathe-*

- matical Physics* Edited by B.Simon, A.Truman, and I.M.Davis, Adam Hilger, (1989).
50. Symmetry Breaking in Mott Insulators, with D. H. Lee *Phys.Rev. Lett*; 65, 1490, (1990).
 51. A Solvable Model of the Metal Insulator Transition, *Intl.J.Mod.Phys.,B4*, 2371, June 1990.
 52. Renormalization Group for Interacting Fermions in $d > 1$., *Physica A177*, 530, (1991).
 53. Bosonization: How to make it work for you in Condensed Matter Physics, Lectures given at the Katmandu Summer School, 1990 in *Current Topics in Condensed Matter and Particle Physics*, Editors J.Pati, Q.Shafi and Yu Lu, World Scientific (1993).
 54. PRINCIPLES OF QUANTUM MECHANICS, Second Edition, Plenum (1994).
 55. Renormalization Group Approach to Interacting Fermions, *Rev. Mod. Phys.* 66, 129, (1994).
 56. The Integer Quantum Hall Transition: New Approach and Exact Results, with A.W.W.Ludwig, M.P.A.Fisher, R.Shankar and G.Grinstein, *Phys. Rev. B* 50 , 7526 , (1994).
 57. Finite Temperature Properties of Quantum Antiferromagnets in a Uniform Field in One and Two Dimensions, with S.Sachdev and T.Senthil, *Phys. Rev. B* 50 , 258, (1994). cond-mat 9401040
 58. Coulomb Interaction is Screened in Bosonized Fermi Liquids, with A.Houghton, H.J.Kwon, and B.Marston, *J.Phys. C J.Phys. Cond. Matt.*, 6, 4909, 1994. cond-matt 9312067,
 59. Thomas Precession, Berry Potential and the Meron, with Harsh Mathur. *Phys. Rev. Lett.*, 73, 1565, (1994). Cond-matt 9403076.
 60. A Condensed Matter Analog of QCD with Quarks, *Int. J. Mod. Phys.* 8, 417, 1994.
 61. *BASIC TRAINING IN MATHEMATICS - A Fitness Program for Science Students*, Plenum Publishers, New York (1995).
 62. Novel phases of planar fermionic systems, with G.Murthy, *Journal of Physics - Condensed Matter*, 7, 9155, (1995).
 63. Effective Field Theory in Condensed Matter Physics, Invited lecture given at the *Conceptual Foundations of Quantum Field Theory*, Editor T.Y.Tao, Cambridge University Press, 1998.
 64. Encyclopedia articles on Quantum Mechanics, Quantum Mechanics and Quantum Field Theory, Quantum Field Theory, Planck's Constant and Quantization, Macmillan,1996.
 65. Phase Transitions in Quantum Spin Ladders, with M.A. Martin-Delgado and G.Sierra, *Phys. Rev. Lett.* 73, 3443, (1996) - condmat-9605035.
 66. Field Theory of the Fractional Quantum Hall Effect, with Ganpathy Murthy, *Phys. Rev. Lett* , 79 , 4437, (1997) Condmat-9702098.
 67. Field Theory of the Fractional Quantum Hall Effect, in *Composite Fermions*, editor, Olle Heinonen, World Scientific. condmat-9802244.
 68. Response to comment on *Phys. Rev. Lett* , 79 , 4437, (1997) by Halperin and Stern, with Ganpathy Murthy, *Phys. Rev. Lett* , 80 , 5458, (1998).
 69. Scaling relations for gaps in the fractional quantum Hall states, with G. Murthy, K. Park and J.K. Jain, *Phys. Rev.B* 58 , 15363, ,(1998).
 70. Hamiltonian description of Composite Fermions: calculation of gaps, with G. Murthy, *Phys. Rev.B* 59 , 12260, (1999).
 71. Hamiltonian description of Composite Fermions: Aftermath, *Phys. Rev. Lett* 83, 2382 (1999), cond-mat 9903064.
 72. Magnetic phenomena at and near $\nu = 1/2$ and $1/4$: theory, experiment and interpreta-

