

ALEXSSANDRE DE OLIVEIRA JUNIOR

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Born: 17 January 1994, Poços de Caldas, Brazil

EMPLOYMENT HISTORY

Technical University of Denmark
Postdoctoral Research Fellow

Lyngby, Denmark
2023 - Ongoing

EDUCATION

Jagiellonian University
PhD in Physics

Kraków, Poland
2020 - 2023

- Summa cum laude
- Distinguished PhD thesis by The Polish Council of Physical Sciences

Supervisor: Dr. Kamil Korzekwa

Thesis: "Geometric and information-theoretic aspects of quantum thermodynamics"

Institute of Physics "Gleb Wataghin", University of Campinas
MSc in Condensed Matter Physics

Brazil
2018 - 2020

- Final grade 10/10 cum laude
- The admission exam is very selective, with an acceptance rate $\sim 25\%$

Supervisor: Prof. Dr. Marcos César de Oliveira

Dissertation: "Thermodynamics and Classicality"

São Paulo State University
BSc in Physics

Brazil
2013 - 2017

- Final grade 8.4/10 cum laude

Supervisor: Prof. Dr. Edson Sardella

Project: "Kinematic vortices in mesoscopic superconductors with a constriction"

AWARDS, GRANTS, AND FELLOWSHIPS

Juan de la Cierva Postdoctoral Fellowships (Declined) 2026

Juan de la Cierva Postdoctoral Fellowships (Declined) 2024

Featured in Quanta Magazine for the paper, "Heat as a Witness of Quantum Properties". A Thermometer for Measuring Quantumness 2025

Featured on Phys.org for the paper, "Heat as a Witness of Quantum Properties". Inspired by Maxwell's demon, heat flow acts as a witness to quantum properties 2024

Featured in New Scientist for the paper, "Heat as a Witness of Quantum Properties". We can diagnose an object's quantumness from the way it radiates heat 2024

Feature on Wolfram Alpha, Algorithm highlighted in "Publication Materials and Staff Picks" columns as a work of outstanding quality. See more in: Thermal cones 2022

Master's CAPES Grant, "Thermodynamics and Classicality", 6960 €. 2018 - 2020

Gleb Wataghin Admission Exam, average acceptance rate $\sim 25\%$. 2018

Undergraduate Research FAPESP grant, "Kinematic vortices in mesoscopic superconductors with a constriction". See more in Scholarship, 2000 €. 2015-2017

ACADEMIC ACTIVITIES

I have been a referee for leading academic journals such as *Physical Review Letters*, *Physical Review A*, *Physical Review E*, *Quantum* and *Journal of Mathematical Physics*.

TEACHING EXPERIENCE

Teaching Assistant - Thermodynamics, University of Campinas (UNICAMP)

2019

INVITED TALKS, SEMINARS, AND POSTER PRESENTATIONS

IT = Invited Talk; CT = Contributed Talk (accepted after abstract submission); ST = Seminar/Group talk (given during departmental visits or research stays); P = Poster presentation.

