Lewis Napper

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Education

2021 – 2025 **Ph.D. Mathematics, University of Surrey.**
Key Topics: Geometry, Hamiltonian Mechanics, Quaternions, Vorticity.
Thesis: *Applications of Geometry to PDEs, Fluid Dynamics, and Relativity*
Supervisors: Dr. M. Wolf and Prof. I. Roulstone.

2017 – 2021 **M.Math. 1st class (hons) Mathematics, University of Surrey.**
Key Topics: Linear Algebra, Matrix Analysis, Graph Theory, Vector Calculus.
Thesis: *Algebraic Bethe Ansatz for $\mathfrak{su}(2)$ Spin Chains and Beyond*.
Supervisors: Prof. A. Torrielli and Dr. A. Prinsloo.
Average grade: 98%

2010–2017 **Therfield Secondary School and Sixth Form**
A-level: 3 A*, 1 A (plus 1 A at AS level).
GCSE: 9 A* including English and German Language, 3 A, 1 B
Other: D*2 Cambridge Nationals ICT, A FSMQ Additional Mathematics

Portfolio Projects

Cellular Automata on Aperiodic Mono-tiles (GitHub, ongoing)
– Developing a C++ application for simulating Cellular Automata with an SFML based UI component, as part of a collaboration with Dr. M. J. Gabbay from Heriot–Watt University.
– Investigating how Cellular Automata, such as Conway's Game of Life, can be encoded as sparse matrix algorithms and how grid regularity affects their emergent behaviour.

Beginning C++ Game Development (GitHub, ongoing)
– Learning C++ (SFML/OpenGL) and game development programming patterns by following John Horton's book of the same name. Includes clones of the classic games Pong and Timber!

3DSage Raycaster (GitHub, dormant)
– Raycaster game engine in C++ (OpenGL/Glut) based on 3DSage's tutorials. Code produces a top down map view as well as a 2.5D world which can be explored.
– On hiatus while I investigate alternatives such as SFML and Binary Space Partitioning.

Employment

2019 – · · · · **Teaching Assistant, University of Surrey, UK**
– Supervised undergraduate MATLAB and R-Studio programming labs for Statistics and Numerical Methods modules. Was regularly contacted by students from other courses for help due to my high quality teaching and code debugging.
– Edited notes and exercises for 3 modules to a high standard, consequently becoming an invited expert for the Journal of Geometry and Physics.
– Supported the delivery of 13 undergraduate modules, including those in which I had no prior experience, providing students with clear and concise feedback within a week of work submission.

Employment (continued)

2024 **Visiting Research Fellow, University of La Rochelle, France**

– Recipient of a 3-month fully-funded research fellowship (Value: £4300) to work at a CNRS laboratory and support Franco–British collaboration, issued by the French Embassy in the UK.

– Researched the application of topological data analysis and geometric numerical integrators to physical dynamical systems, alongside Dr. V. Salnikov.

2019–2020 **Undergraduate Researcher, University of Surrey, UK**

– Awarded a London Mathematical Society funded research bursary (Value: £1440) supervised by Dr. J. Grant, to study synthetic general relativity.

– Initiated a collaboration with outstanding researchers at the Universities of Vienna and Cardiff, resulting in 2 scientific publications.

Skills

Software Skills

- **Scripting:** Moderate experience with MATLAB, Mathematica, R-Studio, and Python through undergraduate study, teaching, and research.
- **Programming:** Basic experience with C♯ and C++ from reviewing and debugging other researchers' code, as well as personal projects.
- **Web Development:** HTML, CSS, JavaScript, and JQuery frontend skills developed through making my Website and several small web apps. See GitHub for more.
- **Source Control:** Familiarity with GitHub Desktop and basic experience with using Git for commits to personal project repositories.
- **Other:** Microsoft Office (Word, Excel, etc.), LaTeX typesetting, Affinity, Adobe Photoshop.

Professional Skills

- **Report Writing:** Refined writing skills during my Ph.D. and Professional Skills university module, resulting in successful grant applications worth over £7000 and 3 scientific publications.
- **Public Speaking:** Contributed 12 talks for conferences and seminars over the past 3 years, including invited talks at Imperial College London and the University of Sorbonne. See my Website for sample slides.

Activities and Achievements

- **Excellence:** Four time winner of the annual Mathematics Department Prize for Excellence (2017-2021) for best performance in a year of an undergraduate/master's degree.
- **Merit:** Awarded the Surrey Merit Scholarship (2017) for exceptional A-level grades.
- **Societies:** Academic secretary of the Surrey Maths Society (2018), for which I produced updated graphic design, ran revision sessions, and organised seminars with invited speakers. Active member of the Surrey Film Society (2017-2022).
- **Quant:** Member of the University of Surrey team and regional finalist in the WorldQuant Championships (2018), for which I learnt the software WebSim.
- **Art:** Produced digital and traditional art for art-shares and paid commissions. Exhibited art at the Surrey Youth Voice Awards and Therfield Art Festival, accompanying the latter by playing guitar as part of a live band. See my Website for samples.