- tion. *Phys. Rev. Lett* , **84** , 3946, (2000) cond-mat 9911288.
73. Luttinger revisited- the renormalization group approach, Invited contribution to the Journal of Statistical Physics issue in honor of J. Luttinger. August 2000.
74. Hamiltonian theory of gaps, masses and polarization in quantum Hall states, cond-mat/0009361. *Phys. Rev.*, **B63** , 085322, (2001).
75. Hamiltonian theory of the Fractional Hall Effect, *Int. J. Mod. Phys.* **15** , 2001.
76. Theories of the Fractional Quantum Hall Effect, cond-mat 0108271. Based on Cargese Lectures, May 2001.
77. Effects of Landau Level Mixing, with Ganpathy Murthy, *Phys. Rev. B* **65**, 245309, 2002.
78. Hamiltonian theories of the FQHE, with Ganpathy Murthy, *Rev. Mod. Phys.* **75**, 1101, (2003)
79. "Quantum Field Theory" for the Encyclopedia of Elementary Particle Physics, Macmillan, 2002.
80. Quantum Dots with Disorder and Interactions: A Solvable Large- g Limit, with Ganpathy Murthy, *Phys. Rev. Lett.* **90**, 066801, 2003.
81. Globalization and Science: A speeded up virtuous cycle, Yale Global on line, March 28, 2003.
82. A solvable regime of disorder and interactions in ballistic nanostructures, Part I: consequences for Coulomb blockade, with Ganpathy Murthy, Damir Herman and Harsh Mathur, cond-mat 0306529, *Physical Review B* **69** 075321, (2004).
83. Renormalization group approach to strongly coupled superconductors, with S.W Tsai, A.H. Castro Neto and D.K. Campbell, cond-mat/0406174, to appear in *Phys. Rev. B* **72**, 054531 (2005).
84. The Renormalization Group Approach- From Fermi Liquids to Quantum Dots, Springer Lecture Notes in Physics, **667**, (2005), Editor: D.Hess. Based on lectures given at the Fifteenth Chris Engelbrecht Summer School, Drakensberg, South Africa. Cond-mat 0407127
85. On the assignment $P = -i\hbar d/dx$., Mc Graw Hill Encyclopedia of Science, March, 2005.
86. Ballistic Chaotic quantum dots with interactions: a numerical study of the Robnick-Berry billiard, with G. Murthy and Harsh Mathur, *Phys. Rev B* **72**, 075364, (2005).
87. Deconfinement in $d = 1$: a closer look, with G. Murthy, cond-mat 0508242, *Phys. Rev. B* **72**, 224414, (2005).
88. Strong coupling superconductivity via an asymptotically exact renormalization group approach, with S.W Tsai, A.H. Castro Neto and D.K. Campbell, *Journal of Physics and Chemistry of Solids*, **67**, 516, (2006).
89. Dots for Dummies, in Festschrift for Pierre Hohenberg and James Langer. *J. Stat. Phys.*, **125**, 1177, (2006).
90. Renormalization group approach to superconductivity from weak to strong electron-phonon coupling, with S.W Tsai, A.H. Castro Neto and D.K. Campbell, *Phil. Mag.*, **86**, 2631, (2006).
91. Large spin-orbit effects in small quantum dots, with G. Murthy, cond-mat 0609460, *Phys. Rev. B* **75**, 075327 (2007).
92. MECHANIKA KWANTOWA, (2006) Polish Translation of Principles of Quantum Mechanics.
93. Hamiltonian theory of the half-filled Landau level with disorder: Application to recent NMR data with by Ganpathy Murthy, *Phys. Rev. B* **76**, 075341, (2007), arXiv:0704.3210.

94. Chaotic quantum dots with strongly correlated electrons, *Rev.Mod. Phys.* **80**, 379, (2008).
95. Flux Hamiltonians, Lie algebras and Root Lattices with Miniscule Decorations, with Fiona Burnell and Shivaji Sondhi, cond-mat-0802.3466, *Annals of Physics*, **324**, 267, (2008).
96. Fermi surfaces in general codimension and a new controlled non-trivial fixed point, with T. Senthil, *Phys. Rev. Lett.*, **102**, 046406 (2009).
97. Globalization and science, one Physicist's view, in *The Multiple Faces of Globalization*, BBVA Publication, 2009.
- 98: Renormalization group for nonrelativistic fermions, *Scholarpedia*, 5(9):9575 June 2010.
99. Renormalization group for non-relativistic fermions *Phil. Trans. R. Soc. A* July 13, 2011 369 (1946) 2612-2624; doi:10.1098/rsta.2010.0385
100. Renormalization group and the superconducting susceptibility of a Fermi liquid, with S. Parameswaran and S. L. Sondhi, *Phys. Rev. B* **82**, 195104, (2010).
101. Equality of bulk wave functions and edge correlations in some topological superconductors: A spacetime derivation with Ashvin Vishwanath, *Phys. Rev. Lett.*, **107**, 106803 , (2011).
102. Quarter-Filled Honeycomb lattice with a quantized Hall conductance, with Ganpathy Murthy, Efrat Shimshoni, and H.A. Fertig, arXiv:1108.2010, *Phys. Rev. B* 85, 073103 (2012).
103. Composite fermions for fractionally filled Chern bands, with Ganpathy Murthy, arXiv: 1108.5501.
104. The last word in strong correlations, *Ann. Phys. (Berlin)* 523, No. 89, 751, (2011)
- 105 Dipolar bogolons: from superfluids to Pfaffians with S. A. Parameswaran, S. A. Kivelson, R. Shankar, S. L. Sondhi, and B.Z. Spivak, arXiv 1202.3444, Feb 17, 2012, *Phys. Rev. Lett.* **109**, 237004.
106. Hamiltonian theory of fractionally filled Chern bands, with Ganpathy Murthy, arXiv 1207.2133, *Phys. Rev. B* **86**, 195146 (2012).
107. *Fundamentals of Physics-mechanics, relativity and thermodynamics*, Yale Press 2013.
108. Gauge choices in the Hamiltonian theory of fractionally filled Chern bands, with Ganpathy Murthy, *Phys. Rev. B* **89**, 195107, (2014).
109. RG for non-relativistic fermions, Ken Wilson Memorial Volume, World Scientific, 2015.
110. The $\nu = \frac{1}{2}$ Landau level: half fully or half empty? <http://arxiv.org/abs/1508.06974>, *Phys. Rev. B* **93** , 085405 , (2016)
107. *Fundamentals of Physics II-electromagnetism, optics and quantum mechanics*, Yale Press 2016.

