

Curriculum Vitae of T V Ramakrishnan

Personal Details

- Full Name : **Tiruppattur Venkatachalamurti Ramakrishnan (T.V. Ramakrishnan)**
- Date of Birth: 14th of August, 1941
- Address :
Department of Physics, Indian Institute of Science, Bangalore 560012, India. Also, Department of Physics, Banaras Hindu University, Varanasi 221005, India.
- Present Position:
 - Distinguished Associate, Centre for Condensed Matter Theory, Indian Institute of Science, Bangalore 560012, India. Also,
 - Emeritus Professor, Banaras Hindu University, Varanasi 221005, India.
DST Year of Science Chair Professor
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Educational Background

- B.Sc. with Honours in Physics and Mathematics, Banaras Hindu University, Varanasi, 1959
- M.Sc. in Physics, Banaras Hindu University, Varanasi, 1961
- Ph.D. in Physics, Columbia University, New York, USA, 1966

Professional Career

- CSIR Junior Research Fellow, Banaras Hindu University, Varanasi, 1961-62.
- Lecturer in Physics, Indian Institute of Technology (IIT) Kanpur, Oct. 1966-March 1967. Assistant Professor, March 1967- Dec. 1967.
- Assistant Research Physicist, University of California, San Diego, La Jolla, California, USA, Jan. 1968 -July 1970.
- Assistant Professor, Indian Institute of Technology, Kanpur, Sept. 1970 - Oct.1977.
- Professor, IIT Kanpur, Oct. 1977- July 1980.
- Visiting Fellow, Princeton University, Princeton, NJ, USA, Aug. 1978- Sept.1981.
- Consultant, Bell Laboratories, Murray Hill, NJ, USA, July 1980-Sept.1981.

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- Visiting Professor, Department of Physics, Indian Institute of Science, Bangalore, Oct.1981- Aug.1984.
- Coordinator, Research Programme on Disorder, Institute for Theoretical Physics, University of California, Santa Barbara, USA, Aug. 1983- Dec.1983.
- Professor, Department of Physics, Banaras Hindu University, Varanasi, Aug. 1984- April 1986.
- Professor, Department of Physics, Indian Institute of Science, Bangalore, April 1986-Aug. 2003.
- Visiting Professor and Visiting Research Physicist, Department of Physics, Princeton University, Princeton, NJ, USA, 1990-1991.
- Consultant, AT & T Bell Laboratories, Murray Hill, NJ, USA, 1990-1991.
- Honorary Professor, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore, 1993-2010.
- INSA Srinivasa Ramanujan Research Professor, 1997-2002.
- Rothschild Visiting Professor, Isaac Newton Institute for Mathematical Sciences, Cambridge University, May-June, 2000.
- DAE Homi Bhabha Chair Professor (held in Banaras Hindu University, Varanasi, 2003-2008)
- Distinguished Associate, Centre for Condensed Matter Theory, Department of Physics, Indian Institute of Science, Bangalore, 2003-present.
- Visiting Fellow Commoner, Trinity College, and Visiting Professor, Cambridge University, 2004.
- Honorary Distinguished Professor, IIT Kanpur, Oct. 2004-2006.
- Emeritus Professor, Banaras Hindu University, Varanasi, India, 2006-present.
- Hindustan Lever Research Professor, 2008- 2011
- NCBS-TIFR Distinguished Visiting Research Professor, April 2012 –March 2013.
- Distinguished Lifetime Professor, University of Mysore, 2013 – present.
- DST Year of Science Chair Professor, April 2013 - present.

Distinctions etc..

- Devasthale Prize in Physics, 1959.
- Higgins Fellow, Columbia University, New York, 1962-63; President's Fellow, Columbia University, 1963-66.
- Doctor of Science, Honoris Causa, Banaras Hindu University, Varanasi, 2004; IIT Kanpur, 2015; University of Calcutta, 2015.

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Fellowship

- Indian Academy of Sciences (Bangalore), 1980.
- Indian National Science Academy (New Delhi), 1984.
- American Physical Society (USA), 1984.
- Third World Academy of Sciences (Trieste, Italy), 1991.
- National Academy of Sciences (Allahabad), 1993.
- Royal Society (London), UK, 2000.
- Institute of Physics, UK, 2000.
- Honorary Fellow, TIFR, Mumbai, 2004.
- Foreign Associate, Academie des Sciences (Paris), France, 2005.
- Honorary Associate, IACS, Kolkata, 2006.

