Sambuddha Sanyal

Contact Information

Department of Physics,
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Personal Information

Born in April 27, 1986.

Research Interests

Strongly correlated quantum systems, disorder effects in condensed matter systems, dynamical properties of quantum systems and non-equilibroum phenomena, matrix models in QCD.

Current and Past positions

- ❑ December, 2019- present, Assistant Professor, Indian Institute of Science Education and Research(IISER), Tirupati
- ❑ January, 2018 -November, 2019, Post Doctoral Fellow, Columbia University, New York, USA.
- ❑ August, 2015 -January, 2018, Post Doctoral Fellow, International Centre for Theoretical Sciences, Bangalore, India.
- ❑ January, 2014 -July, 2015, Research Associate, Indian Institute of Science, Bangalore, India.

Education

- Ph.D. in Physics, degree awarded in February, 2015
  Thesis title: *Defects in low dimensional strongly correlated quantum systems*
  Department of Theoretical Physics, Tata Institute of Fundamental Research, Mumbai, India
- M.Sc. in Physics, August, 2008
  Thesis title: *Kaons and antikaons in hot and dense hadronic matter*
  Indian Institute of Technology Delhi, New Delhi, India
- B.Sc. in Physics, August, 2006
  University of Calcutta, Kolkata, India

Publications and Preprints

- ❑ "Emergent moments and random singlet physics in a Majorana spin liquid", Sambuddha Sanyal, Kedar Damle, JT Chalker, R Moessner,
  preprint: **arXiv:2006.16987(2020)**.
- ❑ "Interplay of uniform U(1) quantum spin liquid and magnetic phases in rare earth pyrochlore magnets : a fermionic parton approach", Sambuddha Sanyal, Kusum Dhochak, and Subhro Bhattacharjee, **Phys. Rev. B 99, 134425(2019)**.
- ❑ "Sub-diffusion and non-equilibrium probes of phases in Aubry-Andre-Harper Model", Archak Purkayastha, Sambuddha Sanyal, Abhishek Dhar, and Manas Kulkarni, **Phys. Rev. B 97, 174206 (2018),** ***selected as Editor's suggestion article***.
- ❑ "Glueball spectra from a matrix model of pure Yang-Mills theory", Nirmalendu Acharyya, A. P. Balachandran, Sambuddha Sanyal, and Sachindeo Vaidya,
  Int. J. Mod. Phys. A 33, 1850073, 2018.

- ❑ "Random Matrices and Holographic Tensor Models", Chethan Krishnan, K.V. Pavan Kumar, Sambuddha Sanyal, **J. High Energ. Phys. (2017) 2017: 36**.
- ❑ "Quantum Chaos and Holographic Tensor Models", Chethan Krishnan, Sambuddha Sanyal, P. N. Bala Subramanian, **J. High Energ. Phys. (2017) 2017: 56**.
- ❑ "Vacancy-Induced Low-Energy States in Undoped Graphene", Sambuddha Sanyal, Kedar Damle and Olexei I. Motrunich, **Phys. Rev. Lett. 117, 116806 (2016)**.
- ❑ "Fermions in Synthetic Non-Abelian Gauge Fields", Sambuddha Sanyal, Sudeep Kumar Ghosh and Jayantha P. Vyasanakere,**Journal of the Indian Institute of Science Vol. 94 No.2 (2014)**.
- ❑ "Antiferromagnetic order in systems with doublet Stot=12 ground states", Sambuddha Sanyal, Sambuddha Sanyal, Argha Banerjee, Kedar Damle, and Anders W. Sandvik , **Phys. Rev. B 86, 064418 (2012)**.
- ❑ "Vacancy-induced spin texture in a one-dimensional $S = 1/2$ Heisenberg antiferromagnet", Sambuddha Sanyal, Argha Banerjee, Kedar Damle, **Phys. Rev. B 84, 235129 (2011)**.
- ❑ "Kaon properties in (proto)neutron stars", Amruta Mishra, Arvind Kumar, Sambuddha Sanyal,V. Dexheimer, Stefan Schramm, **Eur.Phys.J. A45:169-177,(2010)**.
- ❑ "Kaon and antikaon optical potentials in isospin asymmetric hyperonic matter", Amruta Mishra, Arvind Kumar, Sambuddha Sanyal, Stefan Schramm, **Eur.Phys.J. A41:205-213,(2009)**.