Invitations and Seminars 1988-89

1. Some Exact Results in $d = 2$ Random Bond Models: in Mathematical Physics of order and disorder, American Mathematical Society, Maine, June 11-17, 1988
2. Some Exact Results in $d = 2$ Random Bond Models, International Association of Mathematical Physics, IX Congress, Swansea, England, July 17-27, 1988.
3. Exact Solutions in Low Dimensional Electronic Systems, Institute for Scientific Interchange, Torino, October 4-9, 1988.
4. Invited to the ICTP workshop on the Physics of Strongly Correlated Electronic Systems, Trieste, July 1988.
5. Invited to the High T_c workshop at the Institute for Theoretical Physics, University of California, Santa Barbara, Jan.-July 1989.
6. Invited to ICTP workshop on "Interface Between Field Theory and Statistical Mechanics", Trieste, June 1989.
7. Invited to XXI Summer Institute on Topological Methods in Statistical Mechanics and Field Theory at the Ecole Normale Supérieure, Paris, August 1989.

Invitations and Seminars 89-90

1. Invited to International Workshop on Strongly Correlated Electrons , ICTP, Trieste, July 1990.
2. Consultant to IBM, T.J. Watson Center, Summer 1990.
3. Lectures on Statistical Mechanics at the University of Sao Paulo, Brazil, July-August 1990.
4. Mott Insulators, Catholic University, Rio. Colloquium on . August 1990.
5. Exact Results on the Metal-Insulator Transition, A.T. & T Bell Labs, Seminar on 26 September 1990.
6. Field Theory of Holes in a Quantum Antiferromagnet, Barnard Columbia seminar on October, 1990.

Seminars on the Theory of Holes in a Quantum Antiferromagnet at:

1. Technische Hochschule, Aachen.
2. University of Cologne.
3. Harvard University.
4. Florida State University and Supercomputing Center.
5. University of Maryland.
6. Brown University.
7. Ohio State University.
8. IBM Yorktown Heights.
9. University of Sherbrooke, Canada.

Invitations and Seminars 1991

1. Metal-Insulator Transitions, Invited talk, Aspen Workshop in Condensed Matter Theory, January 13-19, 1991.
2. Symmetry Breaking in Mott Insulators, Invited talk on American Physical Society meeting. Cincinnati, March 20, 1991.

3. Renormalization Group for Fermions, seminar at MIT on the April 10, 1991.
4. Renormalization Group for Fermions, Colloquium and Seminar at the University of British Columbia and the Simon Fraser University, April, 1991.
5. A Condensed Matter Analog of QCD with Quarks, Trieste Conference on Quantum Field Theory and Condensed Matter Physics, Invited talk 13-16 May, 1991.
6. *1991 BCSPIN Summer School, Katmandu*, May 1991. Six Lectures on the use of Bosonization in Condensed Matter.
7. Renormalization Group for Fermions in $d > 1$, Invited Talk, International Center for Theoretical Physics, Workshop on Strongly Correlated Electrons.

Invitations and Seminars 1992

Seminars or Colloquia on Renormalization Group for Interacting Fermions.

1. Boston University Jan 24, 1992.
2. University of Pennsylvania 11 February, 1992.
3. Institute for Physics, University of California, Santa Barbara, May , 1992.
4. Rutgers University.
5. Aspen Center for Physics July, 1992.
6. Cornell University September 17, 1992.
7. Indiana University November 23, 1992.
8. Martin Weiner Lecture Series, Brandeis University November 24, 1992.
9. Lectures on Bosonization in Condensed Matter Physics, International Center for Theoretical Physics , Trieste, Summer School, May 1992.

Invitations and Seminars 1993

Seminars or Colloquia on Renormalization Group Approach to Interacting Fermions.

1. University of Illinois, September 13, 1993. Seminar.
2. Princeton University, October 25, 1993. Seminar.
3. Invited to lecture at Ninth South African Summer School in Physics. Jan 1994. (Declined due to conflict.)
4. Brown University, February 10, 1994. Seminar.
5. Columbia University, February 18, 1994. Seminar.
6. American Physical Society, March 23, 1994. Invited Symposium on Fermi and non-Fermi Liquids.
7. International Center for Theoretical Physics, Trieste, May 3-10, 1994. Lectures in Summer School.
8. Laboratoire de Physique des Solides, University Paris Sud, May 11, 1994. Seminar.
9. Invited Speaker Summer Institute of Theoretical Physics of the Canadian Association of Physicists. (Declined due to conflict.)
10. A.T.&T Bell Labs, April 6, 1993.

Invitations and Seminars 1994

1. United Nations Consultant, visited India as a part of the TOKTENS (Technology Transfer program) and gave lectures on the Renormalization group and Berry Phase at Institute of Physics Bhubaneswar, Indian Institute of Science Bangalore and Institute of Mathematical Sciences, Madras over July August 1994.
2. Renormalization Group for Fermions, Institute for Advanced Study, October 12, 1994.
3. Renormalization Group for Fermions, Ohio State University, October 17, 1994.
4. Renormalization Group for Fermions, Stony Brook, March 28, Colloquium.

Invitations and Seminars 1995

1. Renormalization Group for Fermions, Colloquium, Harvard University, April 3, 1995.
2. Renormalization Group for Fermions, Penn State University, *Frontiers in Physics Lecture* on April 7, 1995.
3. Lectures on Bosonization. 35-th Jubilee Summer School of the Jagollonian University, at Zakopane, Poland, June 1-10.