Awards

- Shanti Swarup Bhatnagar Award for Physical Sciences, CSIR, India, 1982.
- Third World Academy of Sciences Award in Physics, 1990.
- Mahendralal Sircar Award for Physical Sciences, 1994.
- Alumni Award for Excellence in Research, Indian Institute of Science, 1997.
- Jawaharlal Nehru Award for Science, MP Council for Science and Technology, 1999.
- C V Raman Centenary Medal, Indian Science Congress, 2001.
- Padma Sri, President of India, 2001.
- Meghnad Saha Medal, Asiatic Society, Kolkata, 2002.
- Distinguished Materials Scientist of the Year, Materials Research Society of India, 2004.
- Goyal Prize in Physics, Kurukshetra, 2004.
- Trieste Science Prize, 2005.
- G M Modi Award in Science, 2008.
- Firodia Award in Science, 2012.
- Hari Om Ashram Prerit Senior Scientist Award, 2014.
- G N Ramachandran Award in Physics, 2016.

Lectureship

- K S Krishnan Award Lecture, Indian National Science Academy, New Delhi, 1997
- Meghnad Saha Memorial Lecture, National Academy of Sciences, Allahabad, 2001
- National Lecturer, Indian Council of Philosophical Research, New Delhi, 2010-12.
- Meghnad Saha Memorial Lecture, Saha Institute of Nuclear Physics, Kolkata, 2015.

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Invited speaker at many international professional conferences, including

- Nobel Symposium 73 (Graftvallen, Sweden, June 1988) on Physics of Low-Dimensional Systems
- Critical Problems in Physics, a conference to commemorate 250 years of Princeton University, Aug. 1996
- Fifty Years of Condensed Matter Physics, Aspen, USA, Jan. 2000.
- Frontiers in Physics: Fortieth Anniversary of the Abdus Salam International Centre for Theoretical Physics, Trieste, Italy, Oct. 4-5, 2004.
- PWA 90 : Philip W Anderson Scientific Workshop and 90th Birthday Celebration, Princeton, NJ USA; Dec. 2013.

Member, Editorial Board

- International Journal of Modern Physics (World Scientific Pub. Co. Singapore); Physica B (North Holland, Amsterdam); Journal of Physics Condensed Matter (IOP, UK; 1991-94); Physical Review B (APS, New York, 1993-98), European Journal of Physics (IOP, UK).

Membership (etc.), Scientific Councils

- International Centre for Theoretical Physics, Trieste, Italy (1994-2003).
- Member, Union of Concerned Scientists, Cambridge MA, USA, 1994-present.
- Science and Engineering Research Council, Department of Science and Technology, Govt. of India, New Delhi (1994-2000)
- Saha Institute of Nuclear Physics, Calcutta, (1995-2003)
- Nuclear Science Centre, New Delhi, (1995-2000)
- Centre for Liquid Crystals Research, Bangalore, (1996- 2004)
- Vice-President, Indian National Science Academy, 2000-2003
- Inter University Consortium, Indore, (2001-2003)
- Indian Association for Cultivation of Science, Kolkata, (2004-2008)
- President, Indian Academy of Sciences, 2004-2006
- Chairman, Governing Council, Inter University Accelerator Centre, New Delhi 2005-2008
- Member, Executive Council, Banaras Hindu University, 2005-2008; 2011 - 2014
- Science Advisory Council to the Prime Minister (2005 - 2014)
- Chairman, Board of Governors, Indian Institute of Science Education and Research (IISER), Pune(2010 - 2015)
- Member, Board of Governors, Indian Institute of Technology, New Delhi (2011-2015)

