

# CURRICULUM VITAE

## ANANDA ROY

Department of Physics and Astronomy,  
Rutgers, the State University of New Jersey  
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### EDUCATION:

- Ph. D** in Applied Physics (2016), Yale University, USA
- M. S.** in Applied Physics (2013), Yale University, USA
- M. Phil.** in Applied Physics (2013), Yale University, USA
- M. Sc. (Five-year Integrated)** in Physics (2010), Indian Institute of Technology Kanpur, India

### RESEARCH POSITIONS:

1. **Research Staff (part-time)** (August 2024 - )  
Condensed Matter Physics and Materials Science Division, Brookhaven National Laboratory
2. **Assistant Professor** (Sep 2021 –)  
Department of Physics and Astronomy, Rutgers University
3. **Postdoctoral researcher** (Dec 2018 – Aug 2021)  
Department of Physics, Technische Universität München, Germany  
Advisor: Frank Pollmann
4. **Visiting researcher** (June 2018 – December 2018)  
Institut de Physique Théorique, CEA Saclay, France  
Advisor: Hubert Saleur
5. **Postdoctoral researcher** (September 2016 – May 2018)  
Institute for Quantum Information, RWTH Aachen University, Germany  
Advisor: Barbara M. Terhal and David P. DiVincenzo
6. **Graduate Researcher** (August 2010 – August 2016):  
Department of Applied Physics, Yale University, USA  
Advisor: Michel Devoret and A. Douglas Stone
7. **Research Assistant** (May 2009- January 2010):  
Department of Physics, École Polytechnique Fédérale de Lausanne, Switzerland  
Advisor: Mikhail Shaposhnikov
8. **Summer Research Assistant** (May 2008- July 2008):  
Department of Physics, École Polytechnique, France  
Advisor: Christoph Kopper

## **STUDENTS AND POSTDOCS:**

### Current graduate students:

Chris Lamb, David Rogerson, Madhav Sinha, Colby Stoddard

### Former graduate students:

Gavin Rockwood (currently postdoc in University of Wisconsin-Madison)

### Former postdoctoral researchers:

Victor Drouin-Touchette (currently researcher at PasQal and University of Sherbrooke), Hiromi Ebisu (currently researcher at Kyoto University)

## **GRANTS:**

1. Co-PI, Co-design Center for Quantum Advantage (C2QA), US Department of Energy (November 2025 – October 2030)
2. Co-PI, Grant: Spin Chain Bootstrap for Quantum Computation, US Department of Energy (July 2023 – August 2027)
3. Co-PI, Grant: Catalyst Design for CO<sub>2</sub> Conversion using Quantum Computation, Brookhaven National Laboratory LDRD, US Department of Energy (October 2025 – August 2027)

## **AWARDS/FELLOWSHIPS:**

1. Rutgers Society of Physics Students Outstanding Teacher Award, 2022-2023
2. Simons Junior Faculty Fellowship (September 2021 – August 2024)
3. Alexander von Humboldt Fellowship for Postdoctoral Researchers (2017-2019)
4. Jawaharlal Nehru Memorial Fund Award for best academic performance (2010) at Indian Institute of Technology Kanpur
5. Fellowship to conduct research during the final year of M. Sc. (academic year 2009-2010) at École Polytechnique Fédérale de Lausanne, Switzerland, initiating a student exchange program between Indian Institute of Technology Kanpur and École Polytechnique Fédérale de Lausanne
6. Academic Excellence Award from Indian Institute of Technology Kanpur for the academic years 2006-2007 and 2007-2008
7. Kishore Vaigyanik Protsahan Yojna (KVPY) fellowship for the years 2006-2010 from the Department of Science and Technology, Government of India

## **INVITED SEMINARS:**

1. *Variational Simulation of Quantum Field Theories with Local Constraints*, Brookhaven National Laboratory, October 2025
2. *Variational Quantum Simulation of Anyonic Chains*, eqMA Fall workshop, Rice University,

