

Boris Andrews CV

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EMPLOYMENT

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

EDUCATION

- 2021 – 2025 **PhD (DPhil)**, Numerical Analysis, University of Oxford
(predicted)
 - Thesis: *Structure preservation in FEMs & 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 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 (In review)

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

Other works

- 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 (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

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

In preparation

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

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 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 **(2×)ACOMEN*** (*Ghent University & University of Liège*) | **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*)

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