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List of Publications

1. Neutron Proton Interaction, Nature 196, 761 (1962) (with V.K. Agarwal)
2. Local Moment Formation and the Kondo Effect, Phys. Rev. Lett. 20, 1370 (1968) (with M.J. Levine and R.A. Weiner).
3. Fluctuation Theory of Dilute Magnetic Alloys, Phys. Rev. B1, 3883 (1970).
4. Localized Dynamic Perturbations in Metals, Phys. Rev. B3, 1102 (1971) (with E.Muller-Hartmann and G. Toulouse).
5. Nonadiabatic Electron Response in Atom Scattering from Metal Surfaces, Solid State Comm. 9, 99 (1971) (with E. Muller-Hartmann and G. Toulouse).
6. Dielectric Behaviour and Exciton Binding in Semiconductors with Small Direct Gaps, in Narrow Gap Semiconductors, (D.L. Carter and R.S. Bate, Editors, Pergamon Press, 1971) p. 219 (with L.J. Sham).
7. Positron Annihilation in a Wigner Crystal, Phys. Rev. B7, 1850 (1973) (with C.K. Majumdar).
8. Lattice Instability and High Temperature Superconductivity, J. Phys. C6, 3041 (1973).
9. Microscopic Theory of Fluctuations in Itinerant Electron Systems : Ferromagnetism, Solid State Comm. 14, 449 (1974).
10. Microscopic Theory of Spin Fluctuations in Itinerant Electron Ferromagnets. I. Paramagnetic Phase, Phys. Rev. B10, 4014 (1974).
11. Covalence and Ionicity in Crystals, Chapter V in Solid State Chemistry (edited by C.N.R. Rao, Dekker, New York, 1974).
12. Electron Electron Interaction and Instabilities, in One Dimensional Metals, Springer Tracts on Modern Physics, (Springer Verlag, Berlin, 1975), Vol.34, p. 361
13. Thermal Properties of Nearly Ferromagnetic Fermi Systems, e.g. Liquid He³, in LT14; Proceedings of the 14th International Conference on Low Temperature Physics, Helsinki (edited by M. Krusius and M. Vuorio, North Holland, 1975), Vol.I, p. 57 (with S.G. Mishra).
14. Electron Interaction and Instabilities in One Dimensional Metals, Pramana, 7, 63 (1976).
15. Temperature Dependence of Spin Wave Stiffness in Itinerant Electron Ferromagnets, Magnetism Letters, 1, 17 (1976) (with S.G. Mishra).
16. Theory of the Liquid Solid Transition, Solid State Comm. 21, 389 (1977) (with M. Yussouff).
17. Spin Wave-like Modes in Itinerant Electron Paramagnets, in Proc. of the International Conference on Magnetism, Amsterdam 1976. Physica 86-88B, 378 (1977).
18. Absence of T² ln T Term in the Spin Susceptibility of Nearly Ferromagnetic Fermi Systems, J. Phys. C10, L667 (1977) (with S.G. Mishra).
19. Spin Fluctuation Curvature of Arrott Plot in Metallic Ferromagnets, Inst. Phys. Conf. Series 39, 528 (1978) (with S.G. Mishra).
20. Temperature Dependence of the Spin Susceptibility of Nearly Ferromagnetic Fermi Systems, Phys. Rev. B18, 2308 (1978) (with S.G. Mishra).
21. First Principles Order Parameter Theory of Freezing, Phys. Rev. B19, 2775 (1979) (with M. Yussouff).
22. Some Models for High Spin-Low Spin Transitions in Rare Earth Cobaltates, J. Phys. C12, 1307 (1979) (with S. Ramasesha and C.N.R. Rao).

