# Benjamin Stratton

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An enthusiastic and ambitious aspiring scientist. Demonstrated diligence and commitment throughout my career and hence developed as a promising physicist, as shown by consistent publications and academic achievements. I have conducted research within the fields of quantum information theory, quantum computation and quantum thermodynamics; written software for research purposes; and taught a post-graduate course in quantum information and quantum computation. Currently studying for a PhD at the University of Bristol within the quantum information theory group as a member of the Quantum Engineering Centre for Doctoral Training.

## EDUCATION

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

- Fully funded by the EPRSC 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*.

## EXAMPLE RESEARCH PROJECTS

**An Algorithm for Estimating $\alpha$-Stabilizer Rényi Entropies via Purity** **Bristol, UK**

- Designed a quantum algorithm to measure the so-called $\alpha$-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 given an arbitrary set of input states.

**Operational Interpretation of the Choi Rank Through k-State Exclusion** **Bristol, UK**

- Used the tools of quantum information theory to developed necessary conditions for performing k-state exclusion on a set of states, defining the notion of weak and strong exclusion in the process.
- Used this condition, along with the introduction of a novel quantum communication task, to give the Choi-rank an operational interpretation.

**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.

## 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.

**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.

## Full List of Publications and Pre-prints

- **An Algorithm for Estimating $\alpha$-Stabilizer Rényi Entropies via Purity**, B.Stratton, *arXiv:2507.02540* (2025).
- **Cooling a Qubit Using $n$ Others**, J.Xuereb, B.Stratton, A.Rolandi, J.He, M.Huber, P.Bakhshinezhad, *arXiv:2506.10059* (2025).
- **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).

## Talks And Conferences

- **Informational nonequilibrium 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, March 2025, *Contributed*
- **Where is the value in Quantum (PhDs)**
  - Institute of Physics (IoP) Quantum and Nano Undergraduate Day, London, November 2024, *Invited*
- **Operational Interpretation of the Choi Rank Through k-State Exclusion**
  - Vienna University of Technology (TU Wein), Vienna, October 2024, *Seminar*
  - Centre for Quantum Technologies - National University of Singapore, Singapore, December 2024, *Seminar*
- **Dynamical Resource Theory of Informational Nonequilibrium Preservability**
  - Quantum Resource Theories Workshop, Singapore, December 2023, *Contributed*

## LEADERSHIP AND EXTRACURRICULAR ACTIVITIES

**Quantum Resources** **Bristol, UK**
*Writer* *April 2024 - Current*

- A comprehensive set of notes on topics in linear algebra, quantum theory, quantum information, error correction and more, that I have developed throughout my PhD and share for education purposes.

**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.

**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

**Dr Paul Skrzypczyk**, Associate 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

**Jamie Macfarlane**, CEO, Creator Fund. jamie@thecreatorfund.com.