Boris Andrews CV

boris.andrews@maths.ox.ac.uk
borisandrews.github.io

Education

2021 – 2025 (predicted) **University of Oxford**, *PhD (DPhil) in Mathematics (Numerical Analysis)*
- Thesis: *Structure-preserving FEMs via auxiliary variables: conservative & accurately dissipative integrators / global & local structures for BVPs*
- Supervisors: *Patrick Farrell*, *Wayne Arter*

2017 – 2021 **University of Oxford**, *Integrated Masters in Mathematics (MMath)*, First (Distinction)
- Thesis: *Computation and approximation properties of near orthogonal matrices for tall random matrices*
- Supervisor: *Yuji Nakatsukasa*

Research Interests

Structure-preserving numerical methods for PDEs & ODEs, *Conservation & dissipation structures* | *Global & local energy estimates & conservation laws* | *Asymptotic-preserving integrators* | *Geometric machine learning*

Finite element theory, *Finite element exterior calculus (FEEC)* | *Domain decomposition* | *Parallel in time (PinT)*

Plasma modelling, *Magnetohydrodynamics (MHD)* | *Hybrid fluid-particle models*

Turbulent systems, *Stabilisation* | *Preconditioning*

Publications & Preprints

Preprints **High-order conservative and accurately dissipative numerical integrators via auxiliary variables**, *with Patrick Farrell*, 16 July 2024
- In review: *IMA Journal of Numerical Analysis (IMAJNA)*

Topology-preserving discretization for the magneto-frictional equations arising in the Parker conjecture, *with Mingdong He*, *Patrick Farrell*, *Kaibo Hu*, 20 January 2025
- In review: *SIAM Journal on Scientific Computing (SISC)*

Upcoming *(Draft on request)* **Globally and locally structure-preserving mixed finite element methods for boundary-value problems**

Conservative–dissipative integrators for reversible–irreversible systems

An augmented Lagrangian preconditioner for natural convection at high Reynolds number, *with Alexei Gazca*, *Patrick Farrell*, *Benjamin Castellaz*

High-order fully conservative integrators for integrable ODE systems

Uniformly accurate magnetic moment–preserving integrators for charged particles

Upcoming **Conservative integrators exhibit greater stability than symplectic integrators on the Toda lattice**, *with Sebastian Ohlig*, *Patrick Farrell*

Programming Languages

Experienced: Python *(Firedrake)*, MATLAB, LaTeX | **Limited:** Julia, C, Fortran, HTML

Languages

Fluent: English | **Intermediate:** Dutch | **Beginner:** Japanese, German

Prizes, Awards and Scholarships

2021 – 2025 **DPhil studentship**, *Engineering and Physical Sciences Research Council (EPSRC)*

CASE award, *United Kingdom Atomic Energy Authority (UKAEA)*

2017 – 2021 **Foundation scholarship**, *Worcester College, University of Oxford*

Collection prizes, *Worcester College, University of Oxford*

Talks (*scheduled/provisional)

Invited Talks & Minisymposium Presentations

2025 **ACOMEN*** *(Ghent University)* | **Numerical Mathematics & Scientific Computing Seminar*** *(Rice University)* | **SIAM CSE*** *(Fort Worth, Texas)* | **Scientific Computing Seminar*** *(Brown University)*

Other Seminar, Workshop & Conference Presentations

2025 **Biennial Numerical Analysis Conference*** *(University of Strathclyde)* | **EMS school on Mathematical Modelling, Numerical Analysis and Scientific Computing*** *(Kácov, Czechia)* | **Numerical Analysis Group Internal Seminar*** *(University of Oxford)*

2024 **External seminar** *(Rice University)* | **Computing Division technical meeting** *(UKAEA)* | **Firedrake User Meeting** *(University of Oxford)* | **PDEsoft** *(University of Cambridge)* | **European Finite Element Fair** *(University College London)* | **Exploiting Algebraic and Geometric Structure in Time-integration Methods workshop** *(University of Pisa)* | **UKAEA PhD student engagement day** *(UKAEA)* | **Junior Applied Mathematical Seminar** *(University of Warwick)*

2023 **ICIAM** *(Waseda University)* | **Numerical Analysis Group Internal Seminar** *(University of Oxford)* | **Junior Applied Mathematics Seminar** *(University of Oxford)* | **Met Office presentation** *(University of Oxford)*

2022 **PRISM workshop** *(Missenden Abbey, UK)*

Professional Experience

Jun 2025 **University of Strathclyde**, *Joint hosting of minisymposium at the Biennial Numerical Analysis Conference*, Charlie Parker
- Topic: *Structure-preserving finite element methods*

Sep – Oct 2024 **University of Oxford**, *Supervision of summer internship*, Sebastian Ohlig
- Project: *Stability study of conservative vs. symplectic integrators on the Toda lattice*

Aug – Oct 2022 **Tokamak Energy**, *Internship*, Physics: theory and modelling
- Project: *Implementation of non-Maxwellian backgrounds in the GENE gyrokinetic code*
- Supervisor: *Salomon Janhunen*

Jul – Aug 2019 **Perm State University**, *Internship*, Computational fluid dynamics

Teaching Experience

2024 – 2025 **Tutor**, *University of Oxford*, Computational Mathematics

2023 – 2024 **Tutor**, *University of Oxford*, Prelims corner

Teaching assistant, *University of Oxford*, Numerical Linear Algebra

2021 – 2022 **Teaching assistant**, *University of Oxford*, Random Matrix Theory

Tutor, *Oriel College, University of Oxford*, Analysis I