Boris Andrews CV

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Education

2021 – 2025 (predicted) **University of Oxford**, *PhD (DPhil) in Mathematics (Numerical Analysis)*
- Thesis: *Structure-preserving finite element methods via auxiliary variables: conservative and accurately dissipative integrators, and energy estimates for inhomogeneous boundary-value problems*
- 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 (AP) integrators*

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*

Publications & Preprints

Preprints **High-order conservative and accurately dissipative numerical integrators via auxiliary variables**, *with Patrick Farrell*, 16 July 2024
- In review: *Foundations of Computational Mathematics*

Upcoming *(Draft on request)* **High-order structure-preserving discretisation for ideal MHD arising in the Parker problem**, *with Mingdong He*, *Kaibo Hu*, *Patrick Farrell*

Structure-preserving finite-element methods for inhomogeneous boundary-value problems via auxiliary variables

High-order conservative–dissipative integrators for reversible–irreversible systems

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

High-order fully conservative integrators for integrable ODE systems

High-order asymptotic-preserving integrators for charged particles in arbitrary magnetic fields

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

Programming Languages

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

Prizes, Awards and Scholarships

2021 – 2025 **DPhil studentship**, *Engineering and Physical Sciences Research Council (EPSRC)*

DPhil studentship, *United Kingdom Atomic Energy Authority (UKAEA)*

2017 – 2021 **Foundation scholarship**, *Worcester College, University of Oxford*

Collection prizes, *Worcester College, University of Oxford*

Seminar, Workshop and Conference Presentations

(*scheduled/provisional)

2025 **EMS school on Mathematical Modelling, Numerical Analysis and Scientific Computing*** *(Kácov, Czechia)* | **Invited talk*** *(Brown University)* | **Firedrake User Meeting USA*** *(Fort Worth, Texas)* | **Numerical Mathematics & Scientific Computing seminar*** *(Rice University)*

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 2023** *(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)* | **PRISM workshop** *(Missenden Abbey, UK)*

Professional Experience

Sep – Oct 2024 **University of Oxford**, *Supervision of summer internship*, Sebastian Ohlig
- Project: *Stability study of conservative vs. symplectic integrators on the Toda lattice*

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

Teaching Experience

2024 – 2025 **Tutor**, *University of Oxford*, Computational Mathematics

2023 – 2024 **Tutor**, *University of Oxford*, Prelims corner

Teaching assistant, *University of Oxford*, Numerical Linear Algebra

2021 – 2022 **Teaching assistant**, *University of Oxford*, Random Matrix Theory

Tutor, *Oriel College, University of Oxford*, Analysis I

Languages

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