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23. Scaling Theory of Localization : Absence of Quantum Diffusion in Two Dimensions, Phys. Rev. Lett. 42, 673 (1979) (with E. Abrahams, P.W. Anderson and D.C. Licciardello).
24. Possible Explanation of Nonlinear Conductivity in Thin-Film Metal Wires, Phys. Rev. Lett. 43, 718 (1979) (with P.W. Anderson and E. Abrahams).
25. Ionic Conductivity of Highly Defective Oxides, in Fast Ion Transport in Solids (eds. P. Vashishta, J. Mundy, G.K. Shenoy; North Holland, 1979), p. 653 (with E.C. Subbarao).
26. Scaling Theory of Localization and Non-Ohmic Effects in Two Dimensions, J. Noncrystalline Solids, 35, 15 (1980) (with E. Abrahams).
27. Theory of Weakly First Order Transitions in Compressible Ising Systems, J.Phys. C13, L957 (1980) (with S.N. Gadekar).
28. Pair Breaking in Superconductors Near and Below the Antiferromagnetic Transition, Phys. Rev. B24, 137 (1981) (with C.M. Varma).
29. Perturbative Theory of Mixed-Valent Systems, in Valence Fluctuations in Solids (L.M. Falicov, W. Hanke, M.B. Maple, eds. North Holland 1981) p. 13.
30. Effect of Mass Anisotropy on the Low Temperature Conductivity of Disordered Systems in Two Dimensions, Proc. of 16th Int. Conf. on Low Temperature Physics LT 16 (W.G. Clark, ed., North Holland, 1981) (Physica 108 B+C, 2078 (1981)) (with R.N. Bhatt).
31. Magnetoresistance in Three Dimensional Disordered Metals, Proc. of 16th Int. Conf. on Low Temperature Physics LT 16 (W.G. Clark ed., North Holland, 1981) Physica 108 B+C, 507 (1981) (with T.F. Rosenbaum et al.).
32. Quasiparticle Lifetime in Disordered Two Dimensional Metals, Phys. Rev. B24, 6783 (1981) (with E. Abrahams, P.W. Anderson and P.A. Lee).
33. Low Temperature Magnetoresistance of a Disordered Metal, Phys. Rev. Lett. 47, 1758(1981) (with T.F. Rosenbaum et al).
34. Why Does Devonshire's Theory Work so Well? in Proc. of the 5th Int. Meeting on Ferroelectrics, Pennsylvania, 1981 Ferroelectrics 35, 249 (1981). (with S.N. Gadekar).
35. Magnetoresistance of Weakly Disordered Electrons, Phys. Rev. B26, 4009 (1982) (with P.A. Lee).
36. Density Wave Theory of First Order Freezing in Two Dimensions, Phys. Rev. Lett. 48, 541 (1982).
37. Theory of a Mixed Valent Impurity, Phys. Rev. B26, 1798(1982) (with K. Sur).
38. Mixed Valent and Kondo Systems, Configurational and Fermi Liquid Approaches, in Valence Instabilities, (P. Wachter and A.H. Boppert, eds., North Holland, Amsterdam, 1982) p. 35.
39. Theory of Universal Degradation of T_c in High Temperature Superconductors, Phys. Rev. B28, 117 (1983) (with P.W. Anderson and K.A. Muttalib).
40. Localization and Diffusion, in Stochastic Processes : Formalism and Applications, (G.S. Agarwal and S. Dattagupta, eds., Springer-Verlag, Berlin, 1983) p. 270.
41. Conductivity Scale in Disordered Systems, Phys. Rev. B28, 6091 (1983) (with R.N. Bhatt).
42. Density Wave Theory of Freezing and the Solid, Pramana, 22, 365 (1984).
43. The Insulating Phase of a Disordered System : Fermi Glass vs. Electron Glass, J. Phys. C17, L639 (1984) (with R.N. Bhatt).

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44. Remarks on Large Orbital Degeneracy and on Transport Properties of Mixed Valent Systems, in Moment Formation in Solids (ed. W.J.L. Buyers, Plenum Press, New York, 1984) p. 249.
45. Liquid to Solid Transformation, in Phase Stability and Phase Transformations, (ed. R. Krishnan, Trans. Tech. Publications, Switzerland, 1984) p. 57.
46. Dipolar Reorientation and Phase Transition in Mixed Alkali Halide/Alkali Cyanide Crystals, Phys. Rev. Lett. 53, 2489 (1984) (with S. Nagel and J. Sethna).
47. Theory of Anomalous Hall Effect in Kondo Lattice and Mixed Valent Systems, in Valence Fluctuations, (eds. E. Muller-Hartmann and D. Wohlleben, North Holland, 1984) p.493 (with P. Coleman and P.W. Anderson).
48. Fluctuation Theory of Specific Heat of Liquid He³, Phys. Rev. B31, 2825 (1985) (with S.G. Mishra).
49. Ultrasonic Attenuation in Strongly Disordered Electronic Systems, Phys. Rev. B31, 8188 (1985) (with G. Kotliar).
50. Localization and Interaction Effects in Anisotropic Disordered Systems, Phys. Rev. 32, 569 (1985) (with P. Wolfle and R.N. Bhatt).
51. Theory of Anomalous Hall Constant of Mixed Valence Systems, Phys. Rev. Lett. 55, 414 (1985) (with P.W. Anderson and P. Coleman).
52. Metal Insulator Transition in Disordered Systems, in Recent Advances in Theoretical Physics, (R. Ramachandran, Ed., World Scientific, Singapore, 1985). p.283.
53. Instability of the Mean Boson Field Solution for Strongly Correlated Fermi Systems, J. Phys. C19, L1 (1986).
54. Metal-Insulator Transition in Advances in Solid State Chemistry (Ed. C.N.R. Rao, Indian National Science Academy, New Delhi, 1986) p. 217.
55. Theory of the Mixed Valent State, J. Mag. and Mag. Materials 63 & 64, 529 (1987).
56. High Temperature Superconductivity in Mixed Valent Copper Oxides: Relation Between T_c and the Nominal $Cu^{3+} Cu^{2+}$ Ratio, Solid State Comm.63, 835 (1987) (with K. Sreedhar and C.N.R. Rao).
57. Absorption of Electromagnetic Radiation by Superconducting $YBa_2Cu_3O_7$: An Oxygen Induced Phenomenon (with S.V. Bhat, P. Ganguly and C.N.R. Rao) J. Phys. C20, L559-63(1987).
58. Microscopic Theory of Strongly Correlated Fermi Systems, in Theoretical and Experimental Aspects of Valence Fluctuations and Heavy Fermions, (eds. L.C. Gupta and S.K. Mallik, Plenum, New York, 1987) p. 109 (with B.S. Shastry).
59. Some Remarks on the Gutzwiller Wave Function, *ibid.*, p. 509 (with B.S. Shastry).
60. Energies of Mixed Valent Systems, *ibid.*, p. 521 (with Leena Chandran and H.R. Krishnamurthy).
61. Density Wave Theory of Dislocations in Solids, Phys. Rev. B37, 1936 (1988) (with M. Raj Lakshmi and H.R. Krishnamurthy).
62. Hole Spin Model for Oxides, Physica C 153-155, 555 (1988).
63. Conference Summary (Theory):Proceedings of the 6th International Conference on Crystal Field Effects and Heavy Fermion Physics (eds. W. Assmus, P. Fulde, B. L'uthi, F. Steglich), Int. J. Mag. and Mag. Materials, 76-77, 657 (1988).
64. Disordered Superconducting Thin Films, in Physics of Low Dimensional Systems (Nobel Symposium 73, eds. S. Lundqvist and N.R. Nilsson), Physica Scripta T27, 24, (1989).

