Benjamin Stratton

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An enthusiastic and ambitious final-year PhD student at the University of Bristol, working within the Quantum Information Theory Group as a member of the Quantum Engineering Centre for Doctoral Training. I have conducted research within the fields of quantum computation and quantum thermodynamics through the lens of quantum information theory; written software for research purposes; and taught a post-graduate course in quantum information and quantum computation. I have demonstrated diligence and commitment throughout my career and hence have developed as a promising physicist, as shown by consistent publications and academic achievements.

EDUCATION

University of Bristol **Bristol, UK**
Quantum Engineering Centre for Doctoral Training (QE-CDT) *September 2021 - Current*

- Fully funded for 4 years (1 MRes year + 3 PhD years)
- Undertook courses in the preliminary year in Quantum Light and Matter (89%), Applied Quantum Theory (pass), Quantum Systems Engineering (78%) and Nano-fabrication (89%).

University of Bristol **Bristol, UK**
Masters of Science (MSci) in Physics *September 2016 - July 2020*

- Awarded degree with first class honours (Average 77%)
  - Units Include: Advance Quantum Mechanics (87%), Quantum Information Theory (78%), Quantum Computation (80%), Advance Computational Physics (78%), General Relativity (82%).

Okehampton College **Okehampton, UK**
GCSE and A-levels *2011 - 2016*

- **A-levels**: Mathematics A*, Further Mathematics A, Physics A, Chemistry A (AS only)
- **GCSEs**: 6 A*, 3A. Including Mathematics and Physics at A*.

RESEARCH HIGHLIGHTS

An Algorithm for Estimating α-Stabilizer Rényi Entropies via Purity **Bristol, UK**

- Designed a quantum algorithm to measure the so-called α-Rényi Stabilizers entropies — a method for quantifying non-stabilizerness — for unknown quantum states using a novel purity encoding.
- Extensively used QISKIT to modeled and benchmark the algorithm, and rigorously assessed and compared its resource requirements.

Cooling a Qubit with n Others **Bristol, UK and Vienna, Austria**

- Used an understanding of the intersection of quantum information theory and quantum thermodynamics to significantly advance our understand of cooling quantum systems via unitary dynamics.
- Successfully modified the developed cooling protocol to be an optimal purity enhancement protocol.

Dynamical Resource Theory of Informational Non-equilibrium Preservability **Bristol, UK**

- Developed a framework for comparing the ability of quantum channels to preserve informational non-equilibrium (purity).
- Applied the results to thermodynamics, high-level noise models and classical communication.

Software Tools for Integrated Photonic Spatial Filter Design **Bristol, UK**

- Developed a fast and efficient ray tracer for use in the design of spatial filters used to scatter excess pump light in integrated photonic circuits.
- Acquired knowledge in both just-in-time compilation and parallelisation.
- Created the foundations of a design toolkit using the ray tracer by testing the effectiveness of the filters for parameters such as length, width, size and density.

The Remote Control of a Spectrometer **Hamburg, Germany**

- Wrote the backend and frontend code for the remote control of a spectrometer used for measuring the temperature of samples on a laser heating table.
- Extensively used python and learnt other hardware specific macrolanguages.

PUBLICATIONS

- **An Algorithm for Estimating α-Stabilizer Rényi Entropies via Purity**, B.Stratton, *arXiv:2507.02540* (2025) (under review by Physical Review A).
- **Cooling a Qubit Using n Others**, J.Xuereb, B.Stratton, A.Rolandi, J.He, M.Huber, P.Bakhshinezhad, *arXiv:2506.10059* (2025) (accepted by PRX Quantum).
- **Informational nonequilibrium concentration**, C.-Y.Hsieh, B.Stratton, H.-C.Weng, V.Scarani, *Phys. Rev. A* (2025).
- **Dynamical resource theory of incompatibility preservability**, C.-Y.Hsieh, B.Stratton, C.-H.Wu, H.-Yu.Ku *Phys. Rev. A* (2025).
- **Operational Interpretation of the Choi Rank Through k-State Exclusion**, B.Stratton, C.-Y.Hsieh, P.Skrzypczyk, *Phys. Rev. A* (2024).
- **Dynamical Resource Theory of Informational Nonequilibrium Preservability**, B.Stratton, C.-Y.Hsieh, P.Skrzypczyk, *Phys. Rev. Lett.* (2024).