- Houston, TX, October 2025
3. *Universal Euler-Cartan Circuits for Quantum Field Theories*, Rutgers DIMACS Workshop, Piscataway, NJ, May 2025
  4. *Lectures on Quantum entanglement in strongly correlated systems*, Rice University, Houston, TX, April 2025
  5. *Breaking Free from Spin Chains: Simulating Quantum Field Theories with Josephson Junction Arrays*, Ecole Normale Supérieure, Lyon, France, March 2025
  6. *Variational Quantum Circuits for Quantum Field Theories*, Rutgers CMT Symposium, Rutgers University, USA, February 2025
  7. *Universal Euler-Cartan Circuits for Quantum Field Theories*, C2QA Workshop, Stony Brook University, USA, February 2025
  8. *Universal Euler-Cartan Circuits for Quantum Field Theories*, InQubator for Quantum Simulation, University of Washington, Seattle, USA, November 2024
  9. *Ising Meson Spectroscopy on a Noisy Quantum Simulator*, RIKEN-BNL workshop, Tokyo, Japan, October 2024
  10. *Universal Euler-Cartan Circuits for Quantum Field Theories*, InTropea Conference on Exact Techniques and their Applications, Tropea, Italy, September 2024
  11. *Efficient Quantum Circuits for Simulation of Quantum Field Theories*, Quantinuum London, London, UK, May 2024
  12. *Breaking Free from Spin Chains: Simulating Quantum Field Theories with Josephson Junction Arrays*, Oxford, UK, May 2024
  13. *Soliton Confinement in a Quantum Circuit*, Exactly Solved Models and Quantum Computing, Leiden, Netherlands, March 2024
  14. *Entanglement Entropy in Conformal Field Theories with Topological Defects*, University of Hamburg, March, 2024
  15. *Efficient Quantum Circuits for Simulation of Quantum Field Theories*, Virginia Tech, January, 2024
  16. *Efficient Quantum Circuits based on the Quantum Natural Gradient*, Rutgers Computer Science and University of Wuppertal Joint Seminar, November 2023
  17. *Efficient Quantum Circuits based on the Quantum Natural Gradient*, Spin Chain Bootstrap Meeting, Brookhaven National Laboratory and Stony Brook University, October 2023
  18. *The Next Quantum Revolution: entanglement is not spooky, it's a resource*, Rutgers Society of Physics Students, Rutgers University, April 2023
  19. *Analog Simulation of Soliton Confinement in a perturbed sine-Gordon model*, Brookhaven National Laboratory, October 2022
  20. *Integrable quantum field theories and quantum electronic circuits*, University of Wuppertal, November 2021
  21. *Entanglement in conformal field theories with boundaries and interfaces*, APS Division of Nuclear Physics Fall Meeting, October 2021
  22. *Entanglement in conformal field theories with boundaries*, Quantum Field Theory at the Boundary, Mainz Virtual Workshop, September 2021
  23. *Integrable quantum field theories and quantum electronic circuits*, The Art of Mathematical Physics, Hubert Saleur's 60<sup>th</sup> Birthday Conference, CEA Saclay, September 2021
  24. *Entanglement in critical quantum spin chains with defects*, Condensed Matter Theory Seminar, Rutgers University, September 2021
  25. *Superconducting quantum circuits as analog simulators for quantum fields*, Quantum Simulation of Strong Interactions (QuaSI) Workshop 2, June, 2021
  26. *Simulating quantum field theories with quantum circuits*, University of Washington, March 2020

27. *The quantum sine-Gordon model with quantum circuits*, Boston University, November 2020
28. *The quantum sine-Gordon model with quantum circuits*, Exotic Quantum Phases Seminar Series, Budapest University of Technology and Economics, November 2020
29. *The quantum sine-Gordon model with quantum circuits*, Max Planck Institute for Quantum Optics, September 2020
30. *The quantum sine-Gordon model with quantum circuits*, Brookhaven National Labs, September 2020
31. *Quantum Electronic Circuit Simulation of Quantum Field Theories*, SISSA/International Center for Theoretical Physics, June 2020
32. *Simulating Quantum Field Theories with Quantum Circuits*, Max Planck Institute for Gravitational Physics, June 2020
33. *Quantum Simulation of Integrable Quantum Field Theories*, Yale University, June, 2019
34. *Quantum Information Processing with Josephson Circuits*, Institut de Physique Théorique, CEA Saclay, April 2019
35. *Concurrent Remote Entanglement with Continuous Variables*, University of Regensburg, July 2018
36. *Quantum Phase Transitions of the Majorana Toric Code in the Presence of Cooper-pair tunneling*, Technische Universität München, April 2018
37. *Concurrent Remote Entanglement with Continuous Variables*, Aachen University, March 2016
38. *Concurrent Remote Entanglement with Continuous Variables*, McGill University, March 2016