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65. Dielectric Properties of Glasses Prepared by Quenching Melts of Superconducting Bi-Ca-Sr-Cu-O Cuprates, *Appl. Phys. Lett.* 55, 75 (1989) (with K.B.R. Varma, G.N. Subbanna and C.N.R. Rao).
66. Systematics in Thermopower Behaviour of Several Series of Bi and Tl Cuprate Superconductors, *Physica C* 165, 183 (1990) (with C.N.R. Rao and N. Kumar).
67. Theory of Freezing (Proceedings of Seventh International Conference on Liquid and Amorphous Metals, Kyoto, Sept. 1989, North Holland, Amsterdam), *J. Noncryst. Solids*, 117-118, 852 (1990).
68. Mott Transition and the Strongly Correlated Metal (International Conference on Physics of Highly Correlated Electron Systems, Santa Fe, Sept. 1989), *Physica B* 163, 34 (1990).
69. The Mott Transition (Invited Talk at the Raman Centenary Symposium, Dec. 1988, Bangalore) *Current Science*, 59, 1125 (1990).
70. Electronic States in a Disordered Metal; Magnetic Transport in Doped Ge, *Phys. Rev.* B42, 3406 (1990), (with T.F. Rosenbaum, S. Pepke and R.N. Bhatt).
71. Phonons in Solids Using Liquid State Data, *Phys. Rev.* B44, 9944 (1991) (with H.R. Krishnamurthy and M.C. Mahato).
72. Anomalous Enhancement of Electron Dephasing from Magnetoresistance Data in $Bi_2Sr_2CuO_6$, *Phys. Rev. Lett.* 67, 761 (1991) (with T.W. Jing, N.P. Ong, J.M. Tarascon and K. Remschnig).
73. Anomalous Magnetoresistance and Hall Current in the Normal State of the Cuprate Superconductors (Proceedings of the Kanazawa International Conference on High T_c Superconductors : 1991) *Physica C*, 185-189, 34 (1991) (with N.P. Ong, T.W. Jing, T.R. Chien, Z.Z. Wang, J.M. Tarascon and K. Remschnig).
74. Flux Pinning and Flux Creep in High T_c Superconductors, *Physica C* 183, 61 (1991) (with C. Dasgupta).
75. Freezing of the Flux Liquid in High T_c Superconductors - A Density Functional Approach, *Phys. Rev. Lett.* 67, 3444 (1991) (with S. Sengupta, C. Dasgupta, H.R. Krishnamurthy and G.I. Menon).
76. Electronic Structure of High T_c Superconductors and Related Compounds, *Pramana (Letters)* 38, L531, 1991 (with H.R. Krishnamurthy, S. Ramasesha, D.D. Sarma, S. Seva Nimkar and P.P. Mitra).
77. Pressure-induced Valence Changes in Mixed-Valent Systems, *J. Phys. Cond. Matt.*, 4, 7067 (1992) (with H.R. Krishnamurthy and L. Chandran).
78. Density Wave Theory of Freezing and of Interfaces, in *Interfaces, Structure and Properties* (Ed. S. Ranganathan, C.S. Pande, B.B. Rath and D.A. Smith, Oxford and IBH, New Delhi, 1993) p.33 (with S. Sengupta).
79. Exotic Physics in the Negative-U, Extended-Hubbard Model for Barium Bismuthates, *Europhysics Letters*, 21, 79, 1993 (with H.R. Krishnamurthy, A. Taraphder and Rahul Pandit).
80. Superfluid and Insulating Phases in an Interacting Boson Model : Mean Field Theory and the RPA, *Europhysics Letters* 22, 257 (1993) (with H.R. Krishnamurthy, K. Seshadri and Rahul Pandit).
81. Boson Localization, in *Ordering Disorder; Prospect and Retrospect: in Condensed Matter Physics* eds. V.Srivastava, A.K.Bhatnagar and D.F.Naagle (AIP Conference Proceeding 286, New York, 1994) p.38.
82. Metal Insulator Transitions - New Phenomena, New Questions : *J. Solid State Chem.* 111, 4 (1994).

