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RESEARCH INTERESTS

- ★ **Numerical analysis** of differential equations, especially geometric integration, exponential integrators and spectral methods, with application to chemistry, financial mathematics, geophysics and plasma physics.
- ★ **Applied dynamical systems**, especially complex networks, pattern formation, the stability of travelling waves and Evans function computations, and the computing symmetries of differential equations.

EMPLOYMENT HISTORY

- 2010–now: **Lecturer**, University of Leeds, United Kingdom.
- 2007–2010: **RCUK Academic Fellow**, University of Leeds, United Kingdom.
- 2006–2007: **Research Assistant**, La Trobe University, Melbourne, Australia.
- 2003–2006: **Research Associate**, Heriot–Watt University, Edinburgh, United Kingdom.
- 2003: **Temporary Instructor**, International University Bremen, Germany (3 months).

EDUCATION

- 1999–2004: **PhD**, Applied Mathematics and Theoretical Physics, University of Cambridge, UK.
- 1993–1999: **ir**¹ (*cum laude*), Computer Science, University of Twente, the Netherlands.
- 1993–1998: **ir**¹ (*cum laude*), Applied Mathematics, University of Twente, the Netherlands.

¹The *ingenieur* degree (abbreviated *ir*) is a former Dutch degree, comparable to an MSc.

TEACHING EXPERIENCE

I have taught the following courses (*i.e.*, I delivered the lectures, wrote and marked the exam, and had overall responsibility except where indicated otherwise):

- 2022: **(Advanced) Dynamical Systems** (MATH3396/5395M) at the University of Leeds, UK.
A course taken by about 20 third-year and 20 fourth-year students on discrete-time dynamical systems, consisting of 33 lectures, with a project for the fourth-year students.
- 2021: **(Advanced) Nonlinear Dynamics** (MATH3397/5398M) at the University of Leeds, UK.
A course taken by about 25 third-year and 20 fourth-year students on continuous-time dynamical systems, consisting of 33 lectures and 10 example classes, with a project for the fourth-year students.
- 2019–2021: **Computations in Finance** (MATH5350M) at the University of Leeds, UK.
A course taken by about 30 MSc students in Financial Mathematics on computational methods, consisting of 22 lectures, 10 example classes and a few computer practicals.
- 2018: **Numerical Analysis with Computation** (MATH2601) at the University of Leeds, UK.
A second-year course taken by about 40 students which extends MATH2600 (see below) with a computational component, covered in 5 lectures and 5 computer practicals.
- 2017: **Computational Mathematics** (MATH2920) at the University of Leeds, UK.
A second-year course taken by over 250 students on programming and computations, consisting of 11 lectures and 10 practicals, taught together with a colleague.
- 2015–2016: **Optimisation Methods in Finance** (MATH5360M) at the University of Leeds, UK.
A course taken by about 30 MSc students in Financial Mathematics on optimisation and computer programming, consisting of 22 lectures, 10 example classes and 10 computer practicals; taught together with a colleague.
- 2012–2018: **Numerical Analysis** (MATH2600) at the University of Leeds, UK.
A second-year course taken by about 80 students on basic numerical analysis, consisting of 22 lectures and 10 example classes.
- 2011–2014: **Financial Mathematics 2** (MATH2515) at the University of Leeds, UK.
A second-year course in the Mathematics and Finance programme, consisting of 22 lectures and 5 example classes. This was a new course although it incorporated parts of a course given the previous year. It was taken by up to 250 students.
- 2010–2012: **Financial Mathematics 1** (MATH1510) at the University of Leeds, UK.
A first-year course in the Mathematics and Finance programme, consisting of 33 lectures and 5 example classes. This was a new course and thus I had to design it myself within the specified curriculum. The largest class had about 170 students.
- 2010: **Mathematical Review** (MATH5310) at the University of Leeds, UK.
A course in the MSc Financial Mathematics programme which summarizes basic maths in preparation of the other courses in the programme. It consists of 10 half-day blocks and was taken by about thirty students.