Invitations and Seminars 1996

1. Renormalization Group for Fermions, Center for Theoretical Physics Distinguished Lecturer, University of Maryland, February 6, 1996.
2. Effective field theory in Condensed Matter Physics, Boston Colloquium for the Philosophy of Science, March 1, 1996.
3. Holes in Quantum Antiferromagnets, Renormalization Group for Fermions, Consejo Superior de Investigaciones Cientificas, Madrid, 27 March 1996, March 29, 1996.
4. Renormalization Group for Fermions, the Royal Road to Fermi Liquids, Institute for Theoretical Physics, Santa Barbara
5. Snakes and Ladders, Institute for Theoretical Physics, Santa Barbara, May 1996.
6. Snakes and Ladders, Aspen Center for Physics, July 1996.
7. Snakes and Ladders, Princeton University and NEC October 96.

The following invitations were declined: Review talk on RG for fermions at the Statistical Mechanics Conference at Rutgers, May 1996, Perturbative Methods for Strongly Correlated Electrons, Brasilia, Brazil, June 1996, Scuola Normale Superiore, Pisa, in Quantum Coherence in Strongly Correlated Electron Systems, RG for fermions, July 1996.

Invitations and Seminars 1997

1. Renormalization Group for fermions, Statistical Mechanics Meeting In Rutgers in honor of Lifschitz's 80 birthday.
2. Field Theory of the Fractional Quantum Hall Effect, Indiana University, Feb 97.
3. Field Theory of the Fractional Quantum Hall Effect, University of Illinois Feb 97.
4. Field Theory of the Fractional Quantum Hall Effect, Aspen Center for Physics, July 1997.
5. Theory of the Fractional Quantum Hall States Rutgers Colloquium 24 September 97.

Invitations and Seminars 1998

1. Theory of the Fractional Quantum Hall Effect, Bell Labs Feb 3 1998
2. Theory of the Fractional Quantum Hall Effect, UCLA March 22, 1998
3. Theory of the Fractional Quantum Hall Effect, Institute of Theoretical Physics, UCSB, Santa Barbara Invited talk Aug 11, 1998 :
4. The Berry Phase, McMaster University Colloquium, Oct 28, 1998:

Invitations and Seminars 1999

1. Hamiltonian Theory of Composite Fermions, Ohio State University seminar, Feb 8, 99:
2. Hamiltonian Theory of Composite Fermions, Invited Symposium at the Centennial Meeting of the APS, Atlanta, (Talk delivered by collaborator, G. Murthy). March 22 , 1999
3. Hamiltonian Theory of Composite Fermions, Heinz Schulz Memorial Lecture (Paris) May 10
4. **Distinguished Lecture series in Technion, Haifa, Israel.** May 11-18: Two lectures on the Renormalization Group, A Colloquium and two lectures on the Hamiltonian Theory of the Fractional Quantum Hall Effect.
5. Hamiltonian Theory of the Fractional Quantum Hall Effect Weizmann Institute of Science, Israel, May 19.
6. Hamiltonian Theory of Composite Fermions, Theoretical Methods in Strongly Correlated Electrons, 1999-2000 Theme Year of Mathematical Physics, Montreal - May 29.
7. Aspen workshop on Integrable models (July 99)

The following engagements were canceled due to conflicts.

APCTP Winter school on "Quantum Hall Effects and High T_c Superconductivity", to be held at Phoenix Park, Korea, during February 8 -13, 1999.

International Center for Theoretical Physics, Lecture Series on the Quantum Hall effect, (July 1999).

Workshop on Topology, Gauge fields etc., Amsterdam, (July 1999).

Invitations and Seminars 2000

1. Retreat Lectures, Massachusetts Institute of Technology, Renormalization Group for Interacting Fermions and Hamiltonian Theory of the Fractional Quantum Hall Effect, January, 12-14, 2000.
2. Gaps, masses, polarization and relaxation near $\nu = 1/2, 1/4$: calculation and interpretation of experiments, Invited symposium at the American Physical Society Meeting, Minneapolis, March 23, 2000.
3. Hamiltonian Theory of the Fractional Quantum Hall Effect, Colloquium, University of Wisconsin, March 9, 2000.
4. Renormalization Group for Nonrelativistic Fermions, James Frank Institute Colloquium, University of Chicago, April 25, 2000.
5. Hamiltonian Theory of the Fractional Quantum Hall Effect, Northwestern University, April 27, 2000.

6. Renormalization Group for Nonrelativistic Fermions, Northwestern University Colloquium, April 26, 2000.
7. Hamiltonian Theory of the Quantum Hall Effect, Aspen Center of Physics, July, 2000.
8. Heinz Pagels 2000 Summer Lecture Series: When you come to a fork in the road, you gotta take it: Yogi Berra's guide to the quantum world.
9. Hamiltonian theory of the FQHE : What is it and what can it do for you? Princeton University October 2, 2000.
10. Hamiltonian theory of the FQHE Institute of Mathematical Sciences, Madras, India. October 17, 2000.
11. Hamiltonian theory of the FQHE, Saha Institute Golden Jubilee Lecture, Calcutta, India October 25, 2000.
12. Hamiltonian theory of the FQHE, Colloquium Brown University, November 6, 2000.

Declined Invited talks: Renormalization group for fermionic systems, workshop Strasbourg, June 22-23, . TRIESTE 2000: STRONG CORRELATION IN THE HIGH TC ERA 17- 28 July, 2000

Invitations and Seminars 2001

Theories of the Fractional Quantum Hall Effect, Lectures given at the Cargese Summer school on *Trends in High Magnetic Fields Science*. May 2001.

Hamiltonian theory of the FQHE, workshop on *Flux, charge, topology and statistics*, Amsterdam, June 25-30, Amsterdam.

FQHE for Dummies, University of Kentucky, Colloquium, October 29 ,2001

FQHE for Dummies Harvard University seminar, December 12, 2001.

