Boris Andrews CV

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Employment

2025 – 2027 *(predicted)* **Postdoctoral Research Associate**, *Numerical Analysis*, University of Oxford
- 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 for publication)

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)

Conservative and dissipative time discretisations for conservative and GENERIC systems, *with* *Patrick Farrell*
- Note: *Part 2 of* *High-order conservative and accurately dissipative numerical integrators [. . .]*

Automated Galerkin time stepping in Irksome, *with* *Pablo Brubeck*, *Patrick Farrell*, *Rob Kirby*, *Scott MacLachlan*

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

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

Uniformly accurate asymptotic-preserving integrators for charged particles

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

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 **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 *(predicted)* **University of Oxford**, *Organisation of the Numerical Analysis Group's weekly 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*