

# 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

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## 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)

**Energy- and entropy-stable time discretisations for conservative and GENERIC systems**, with *Patrick Farrell*

- Note: Part 2 of *High-order conservative and accurately dissipative numerical integrators [...]*

**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**

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## 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

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## 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*

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## 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*)

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## 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