Fermi Liquid Theory for Dummies, Tata Institute for Fundamental Research, Bombay India, Colloquium, December 19, 2001

FQHE for Dummies, Tata Institute for Fundamental Research

Invitations and Seminars 2002

FQHE for Dummies, Second India and Abroad conference on Condensed Matter Physics, Jan 3, 2002, Bangalore, India.

FQHE for Dummies, Colloquium Penn State, March 28, 2002

Fermi Liquids for Everyone, Boston University Colloquium, October 1, 2002

When you come to a fork in the road take it- Yogi Berra's guide to the quantum world, ean's Lecture Series, In The Company of Scholars, Yale, October 21, 2002.

Dresden Workshop on Quantum Dots, invited speaker Nov 16-23, 2002

FQHE for Dummies, Colloquium, Brandeis University, December 3 2002

Invitations and Seminars 2003

Quantum dots with disorder and interactions, Max Planck Institute, March 15-20, 2003

Introduction to quantum mechanics, Perspectives in Science, April 4, 2003

Dots for Dummies, University of Pennsylvania Seminar, April 24, 2003.

When you come to a fork in the road take it - Yogi Berra's guide to the quantum world, Association of Yale Alumni , May 30 and June 6, 2003.

Renormalization Group for Fermions, Max Planck Institute for Complex Systems, workshop on Functional Renormalization Group Methods, Dresden , July 8-16, 2003.

Fermi liquid for everyone, University of Florida, Gainesville, October 16, 2003

Fermi Liquids for dummies, Boston College, December 10, 2003.

Renormalization Group for Dummies, Society of Physics Students, MIT, December 11, 2003.

Fermi Liquids for dummies, Rice University, December 8, 2003.

Invitations and Seminars 2004

Lectures in 15th Chris Engelbrecht Summer school, Drakensberg, South Africa, January 23-30, 2004.

Renormalization Group for Dummies, Opening Lecture, European Center for Theoretical Studies, Trento, September 6, 2004.

Kavli Institute of Theoretical Physics, 25th Anniversary, Banquet Speaker, October 8, 2004

Dots for Dummies, 92 Statistical Mechanics Conference, Rutgers University, December 20, 2004

Invitations and Seminars 2005

Irons Lecture, Rutgers University, January 29, 2005, "When you come to a fork in the road take it, Yogi Berra's guide to the quantum world"

Association of Yale Alumni, May 27, 2005, "When you come to a fork in the road take it, Yogi Berra's guide to the quantum world"

Dots for Dummies, Princeton University, May 26, 2005.

Dots for Dummies, Mottness Conference, Tobago June 13-19, 2005.

"Quantum for Kids", Aspen Center for Physics, August 10, 2005. Televised on Grassroots TV, Aspen.

"The strange world of the quantum", address to 500 Physics students from the Apeejay Schools, New Delhi on 23rd August, 2005.

"When you come to a fork in the road take it, an informal introduction to quantum mechanics", Public Lecture, August 25, The 2005 International Conference on Physics Education, New Delhi, India.

Yale Parents' weekend, October 7, 2005, "When you come to a fork in the road take it, Yogi Berra's guide to the quantum world".

Invitations and Seminars 2006

Dots for Dummies, Indian Institute for Science, January 6, Bangalore India.

Dots for Dummies, University of Toronto, Colloquium, January 19 , 2006

Deconfinement in $d = 1$, a closer look, Rutgers University, February 7, 2006.

COUP at Yale , Workshop on Achieving systemic changes in Physics teaching at leading research universities, American Center for Physics, MD. June 3, 2006.

Dialog on Quantum Mechanics, Aspen Center for Physics, July 13, 2006.

Hamiltonian theory of the Fractional Quantum Hall Effect, Max Planck Institute, Invited Lecture, Dresden, October 4, 2006.

Dots for Dummies University of Oregon, Nov 9, 2006

Dots for Dummies Johns Hopkins University, Nov 16, 2006

Invitations and Seminars 2007

Dirac hamiltonians with disorder, Kavli Institute of Physics, January 15, 2007.

"When you come to a fork in the road take it, Yogi Berra's guide to the quantum world",

Connect with Yale in Los Angeles, February 10, 2007.

Dots for Dummies, U Mass Amherst, April 5, 2007

Einstein for Dummies, Yale Bulldog Lecture, April 17, 2007.

Dots for Dummies, Institute of Mathematical Sciences, Chennai, India, July 3, 2007

Landau Theory for Dummies, Indian Institute of Technology, Chennai, India, July 12, 2007

Introduction to Theoretical Physics, SCHOLAR program for Career High School Students of New Haven, July 18, 2007

Renormalization Group for Dummies, Three lectures at the Princeton Center for Complex Material, Summer School on Condensed Matter Physics, August 13-14, 2007.

Dots for Dummies, Oxford University, October 3, 2007.

Invitations and Seminars 2008

Association of Yale Alumni, Portland OR, April 5, 2008, "When you come to a fork in the road take it, Yogi Berra's guide to the quantum world"

Connect with Yale at Seattle WA, April 6, 2008, "When you come to a fork in the road take it, Yogi Berra's guide to the quantum world"

Lie Groups and Flux phases, Harvard, April 2, 2008.

Renormalization Group for Fermions, three lectures at the Boulder School for Condensed Matter and Materials Physics, June-July 2008.

"When you come to a fork in the road take it, Yogi Berra's guide to the quantum world" Public Lecture Boulder School for Condensed Matter and Materials Physics, June-July 2008.