#### **OTHER INVITATIONS:**

1. KITP Workshop on Integrability, Santa Barbara, November 2024 (declined)
2. Banff International Research Station Workshop on Quantum Information: Entanglement, Topology and Quantum Circuits, February 2025 (declined)
3. CERN workshop on Real-time and out-of-equilibrium dynamics in the quantum HEP era, May 2025 (declined)
4. IHES Fuzzy Sphere Workshop, June 2025 (declined)
5. CERN workshop on TH Institute on Quantum Simulation and Computation in HEP, September 2025 (declined)

#### **PRESENTATIONS AT CONFERENCES AND WORKSHOPS:**

1. *Efficient Quantum Circuits based on the Quantum Natural Gradient*, American Physical Society March Meeting, Minneapolis, MN, March 2024
2. *Spectroscopy of Ising Mesons on a Noisy Quantum Simulator*, American Physical Society Topical Group on Hadronic Physics Workshop, April 2023
3. *Entanglement Entropy in the Ising Model with Topological Defects*, American Physical Society March Meeting, Chicago, IL, March 2022
4. *The quantum sine-Gordon model with quantum circuits*, American Physical Society March Meeting, Virtual, March 2021
5. *Topological Phases in a One-dimensional Majorana-Bose-Hubbard Model*, American Physical Society March Meeting, Denver, CO, March 2020
6. *An integrable multi-field sine-Gordon model with Josephson circuits*, American Physical Society March Meeting, Boston, MA, March 2019
7. *An integrable multi-field sine-Gordon model with Josephson circuits*, Deutsche Physikalische Gesellschaft Meeting, Regensburg, Germany, July 2019

8. *Quantum Phase Transitions of the Majorana Toric Code in the Presence of Cooper-pair tunneling*, American Physical Society March Meeting, Los Angeles, CA, March 2018
9. *Continuous Generation and Stabilization of Schrödinger Cat States in a Quantum Circuit*, American Physical Society March Meeting, San Antonio, TX, March 2015

## **ACADEMIC SERVICES:**

Editorial Services: Advisory Editor, Nuclear Physics B

Peer Review: Physical Review Letters, Physical Review A, Physical Review B, Physical Review E, Nature Communications, Nature Physics, Nuclear Physics B, Quantum Information Processing, SciPost Physics

PhD Committee Service: Chad Ummel (Rutgers University)

Panel and Grant Review: Reviewer for US Department of Energy, Office of High Energy Physics

## **TEACHING FELLOW POSITIONS:**

Advanced Quantum Optics (Winter 2016), Electromagnetism (Spring 2016), Thermal and Statistical Physics (Fall 2015), Quantum Optics (Spring 2014), Ordinary and Partial Differential Equations (Fall 2014), Intensive Introductory Physics (Fall 2013), University Physics (Spring 2013), Noise: Dissipation and Amplification (Fall 2012), Multivariable Calculus for Engineers (Fall 2011)

## **TEACHING:**

1. Introduction to Quantum Computing, Spring 2024, Rutgers University
2. Advanced Topics in Solid State Physics – Quantum Computing, Fall 2023 and Fall 2025, Rutgers University
3. Classical Mechanics, Fall 2022, Rutgers University
4. Analytical Physics, Spring 2021, Rutgers University
5. Exactly Solvable Models in Statistical Mechanics (Summer 2020 and Summer 2021, Technische Universität München)

## **REFERENCES:**

Prof. Hubert Saleur  
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## PUBLICATIONS:

