

# Boris Andrews CV

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 [borisandrews.github.io](https://borisandrews.github.io)

## EDUCATION

- 2021 – 2025 **University of Oxford, PhD (DPhil) in Mathematics (Numerical Analysis)**  
(predicted)
  - 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

## 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

- 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 manuscripts

- 16 Jul 2024 **High-order conservative and accurately dissipative numerical integrators via auxiliary variables**, with [Patrick Farrell](#)  
○ Currently being partitioned into multiple submissions (See “In preparation”)

### In preparation (Draft available on request)

**Enforcing conservation laws and dissipation inequalities numerically via auxiliary variables**, with [Patrick Farrell](#)

- Part 1 of [High-order conservative and accurately dissipative numerical integrators \[...\]](#)

**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](#)

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## 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)

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## 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