(ST) Trading athermality for nonstabiliserness , <i>Universitat Autònoma de Barcelona, Spain</i>	2026
(CT) Trading athermality for nonstabiliserness , <i>International Conference for Young Quantum Information Scientists, Austria</i>	2026
(IV) Heat as a witness of quantum properties , <i>Quantum Thermodynamics Conference, Brazil</i>	2026
(ST) Heat as a witness of quantum properties , <i>University College Dublin, Ireland</i>	2026
(IT) Privacy in continuous-variable distributed quantum sensing , <i>Quantum at the Dunes, Brazil</i>	2026
(IT) Resource-theoretic approach to quantum thermodynamics , <i>Quantum at the Dunes, Brazil</i>	2026
(IT) Privacy in continuous-variable distributed quantum sensing , <i>Workshop on Secure Networks of Quantum Sensors, France</i>	2026
(P) Trading athermality for nonstabiliserness , <i>Nordic Quantum Information Processing workshop, Sweden</i>	2026
(IT) Heat as witness of quantum properties , <i>Quantum PEQUI workshop (Brazil)</i>	2025
(ST) Resource theory of thermodynamics , <i>International Institute of Physics, Natal, Brazil</i>	2025
(ST) Heat as a witness of quantum properties , <i>Jagiellonian University, Kraków, Poland.</i>	2025
(ST) Heat as a witness of quantum properties , <i>Quantum Information and Foundations of Quantum Theory group, Lund, Sweden.</i>	2025
(ST) Heat as a witness of quantum properties , <i>The InQlings group, Singapore.</i>	2024
(ST) Quantum catalysis in cavity QED , <i>Quantum Information theory group, Campinas, Brazil.</i>	2024
(P) Heat as a witness of quantum properties , <i>Quantum Thermodynamics 2024, Maryland (United States)</i>	2024
(P) Entanglement from athermality , <i>Quantum Thermodynamics 2024, Maryland (United States)</i>	2024
(CT) Quantum catalysis in cavity QED , <i>Quantum Morocco (Rabat)</i>	2024
(CT) Geometric structure of thermal cones , <i>Quantum Thermodynamics 2023 (Austria)</i>	2023
(ST) Geometric and information-theoretic aspects of quantum thermodynamics , <i>Quantum Information and Quantum Computing Working Group, Warsaw, Poland.</i>	2023
(ST) Quantum catalysis in cavity QED , <i>Jagiellonian University, Kraków, Poland.</i>	2023
(ST) Geometric structure of thermal cones , <i>Vienna University of Technology, Vienna, Austria.</i>	2023
(ST) Geometric structure of thermal cones , <i>Jagiellonian University, Kraków, Poland.</i>	2023
(P) Quantum catalysis in cavity QED , <i>Workshop on Gaussian and non-Gaussian Quantum Correlations, Copenhagen (Denmark).</i>	2023
(P) Thermal recall: Memory-assisted Markovian thermal processes , <i>Quantum Thermodynamics 2023, Vienna (Austria).</i>	2023
(P) Thermal recall: Memory-assisted Markovian thermal processes , <i>Near-term Quantum Computing 2020(+3), Warsaw (Poland).</i>	2023
(CT) Geometric structure of thermal cones , <i>DPG Meeting of the Condensed Matter Section, Regensburg (Germany).</i>	2022
(ST) Geometric structure of thermal cones , <i>University of Geneva, Geneva, Switzerland.</i>	2022
(ST) A resource-theoretic approach to the thermodynamic arrow of time and its applications , <i>Jagiellonian University, Kraków, Poland.</i>	2022
(P) Geometric structure of thermal cones , <i>Quantum Thermodynamics Conference, Belfast (Ireland).</i>	2022
(P) Geometric structure of thermal cones , <i>Entanglement in Action Conference, Benasque (Spain).</i>	2022
(CT) A resource-theoretic approach to the thermodynamic arrow of time and its applications , <i>Quantum Speedup Workshop, Gdańsk (Poland).</i>	2021
(CT) Information theory and statistical mechanics , <i>IQIT, Workshop on quantum information, Koninki (Poland).</i>	2021

(ST) Fluctuation-dissipation relations for thermodynamic distillation processes , <i>Jagiellonian University, Kraków, Poland</i> .	2021
(P) A resource-theoretic approach to the thermodynamic arrow of time and its applications , <i>Quantum Speedup Workshop, Gdańsk (Poland)</i> .	2021
(P) Machine classification for probe-based quantum thermometry , <i>Quantum Thermodynamics Summer School, Les Diablerets (Switzerland)</i> .	2021
(P) Fluctuation-dissipation relations for thermodynamic distillation processes , <i>Quantum Optics X, Toruń (Poland)</i> .	2021
(P) Thermodynamics and Classicality , <i>College on Energy Transport and Energy Conversion in the Quantum Regime, Trieste (Italy)</i> .	2019
(P) Kinematic vortices in mesoscopic superconductors with a constriction , <i>Topics in Superconductivity, Recife (Brazil)</i> .	2016
(P) Kinematic vortices in mesoscopic superconductors with a constriction , <i>XXVIII Congresso de Iniciação Científica da UNESP, Bauru (Brazil)</i> .	2016