"Renormalization group for dummies", Society of Physics Students, September 24, Yale, 2008.

"Quantum mechanics, does anybody really get it?", in Intellectual circles and twentieth century science, October 31, 2008, Yale.

"The Renormalization Group and the Landau Fermi liquid: what are they and who cares?", Physics Club, Yale, November 14, 2008

"Einstein for everyone", Saybrook College Fellows, November 17, 2008.

Invitations and Seminars 2009

"Dots for dummies, Ohio State University Feb 2009

"Quantum mechanics, does anyone get it?", Tilde Cafe, Branford, CT (2009).

"Fermions in general codimension and test of Hertz-Millis, Kavli Institute of Physics, UCSB, March 4, 2009

"Dots for dummies, UC Santa Cruz, March 6, 2009

"New directions for the Fermi liquid", University of Illinois, April 17, 2009.

"Einstein for the masses", Connect with Yale in New Haven, May 2, 2009.

"Effective Field Theories in Condensed Matter Physics, 7 Pines Meeting, May 6-10, 2009 Outing Lodge, Stillwater, MN.

"Fermions with varying codimensions", Aspen Center for Physics, August 26, 2009.

"Dots for Dummies", Case Western University, Colloquium, September 17, 2009.

"Dots for Dummies", University of Cincinnati, Colloquium, September 17, 2009.

"Dots for Dummies", Caltech Physics Research Conference, October 22, 2009.

Invitations and seminars 2010

"Renormalization Group for nonrelativistic fermions", Institute for Nuclear Theory, Seattle February 26, 2010.

- "Fireside Chat", Metro-Gotham Conference, New York Academy of Science, April 9, 2010.
- "Einstein for Everyone" , Yale Bulldog Days Master Class, April 20, 2010.
- "Einstein for Masses" Alumni Reunion, May 29, 2010.
- "Einstein for Masses", Alumni Lecture , June 5, 2010.
- "Zero to c in 60 minutes: A crash course in Einstein using planes trains and automobiles" Aspen Center for Physics, Heinz Pagels Memorial Lecture, August 3, 2010.
- "Dots for dummies", Physics Department, U of South Florida, Tampa, September 10, 2010.
- "Dots for dummies", Physics Department, Washington University, St Louis, October 13, 2010.
- "Science at Yale", talk given to High School Students , Long Island, November 8, 2010.
- Chairman's Tea, "This year's Nobel Prize: Graphene", Sloane Lab, Nov 17, 2010.

Invitations and seminars 2011

- "Dots for Dummies", U of California, Santa Cruz, April 22, 2011.
- "Dots for Dummies", U of California, Riverside, May 19, 2011.
- "Dots for Dummies", U of California, Davis, May 23, 2011.
- "Einstein for Masses", Alumni Lecture , June 4, 2011.
- "Three lectures on the quantum Hall Effect" Eurasia-Pacific Summer School on Correlated Electrons, Turunc Turkey, July 4-9, 2011
- "Equality of bulk wave functions and edge correlations in some topological superconductors", Eurasia-Pacific Conference on Correlated Electrons, Turunc Turkey, July 10-14, 2011
- "Equality of bulk wave functions and edge correlations in some topological superconductors: A spacetime derivation", Aspen Center for Physics, July 27 , 2011.
- "Science at Yale", talk given to High School Students at the Science and Engineering Forum, Montclair Kimberley Academy, Montclair, New Jersey, September 14, 2011.
- "Lagrangian Field Theory", Quantum Field Theory Workshop, Center for Philosophy, October Pittsburgh
- "A strange equality in some topological superconductors, what and why?", Conference on Emergence and Effective Field Theories, The Perimeter Institute, Waterloo, Canada, October 26-28, 2011.
- "Dots for Dummies", Brown University, October 31, 2011.

Invitations and seminars 2012

- "Zero to c in 60 minutes: A crash course in Einstein", Master Class during YES-W at Yale, February 19, 2012.
- "Composite fermions for fractionally filled Chern bands", APS meeting Invited talk, Boston Ma, March 1, 2012
- "Zero to c in 60 minutes: A crash course in Einstein", May 26 and June 2, 2012, Alumni Reunion Yale.
- "Master Class: Ramanujan, the Tragic Genius", Bulldog Lecture, April 18, 2012, 10:30-11:20 AM
- "Hamiltonian Theory of Fractional Chern Bands", Indiana University, August 29, 2012
- "Hamiltonian Theory of Fractional Chern Bands", Perimeter Institute, Canada, September 14, 2012
- "Science at Yale", STEM presentation, San Francisco, September 29, 2012.
- "Science at Yale", STEM presentation, San Jose, September 30, 2012.
- "Hamiltonian Theory of Fractional Chern Bands", U Penn, October 4, 2012
- "Hamiltonian Theory of Fractional Chern Bands", Stanford University, October 25, 2012.

"Hamiltonian Theory of Fractional Chern Bands", UC Berkeley , October 26, 2012.

Invitations and seminars 2013

"Zero to c in 60 minutes: A crash course in Einstein", February 2, 2013, Princeton University Science on Saturday Lecture Series.

"Zero to c in 45 minutes", February 18, 2013, Yale STEM recruitment.

"Hamiltonian Theory of Fractional Chern Bands", University of St Andrews, May 8, 2013

"Equality of bulk wave functions and edge correlations in some topological superconductors, University of St Andrews, May 9, 2013

"Hamiltonian Theory of Fractional Chern Bands", Cambridge University, May 16, 2013

"Hamiltonian Theory of Fractional Chern Bands", Ecole Normale Supérieure, Paris, May 23, 2013

Invitations and seminars 2014

"Zero to c in 45 minutes", February 16, 2014, Yale STEM recruitment.

