Sthitadhi Roy

Curriculum Vitae updated February 2025

CURRENT POSITION

Reader-F (Assistant Professor), *February 2022 - present*
International Centre for Theoretical Sciences- TIFR
Bengaluru, 500089
India

Email:sthitadhi.roy@icts.res.in
sthitadhi91@gmail.com

URL: sites.google.com/view/sthitadhiroy

EMPLOYMENT

– Postdoctoral researcher, *November 2017-January 2022*
Condensed Matter Theory Group
University of Oxford
Oxford, United Kingdom

– Doktorand (Ph.D. student), *July 2013-November 2017*
Max-Planck-Institut für Physik komplexer Systeme
Dresden, Germany

RESEARCH INTERESTS

Broadly **Theoretical Condensed Matter Physics and Statistical Mechanics**
– Many-body localisation and disordered quantum systems
– Many-body quantum systems out of equilibrium
– Entanglement phase transitions
– Open quantum systems

EDUCATION

– **Ph.D.** in Theoretical Physics, *July 2013 - November 2017*
Max-Planck-Institut für Physik komplexer Systeme, Dresden, Germany
Advisor: Prof. Dr. Roderich Moessner
Thesis: Nonequilibrium and semiclassical dynamics in topological phases of quantum matter
Degree granted by TU Chemnitz, Germany *Thesis defended on March 28, 2018*

– **M.Sc.** (Master of Science-Integrated) in Physics, *July 2008 - May 2013*
Indian Institute of Technology, Kanpur, India, **CPI: 9.6/10**

GRANTS

– Head of **Max Planck Partner group grant** with Max-Planck-Institut für Physik komplexer Systeme, Dresden, Germany (2023-2028)
– SERB-SRG grant from (Start-Up Research Grant) from SERB-DST, India

PUBLICATIONS

1. S. Manna, **S. Roy**, G. J. Sreejith, *Projected ensemble in a system with conserved charges with local support*, arXiv:2501.01823
2. A. Sherry and **S. Roy**, *Measurement-invisible quantum correlations in scrambling dynamics*, arXiv:2410.24212
3. B. Pain and **S. Roy**, *Entanglement dynamics and eigenstate correlations in strongly disordered quantum many-body systems*, **Phys. Rev. B 110**, 224201 (2024)
4. **S. Roy** and D. E. Logan, *The Fock-space landscape of many-body localisation*, (invited Topical Review article) **J. Phys.: Condens. Matter 37**, 073003 (2025)
5. **S. Roy**, *Spectral Multifractality and Emergent Energyscales Across the Many-Body Localisation Transition*, arXiv:2404.07975
6. B. Pain, K. Khanwal, and **S. Roy**, *The connection between Hilbert-space return probability and real-space autocorrelations in quantum spin chains* **Phys. Rev. B 108**, L140201 (2023) (Letter)
7. S. Ghosh, M. Kulkarni, and **S. Roy**, *Eigenvector Correlations Across the Localisation Transition in non-Hermitian Power-Law Banded Random Matrices*, **Phys. Rev. B 108**, L060201 (2023) (Letter)
8. **S. Roy**, *Anatomy of localisation protected quantum order on Hilbert space, (Invited article for J. Phys.: Condens. Matter special issue – Emerging Leaders 2023*, **J. Phys.: Condens. Matter 35, 415601 (2023)**