1. *Integrability and lattice discretizations of all Topological Defect Lines in minimal CFTs*, Madhav Sinha, Thiago Silva Tavares, **Ananda Roy**, Hubert Saleur, arXiv: 2509.04257 (2025)
2. *Boundary Conditions for the Entanglement Cut in 2D Conformal Field Theories*, **Ananda Roy**, Sergei L. Lukyanov, and Hubert Saleur, arXiv:2503.12674 (2025)
3. *Variational Quantum Simulation of Anyonic Chains*, **Ananda Roy**, arXiv:2412.17781 (2024)
4. *Quantum Circuit Optimization using Differentiable Programming of Tensor Network States*, David Rogerson and **Ananda Roy**, arXiv:2408.12583 (2024)
5. *Integrable RG Flows on Topological Defect Lines in 2D Conformal Field Theories*, Thiago Silva Tavares, Madhav Sinha, Linnea Grans-Samuelsson, **Ananda Roy**, Hubert Saleur, arXiv:2408.08241 (2024)
6. *Universal Euler-Cartan Circuits for Quantum Field Theories*, **Ananda Roy**, Robert M. Konik, David Rogerson, arXiv:2407.21278 (2024)
7. *Topological Interfaces of Luttinger Liquids*, **Ananda Roy** and Hubert Saleur, Phys. Rev. B 109, L161107 (2024), arXiv:2312.05566
8. *Lattice Realizations of Topological Defects in the critical (1+1)-d Three-State Potts Model*, Madhav Sinha, Fei Yan, Linnea Grans-Samuelsson, **Ananda Roy**, Hubert Saleur, JHEP 07, 225 (2024), arXiv:2310.19703
9. *Efficient Quantum Circuits based on the Quantum Natural Gradient*, **Ananda Roy**, Sameer Erramilli, Robert M. Konik, arXiv:2310.10538 (2023), accepted in Phys. Rev. Res.
10. *Simulating the Transverse Field Ising Model on the Kagome Lattice using a Programmable Quantum Annealer*, Pratyankara Narasimhan, Stephan Humeniuk, **Ananda Roy**, Victor Drouin-

- Touchette, Phys. Rev. B 110, 054432 (2024), arXiv:2310.06698 (2023)
11. *Quantum Electronic Circuits for Multicritical Ising Models*, **Ananda Roy**, Phys. Rev. B 108, 235414 (2023), arXiv:2306.04346
  12. *Ising Meson Spectroscopy on a Noisy Digital Quantum Simulator*; Chris Lamb, Yicheng Tang, Robert Davis and **Ananda Roy**, Nature Communications 15, 5901 (2024), arXiv:2303.03311
  13. *Soliton Confinement in a Quantum Circuit*, **Ananda Roy** and Sergei L. Lukyanov, Nature Communications 14, 7433 (2023), arXiv: 2302.06289
  14. *Entanglement entropy and negativity in the Ising model with defects*, David Rogerson, Frank Pollmann, and **Ananda Roy**, JHEP 06, 165 (2022), arXiv:2204.03601
  15. *Entanglement entropy in critical quantum spin chains with boundaries and defects*, **Ananda Roy** and Hubert Saleur, Book chapter in Entanglement in Spin Chains - Theory and Quantum Technology Applications, Springer, arXiv: 2111.04534, (2021)
  16. *Entanglement entropy in the Ising model with topological defects*, **Ananda Roy** and Hubert Saleur, Phys. Rev. Lett. 128, 090603 (2022), arXiv: 2111.04534
  17. *The quantum sine-Gordon model with quantum circuits*, **Ananda Roy**, Dirk Schuricht, Johannes Hauschild, Frank Pollmann, and Hubert Saleur, Nucl. Phys. B 968, 115445 (2021), arXiv:2007.06874
  18. *Entanglement Hamiltonian of the 1+1-dimensional free, compactified boson conformal field theory*, **Ananda Roy**, Frank Pollmann, and Hubert Saleur, J. Stat. Mech 083104 (2020), arXiv: 2004.14370
  19. *Quantum phases of a one-dimensional Majorana-Bose-Hubbard model*, **Ananda Roy**, Johannes Hauschild, and Frank Pollmann, Phys. Rev. B 101, 075419 (2020), arXiv: 1911.08120
  20. *The critical properties of the Ising model in hyperbolic space*, Nikolas Breuckmann, Benedikt Placke, and **Ananda Roy**, Phys. Rev. E 101, 022124 (2020), arXiv: 1909.12107
  21. *Topological ordering in the Majorana toric code*, Alexander Ziesen, Fabian Hassler, and **Ananda Roy**, Phys. Rev. B 100, 104508 (2019), arXiv: 1906.05158
  22. *Quantum electronic circuit simulation of generalized sine-Gordon models*, **Ananda Roy** and Hubert Saleur, Phys. Rev. B 100, 155425 (2019), arXiv:1902.09530
  23. *Dynamical structure factor in the non-Abelian phase of the Kitaev honeycomb model in the presence of quenched disorder*, Daniel Otten, **Ananda Roy** and Fabian Hassler, Phys. Rev. B 99, 035137 (2019), arXiv: 1810.01426
  24. *Dual Shapiro steps of a phase-slip junction in the presence of a parasitic capacitance*, Lisa Arndt, **Ananda Roy** and Fabian Hassler, Phys. Rev. B. 98, 014925 (2018), arXiv:1802.08123
  25. *Quantum-limited parametric amplification with Josephson circuits in the regime of pump*

