

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 research and continue to take modules that will aid me in further developing this; I take a broad range of Mathematics modules (both pure and applied) as well as specialising where possible in Physics, such as taking 4th year General Relativity a year early. 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%**
4th Year (Masters Year):
○ **Relevant Modules (TBC):**
- Mathematics: Differential Geometry, Classical Groups, Data Driven Mathematical Modelling
- Physics: The Distant Universe, Advanced Quantum Theory, High Performance Computing and Machine Learning
○ **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, focused towards the Theoretical and Computational explorations of this subject. I currently research the Cosmic Infrared Background as a means to better understand the LSS. I am interested in beginning to work with simulations and growing expertise in the mathematical basis of the field.

As part of my fourth year I get the opportunity to research for a dissertation. Sure that I wanted to continue in the field of Cosmology, I was able to liaise with Prof. Chongchitnan (see above) to secure supervision that would allow me to pursue this. 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. 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: *Using HSC and DESI Data to Explore the Star Formation Rate Histories using CIB Tomography.*

Programming Languages & Computational Skills

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

Activities

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*