9. I. Creed, D, E. Logan, and **S. Roy**, *Probability transport on the Fock space of a disordered quantum spin chain*, **Phys.Rev. B 107**, 094206 (2023)
10. A. Nahum, **S. Roy**, S. Vijay, and T. Zhou, *Real-time correlators in chaotic quantum many-body systems*, **Phys. Rev. B 106**, 224310 (2022)
11. **S. Roy**, *Hilbert-space correlations beyond multifractality and bipartite entanglement in many-body localised systems*, **Phys. Rev. B 106**, L140204 (2022) (Letter)
12. A. Deger, A. Lazarides, and **S. Roy**, *Constrained Dynamics and Directed Percolation*, **Phys. Rev. Lett. 129**, 190601 (2022) **[Editors' Suggestion]**
13. A. Deger, **S. Roy**, and A. Lazarides, *Arresting classical many-body chaos by kinetic constraints*, **Phys. Rev. Lett. 129**, 160601 (2022)
14. M. McGinley, **S. Roy**, and S. A. Parameswaran, *Absolutely Stable Spatiotemporal Order in Noisy Quantum Systems*, **Phys. Rev. Lett. 129**, 090404 (2022)
15. S. J. Garratt and **S. Roy**, *Resonant energy scales and local observables in the many-body localised phase*, **Phys. Rev. B 106**, 054309 (2022)
16. J. Sutradhar, S. Ghosh, **S. Roy**, D. E. Logan, S. Mukerjee, S. Banerjee, *Scaling of Fock-space propagator and multifractality across the many-body localization transition*, **Phys. Rev. B 106**, 054203 (2022)
17. A. Duthie, **S. Roy**, and D. E. Logan, *Anomalous multifractality in quantum chains with strongly correlated disorder*, **Phys. Rev. B 106**, L020201 (2022) (Letter)
18. S. J. Garratt, **S. Roy**, and J. T. Chalker, *Local resonances and parametric level dynamics in the many-body localised phase*, **Phys. Rev. B 104**, 184203 (2021)
19. **S. Roy** and David E. Logan, *Fock-space anatomy of eigenstates across the many-body localisation transition*, **Phys. Rev. B 104**, 174201 (2021)
20. A. Duthie, **S. Roy**, and D. E. Logan, *Localisation in quasiperiodic chains: a theory based on convergence of local propagators*, **Phys. Rev. B 104**, 064201 (2021)
21. **S. Roy**, R. Moessner, and A. Lazarides, *How periodic driving stabilises and destabilises Anderson localisation on random trees"*, **Phys. Rev. B 103**, L100204 (2021) **[Letter]**
22. A. Nahum, **S. Roy**, B. Skinner, and J. Ruhman, *Measurement and entanglement phase transitions in all-to-all quantum circuits, on quantum trees, and in Landau-Ginsburg theory*, **PRX Quantum 2**, 010352 (2021) **[Editors' Suggestion]**
23. A. Duthie, **S. Roy**, and D. E. Logan, *Self-consistent theory of mobility edges in quasiperiodic chains*, **Phys. Rev. B 103**, L060201 (2021) **[Letter]**
24. **S. Roy** and D. E. Logan, *Localisation on certain graphs with strongly correlated disorder*, **Phys. Rev. Lett., 125**, 250402 (2020)
25. **S. Roy**, J. T. Chalker, I. V. Gornyi, Y. Gefen, *Measurement-induced steering of quantum systems*, **Phys. Rev. Research 2**, 033347 (2020)
26. **S. Roy** and A. Lazarides, *Strong ergodicity breaking due to local constraints in a quantum system*, **Phys. Rev. Research 2**, 023159 (2020)
27. **S. Roy** and D. E. Logan, *Fock-space correlations and the origins of many-body localisation,* **Phys. Rev. B 101**, 134202 (2020) **[Editors' Suggestion]**
28. A. Lazarides, **S. Roy**, F. Piazza, R. Moessner, *On time crystallinity in dissipative Floquet systems*, **Phys. Rev. Research 2**, 022002(R) (2020) **[Rapid Communication]**
29. **S. Roy** and D. E. Logan, *Self-consistent theory of many-body localisation in a quantum spin chain with long-range interactions*, **SciPost Phys. 7**, 042 (2019)
30. **S. Roy**, J. T. Chalker, and D. E. Logan, *Percolation in Fock space as a proxy for many-body localisation*, **Phys. Rev. B 99**, 104206 (2019) **[Editors' Suggestion]**
31. **S. Roy**, D. E. Logan, and J. T. Chalker, *Exact solution of a percolation analogue for the many-body localisation transition*, **Phys. Rev. B 99**, 220201(R) (2019) **[Rapid Communication]**

