Nathan Durrant

Curriculum Vitae

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Personal Statement

I am an eager and independent student with a strong motivation to continue to pursue research. I am currently in the fourth year of a Mathematics and Physics degree, integrating directly to a masters. I have strong preliminary experience in Astrophysics/Cosmology research and continue to take modules that will aid me in further developing this; I have studied a broad range of Mathematics modules (both pure and applied) as well as specialising where possible in Physics. I thrive in collaborative environments and am a strong public speaker. I hope to undertake a full time career in academia after my graduation.

Education

2023 - 2027 **MMathPhys Mathematics and Physics**, *Warwick University*, CV4 7AL
1st Year Score: **76.3%**
2nd Year: **73.3%**
3rd Year: **73.2%** – (Includes 4th year General Relativity)
4th Year (Masters Year):
- **Relevant Modules**:
  - Mathematics: Differential Geometry, Classical Groups
  - Physics: The Distant Universe, High Performance Computing and Machine Learning, Advanced Quantum Theory, Theoretical Particle Physics
- **4th Year Dissertation**:
  - Working Title: *Cosmological Perturbation Theory: Building The Universe from Quantum Fluctuations*
  - Supervisor: Prof. Siri Chongchitnan¸ (University of Warwick, Siri.Chongchitnan@warwick.ac.uk)

2021 - 2023 **A-Level Student**, *Spalding Grammar School*, Lincolnshire, PE12 2XH
A-Levels: Further Mathematics (A); Mathematics (A*); Physics (A); Computer Science (A)

Research Interests

I am predominantly interested in Large Scale Structure (LSS) Cosmology, focussed towards the Theoretical and Computational explorations of this subject, and how recent surveys can inform our theories of the Universe as a whole. I currently research the Cosmic Infrared Background as a means to better understand the LSS. This experience has helped me harbor an interest in using surveys of the LSS to search for signatures of new/modified physics.

As part of my fourth year I have liased with Prof. Chongchitnan (see above) to secure supervision for a cosmology-based dissertation. I currently plan to take a more analytical path with this project, giving me an opportunity to complement my computational experience with a more theoretical viewpoint. Although an exact direction for this project has not yet been decided, it

will be based in the theory of Cosmological Perturbations and Inflation. I will be eager to find links between this work and work I have undertaken previously.

Research Experience

2025 - Ongoing **Investigating Star Formation Rate History using the Cosmic Infrared Background**, *Department of Astrophysics*, University of Oxford, OX1 3RH

Under supervision of Dr Tom Cornish and Prof. David Alonso.

- Implemented Markov Chain Monte Carlo frameworks for multi-dimensional parameter space exploration. Used likelihood calculations to fit a computationally verified model to HSC and DESI data.
- Developed a generalised Python backend to automate angular power spectrum modelling. This remains being developed as I continue my work. I aim to fully document this such that it can be a tool for other researchers. (See https://github.com/NattyDuzza/APEX)
- Presented my work at a department wide symposium to other research interns, students, and staff.
- Paper in progress: *Cosmic Star Formation History from HSC-CIB Tomography.*
- This work has been presented in poster form at the International Conference of Undergraduate Research 2026. The poster can be found on my website (see above).

Programming Languages & Computational Skills

- Python
  - Projects: Angular Power Spectrum Modelling and Fitting, Relativistic Magnetic Trap Simulation
  - Relevant Libraries: PyCCL, Cobaya, SACC, HealPy, NaMaster, AstroPy, CAMB, SciPy, NumPy, Matplotlib
  - Relevant Skills: Markov Chain Monte Carlo Methods, Numerical Methods, Data Analysis and Presentation, Back End Development, Object Oriented Programming, Large Project Management
- Mathematica
- Experience using compute clusters
- Git version control and collaborative development
- Extensive Linux experience (Arch based)
- LaTeX
- Markdown, HTML, CSS (for Static Site Generation)
  - Projects: Personal Webpage (NHDurrant.com), LambdaStudy (LambdaStudy.com) - Revision website for A-Level Students

Activities

2026 - Ongoing **Warwick Mathematics Department**, *Supervisor for First Year Students*

I am employed by the Warwick Mathematics Department to meet weekly with first year students of Mathematics and Physics, to help them through the content as well as mark their assignments.

Relevant Skills:

- Small-group Teaching; *delivering personalised sessions to students in university level courses*

2024 - Ongoing **Warwick Physics Department**, *Department Ambassador*

I am employed by my own department to help present Warwick Physics, and the university as a whole, to prospective students and their parents. This involves setting up events and helping with their smooth running, touring students around the campus, and providing information and guidance to visitors.

Relevant Skills:

- Front-facing communication; *building rapport with a wide range of people*
- Operations co-ordination; *adapting to changing plans/environments, taking a leading organisational role*

2023 - Ongoing **Candela**, *Outreach Coordinator*

I work with the student startup not-for-profit company Candela, engaging in Physics outreach for GCSE and A-Level students through VR. I am in charge of volunteer recruitment, and also lead the in-school sessions.

Relevant Skills:

- Experience *teaching* Physics in an educational environment; *distillation and presentation of complex ideas, scientific communication*
- Application to grant schemes and financing sessions; *grant applications, proposal development*

2023 - 2025 **Warwick Aerospace**, *Chief Engineer, formerly Deputy Project Manager*, Radio Controlled Aircraft Division

Lead a team of students to design novel radio controlled aircraft based on a custom rulebook. Throughout the project I provided regular feedback on their designs and technical advice. The final outcome was three planes designed from scratch and within the budget given.

Relevant Skills:

- Experience leading teams; *communication, management, and delegation*
- Gained expertise at reading technical documentation; *data interpretation, specification analysis*
- Project management; *defining scope of project, financing + budgeting*