Schools
Workshops
Conferences

- Simons collaboration on cracking the glass problem annual meeting, Flatiron Institute, New York, USA, March 2019.
- American Physical Society March Meeting, Boston, USA, March 2019.
- Princeton workshop on Non-equilibrium Statistical Physics, Princeton University, New Jersey, USA, April 2018.
- Simons collaboration on cracking the glass problem annual meeting, CUNY Graduate Center, New York, USA, March 2018.
- HRI workshop on Non-equilibrium Quantum Systems, HRI, Allahabad, India, November 2016.
- Bangalore school on Statistical Physics-7, ICTS, Bangalore, India, July 2016.
- School on current frontiers in condensed matter research, ICTS, Bangalore, India, June 2016.
- Discussion Workshop on Non-equilibrium Statistical Physics, ICTS, Bangalore, India, Oct. 2015.
- Conference on Frustration, Disorder and Localization: Statics and Dynamics, ICTP, Trieste, Italy, Sept. 2015.
- School in Computational CMP: Atomistic Simulations to Universal Model Hamiltonians, ICTP, Trieste, Italy, Sept. 2015.
- Bangalore school on Statistical Physics-5, RRI, Bangalore, India, March 2014.
- Strongly correlated systems: From models to materials, Bangalore, India, January 2014.
- ICTS mini school on Dirac Materials and Subramanyan Chandrasekhar Discussion meeting, Bangalore, India, December 2012.
- DAE Solid State Physics Symposium, Mumbai, India, December 2012.
- ICTS Condensed Matter Programme, Bangalore, India, December, 2011.
- International School on Topology in Quantum Matter, IISc Bangalore, India, June, 2011.
- The 28th Jerusalem Winter School in Theoretical Physics, Jerusalem, Israel, December 2010.
- ICTS Condensed Matter Programme, Mysore, India, December, 2010.
- RRI school on Statistical Physics, RRI, Bangalore, India, 2010.
- K. S. Krishnan Discussion Meeting on Frontiers in Quantum Science on AdS/CFT and Condensed matter correspondence, IMSC, Chennai, India, 2009.

- ICTS Condensed Matter Programme, Mahabaleswar, India, 2009.

Presetations Posters

- ❑ "Quantum Matter in Rare-earth Pyrochlores", Indian Institute of Technology Delhi, New Delhi, December, 2019.
- ❑ "Quantum Matter in Rare-earth Pyrochlores", Jawaharlal Nehru University, New Delhi, December, 2019.
- ❑ "Interplay of uniform U(1) quantum spin liquid and magnetic phases in rare earth pyrochlore magnets : a fermionic parton approach ", APS March Meeting, Boston, March, 2019.
- ❑ "Quantum matter in rare-earth pyrochlores and a semi-classical approach to quantum bound on chaos ", IISER Mohali, November, 2018.
- ❑ "Some recent advances in quantum spin-ice systems and non-equilibrium transport in 1D", ICTS, June, 2017.
- ❑ "Randomly diluted chiral metal", IIT Delhi, New Delhi, Nov., 2016.
- ❑ "Is vacancy-type disorder different from random-hopping disorder?", IACS, Kolkata, Jan., 2016.
- ❑ "Is vacancy-type disorder different from random-hopping disorder?",ICTS, Bangalore, March, 2016.
- ❑ "Site dilution in low dimensional chiral metals",ICTS, Bangalore, May, 2015.
- ❑ Poster on "Random site dilution in Graphene", School on topological quantum matter, HRI, Allahabad, India, February, 2015.
- ❑ Poster on "Fermions in synthetic non-abelian gauge fields: Fermi surface topology ad competing orders", In-house Symposium, Physics Department, IISc, India, November, 2014.
- ❑ Invited talk on "Studies on defects in strongly correlated quantum systems", IISC, Bangalore, India, March 2013.
- ❑ Poster on "Antiferromagnetic order in systems with doublet $S_{tot} = 1/2$ ground states", ICTS mini school on Dirac Materials and Subramanyan Chandrasekhar Discussion meeting, Bangalore, India,December 2012.
- ❑ Poster on "Antiferromagnetic order in systems with doublet $S_{tot} = 1/2$ ground states", DAE Solid State Physics Symposium, Mumbai, India, December 2012.

