

Avijit Lahiri, Resumé

A. General

Name: AVIJIT LAHIRI

Date of birth: 19 May, 1948.

Address (residence): 252 Laketown (first floor), Block A, Kolkata 700 089, India.

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B. Professional and academic

B1. Present employment and designation : Retired.

B2. (Formerly) Associate Professor of Physics,

Vidyasagar Evening College (Now Vidyasagar Metropolitan College)

Kolkata 700 006, India.

B3. Academic qualifications:

M.Sc (Calcutta University, 1968)

Post-M.Sc (Saha Institute of Nuclear Physics. 1969-70)

Ph. D. (Calcutta University, 1975)

B4. Teaching experience:

Undergraduate physics courses at

Vidyasagar Evening College, Kolkata,

1972-2008.

B5. Additional Teaching Experience

Acted from time to time as part time invited Faculty in University of Kalyani, West Bengal (course on Non-equilibrium Thermodynamics in M. Sc Biophysics class), and Saha Institute of Nuclear Physics, Calcutta (Courses on Non-equilibrium Thermodynamics and on Non-linear Dynamics in Post-M.Sc class).

Delivered a lecture course at U.G.C. Refresher Course in Physics, University of Kalyani, West Bengal, held in February, 2004; delivered 4 (four) courses of lectures at U.G.C. Refresher Courses for college teachers at Calcutta University (1999, 2001, 2005, 2008).

Delivered a one-semester Post-Graduate course on Classical Mechanics at S. N. Bose National Centre for Basic Sciences, Kolkata (July-December, 2002).

B6. Research Interests

Current research interests include (a) Quantum measurement theory, (b) Non-equilibrium statistical mechanics (c) Philosophy of science, (d) Philosophy of mathematics.

B7. Summary of publications

Publications in Indian Journals : 3 (including 2 (two) invited articles)

Publications in Proceedings of Seminars and Symposia (India) : 2

Miscellaneous : 3

Publications in International Journals : 43

Books under sole authorship : 5

Books under preparation : 2

B8. Invited lectures delivered (since 1993)

(1) Lecture on 'Quasi-energy Spectra in Driven Systems and Quantum Non-recurrence', at Seminar on Computational Aspects in Chaos and Non-linear Dynamics, Dept of Physics, Maharajas College, Cochin, India, 21-25 March, 1994.

- (2) Introduction to Bifurcation Theory and Chaos in Dynamical Systems; course of five lectures delivered at Saha Institute of Nuclear Physics, Kolkata, May 10, 17, 24, and June 7, 14, 1994.
- (3) The Caratheodory Approach in Thermodynamics; two lectures delivered at Relativity and Cosmology Research Centre, Dept of Physics, Jadavpur University, India, July 19, 26, 1994.
- (4) One lecture at University of Pune, on 'Quasiperiodic Motions in Dissipative and Conservative Maps', 1994.
- (5) Two lectures at Physical Research Laboratory, Ahmedabad, India, on 'Bifurcations in Area-preserving Mappings, and Quasienergy Spectra in Driven Quantum Systems', 1994.
- (6) Seminar talk on 'Quasiperiodicity in Classical and Quantum Dynamics' at School on Complex Systems, Indian Association for the Cultivation of Science, Kolkata, January, 1995.
- (7) Quantum Time-evolution under Periodic Driving; talk delivered at Saha Institute of Nuclear Physics (Theoretical Nuclear Physics Division), Kolkata, 1996.
- (8) Regular and Irregular Motions in Hamiltonian Dynamics ; course of three lectures delivered at Relativity and Cosmology Research Centre, Dept of Physics, Jadavpur, University, Kolkata, 1996.
- (9) One lecture on 'Discrete Breathers : Exact Solutions in Piecewise Linear Models' at the seminar 'Condensed Matter Days : 1999' at Jadavpur University, Kolkata, 27 August, 1999.
- (10) One lecture on 'Classical Chaos and Quantum Time Evolution' at National Workshop on Non-linear Dynamics, at IIT Kharagpur, 29 Feb-3 March, 2000.
- (11) One lecture on 'A Heartful of Chaos' at Institute of Theoretical Physics, 4/1 Mohun Bagan Lane, Kolkata, 16 Sept, 2000.
- (12) One lecture on 'Localised excitations in Discrete Lattices' at Indian Association for the Cultivation of Science, Kolkata., 10 August, 2001.
- (13) One lecture on 'Quantum Computers – an Elementary Introduction' at Kalyani University, 24 June, 2002 (organised by Indian Association of Physics Teachers).
- (14) Course of two lectures on 'The Parametrically Driven Pendulum' at Presidency College, Kolkata, 28-29 June, 2002.
- (15) Seminar talk on 'Introduction to Deterministic Chaos', at Jogesh Ch.College, Kolkata (14 January, 2003).
- (16) Seminar talk on 'Quantum Chaos : Stationary and Dynamical Features', at Indian Association for the Cultivation of Science, Kolkata (24 January, 2003).

