Rodolfo Reis Soldati

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My homepage

Curriculum Vitae

Rodolfo Reis Soldati

Personal details

- Date of birth: 12th of January, 1995.
- Place of birth: Juiz de Fora, MG, Brazil.

Education and Academic appointments

2023 – Present **Postdoctoral Fellow**, *Group of Prof. Raymond Laflamme.*, Institute for Quantum Computing, University of Waterloo, Waterloo, ON, Canada.

2019 – 2023 **Ph.D. (CNPq/DAAD fellow) – Advisors: Prof. Eric Lutz, Prof. Gabriel Landi**, *Cotutelle*, Universität Stuttgart, ITP1, Universidade de São Paulo, IFUSP
Thesis. *Quantum cooling: thermodynamics and information*.

2017 – 2018 **M.Sc. Physics – Advisor: Prof. Nelson Yokomizo**, Universidade Federal de Minas Gerais, ICEx, Belo Horizonte, MG, Brazil
Dissertation. Entanglement entropy in quantum field theory.

2014 – 2015 **Visiting student – Theoretical Physics**, Durham University, Durham, UK
Awarded with the Science Without Borders scholarship.

2013 – 2016 **B.Sc. Physics**, Universidade Federal de Minas Gerais, ICEx, Belo Horizonte, MG, Brazil

Publications

2025 R. Chakraborty, K, Driscoll, *Soldati, R. R.*, B. S. de Mendonça, R. Laflamme (2025). Responsible quantum innovation in Canada. In preparation.

2024 *Soldati, R. R.*, Quantum cooling: thermodynamics and information (Doctoral dissertation, Stuttgart, Universität Stuttgart, 2023).

2023 *Soldati, R. R.*, Dasari, D. B., Wrachtrup, J., & Lutz, E. (2024). Cooling Limits of Coherent Refrigerators, [arXiv:2410.18201].

2022 *Soldati, R. R.*, Dasari, D. B., Wrachtrup, J., & Lutz, E. (2022). Thermodynamics of a minimal algorithmic cooling refrigerator. **Physical Review Letters, 129(3), 030601.** [arXiv:2109.14056].

2021 *Soldati, R. R.*, Menicucci, L. S., & Yokomizo, N. (2021). Universal terms of the entanglement entropy in a static closed universe. **Physical Review D, 104(12), 125016.** [arXiv:2106.06803].

2021 *Soldati, R. R.*, Mitchison, M. T., & Landi, G. T. (2021). Multipartite quantum correlations in a two-mode Dicke model. **Physical Review A, 104(5), 052423.** [arXiv:2105.09260].

2016 da Paz, I. G., *Soldati, R.*, Cabral, L. A., de Oliveira Jr, J. G. G., & Sampaio, M. (2016). Poisson's spot and Gouy phase. **Physical Review A, 94(6), 063609.** [arXiv:1609.09023].

Teaching

2024 Fall	Teaching Assistant.	University of Waterloo.	PHYS468 Implementations of Quantum Computers.
2023 Summer	Teaching Assistant.	University of Stuttgart.	Classical Mechanics.
2022/23 Winter	Teaching Assistant.	University of Stuttgart.	Mathematical Methods of Physics 1.
2022 Summer	Teaching Assistant.	University of Stuttgart.	Electrodynamics.
2021/22 Winter	Teaching Assistant.	University of Stuttgart.	Mathematical Methods of Physics 1.
2021 Summer	Teaching Assistant.	University of Stuttgart.	Seminar Training.
2020.1	Teaching Assistant.	University of São Paulo.	Physics 1, Classical Mechanics.

Events and presentations

February 2025	Quantum Days 2025	Toronto, Canada	Participant.
August 2024	RQI North 2024	Prague, Czechia	Poster on "Trajectory superpositions in signalling with quantum fields."
July 2023	Quantum Thermodynamics Conference 2023	Vienna, Austria	Poster on "Cooling advantage of coherent virtual qubits."
Sep 2022	Qalypso Summer School on Quantum Computation & Open Quantum Systems	Gozo, Malta	Poster and short talk on "Thermodynamics of a minimal algorithmic cooling refrigerator."
Jul 2022	Entropy and the Second Law of Thermodynamics	WE-Heraeus-Seminar 761	Poster on "Thermodynamics of a minimal algorithmic cooling refrigerator."
Jun 2022	Quantum Thermodynamics Conference 2022	QUB/Online	Poster on "Thermodynamics of a minimal algorithmic cooling refrigerator."
Aug 2021	Quantum Thermodynamics Summer School	SwissMap	Poster on "Multipartite quantum correlations in a two-mode Dicke model."