TEACHING (CONTINUED)

- 2008: **Applications of Mathematics** (MATH1351) at the University of Leeds, UK.
A first-year course in the Mathematics and Finance programme, covering vector algebra and difference equations. The course consists of 22 lectures. It was taken by about forty students.
- 2007: **Numerical Analysis** (MAT3NA) at La Trobe University, Australia.
I shared responsibility for this third-year course for students in mathematics and computer science with two other lecturers. The part I was responsible for treated programming in Fortran 90. This part consisted of twelve lectures supplemented by computer labs.
- 2005: **Intermediate Mathematics** (F1.1UM1) at Heriot-Watt University, UK.
A first-year course, taken by students from various disciplines in science and engineering. The course consists of 24 lectures and 8 tutorials.
- 2003: **Natural Sciences Laboratory, Mathematics Module III** (100123) at the International University Bremen, Germany.
A first-year course, introducing students in the School of Engineering and Science to Matlab. The course consists of four two-hour lectures, and four afternoons in the computer laboratory. Since this was the first time that the course was given, I had to design the course myself.

In addition, I supervise undergraduate projects and Master's dissertations and I am responsible for pastoral care at the University of Leeds. I also delivered tutorials and exercise classes from 1996 at the above universities, the University of Cambridge, UK, and the University of Twente, the Netherlands.

PHD (CO)SUPERVISION

- ★ Abeer Alnahdi (2011–2015), supervised by Alastair Rucklidge and JN.
Oscillons: localized patterns in a periodically forced system.
- ★ Moataz Alosalmi (2018–2022), supervised by Daniel Lesnic and JN.
Inverse problems associated with hyperbolic thermal-wave models of bio-heat transfer.
- ★ Shami Alsallami (2014–2018), supervised by Frank Nijhoff and JN.
Discrete integrable systems and geometric numerical integration.
- ★ Colin Hardy (2017–2021), supervised by Phil Livermore and JN.
Magnetostrophic analysis of Earth's internal magnetic field.
- ★ Laya Haweil (started 2013), supervised by Rainer Hollerbach, Evy Kersalé and JN.
- ★ Kieran Jervis (2017–2022), supervised by Frans Muller and JN.
A universal approach to phenomenological compartment models of unit operations.
- ★ Kristoffer Smedt (2017–2021), supervised by Daniel Ruprecht and JN.
High-order particle integration for particle-in-cell schemes using Boris with spectral deferred corrections.
- ★ Ghadeer Surrati (2017–2022), supervised by Alastair Rucklidge and JN.
Fourier extensions for approximation and differential equations.
- ★ Patrick Wright (2014–2018), supervised by Rob Sturman and JN.
Bounds on Lyapunov exponents in non-Anosov systems.

