Boris Andrews CV

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EDUCATION

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

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*

Globally and locally structure-preserving mixed finite-element methods for boundary-value problems

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

Uniformly accurate magnetic moment–preserving integrators for charged particles

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
	o Project: *Stability study of conservative vs. symplectic integrators on the Toda lattice*
Aug – Oct 2022	**Tokamak Energy**, *Internship*, Physics: theory and modelling
	o Project: *Implementation of non-Maxwellian backgrounds in the GENE gyrokinetic code*
	o 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