- (17) Seminar talk on 'Science in the Present Century : Some Thoughts and Opinions', at Ramsaday College, Amta, Howrah, West Bengal, on 25. 2. 2003.
- (18) Seminar talk on 'Reduced Entropy : in Statistical Mechanics and in Quantum Chaos', at Institute of Physics, Bhubaneswar, on 4 June, 2003.
- (19) Course of three lectures on 'Stationary Points of Functions of several Variables, and Introduction to Calculus of Variations', presented to I year Physics (Hons) students of Presidency College, Kolkata, on 19 and 23 June, 2003.
- (20) Lecture on 'Reduced Density Matrix: in Statistical Mechanics and in Quantum Chaos', at Saha Institute of Nuclear Physics, Kolkata, 13 Oct, 2003.
- (21) Four lectures, on 'Local Description of Flows and Mappings: Normal Forms and Bifurcations', at National School on Nonlinear Dynamics, Indian Statistical Institute, Kolkata, 21.12.03 to 27.12.03.
- (22) Two lectures on 'Maxwell's Demon' at Dept of Physics, Presidency College, Kolkata, on 21.6.04, 22.6.04.
- (23) One lecture on 'Maxwell's Demon' at Dept of Physics, Moulana Azad College, Kolkata, on 27 september, 2004.
- (24) Two lectures on 'Dynamical Signatures of Quantum Chaos' presented at Second National Workshop on Techniques in Applied Mathematics, held at Department of Applied Mathematics, University of Calcutta, June 20-28, 2006.
- (25) Lecture on 'Nonlinear Dynamics and Chaos' at national seminar at Sammilani Mahavidyalaya, Kolkata, 25 Oct, 2006.
- (26) Lecture on 'Acharya Jagadish Chandra: the Soul of Indian Science', at Acharya Jagadish Chandra Bose College, Kolkata, 30 Nov, 2007.
- (27) Two lectures on 'Respiration as Biological Rhythm: Chaos in Temporal Order', delivered at International Workshop on Complex Systems, organized by Indian Statistical Institute, Kolkata, and West bengal University of Technology, Kolkata, 24 and 25 March, 2008.
- (28) Two lectures on (a) Centre manifolds and normal forms: a short introduction, and (b) Populations of interacting nonlinear oscillators: the Kuramoto model; at Workshop on "Stability and Bifurcation Analysis and Pattern Formation in Mathematical Ecology and Epidemiology" held during 25th February to 2nd March, 2011, at Indian Institute of Technology, Kanpur.
- (29) Six lectures at Dept of Applied Mathematics, Calcutta University, on 'Bifurcations in flows and maps: a brief introduction', September, 2011.

(30) Two lectures on 'Fermat's principle: the nature of extrema' at workshop organized by Indian Association of Physics Teachers, at Kolkata, 21 June, 2012.

(31) One lecture on 'Coherence in classical and quantum optics' at Department of Physics, University of Calcutta, 27 June, 2012.

(32) One lecture at DST_JBNSTS INSPIRE Science Camp, held in Kolkata, 24 March, 2015, on 'Logic in Mathematics and the Sciences'.

B9. Courses Delivered as Resource-person at Refresher Courses, University of Calcutta, and University of kalyani, West Bengal, India

(i) Two lectures on 'Topics and Problems in Under-graduate Physics', 1999 (Seventh Refresher Course in Physics, University of Calcutta).

(ii) Four lectures on 'Fundamentals of Atomic Spectroscopy', on 4.9.2001, 5.9.2001, 7.9.2001, 10.9.01 at 9th Refresher Course in Physics at University of Calcutta.

