Boris Andrews CV

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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*

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*

PROGRAMMING LANGUAGES

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

LANGUAGES

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

Publications & Preprints

Preprints

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

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

In preparation (Draft available on request)

Uniformly accurate asymptotic-preserving integrators for charged particles

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

Conservative–dissipative integrators for reversible–irreversible systems

Globally and locally structure-preserving mixed finite element methods for boundary-value problems

In preparation

Enstrophy-stable integrators for the 2D incompressible Navier–Stokes equations, *with Matin Shams*

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

Teaching

University of Oxford (2021 – 2025)

2024 – 2025 **Tutor**, *Computational Mathematics*

2023 – 2024 **Tutor**, *Prelims corner*

Teaching assistant, *Numerical Linear Algebra*

2021 – 2022 **Teaching assistant**, *Random Matrix Theory*

Tutor, *Analysis I (Oriel College)*

Supervision

University of Oxford (2021 – 2025)

Feb – Aug 2025 **Matin Shams**, *MMSC special topic & dissertation*
  ○ Project: *Enstrophy-stable integrators for the 2D Navier–Stokes equations*

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

TALKS (*scheduled/provisional)

INVITED TALKS & MINISYMPOSIUM PRESENTATIONS

2025 **ACOMEN*** *(Ghent University)* | **ECCOMAS Thematic Conference on Modern Finite Element Technologies*** *(Aachen, Germany)* | **Self-Consistency Group seminar*** *(CHaRMNET)* | **Numerical Mathematics & Scientific Computing Seminar** *(Rice University)* | **SIAM CSE** *(Fort Worth, Texas)* | **Scientific Computing Seminar** *(Brown University)* | **METHODS Group seminar** *(Brown University)*

2024 **External seminar** *(Rice University)*

OTHER SEMINAR, WORKSHOP & CONFERENCE PRESENTATIONS

2025 **Biennial Numerical Analysis Conference*** *(University of Strathclyde)* | **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 organisation of minisymposium at the Biennial Numerical Analysis Conference*
- ○ Topic: *Structure-preserving finite element methods*
- ○ Co-organiser: *Charlie Parker*

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