"Fermi surfaces in general co-dimensions and a new controlled non-trivial fixed point", Stanford, Workshop on non-Fermi liquids.

"Master Class: Ramanujan, the Tragic Genius", Yale Bulldog Master Class, April 24, 2014

"Tragic tale of Ramanujan, the mathematical genius", Aspen Center for Physics, Public Dialog, July 31, 2014.

"Science at Yale", STEM presentation, San Jose, September 20, 2014.

"Science at Yale", STEM presentation, San Francisco, September 21, 2014.

Impact of on-line education, Class Speaker, American Academy of Arts and Sciences, Cambridge MA, October 11, 2014. "Zero to c in 60 minutes", Kavli Institute of Theoretical Physics Public Lecture, Santa Barbara, November 18, 2014.

"Hamiltonian Theory of Fractional Chern Bands", Colloquium, UC Riverside, November 13, 2014

"Hamiltonian Theory of Fractional Chern Bands", Seminar, Caltech, December 8, 2014.

Invitations and seminars 2015

"Tragic tale of Ramanujan, the mathematical genius", Yale STEM Yes weekend, February 15, 2015.

"Dots for dummies", Colloquium, Worcester Polytechnic Institute, February 16, 2015.

"Royal road to Fermi liquids", colloquium, IIT Madras, March 10, 2015.

"Crash course in Einstein and applications to GPS", Techriti Festival, IIT Kanpur, March 21, 2015

"Tragic tale of Ramanujan, the mathematical genius", Yale Bulldog Days, April 22, 2015.

"Science at Yale", STEM presentation, San Francisco, September 19, 2015

. "Science at Yale", STEM presentation, San Jose, September 20, 2015.

"Zero to c in 60 minutes", GWPI Distinguished Lecture, Waterloo, October 5, 2015.

Invitations and seminars 2016

"Dots for Dummies", Jawaharlal Nehru Center for Scientific Research, January 6, (2016).

"Fractional Chern Bands", Jawaharlal Nehru Center for Scientific Research, January 7, (2016).

"Renormalization group", 6 Lectures, Indian Institute of Technology, Madras, January 8-15, 2016. "Dots for Dummies", Chennai Mathematical Institute, January 10, (2016).

"Dots for Dummies", Amherst College, April 19 , (2016).

"Master Class: Zero to c in 60 minutes", Yale Bulldog Master Class, April 26, 2016

"Equality of certain bulk wave functions and edge correlations in $d=2$ and 3," Technion, Haifa, Israel, June 20, 2016.

"Tragic tale of Ramanujan, the mathematical genius", University of Colorado Colloquium, September 21, 2016

"Equality of certain bulk wave functions and edge correlations in $d=2$ and 3," University of Colorado, Boulder CO, Condensed matter seminar, September 22, 2016.

Invitations and seminars 2017

"Path integrals and bosonization", 6 lectures given at the Indian Institute of Technology, Madras, January, 2017

"The tragic tale of the mathematician Ramanujan", Harvard University Colloquium, February 27, 2017.

"Physics pedagogy", two lectures at the Conference on Education, Tsinghua University, Beijing, Jun2 1-2, (2017). Release of Fundamentals of Physics I, in Chinese.

"Unusual equality of bulk and edge wavefunctions in a superconductor", Nordita, Copenhagen, August 10, (2017).

"Renormalization group and applications", 4 lectures at the Nordita Masterclass, Hillerod, Denmark, August 16-17, (2017).

Committee Work at Yale (92 onwards)

1. Office of Foreign Scholars 1992.
2. Term Appointments. Fall 93- Spring 94 inclusive.
3. Math Instruction at Yale. Spring 94- Fall 94 .
4. Steven Manly and Paul Karchin promotion Fall 94
5. Graduate Admissions 94
6. Chairman, Qualifier Exams in Physics 1994
7. Tenured Appointments Committee, 95-96.
8. Divisional Advisory Committee for Physical Sciences and Engineering. 95-96
9. Packard Foundation Selection Committee 94.
10. Packard Foundation Selection Committee 95.
11. Chairman Samson Shatashvili promotion.
12. Chairman Steven Hsu promotion, 95-96
13. Senior Atomic Physics search 95-96
14. Tenured Appointments Committee, 96-97
15. Divisional Advisory Committee for Physical Sciences and Engineering. 96-97
16. Promotion of Sean Barrett (Expt Cond Matt) 97-98
17. Replacement for Steve Hsu (Particle Theory)
18. Promotion of Robert Grober (Appl. Phys.)
19. Tenured Appointments Committee 97-98.
20. Divisional Advisory Committee for Physical Sciences and Engineering (Director for second half) 97-98
21. Tenured Appointments Committee, 98-99.
22. Divisional Advisory Committee for Physical Sciences and Engineering. 98-99