(iii) Two lectures on 'Principle of Least Action : Nature of Stationarity' at Refresher Course, Dept of Physics, Univ of Kalyani, 11.2.04

(iv) Three lectures on 'Statistical Mechanics: a brief outline', at 13th Refresher Course in Physics, held at University of Calcutta, 9.7.05, 11.7.05, 13.7.05.

(v) Four lectures on 'Diffraction, Image Formation, and Fourier Optics' presented at 16th Refresher Course held at University of Calcutta, September, 2008.

C. List of Publications

01. T. Pradhan and A. Lahiri : Finite Quantum Electrodynamics ; Proc. Ind. Acad. Sci., vol. LXXVIII, no.1 (1973) 25 - 35.
02. S.K. Majumdar, D. Adhikari and A. Lahiri : Thermal Conductivity of a Gaseous Plasma ; Plasma Phys. 415, 1 (1973) 1259 - 61.
03. T. Pradhan and A. Lahiri : Finite Quantum Electrodynamics ; Phys. Rev. D 10 (1974) 1872 - 82.
04. Avijit Lahiri : The Functional Approach in Biology ; Biosystems 9 (1977) 57 - 68.
05. Debajyoti Bhaumik, Binayak Dutta-Roy and Avijit Lahiri : The van der Waals' Interaction between Loose Structures ; Phys. Lett. A 68 (1978) 131 - 34.
06. Debajyoti Bhaumik, Binayak Dutta-Roy and Avijit Lahiri :Effect of the Intervening Medium and Feeding of Energy into polar Modes on Macromolecular Interactions ; Phys. Lett. A 69 (1978) 68 - 72.
07. Dilip Goswami, Avijit Lahiri and Brahmananda Dasgupta : A Generalised Prey-Predator Model ; J. Theor. Biol. 79 (1979) 243 - 46.
08. N.K. Nag, S.S. Ganguly and A. Lahiri : Intermediate Ballistics, a Derivation of Distribution Pattern of Gun Discharge Residue on Target ; Memorial de l'Artilerie Francaise, 54 (1980) 683 - 94.
09. Debajyoti Bhaumik, Binayak Dutta-Roy and Avijit Lahiri : Solitary Waves and Macromolecular Systems ; Bull. Math. Biol. 44 (1982) 705 - 13.
10. Debajyoti Bhaumik, Binayak Dutta-Roy, Tarun Kanti Chaki and Avijit Lahiri : Electric Field Dependence of Phase Transitions in Bilayer Lipid Membranes and Possible Biological Implications ; Bull. Math. Biol. 45 (1983) 91 - 101.
11. A. Lahiri, D. Goswami and Brahmananda Dasgupta : Multiple Pulse Homoclinic Orbits in a Nerve Conduction Equation ; Phys. Lett. A 108 (1985) 173 - 176.
12. A. Lahiri, D.K. Goswami and Brahmananda Dasgupta : Chaotic Wavetrains in a Nerve Conduction Model ; Phys. Lett. A 111 (1985) 246 - 250.
-Errata , Phys. Lett. A 121 (1987) 466.
13. A. Lahiri, D.K. Goswami and Brahmananda Dasgupta : A Model for Nerve Impulse Propagation involving Phase Change in Membrane Lipid ; Phys. Lett. A 111 (1985) 256 - 260.
14. N.K. Nag and A. Lahiri : An Evaluation of Distribution of Pellets due to Shotgun Discharge ; Forensic Sc. International, 32 (1986) 151 - 59.

