

Boris Andrews CV

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EMPLOYMENT

- 2025 – 2027 **Postdoctoral Research Associate**, Numerical Analysis, University of Oxford
(predicted)
 - Project: ERC Starting Grant for *Geometric Finite Element Methods (GeoFEM)*
 - Advisor: *Kaibo Hu*

EDUCATION

- 2021 – 2025 **PhD (DPhil)**, Numerical Analysis, University of Oxford
 - Thesis: *Geometric numerical integration via auxiliary variables*
 - Supervisors: *Patrick Farrell*, *Wayne Arter*

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

RESEARCH INTERESTS

Structure-preserving/compatible 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

LANGUAGES

Programming

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

Spoken

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

PUBLICATIONS & PREPRINTS

Preprints (Accepted)

- 29 Apr 2025 **Enforcing conservation laws and dissipation inequalities numerically via auxiliary variables**, with *Patrick Farrell*
- Accepted: *SIAM Journal on Scientific Computing (SISC)*
 - Note: Part 1 of *High-order conservative and accurately dissipative numerical integrators [...]*

Preprints (In review)

- 20 Jan 2025 **Helicity-preserving finite element discretization for magnetic relaxation**, with *Mingdong He, Patrick Farrell, Kaibo Hu*
- In review: *SIAM Journal on Scientific Computing (SISC)*

Other works

- 18 Jul 2025 **Geometric numerical integration via auxiliary variables**
- Note: *PhD (DPhil) thesis*
- 16 Jul 2024 **High-order conservative and accurately dissipative numerical integrators via auxiliary variables**, with *Patrick Farrell*
- Note: *Currently being partitioned into multiple submissions*

In preparation (Drafts 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*

Conservative–dissipative integrators for reversible–irreversible systems

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

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

TEACHING

- 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

- Feb – Aug 2025 **Matin Shams**, *MMSC special topic & dissertation*
- Project: *Enstrophy-stable integrators for the incompressible 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 **(2×)ACOMEN** (*Ghent University*) | **ECCOMAS Thematic Conference on Modern Finite Element Technologies (MFET)** (*Aachen, Germany*) | **Self-Consistency Group seminar** (*CHaRMNET*) | **ACM Colloquium** (*University of Edinburgh × Heriot-Watt University*) | **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 **Numerical Analysis Group internal seminar*** (*University of Oxford*) | **Biennial Numerical Analysis Conference** (*University of Strathclyde*)
- 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*)

OTHER EXPERIENCE

- 2025 – 2027 **University of Oxford, Organisation of the Numerical Analysis Group's weekly** (*predicted*) *finite element methods reading group*
- Apr – Jun 2026 **University of Vienna, Attendance at the Programme on Differential Complexes at the Erwin Schrödinger International Institute for Mathematics and Physics (ESI)**
- 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 2022 **United Kingdom Atomic Energy Authority (UKAEA), Plasma physics summer school**