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83. Anomalies in Free Flux-Flow Hall Effect, Phys. Rev. Lett. 73, 1699-1702 (1994) (with S. Bhattacharya and M.J. Higgins).
84. Density Functional Theory of the FCC-BCC Interface, Europhys. Lett. 27, 587 (1994) (with S. Sengupta and H.R.Krishnamurthy).
85. Microscopic Theory of Vortex Dynamics, Physica C 235-240, 245 (1994) (with D.M. Gaitonde).
86. Fluid to Solid, in Topics in Condensed Matter Physics (ed. M.P. Das, Nova Science Publishers, New York, 1994).
87. Negative-U Extended Hubbard for Doped Barium Bismuthates, Phys.Rev.B 52, 1368 (1995). (with A. Taraphder, H.R. Krishnamurthy and Rahul Pandit)
88. Percolation Enhanced Boson Localization in the Disordered Bosonic Hubbard Model, Phys. Rev. Lett. 75, 4075 (1995). (with K. Sheshadri, H.R. Krishnamurthy and Rahul Pandit).
89. Structure, Electron Transport Properties and Giant Magnetoresistance of Hole Doped LaMnO₃ Systems, Phys. Rev. B 53, 3348 (1996) (with R. Mahendiran, S.K. Tiwary, A.K. Raychaudhuri, R. Mahesh, N. Rangavittal and C.N.R. Rao).
90. Freezing of a Vortex Liquid in Layered Superconductors, Phys.Rev.B 54, 16192(1996) (with G.I. Menon, C. Dasgupta and H.R. Krishnamurthy).
91. Coherence and Localization in 2d Luttinger Liquids, Phys.Rev.Lett.77 4241 (1996) (with P.W. Anderson, S. Strong and D.G. Clark).
92. Inertial Mass of a Vortex in Cuprate Superconductors, (Phys. Rev. B 58, 11951 (1997) (with D.M. Gaitonde).
93. High Temperature Superconductors: Facts and Theories, in Critical Problems in Physics (eds. VL Fitch, D Marlow and R Taylor, Princeton University Press, 1997) p. 180.
94. Colossal Magnetoresistance Oxides: Phenomena and Questions, Phil. Trans. Roy. Soc. Lond. A 356, 1-15 (1998).
95. Magnetic Field Induced id_{xy} Order in a $d_{x^2-y^2}$ Superconductor, (Proceedings of SNS 97, Cape Cod, USA) J. Phys. Chem. Solids, 59, 1750 (1998).
96. Colossal Magnetoresistance in Oxides: Some Questions, in Colossal Magnetoresistance, Charge Ordering, and Related Properties of Manganese Oxides, eds.C.N.R.Rao and B.Raveau, World Scientific, Singapore, 1998.
97. Muon-spin Rotation Spectra in the Mixed Phase of High- T_c Superconductors: Thermal Fluctuation and Disorder Effects (with Gautam I. Menon and Chandan Dasgupta), Phys. Rev. B 60,7607-7621 (1999).
98. Electronic Properties of the Vortex State in Cuprate Superconductors, J. Solid State Chem. 148, 85-92 (1999).
99. Effective Actions and Phase Fluctuations in d-Wave Superconductors, Phys. Rev. B 62, 6786 (2000). (with Arun Paramakanti, Mohit Randeria, and S.S.Mandal) .
100. Localization Yesterday, Today and Tomorrow, in Fifty Years of Condensed Matter Physics, eds., R.N. Bhatt and N.P. Ong, Princeton University Press, 2001, p.9-32.
101. Quasiparticles in the Mixed Phase of Superconducting Cuprates: A Semiclassical Green's Function Approach, J. Stat. Phys. 103, 441 (2001). (with A K Rajagopal).
102. Small Polarons in Dense Lattice Systems, J. Low Temp. Physics 126, 1055 (2002) (with G Venketeswara Pai).
103. Ground State Vortex Lattice Structures in d-Wave Superconductors (with S S Mandal) Phys. Rev. B 65, 184513 (2002).