15. Avijit Lahiri and S.S. Ghosal : Spatial Patterns in a Simple Reaction-Diffusion System ; Phys. Lett. A 124 (1987) 47 - 52.
16. Avijit. Lahiri and S.S. Ghosal : Spatially Inhomogeneous Structures in One-dimensional Array of Brussellators ; J. Ch. Phys. 88 (1988) 7459 - 67.
17. Avijit Lahiri and Tarasankar Nag : Intermittency in Inverted Pitchfork Bifurcations in Dissipative and Conservative Maps ; Phys. Rev. Lett. 62 (1989) 1933 - 36.
18. Kumkum Bhattacharya, Avijit Lahiri, Debajyoti Bhaumik and Binayak Dutta-Roy ; Oscillator Approach to the Problem of Hydrogen Atom in a Magnetic Field and Feneuille Scaling ; J.Phys. A : Math.Gen. 23 (1990)4455 - 62.
19. Tarun Kanti Roy and Avijit Lahiri : Localisation and Mobility Edges in a One-dimensional Lattice with a Self-similar Feigenbaum Structure ; J. Phys. : Condens. Matt., 3 (1991) 1153 - 64.
20. M.B. Sevryuk and A. Lahiri : Bifurcations of Families of Invariant Curves in Four-dimensional Reversible Mappings ; Phys. Lett. A 154 (1991) 104 - 110.
21. Tarun Kanti Roy and Avijit Lahiri : Reversible Hopf Bifurcation in Four-dimensional Maps ; Phys. Rev. A 44 (1991) 4937 - 44.
22. Avijit Lahiri : Inverted Period Doubling Sequences in Four-dimensional Reversible Maps and Solutions to the Renormalisation Equations ; Phys. Rev. A 45 (1992) 757 - 62.
23. A. Lahiri, A. Bhowal, T.K. Roy and M.B. Sevryuk : Stability of Invariant Curves in Four-dimensional Mappings near 1:1 Resonance ; Physica D 63 (1993) 99 - 116.
24. Avijit Lahiri : Non-recurrent Quantum States : Systems with Singular-Continuous and Discrete Spectra ; Phys. Rev. Lett. 70 (1993) 1611 - 14.
25. A. Bhowal, T.K. Roy and A. Lahiri : Small-angle Krein Collisions in a Family of Four-dimensional Reversible Maps ; Phys. Rev. E 47 (1993) 3932 - 40.
26. A. Bhowal, T.K. Roy and A. Lahiri : Hopf Bifurcation in Four-dimensional Reversible Maps and Renormalisation Equations ; Phys. Lett. A 179 (1993) 9 - 14.
27. Avijit Lahiri : Inverted Bifurcations in Reversible Maps and Spatial Structures in Reaction-Diffusion Systems (abstract) ; 81st Session of Indian Science Congress (1994).
28. Avijit Lahiri : Wave Functions in Aperiodic Lattices and Quantum Non-recurrence ; Phys. Rev. B 49 (1994) 1425 - 29.

29. Avijit Lahiri : Quasi-energy Spectra in Driven Systems and Quantum Non-recurrence ; in Computational Aspects in Chaos and Non-linear Dynamics, ed. G. Ambika and V. M. Nanmdkumar, Wiley Eastern Ltd., New Delhi, (1994).
30. A. Lahiri, A. Bhowal and T.K. Roy : Fourth Order Resonant Collisions of Multipliers in Reversible Maps : Period-4 Orbits and Invariant Curves ; Physica D 85 (1995) 10 - 24.
31. Avijit Lahiri : AC Conductivity of Incommensurate Lattices : Anatomy of Wave Functions ; Phys. Rev. B 53 (1996) 3702 - 06.
32. A. Lahiri, T.K. Roy, and A. Bhowal : Exotic Spectra, Wavefunctions and Transport in Incommensurate Lattices ; Pramana - Journal of Physics, 48 (1997) 555-588.
33. T.J. Bridges, J. Furter, and A. Lahiri : Instability and Bifurcation near the Symplectic 1:4 Resonance ; Dynamics and Stability of Systems, 12 (1997) 271-293.
34. Avijit Lahiri, Ajanta Bhowal, and Tarun K. Roy : Resonant Collisions in Four-dimensional Reversible Maps : a Description of Scenarios ; Physica D 112 (1998) 95-116.
35. A. Lahiri, G. Ghosh, and T.K. Kar : Action-Angle variables in Quantum Mechanics ; Physics Letters A 238 (1998) 239-243.
36. A. Lahiri, S. Panda, and T. K. Roy : Discrete Breathers : Exact Solutions in a Piecewise linear Model, Phys. Rev. Lett., 84 (2000) 3570-3573.
37. A. Lahiri and M. Sinha Roy : The Hamiltonian Hopf Bifurcation, an Elementary Perturbative Approach , Int. J. Non-linear Mechanics, 36 (2001) 787-802.
38. A. Lahiri and P. Majumdar : Pulses and Waves in Excitable Media, and Low-dimensional Chaos in the Human Heart. Indian J. Th. Phys (Kolkata) 48 (2000) 61-73.
39. S. Nag, A. Lahiri, and G. Ghosh : Entropy production due to coupling to a heat bath in the kicked rotor problem, Physics Lett. A, 292 (2001) 43-48.
40. A. Lahiri, P. Majumdar, and M. Sinha Roy : Traveling kinks in discrete media : Exact solution in a piecewise linear model, Phys Rev E, 65 (2002)026106.
41. A. Lahiri , S. Panda, and T. K. Roy : Breathers in a Discrete Non-linear Schrodinger type Model : Exact Stability Results, Phys. Rev E 66, 056603 (2002) .
42. A. Lahiri: Dynamical Criterion for Quantum Chaos: Entropy Production in Subsystems, arXiv:quant-ph/0302029v2 (2003).
43. A. Lahiri and S. Nag: Dynamical manifestation of quantum chaos: Density matrix fluctuations in subsystems, Phys. Lett. A, 318 (2003) 6-14.