- depletion*, **Ananda Roy** and Michel Devoret, Phys. Rev. B. 98, 045405 (2018), arXiv: 1801.10115
26. *Charge-response of the Majorana toric code*, **Ananda Roy** and Fabian Hassler, Phys. Rev. B. 97, 024512 (2018), arXiv:1710.04168
  27. *Quantum phase transitions of the Majorana toric code in the presence of finite Cooper-pair tunneling*, **Ananda Roy**, Barbara M. Terhal, and Fabian Hassler, Phys. Rev. Lett. 119, 180508 (2017), arXiv: 1705.02864
  28. *Topological Quantum Computing*, **Ananda Roy** and David P. DiVincenzo, in Topological Matter: Topological Insulators, Skyrmions and Majoranas, Lecture notes of the 48th IFF Spring School 2017, eds. S. Bluegel, Y. Mokrusev, T. Schaepers, and Y. Ando (Forschungszentrum Juelich, Key Technologies, Vol. 139, 2017), Sec. D7, arXiv:1701.05052
  29. *Concurrent remote entanglement with quantum error correction against photon losses*, **Ananda Roy**, A. Douglas Stone, and Liang Jiang, Phys. Rev. A 94, 032333 (2016)
  30. *Introduction to quantum-limited parametric amplification of quantum signals with Josephson circuits*, **Ananda Roy** and Michel Devoret, Comptes Rendus Physique, 17, 7, 740 (2016)
  31. *Remote entanglement by coherent multiplication of concurrent quantum signals*, **Ananda Roy**, Liang Jiang, A. Douglas Stone, and Michel Devoret, Phys. Rev. Lett. 115, 150503 (2015)
  32. *Continuous generation and stabilization of mesoscopic field superposition states in a quantum circuit*, **Ananda Roy**, Zaki Leghtas, A. Douglas Stone, Michel Devoret, and Mazyar Mirrahimi, Phys. Rev. A 91, 013810 (2015)
  33. *Asymmetric frequency conversion in nonlinear systems driven by a biharmonic pump*, Archana Kamal, **Ananda Roy**, John Clarke and Michel Devoret, Phys. Rev. Lett. 113, 247003 (2014)
  34. *Three-wave mixing with three incoming waves: Signal-Idler Coherent Cancellation and Gain Enhancement in a Parametric Amplifier*, Flavius Schakert, **Ananda Roy**, Michael Hatridge, A. Douglas Stone and Michel Devoret, Phys. Rev. Lett. 111, 073903 (2013)
  35. *Resonant production of the sterile neutrino dark matter and fine-tunings in the neutrino minimal standard model*, **Ananda Roy** and Mikhail Shaposhnikov, Phys. Rev. D 82, 065014 (2010)
  36. *Renormalization of masses of sterile neutrinos in the neutrino minimal standard model*, **Ananda Roy**, arXiv:1006.4007