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104. Raman Scattering in Charge Ordered $Pr_{0.63}Ca_{0.37}MnO_3$: Anomalous Temperature Dependence of Linewidth (with Rajeev Gupta, G Venketeswara Pai, A K Sood and C N R Rao) Europhysics Letters 58, 778 (2002).
105. Zero Temperature Insulator Metal Transition in Doped Manganites, Europhysics Letters 64, 696 (2003) (with G V Pai, S R Hassan and H R Krishnamurthy).
106. Colossal Magnetoresistance: A New Approach. Proc. Ind. Acad. Sci. (Chemical Sciences) 115, 767 (2003) (with H R Krishnamurthy, S R Hassan and G V Pai).
107. Theory of Manganites Exhibiting Colossal Magnetoresistance, in Physics of Manganites ed. T Chatterji, Kluwer Academic Publishers, Dordrecht, Holland Feb. 2004 (Also cond-mat 0308396) (with H R Krishnamurthy, S R Hassan and G V Pai).
108. Theory of Insulator Metal Transition and Colossal Magnetoresistance in Doped Manganites, Phys. Rev. Lett. 92, 157203 (2004) (with H R Krishnamurthy, S R Hassan and G V Pai).
109. Tracking Operator State Fluctuations in Gene Expression in Single Cells, Biophysical Journal 86, 3052 (2004) (with B Banerjee, S Balasubramanian, G V Shivashankar and G Ananthakrishna).
110. The Origins and Implications of Long-tailed Distributions in Gene Expression, PNAS 102, 4771, 2005 (with S Krishna, B Banerjee, and G V Shivashankar).
111. Doping and Magnetic Field Induced Insulator-Metal Transitions in Half-Doped Manganites, Phys. Rev. Lett. 94, 24727 (2005) (with O Cepas and H R Krishnamurthy).
112. Instabilities and Insulator-Metal Transitions in Half-Doped Manganites Induced by Magnetic Field and Doping, Phys.Rev.B 73,035218(2006) (with O Cepas and H R Krishnamurthy)
113. Theory of the Unusual Doping and Temperature Dependence of Photomission Spectra in Manganites, Europhysics Letters 82, 47010(2008) (with P Sanyal, Subhro Sengupta, Nandan Pakhira, HR Krishnamurthy and DD Sarma)
114. Fluctuations in Protein Synthesis from a Single RNA Template:Stochastic Kinetics , Phys.Rev.E 79,011916 (2009) (with D.Chowdhury and A.Garai)
115. Stochastic Kinetics of Ribosomes: Single Motor Kinetics and Collective Properties, Phys.Rev.E 80,0111908,2009 (with D. Chowdhury, D. Chowdhury and A. Garai)
116. Long Range Coulomb Interaction and Nanoscale Electronic Inhomogeneities in Correlated Oxides , Phys.Rev.B. 80,12521(2009) (with Tribikram Gupta, Vijay Shenoy and H R Krishnamurthy)
117. Intrinsic Electron Localization in Manganites, Int.J.Mod.Phys.B 24,1664(2010) (Special Issue on 50 Years of Anderson Localization)
118. Phenomenological Ginzburg Landau Like Theory for Superconductivity in the Cuprates : cond-mat 1007.3287 and Phys.Rev.B.83, 024510, 2011 (with S.Banerjee and C.Dasgupta)
119. Novel Effects of Localization Due to Intrinsic Disorder in Manganites, Eur. J.Phys. 81, 393 (2011) (with P.Sanyal, V Shenoy and H.R. Krishnamurthy)
120. Pairing Fluctuations Determine Low Energy Electronic Spectra in Cuprate Superconductors: cond-mat 1011.4543 (Phys. Rev.B 84, 144525,2011) (with S. Banerjee and C.Dasgupta)
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2. The Metal Insulator Transition, in *Metallic and Non-metallic States of Matter*, (Sir Nevill Mott's 80th Birthday Festschrift; eds. P.P. Edwards and C.N.R. Rao, Taylor and Francis, London, 1986) p. 16.
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9. Many Electrons Strongly Avoiding Each Other: Strange Goings On (book chapter in *Legacy of Albert Einstein*, ed.S.Wadia, World Scientific,Singapore, 2006)
10. Modelling Colossal Magnetoresistance Manganites , J.Phys.Cond.Mat. 19,125211,2007
11. Strong Electronic Correlations in Solids, Current Science, 95, 1284, 2008 (No.9, Nov.10, 2008)
12. Experimental Features of High Superconducting T_c Cuprates: A Theorist's Viewpoint (to appear, Advances in Physics, 2017).