23. History of Science Senior Search (Chair Larry Holmes)98- 00
 24. Tenured Appointments Committee 99-00
 25. Divisional Advisory Committee for Physical Science and Engineering 99-00(Director Fall and Spring)
 26. Physics Undergraduate Committee. 99-00
 27. Junior Faculty Fellowship Committee. Fall 99
 28. Wilbur Cross Medalist Selection Committee.Fall 99
 29. Karin Rabe promotion to Full Professor Spring 99.
 30. Nuclear Theory Junior Appointment (Chairman, Spring 99)
 31. Search Committee Director of Yale Summer Program, 2000.
 32. 2001 Particle Theory (senior) Search Committee.
 33. History of Science Ad Hoc Committee (Kevles) 2001-
 34. Packard Selection Committee 2001.
 35. Chairman, Physics Qualifiers for Fall 2001.
- Chairman Physics July 1,2001-
- Meeting of leading 25 Physics Chairman, American Center for Physics, College Park, MD, November 17,2001.
- COUP (Committee for Overseeing Undergraduate Program), Member 2001, 2002.
- Steering Committee, Yale College 2002-03
- Chairman, Quantitative Reasoning Committee, part of Yale's curriculum revision, 2003-04
- Library committee, Yale, 2003-04
- Committee to choose new Dean of Yale College, 2004
- Committee to choose new Dean of Yale Graduate School, 2004
- Porter Prize and Field Prize selection committee 2004.
- Member Quantitative Reasoning Committee, part of Yale's curriculum revision 2004-05.
- Steering Committee, Yale College 2004-05.
- Committee member, Physics Alumni Weekend, 2008-2009
- Chair Particle Experiment Search 2008-09
- Spectacle of India, AYA tour Feb- March 2008.
- University Budget Committee, 2008-2009
- Committee on the Economic Status of the Faculty, 2008-09
- Committee member, Penultimate year review of Karyn Le Hur, 2008-2009
- Chair, High Energy Junior Experiment Search, 2008-09. Yielded 2 appointments: Sarah Demers and Tobias Golling
- Member, Ad hoc Tenure committee of Priya Natarajan, 2009
- Chair, Committee to consider promotion to tenure of Jack Harris, 2009-10.
- Committee to consider promotion to tenure of Karyn LeHur, 2009-2010.
- University Budget Committee, 2009-2010
- Committee on the Economic Status of the Faculty, 2009-2010.
- Committee on collaboration with NUS Singapore Fall 2009.
- (Nordhaus) Committee to Review Process and Metrics Yale 2011
- Recruitment for Yale: 2010, 2011
- Spectacle of India, AYA tour Dec 2011.
- Ad-hoc committee on grades, Yale College 2012-14
- Qualifying Exam committee 2011,2012

Academic Review Committee, 2012-2014
 Decanal Review 2013-2014
 Biological Introductory Sequence Review, 2014.
 Diversity Committee, physics 2014-15
 Target of Opportunity Committee, physics 2014-
 On line education committee, Yale. 2015-
 Condensed matter theory search committee, Physics department, 2016.
 Jack Harris Promotion to Professor, Physics, 2016-17.
 Qualifying committee 2016.
 Qualifying committee 2017.
 Graduate education committee, 2017 Fall only.

I also designed and taught, for nearly a decade, Physics 301a, which is a one semester course aimed at our freshmen and sophomores, to bridge the gap between their state of mathematical knowledge and what the faculty tends to assume. The book I wrote based on this course, **Basic Training in Mathematics**, now serves as the next.

In Fall 2007, my Introductory course Physics 200a, was video taped and made available on line as part of Yale's Open Courses, funded by the Hewlett Foundation. I had to prepare auxiliary notes, as well as new problems for weekly use as well as exams since copyright laws prevented posting the complete solutions of problems from any course book. These lectures are used worldwide and serve as core material for some courses especially in Latin America.

The second part 201b on electromagnetic theory and quantum mechanics was taped in Spring 2010 and released spring 2011.

In 2013 I finished a book on part 1 of these lectures to be published by Yale University Press.

Committee Work Outside Yale

1. Selection committee Dannie Heineman Prize of the American Physical Society in Mathematical Physics. 1997-1998
 2. General Member Aspen Center for Physics. Members run the center choosing programs, visitors etc. Only condensed matter theorist elected this year. 98-2003
 3. Member Division of Materials Research, Triennial Committee of Visitors (COV) 1999. This important activity, mandated by the National Science Board, ensures that NSF programs are being managed in a professional and responsible way. The COV is particularly important this year with the institution of the Government Performance and Results Act.
 4. Nomination Committee for Aspen center for Physics: Process renewals, new appointment, election of trustees and officers. 1999
- Nomination Committee for Aspen center for Physics: Process renewals, new appointment, election of trustees and officers. 2000.
- Colloquium committee Aspen Center for Physics.
- Chair Nomination Committee Aspen center for Physics, 2004
- Trustee Aspen Center for Physics 2004-
- Board of Directors, *Cogito*, Templeton Project, Johns Hopkins, 2005.
- Chair Heinz Pagels Summer Lecture Series, Aspen Center for Physics, 2006.
- Yale's Hewlett Project for taping Physics 200 lectures Fall 2006.
- Chair, Presidential Selection Aspen Center for Physics, 2007.
- Member, Scientific advisory Board, the Center for Correlated Electrons and Magnetism, Augsburg, Germany . Visited October 1-2, 2007.
- Visiting Committee Boston College Physics Department, Dec 10-11, 2009.
- Member, Scientific advisory Board, the Center for Correlated Electrons and Magnetism, Augsburg, Germany . Visited October 4-5, 2010.
- Julius Edgar Lilienfeld Prize selection committee, American Physical Society, 2010.
- Advisory Board, Kavli Institute for Physics, Santa Barbara 2010-2013
- Chair, Presidential Search of the Aspen Center for Physics, 2012-13.
- Presidential Search of the Aspen Center for Physics, 2016.