PUBLICATIONS AND PRE-PRINTS

- **Anomalous Local Heat Capacity and Bipartite Entanglement**, Jake Xuereb, A. de Oliveira Junior *arXiv:2608.21508* (2026).
- **Randomness Certification and Trade-offs in the Prepare-and-Broadcast Scenario**, T.S. Sarubi, M. Alves, V.F. Alves, S. Zamora, D.H.G Duarte, A. Junior, R Chaves *arXiv:2608.08329* (2026).
- **The Prepare and Broadcast Scenario**, T.S Sarubi, M. Alves, S. Zamora, V.F Alves, A. de Oliveira Junior, R. Chaves *arXiv:2606.28632* (2026).
- **Every Little Thing Heat Does Is Magic**, Rafael A. Macêdo, A. de Oliveira Junior, Naim E. Comar, Luna Lima Keller, Jonatan Bohr Brask, Lucas C. Céleri and Rafael Chaves *arXiv:2602.18939* (2026).
- **Predicting Magic from Very Few Measurements**, Joab M. Varela, Luna L. Keller, A de Oliveira Junior, Darlan A. Moreira, Rafael Chaves, Rafael A. Macêdo *arXiv:2602.18939* (2026).
- **Robust Bell Nonlocality from Gottesman–Kitaev–Preskill States**, Xiaotian Yang, Santiago Zamora, Rafael Chaves, Ulrik L. Andersen, Jonatan Bohr Brask, A. de Oliveira Junior *arXiv:2601.16189* (2026).
- **Trading athermality for nonstabiliserness**, A. de Oliveira Junior, Rafael A. Macedo, Jakub Czartowski, Jonatan Bohr Brask, Rafael Chaves *Phys. Rev. A* **113**, 052421 (2026).
- **Semi-device-independent randomness certification on discretized continuous-variable platforms**, Moisés Alves, Vitor L. Sena, Santiago Zamora, Tailan S. Sarubi, A. de Oliveira Junior, Alexandre B. Tacla, Rafael Chaves *Phys. Rev. A* **113**, 042418 (2026).
- **Privacy in continuous-variable distributed quantum sensing**, A. de Oliveira Junior, Anton Andersen, Benjamin Lundgren Larsen, Sean William Moore, Damian Markham, Masahiro Takeoka, Jonatan Bohr Brask, Ulrik Andersen *arXiv:2509.12338* (2025).
- **A Friendly Guide to Exorcising Maxwell’s Demon**, A. de Oliveira Junior, Jonatan Bohr Brask, Rafael Chaves *PRX Quantum* **6**, 030201 (2025).
- **Heat as a witness of quantum properties**, A. de Oliveira Junior, Jonatan Bohr Brask, Patryk Lipka-Bartosik *Phys. Rev. Lett.* **134**, 050401 (2025).
- **Relative volume of comparable pairs under semigroup**, Fabio Deelan Cunden, Jakub Czartowski, Giovanni Gramegna, A. de Oliveira Junior *Letters in Mathematical Physics* **115**, 79 (2025).
- **What resources do agents need to acquire knowledge in Quantum Thermodynamics?**, J. Xuereb, A. de Oliveira Junior, F. Clivaz, P. Bakhshinezhad, M. Huber *arXiv:2410.18167* (2024).
- **Geometric and information-theoretic aspects of quantum thermodynamics**, A. de Oliveira Junior *arXiv:2404.00617* (2024).
- **Catalytic transformations for thermal operations**, Jakub Czartowski, A. de Oliveira Junior *Phys. Rev. Research* **6**, 033203 (2024).
- **Entanglement from athermality**, A. de Oliveira Junior, Jeongrak Son, Jakub Czartowski, Nelly H. Y. Ng *Phys. Rev. Research* **6**, 033236 (2024).
- **Quantum catalysis in cavity QED**, A. de Oliveira Junior, Martí Perarnau-Llobet, Nicolas Brunner, Patryk Lipka-Bartosik *Phys. Rev. Research* **6**, 023127 (2024).

- **Thermal recall: Memory-assisted Markovian thermal processes***, J. Czartowski, A. de Oliveira Junior, K. Korzekwa *PRX Quantum* **4**, 040304 (2023).
*A. de Oliveira Junior and J. Czartowski contributed equally; the order is alphabetical.
- **Geometric structure of thermal cones**, A. de Oliveira Junior, J. Czartowski, K. Życzkowski, K. Korzekwa *Phys. Rev. E* **106**, 064109 (2022).
- **Unravelling the non-classicality role in Gaussian heat engines**, A. de Oliveira Junior, M. C. de Oliveira *Sci. Rep.* **12**, 10412 (2022).
- **Resource theory of Absolute Negativity**, R. Salazar, J. Czartowski, A. de Oliveira Junior *arXiv:2205.13480* (2022).
- **Fluctuation-dissipation relations for thermodynamic distillation processes**, T. Biswas, A. de Oliveira Junior, M. Horodecki, K. Korzekwa *Phys. Rev. E* **105**, 054127 (2022).
- **Machine classification for probe-based quantum thermometry**, F. S. Luiz, A. de Oliveira Junior, F. F. Fanchini, G. T. Landi *Phys. Rev. A* **105**, 022413 (2022).
- **Spin-orbit implementation of Solovay–Kitaev decomposition of single-qubit channel**, M. H. M. Passos, A. de Oliveira Junior, M. C. de Oliveira, A. Z. Khourey *Phys. Rev. A* **102**, 062601 (2020).
- **Ultra-fast Kinematic Vortices in Mesoscopic Superconductors: The Effect of the Self-Field**, L. R. Cadorn, A. de Oliveira Junior, E. Sardella *Sci. Rep.* **10**, 18662 (2020).

REFERENCES

- **Dr. Kamil Korzekwa**, Jagiellonian University (kamil.korzekwa@uj.edu.pl).
- **Prof. Karol Życzkowski**, Jagiellonian University (karol.zyczkowski@uj.edu.pl).
- **Prof. Jonatan Bohr Brask**, Technical University of Denmark (jobb@fysik.dtu.dk).
- **Prof. Ulrik Lund Andersen**, Technical University of Denmark (ulrik.andersen@fysik.dtu.dk).
- **Prof. Rafael Chaves**, International Institute of Physics (rafael.chaves@ufrn.br).

LANGUAGES

Portuguese: Native English: Fluent Spanish: Intermediate