32. J. Behrends, **S. Roy**, M. H. Kolodrubetz, J. H. Bardarson, A. G. Grushin, *Landau levels, Bardeen polynomials, and Fermi arcs in Weyl semimetals: Lattice-based approach to the chiral anomaly*, **Phys. Rev. B 99**, 140201(R) (2019) **[Rapid Communication]**
33. **S. Roy** and A. Lazarides, *Nonequilibrium quantum order at infinite temperature: spatiotemporal correlations and their generating functions*, **Phys. Rev. B 98**, 064208 (2018)
34. **S. Roy**, Y. Bar Lev, D. J. Luitz, *Anomalous thermalization and transport in disordered interacting Floquet systems*, **Phys. Rev. B 98**, 060201(R) (2018) **[Rapid Communication]**
35. **S. Roy**, A. Lazarides, M. Heyl, R. Moessner, *Dynamical potentials for non-equilibrium quantum many-body phases*, **Phys. Rev. B 97**, 205143 (2018)
36. **S. Roy**, M. H. Kolodrubetz, N. Goldman, A. G. Grushin, *Tunable axial gauge fields in engineered Weyl semimetals: Semiclassical analysis and optical lattice implementations*, **2D Materials 5**, 024001 (2018)
37. **S. Roy**, I. M. Khaymovich, A. Das, R. Moessner, *Multifractality without fine-tuning in a Floquet quasiperiodic chain*, **SciPost Phys. 4**, 025 (2018)
38. L. Bucciantini, **S. Roy**, S. Kitamura, T. Oka, *Emergent Weyl nodes and Fermi arcs in a Floquet Weyl semimetal*, **Phys. Rev. B 96**, 041126(R) (2017) [**Rapid Communication**]
39. **S. Roy**, R. Moessner, A. Das, *Locating topological phase transitions using non-equilibrium signatures in local bulk observables*, **Phys. Rev. B 95**, 041105(R) (2017) [**Rapid Communication**]
40. **S. Roy**, G. J. Sreejith, *Disordered Chern insulator with a two step Floquet drive*, **Phys. Rev. B 94**, 214293 (2016)
41. **S. Roy**, M. H. Kolodrubetz, J. E. Moore, A. G. Grushin, *Chern numbers and chiral anomalies in Weyl butterflies*, **Phys. Rev. B 94**, 161107(R) (2016) [**Rapid Communication**]
42. G. De Tomasi, **S. Roy**, S. Bera, *Generalized Dyson model: nature of zero mode and its implication in dynamics*, **Phys. Rev. B 94**, 144202 (2016)
43. A. G. Grushin, **S. Roy**, M. Haque, *Response of fermions in Chern bands to spatially local quenches*, **J. Stat. Mech. 083103** (2016)
44. **S. Roy**, K. Roychowdhury, S. Das, *Pseudo-spin half metals on the surface of 3-D topological insulators*, **New J. Phys. 18**, 073038 (2016)
45. **S. Roy**, S. Das, *Transport signatures of surface potentials on three-dimensional topological insulators*, **Phys. Rev. B 93**, 085422 (2016)
46. **S. Roy**, A. G. Grushin, R. Moessner, M. Haque, *Wavepacket dynamics on Chern band lattices in a trap*, **Phys. Rev. A 92**, 063626 (2015)
47. **S. Roy**, K. Saha, S. Das, *Probing surface states exposed by crystal terminations at arbitrary orientations of three-dimensional topological insulators*, **Phys. Rev. B 91**, 195415 (2015)
48. **S. Roy**, A. Soori, S. Das, *Tunnel Magnetoresistance scan of a pristine 3D topological insulator*, **Phys. Rev. B 91**, 041109(R) (2015) [**Rapid Communication**]
49. T. Nag, **S. Roy**, A. Dutta, D. Sen, *Dynamical localization in a chain of hard core bosons under a periodic driving*, **Phys. Rev. B 89**, 165425 (2014)
50. **S. Roy**, T. Nag, A. Dutta, *Fidelity, Rosen-Zener dynamics, entropy and decoherence in one dimensional hard-core bosonic systems*, **Eur. Phys. J. B 86**, 204 (2013)
51. **S. Roy** and A. Pikovsky, *Spreading of energy in the Ding-Dong model*, **Chaos 22,** 026118 (2012)

AWARDS AND SCHOLARSHIPS

- Awarded the **Associateship of the Indian Academy of Sciences** (2024)
- Awarded a **Max Planck Partner Group grant** as its head with MPIPKS, Dresden
- **ICTS-Simons Early Career Faculty Fellowship** (2022)
- Proficiency medal for the **Best Academic Performance in Physics** by I.I.T. Kanpur for the graduating year 2012-13.
- **Academic Excellence Award**, by I.I.T. Kanpur, for excellent academic performance during the academic years 2008-09, 2010-11 and 2011-12.
- **WISE-2011** scholarship by the German Academic Exchange Service (**DAAD**) for carrying out research at a German university for a period of three months.
- **INSPIRE** scholarship by **Department of Science and Technology, Govt. of India** for the period 2008-13.

