# Thomas Bourke

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## 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** **Sept. 2021 – Present (expected graduation 2025)**

*Physics Masters student* *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** **Graduated August 2020**

*A level student* *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** **Summer 2017**
*Internship at School of Biological Sciences* *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** **Summer 2017**
*Work placement at visitor center for nature reserve* *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

Prof Jonathan Knight, Personal Tutor - J.C.Knight@bath.ac.uk, +44(0)1225386141