Teaching

- Teaching Assistant, Statistical Mechanics (TIFR), Spring 2009.
- Teaching Assistant, Mathematical Methods (TIFR), Autumn 2010.
- Teaching Assistant, Solid State Physics (TIFR), Spring 2011.
- Teaching Assistant, Quantum Mechanics-1 (TIFR), Autumn 2011.
- Teaching Assistant, Statistical Mechanics(ICTS), Autumn 2016.
- Instructor, Quantum Mechanics II(IISER Tirupati), Spring 2020.

Mentoring

- ❑ Indian Academy of Science summer internship project trainee Ms. Saumya Sahai, on *Superfluidity in interacting bosonic systems* at IISc, 2014 (Co-mentor with Prof. Vijay Shenoy).
- ❑ Semester project of Mr. Tushar Ranjan Sathpathy(BS-MS student) on *Vacancy induced low energy states in graphene*, 2020.
- ❑ Semester project of Mr. Aditya Sharma(BS-MS student) on *Aspects of SYK and Tensor model*, 2020.
- ❑ Semester project of Mr. Krushna Chandra Sahu(Int-PhD student) on *Parton Construction for Quantum spin liquid*, 2020.
- ❑ PhD thesis of Mr. Krushna Chandra Sahu(Int-PhD student), 2020-present.

Fellowships and distinctions

2005	Rank in top 1 percent in the National Graduate Physics Examination (NGPE), conducted by the Indian Association of Physics Teachers (IAPT).
2008	CSIR Junior Research Fellowship Human Resource Development Group, Council of Scientific and Industrial Research, Government of India.
2008	TIFR Fellowship for Graduate studies Tata institute of Fundamental Research, Mumbai, India.
2012	Canadian Commonwealth Fellowship, Government of Canada.
2015	Dr. D. S. Kothari Post Doctoral Fellowship, Government of India-(*declined*)
2017	Indo-US Post Doctoral Fellowship, Indo-US Science and Technology Forum, Science and Engineering Research Board, Government of India
2018	INSPIRE faculty award, Department of Science and Technology, Government of India

Professional Duties

- Reviewer in American Physical Society Journals (Physical Review Letter, Physical Review B).

Relevant Skills

Languages:	English, Bengali(native language), Hindi
Programing:	C(first language), C++, Mathematica, Matlab, Python, Julia

References

- **Prof. David Reichman**,
  Department of Chemistry,
  Columbia University,
  New York - 10027, USA.
  Contact No: +1-212-854-0469
  E-mail: drr2103@columbia.edu

- **Prof. Subhro Bhattacharjee**,
  International Centre for Theoretical Sciences,
  Survey No. 151, Shivakote,
  Hesaraghatta Hobli,
  Bengaluru - 560089, India.
  Contact No: +91-80-6730-6250, +91-80-4653-6250
  E-mail: subhro@icts.res.in

- **Prof. Kedar Damle**,
  Department of Theoretical Physics,
  Tata Institute of Fundamental Research,
  Homi Bhabha Road, Mumbai 400005, India.
  Contact No: +91-22-22782213,
  E-mail: kedar@theory.tifr.res.in

- **Prof. Chethan Krishnan**,
  Centre for High Energy Physics,
  Indian Institute of Science, Bangalore 560012, India.
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