INVITED TALKS

Pan-TIFR CMP meeting
TIFR, Mumbai, India **February 2025**

Quantum Trajectories
ICTS-TIFR Bengaluru, India **January 2025**

SINP Theory Seminar
Saha Institute of Nuclear Physics, Kolkata, India **October 2024**

CEFIPRA workshop on Topology and Entanglement in Quantum Matter
Université Toulouse III - Paul Sabatier, Toulouse, France **June 2024**

Indian Statistical Physics Community Meeting
ICTS-TIFR Bangalore **April 2024**

Quantum Dynamics and Chaos,
Ashoka University, India **March 2024**

Stability of quantum matter in and out of equilibrium at various scales,
ICTS-TIFR Bengaluru **January 2024**

Anderson Centenary Symposium
IISc Bangalore **January 2024**

Pan-TIFR CMP Conference,
TIFR-Hyderabad **December 2023**

QMAT 2023,
NISER Bhubaneswar **November 2023**

Recent Advances in Quantum Many-Body Dynamics,
Loughborough University, UK **August 2023**

Quantum Localisation and Glassy Physics,
Institut d'études scientifiques de Cargèse, France **July 2023**

Periodically and quasi-periodically driven complex systems,
ICTS-TIFR, Bengaluru **June 2023**

Matrices*Joint Condensed Matter Seminar, KTH Royal Insitute of Technology, Nordita, and Stockholm University*,
Nordita, Sweden (online talk) **May 2023**

DPS Day Seminar,
IISER Kolkata **March 2023**

IMSc Colloquium,
Institute of Mathematical Sciences, Chennai, India **January 2023**

Conference on correlated and/or driven quantum matter

IACS Kolkata **January 2023**

Ergodicity Breaking and Integrability in Long-Range Systems and on Random Graphs
Nordita, Stockholm **November 2022**

CMD 29, Institute of Physics **August 2022**
Manchester, UK

ICTS Seminar, **June 2021**
International Centre for Theoretical Sciences, Bengaluru

ICTS Colloquium, **May 2021**
International Centre for Theoretical Sciences, Bengaluru

Condensed Matter Seminar, **March 2021**
Indian Association for the Cultivation of Science, Kolkata

Condensed Matter Seminar, **March 2021**
Indian Institute of Technology, Madras

SINP Theoretical Physics Seminar, **March 2021**
Saha Institute of Nuclear Physics, Kolkata

Random Interactions Seminar, **March 2021**
Tata Institute of Fundamental Research, Mumbai

Condensed Matter Seminar, **March 2021**
University of Colorado Boulder

Quantum Matter meets Maths seminar, **January 2021**
IST, Lisbon, Portugal

Condensed Matter Seminar, **November 2020**
MPIPKS, Germany

Leeds-Loughborough-Nottingham Non-equilibrium Seminars **November 2020**

Conference entitled *Localisation 2020* **August 2020**

Theoretical Solid State Physics Seminar, **April 2020**
Karlsruhe Institute of Technology, Germany

Physical Sciences Seminar, **April, 2020**
IST, Austria

International ICMM Workshop, **May, 2019**
University of Loughborough

Birmingham Theory Seminar, **May, 2019**
Department of Physics, University of Birmingham

CCMT Seminar, **April, 2019**
Indian Institute of Science, Bengaluru

Theory Seminar, **April, 2019**
HRI, Allahabad

Workshop on Nonequilibrium Physics Across Boundaries, **January, 2019**
Weizmann Institute of Sceince, Israel

TCM Seminar, **November, 2018**
University of Nottingham

Forum Seminar, **November, 2018**
Theoretical Physics, University of Oxford

Workshop entitled *Chaos and Dynamics in*

Correlated Quantum Matter, **March, 2018**
MPIPKS, Dresden

Conference entitled *Driven quantum systems*, **February, 2018**
Indian Association for Cultivation of Science, Kolkata

Weizmann-Max Planck workshop, **June 4, 2017**
Dresden

TEACHING

- Lecturer for Advanced Quantum Mechanics (Fall semester Aug-Dec 2023)
  ICTS-TIFR
- Lecturer for Advanced Quantum Mechanics (Fall semester Aug-Dec 2022)
  ICTS-TIFR
- Stipendiary Lecturer at St Hugh's College, University of Oxford (2019-20)
  Courses: Thermal Physics, Condensed Matter Physics, Symmetry and Relativity
- Tutor for Masters' course entitled *Renormalisation Group*
  University of Oxford
- Tutor for Masters' course entitled *Advanced Quantum Theory*
  University of Oxford
- Supervision of a student for their Master of Physics project
  University of Oxford

REFEREEING SERVICE

Active referee since 2017 for Physical Review A, Physical Review B, Physical Review Letters, Physical Review X, and SciPost Physics

ACADEMIC SERVICE

- Co-conducted *viva voce* examinations for MPhys and MMathPhys projects at the University of Oxford
- Co-conducted DPhil transfer-of-status and confirmation-of-status examinations for doctoral students in Theoretical Physics at the University of Oxford
- Co-organiser of the weekly *Forum* seminar series of the condensed matter theory group in Theoretical Physics at the University of Oxford

PERSONAL DETAILS

- Date of Birth: January 28, 1991
- Nationality: Indian