44. Sankhasubhra Nag, Gautam Ghosh, and Avijit Lahiri: Quantum Chaos: Reduced Density Matrix Fluctuations in Coupled Systems, *Physica D*, 204 (2005) 110-121
45. S. Nag, A. Lahiri, and G. Ghosh, Study of Coupled Systems in Search of Quantum Signature of Chaos, in 'Proc. of the Second National Conference on Nonlinear Systems and Dynamics', Department of Physics, Aligarh Muslim University (2005), pp. 97.
46. Subhendu Panda, Anindita Lahiri, Tarun K. Roy, and Avijit Lahiri : Standing Waves in a Non-linear 1D Lattice: Floquet Multipliers, Krein Signatures, and Stability, *Physica D*, 210 (2005) 262-283.
47. Anindita Lahiri, Priyadarshi Majumdar, and Avijit Lahiri, Exact travelling breather solutions in a discrete Klein-Gordon ring, *Phys. Rev. B* 72 (2005) 224306(6).
48. Priadarshi Majumdar, and Avijit Lahiri, Travelling Fronts, Pulses, and Pulse Trains in a 1D discrete Reaction-Diffusion System, *Chaos, Solitons, and Fractals*, 31 (2007) 977-994.
49. Avijit Lahiri, Mixing and Decoherence to nearest Separable States in Quantum Measurements, arXiv:quant-ph/0705.0733.
50. Avijit lahiri, Gautam Ghosh, and Sankhasubhra Nag, Mixing and Decoherence to Nearest Separable States, *International Journal of Quantum Information*, vol 7, no. 4 (2009) 829-846.
51. Tarun Kanti Roy, and Avijit Lahiri, Synchronized oscillations on a Kuramoto ring and their entrainment under periodic driving, *Chaos, Solitons, and Fractals*, 45 (2012), 888-898.

D. Books published under sole authorship

1. *Physics in Application* (earlier published under the title, *A General Course in Physics : III*), Grantha Bharati, Kolkata, 2007.
2. *Prayogik Padarthavidya* (in Bengali), Grantha Bharati, Kolkata, 2001.
3. *Statistical Mechanics : An Elementary Outline* (2nd ed.), Universities Press, Hyderabad, 2008 (CRC Press imprint, 2009).
4. *Basic Physics: A Survey of Concepts*, a self-published e-book (2015; currently in process of edition).
5. *Basic Optics: Principles and Concepts* (for graduate and post-graduate students) published by Elsevier Inc., 2016.

E. Books in preparation

1. Equilibrium and Non-equilibrium Statistical Mechanics: A Primer.
2. Inductive Inference and the Sciences (a book on Philosophy of Science)

F. Ph. D work supervised

(since the year 2000; earlier supervision was informal)

- (i) Co-guide of two students registered for Ph. D work with Calcutta University; work of both students completed; both awarded Ph.D. degree (2007 and 2008).
- (ii) Supervisor of one student working on a CSIR fellowship; Ph.D thesis submitted to the University of Calcutta, and Ph.D. degree awarded (2009).

Date: Kolkata, 21 October, 2016.