CONFERENCES, SEMINARS AND OUTREACH

- **Purity Enhancement from Athermaility Enhancement**
  - Département de Physique Appliquée, University of Geneva, September 2025, *Seminar*
  - Grup d'Informació Quàntica (GIQ), Universitat Autònoma de Barcelona, October 2025, *Seminar*
- **Informational Non-equilibrium Concentration**
  - 8th International Conference for Young Quantum Information Scientists, Barcelona, October 2025, *Contributed*
  - Fundamental Limits of Quantum Technologies, Dublin, August 2025, *Contributed*
  - Quantum Resources Theories Workshop, Jeju Island South Korea, March 2025, *Contributed*
- **Operational Interpretation of the Choi Rank Through k-State Exclusion**
  - Atominstitut, Vienna University of Technology (TU Wein), October 2024, *Seminar*
  - Centre for Quantum Technologies, National University of Singapore, December 2024, *Seminar*
- **Dynamical Resource Theory of Informational Nonequilibrium Preservability**
  - Quantum Resource Theories Workshop, Singapore, December 2023, *Contributed*
- **Where is the value in Quantum (PhDs) — Outreach Talk**
  - Institute of Physics, Quantum and Nano Undergraduate Day, London, November 2024, *Invited*
  - Institute of Physics, Quantum and Nano Undergraduate Day, London, November 2025, *Invited*

WORK EXPERIENCE

The University of Bristol **Bristol, UK**

Teaching *September 2021 - Current*

- Improving my skills in communicating complex information by educating postgraduates on quantum information theory and quantum computation, and undergraduates on topics in the foundations of physics.

Vienna University of Technology (TU Wein) **Vienna, Austria**

Research Secondment *May 2025 - August 2025*

- Integrated into the group of Professor Marcus Huber to research problems at the intersection of quantum information theory and quantum thermodynamics.

Creator Fund **Remote**

Venture Fellow *September 2023 - September 2024*

- Sourcing deals, assessing technology and performing due diligence for the largest student lead venture capital firm in Europe.
- Focusing on deep tech deals with a particularly emphasis on quantum technologies.

On Call Africa **Livingstone, Zambia**

Volunteer Coordinator *Jan 2021 - August 2021*

- Provided technical and logistical support to volunteer doctors running health clinics in rural areas.
- Succeeded in designing and creating an interactive map using javascript for marketing and logistics.
- Gained experience in team management by coordinating teams collecting data in remote locations, often off grid for weeks at a time.

DESY **Hamburg, Germany**

Research Intern *July 2019 - September 2019*

- Gained skills in software engineering by writing backend and frontend code for the remote control of a spectrometer on a laser heating table.
- Attended an extensive lecture series on topics including photonics, particle physics and detector engineering.

LEADERSHIP AND EXTRACURRICULAR ACTIVITIES

Quantum Resources **Remote**

Writer *April 2024 - Current*

- A comprehensive, but ongoing, set of notes on topics in linear algebra, quantum theory, quantum information, error correction and more. Whilst developed for personal use, they are now shared for educational purposes.
- In the future, I intend to invite other PhD students to contribute with notes on subjects they wished they had had access to during their PhDs.

Careers in Quantum, 2024 **Bristol, UK**

Event Organiser *June 2023 - March 2024*

- Co-organising Careers in Quantum, the largest student led quantum careers fair in the UK.
- Proudly led the implementation of a travel bursary scheme to ensure students from all around the country could afford to attend the event.

National Quantum Computing Centre Hackathon 2023 **Birmingham, UK**

1st Place *July 2023*

- Successfully understood the Variational Quantum Linear Solver algorithm and ran it on multiple different quantum hardwares and simulators to access its performance, earning my team 1st place in the competition.

Chaos, Bristol Physics Society **Bristol, UK**
Vice-President *June 2019 - June 2020*

- Co-managed the award-winning Chaos committee of 18 individuals to run talks, trips and socials for our 700 members.
- Under my leadership Chaos won the 'committee excellence' award at the National Society and Volunteering awards as well as 'best academic society' at the Bristol SU society awards.
- Instrumental in the implementation of 'cup-less' Fridays into our society run coffee shop as part of my 3-year plan to improve sustainability.

REFERENCES

Professor Paul Skrzypczyk, Professor, H.H.Wills Physics Laboratory, The University of Bristol. *PhD Supervisor*. paul.skrzypczyk@bristol.ac.uk

Dr Chung-Yun Hsieh, Leverhulme Early Career Fellow, H.H.Wills Physics Laboratory, The University of Bristol. *PhD Supervisor*. chung-yun.hsieh@bristol.ac.uk

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