

Thomas Bourke

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SUMMARY

I am a 3rd year physics student at the University of Bath who is seeking an undergraduate summer placement with UCL's Quantum Science and Technology Institute. During my studies I have gained a passion for quantum physics and technologies and would be delighted to have the experience working in one of your cutting-edge labs over the summer. I believe my past lab experience combined with my diligent attitude and willingness to learn would make me a great fit for one of these projects.

KEY SKILLS

- Excellent coding skills in Python, C, C++, Git
- Strong understanding of undergraduate quantum mechanics, self-studying quantum information theory
- Experience working in laboratory environment: past work experience, Openflexure project
- Maths skills including linear algebra, statistics, ODE, PDE solving, Fourier analysis, calculus
- Experience with Qiskit, IBM quantum platform
- Simulation techniques: Monte Carlo, FEA, FDM, exact methods, Newton-Raphson, molecular dynamics, De-dimensionalisation
- Condensed matter knowledge: Crystal lattices & dynamics, electron band theory, defects
- Electronics hobbyist: Raspberry Pi, Linux, open hardware, self-built computer, generator

EDUCATION

University of Bath MPhys, predicted 1st

Physics Masters student

Sept. 2021 – Present (expected graduation 2025)

Bath, United Kingdom

- **Relevant modules:** Quantum mechanics: 78%, Condensed Matter Physics: 75%, Simulation techniques: 84%, Mathematical Methods for Physics: 75%, Experimental Physics and Computing: 70%
- **PhySoc committee** current member: Welfare and Inclusivity Officer.
- **Volunteered for Vertically Integrated Project:** Open Science – Hardware for Microscopy.
- **SSLC Academic Rep:** Represent students by communicating with staff and voicing student's feedback about teaching and learning.

City of Norwich School: A-levels

A level student

Graduated August 2020

Norwich, United Kingdom

- A*'s in Maths, Physics, Chemistry
- Achieved a silver Crest award: Building an electric generator.

PROJECTS

- **Open Science – Hardware for microscopy** Ongoing project, joined January 2024
 - Part of globally recognized open hardware project <https://openflexure.org/>, acknowledged by the UN.
 - Raised issues with hardware on GitLab page.
 - Contributed to documentation of source code.
 - Learning openSCAD software to contribute to development of microscopes.
- **Review paper - Quantum Communications and Networks** March 2024
 - Wrote a review paper which explored Quantum Key Distribution.
 - Literature review: Reviewed original BB84 paper which proposed QDK method using polarized photons.
 - Practical implementation: Discussed 2016 implementation of QDK with defenses against side channel hacking attacks.
- **Transit analysis of Kepler data with Transit Timing variations** December 2023
 - Analyzed data from Kepler telescope to detect habitable exoplanets.
 - Transit timing variation analysis carried out to detect hidden exoplanets.
 - Techniques used: Masking, filtering, normalizing of large data sets, Fourier signal analysis, light curve folding, data visualization with seaborn, matplotlib, TTVs, NASA exoplanet archive comparison.

WORK EXPERIENCE

University of East Anglia

Internship at School of Biological Sciences

Summer 2017

Norwich, United Kingdom

This was a summer internship at the University of East Anglia in the School of Biological Sciences (before I had decided that I wanted to study physics). In this internship, I participated in a research project in which the goal was to sequence environmental DNA to identify the fauna of freshwater habitats.

- **Data management:** MS Excel was used to manage data and PowerPoint used to present.
- **Precision and Responsibility:** Required to use specialized equipment such as microscopes and centrifuges.

Norfolk Wildlife Trust - Cley Marshes Visitor Center

Work placement at visitor center for nature reserve

Summer 2017

Cley next the Sea, Norfolk, England

This was a summer internship at Cley Marshes Visitor Centre as a part of my GCSE work experience. I helped around the nature reserve, worked at the till, and assisted the visitors.

- **Teamwork:** Coordinated with other employees when managing tasks such as guided walks about the reserve.
- **Responsibility:** Managing the reception and communicating with customers at the main desk.

RECENT HACKATHONS AND CONFERENCES

- **PhySoc x Optica Hackathon** **March 2024**
 - Came 2nd place in astrophysics themed hackathon which explored black holes – Python language.
 - Calculated masses of black holes, created black hole 3D model in Blender, contributed to front end of educational website.
- **Careers in Quantum** **March 2024**
 - Networked with academic staff and industry professionals at University of Bristol Quantum Engineering CDT.
- **Oxford Physics Summit** **February 2024**
 - Attended talks by University of Oxford faculty including Prof Alexander Lvovsky and Sir Roger Penrose.
 - Participated in workshops: IBM quantum computing platform, neuromorphic computing.
 - Networked with aspiring young physicists from across the United Kingdom.

CERTIFICATIONS, INTERESTS & VOLUNTEERING

- **DVSA UK Driver's license**
- **Enhanced DBS background certificate**
- **ABRSM:** Grade 5 certification for piano
- **Silver Crest award:** Building an electric generator.
- **Physics in industry:** Went on a guided tour of Sizewell B nuclear power plant.
- **Volunteering:** University of Bath PhySoc committee, Openflexure project, SSLC rep
- **Other interests:** computer science, quantum computing, quantum communications, optics & photonics, open hardware, playing piano, running.

REFERENCES

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