Sep/Oct 2019	Predoc School on Interaction of Light with Cold Atoms	Les Houches	Poster on "Symmetry Breaking in a U(1) Dicke model."
Nov 2018	Workshop Physics in the Department	UFMG, Brazil	Talk delivered on "Universal terms of the entanglement entropy in Einstein space."
Nov 2017	Workshop Physics in the Department	UFMG, Brazil	Talk delivered on "Quantum correlations for scalar field in closed spacetime."
Mar 2016	II Workshop on Quantum Field Theory and Quantum Optics	UESC, Brazil	Talk delivered on "Poisson spot with matter waves."

More details on schools I participated below.

Aug 2021 **Quantum Thermodynamics Summer School**, *SwissMap Research Station, Les Diablerets. Organized by ETH Zurich and Squid*

Nov/Dec 2020 **A mini-course on Quantum-Information Thermodynamics**, *Online, hosted by USP*

Aug 2020 **Online School on Ultra Quantum Matter**, *Perimeter Institute*

Sep/Oct 2019 **Predoc School on Interaction of Light with Cold Atoms**, *Les Houches*

Sep 2019 **School on Interaction of Light with Cold Atoms**, *ICTP-SAIFR*

Jul 2019 **XXI Giambiagi Winter School — Quantum simulations and quantum metrology with cold trapped ions**, *University of Buenos Aires*

Apr 2019 **Minicourse on Quantum Gravity from the QFT perspective**, *ICTP-SAIFR*

Jun 2018 **1st Joint ICTP-Trieste/ICTP-SAIFR School on Particle Physics**, *ICTP-SAIFR*

Jan/Feb 2018 **Mathematics Summer Programme**, *UFMG*

Aug 2017 **XVI Brazilian School on Cosmology and Gravitation**, *CBPF*

Jul 2016 **IFT-Perimeter-SAIFR Journeys into Theoretical Physics**, *ICTP-SAIFR*

Research experience

2019 – present **Ph.D. in a double-degree programme (CNPq and DAAD fellowships)**, *Cotutelle by Prof. Gabriel Landi and Prof. Eric Lutz*, USP, University of Stuttgart

I am currently working on the theory and applications of information theory in the thermodynamics of quantum refrigerators. We investigate different platforms and their correlation profiles to characterize the advantages and overall differences on the operation of refrigerators in a genuine quantum regime.

2017 – 2018 **Master's degree research project (CNPq scholarship)**, *advised by Prof. Nelson Yokomizo*, UFMG

My master's degree research project is on the behaviour of universal contributions to entanglement entropy in field theory. It is known that the area law for entropy gets corrections due to curvature of spacetime, and we are looking for them using numerical methods and lattice regularisation for the fixed background of the Einstein universe.

2016 **Undergraduate research project (CNPq scholarship)**, *advised by Prof. Marcos Sampaio*, UFMG

Study of the Poisson spot with matter waves using path integral formulation and including effects of decoherence. We also noticed how the Poisson spot intensity is augmented when the Gouy phase shift is taken into account, leading to better fit of experimental data for interferometry of deuterium molecules.

Summer 2015 **Final project for Science Without Borders scholarship programme**, *advised by Prof. Ian Terry*, Centre for Materials Physics, Durham University
Simulations with the software MCNP6 of the response of transistors to irradiation from the beta decay of Sr^{90} and Y^{90} and the characteristic X-ray spectrum of a Ag target.

July 2013 – June 2014 **Institutional Program to aid the Research of Newly Licensed Doctors (PRPq scholarship)**, *advised by Prof. Ethan Cotterill*, Department of Mathematics, UFMG
Gonality of tree-decomposed graphs: identification of tree decomposition of metric graphs with the *chip-firing burning algorithm* and use of *cut-and-join* method for visualizing the embedding of graphs on a Riemann sphere.

Other projects

Board member at QBrasil — I am a board member of QBrasil, the local branch of QWorld, an international non-profit organization aiming at popularizing and democratizing education in quantum technologies and quantum information science. Our latest event was QBronze148 (see link above), an introductory lecture course on quantum computing with certification at the undergraduate level.

Conference organization — I am part of the organizing committee for the Policymaking for Quantum Technologies Conference to be announced at Perimeter Institute, 2025.

Lecture recording — I am part of the team managing the recording and live stream of lectures during the academic years of 2021 and 2022 at the University of Stuttgart. I have been particularly responsible for the two lecture courses: (1) Mathematical Methods of Physics; (2) Electrodynamics.

Institute seminar — In 2019 I assisted the organization of the Quantum Discussions seminar series at USP, with Prof. Gabriel Landi, with the aim to bring closer together research at the interface between quantum information, condensed matter and high-energy physics.

Group seminar — I have been responsible from the second half of 2017 to 2018 for managing the weekly meetings of the Group for Fundamental Theory at UFMG, which include a seminar given by one of our members or invited speakers, and the "PI session", when we gather to watch the latest research seminars provided by the Perimeter Institute at PIRSA. I have also worked on setting up the group's webpage, at GFT.

Languages

Portuguese	Native
Spanish	Basic
English	Fluent