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Books

1. *Non Debye Relaxation in Condensed Matter*, (World Scientific, Singapore, 1987 (ed. with M. Raj Lakshmi).
2. *Physics* (a text book in four volumes for classes XI and XII; for all schools affiliated to the Central Board of Secondary Education, New Delhi, India) (coauthored with five others; editor and convenor, writing team; NCERT, New Delhi, 1988-89. Chairman, writing team, and editor, completely rewritten new edition, NCERT, New Delhi, 1995).
3. *Superconductivity Today*, (An elementary introduction) (Wiley Eastern, New Delhi, 1992. Second edition, Universities Press, Hyderabad, 1999).(with C.N.R. Rao).
4. *Introduction to Condensed Matter Physics* (in preparation).

General

1. Condensed Matter Physics in India, p.159 : in *History of Science, Philosophy, and Culture in Indian Civilization Vol.XIII.pt.I* (General Editor, D.P.Chattopadhyay, volume on *India's Contribution to Global Physics*, edited by AN Mitra. Imprint: Pearson Education , New Delhi, 2008)
2. Banaras Hindu University and Science in India, 1916-1947, p.947 in *History of Science, Philosophy, and Culture in Indian Civilization Vol.XV.pt.I* (General Editor, D.P.Chattopadhyay, volume on *Science and Modern India, an Institutional History*, edited by U.Dasgupta. Imprint: Pearson Education,New Delhi, 2010)
3. Physics, p.321: in *Science in India – Achievements and Aspirations , 75 Years of the Academy* (editors H Y Mohan Ram and P N Tandon, Indian National Science Academy, New Delhi, 2010)
4. Superconductivity Yesterday, Today and Tomorrow (Dream 2047, DST, New Delhi, May 2012, Vol. 14 , May 2012 p.35)
5. In Conversation (Current Science, 103, 473, 2012)
6. Vivekananda and Modern Science (*Swami Vivekananda and Youth*, RKM VCC, Rahra, Kolkata, 2015).
7. Anderson and Condensed Matter Physics, p.39 (in PWA 90; a lifetime of emergence. Eds. P. Chandra, P. Coleman, G. Kotliar, P. Ong, D.L. Stein, C. Yu; World Scientific, Singapore, 2015).
8. One Subject; Two Lands: My Journey in Condensed Matter Physics. (Annu. Rev. Condens. Matter Phys. 7, 1-10, 2016)
9. Rediscovering our Universities (Guest Editorial, Current Science, 110, 1879, 2016).
10. Living Legends in Indian Science: C.N.R. Rao (Current Science, 111, 936, 2016).
11. Nobel Prize in Physics 2016 (Current Science, to appear).

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Current Activities

1. Research

- a) **High Temperature Superconductivity:** Further development of a novel phenomenological theory proposed, implemented and confronted successfully with experiment in papers 118, 120, 122 as also 123 and 127. Ineluctable complexity. Microscopic theory. Novel theory of quantum oscillations in superconducting cuprates. Salient, characteristic, experimental features needing new ideas and comprehensive theory.
- b) **Strongly correlated electron systems:** High temperature incoherence and low temperature quantum coherent fluid. Linear resistivity.
- c) **Quantum spin liquids:** Ubiquity of Kitaev like correlations. New theoretical approaches for comparison with observed spatial, temporal and thermal spin correlations.

2. Education

- a) General popular articles on condensed matter physics.
- b) Textbooks in condensed matter physics:- elementary, intermediate, advanced; novel electronic modular versions.