PEER-REVIEWED JOURNAL ARTICLES

- ★ Patrick Wright, JN and Rob Sturman.
“Rigorous bounds on Lyapunov exponents of linked twist maps.”
Nonlinearity, vol. 36, nr. 3, pp. 1699–1715, 2023.
- ★ Kris Smedt, Daniel Ruprecht, JN, Steven Tobias and Joonas Näättilä.
“New applications for the Boris Spectral Deferred Correction algorithm for plasma simulations.”
Appl. Math. Comput., vol. 442, article 127706 (18 pages), 2023.
- ★ Colin M. Hardy, Philip W. Livermore and JN.
“The inherent instability of axisymmetric magnetostrophic dynamo models”
Geophys. Astrophys. Fluid Dyn., vol. 116, nr. 5–6, pp. 499–520, 2022.
- ★ Moataz Alosaimi, Daniel Lesnic and JN.
“Determination of the thermo-physical properties of multi-layered biological tissues.”
Appl. Math. Model., vol. 99, pp. 228–242, 2021.
- ★ Moataz Alosaimi, Daniel Lesnic and JN.
“Identification of the thermo-physical properties of a stratified tissue. Adiabatic hypodermic wall.”
Internat. Commun. Heat Mass Transfer, vol. 126, article 105376 (7 pages), 2021.
- ★ Moataz Alosaimi, Daniel Lesnic and JN.
“Reconstruction of the thermal properties in a wave-type model of bio-heat transfer.”
Internat. J. Numer. Methods Heat Fluid Flow, vol. 30, nr. 12, pp. 5143–5167, 2020.
- ★ Colin M. Hardy, Philip W. Livermore and JN.
“Enhanced magnetic fields within a stratified layer.”
Geophys. J. Internat., vol. 222, nr. 3. pp. 1686–1703, 2020.
- ★ Yingzhe Li, Yang He, Yajuan Sun, JN, Hong Qin and Jian Liu.
“Solving Vlasov-Maxwell equations by using Hamiltonian splitting.”
J. Comput. Phys., vol. 396, pp. 381–399, 2019.
- ★ Shami A. M. Alsallami, JN and Frank W. Nijhoff.
“Closed-form modified Hamiltonians for integrable numerical integration schemes.”
Nonlinearity, vol. 31, nr. 11, pp. 5110–5146, 2018.
- ★ Colin M. Hardy, Philip W. Livermore, JN, Jiawen Luo and Kuan Li.
“Three-dimensional solutions for the geostrophic flow in the Earth’s core.”
Royal Soc. Proc. A, vol. 474, nr. 2218, article 20180412 (28 pages), 2018.
- ★ Abeer S. Alnahdi, JN and Alastair M. Rucklidge.
“Localized patterns in periodically forced systems: II. Patterns with non-zero wavenumber.”
SIAM J. Appl. Dynam. Systems, vol. 17, nr. 2, pp. 1478–1502, 2018.
- ★ Abeer S. Alnahdi, JN, Alastair M. Rucklidge and Thomas Wagenknecht.
“Localized patterns in periodically forced systems.”
SIAM J. Appl. Dynam. Systems, vol. 13, nr. 3, pp. 1311–1327, 2014.
- ★ Per Christian Moan and JN.
“On an asymptotic method for computing the modified energy for symplectic methods.”
Discrete Contin. Dyn. Syst., vol. 34, nr. 3, pp. 1105–1120, 2014.

PEER-REVIEWED JOURNAL ARTICLES (CONTINUED)

- ★ JN and Will M. Wright.
“Algorithm 919: A Krylov subspace algorithm for evaluating the φ -functions appearing in exponential integrators.”
ACM Trans. Math. Software, vol. 23, nr. 3, article 22 (19 pages), 2012.
- ★ Nicoleta Bilă and JN.
“A new class of symmetry reductions for parameter identification problems.”
J. Nonlinear Math. Phys., vol. 16, nr. 3, pp. 355–371, 2009.
- ★ Veerle Ledoux, Simon J. A. Malham, JN and Vera Thümmel.
“Computing stability of multi-dimensional travelling waves.”
SIAM J. Appl. Dynam. Systems, vol. 8, nr. 1, pp. 480–507, 2009.
- ★ Per Christian Moan and JN.
“Convergence of the Magnus series.”
J. Found. of Comp. Math., vol. 8, nr. 3, pp. 291–301, 2008.
- ★ Simon Malham and JN.
“Evaluating the Evans function: Order reduction in numerical methods.”
Math. Comp., vol. 77, nr. 261, pp. 158–178, 2008.
- ★ Nicoleta Bilă and JN.
On a new procedure for finding nonclassical symmetries.
J. Symbolic Comput., vol. 38, nr. 6, pp. 1523–1533, 2004.
- ★ JN. “A priori estimates for the global error committed by Runge–Kutta methods for a nonlinear oscillator.”
LMS J. Math. Comput., vol. 6, pp. 18–28, 2003.

OTHER PUBLICATIONS

- ★ Yingzhe Li, Yang He, Yajuan Sun, JN, Hong Qin and Jian Liu.
“Solving Vlasov-Maxwell equations by using Hamiltonian splitting.”
Proc. ICNAAM 2016, AIP Conference Proceedings, vol. 1863, 160009 (4 pages), 2017.
- ★ JN and Will M. Wright.
Krylov subspace method for pricing options.
Report SSRN 1799124, 22 pages, 2011.
- ★ JN. *On the global error committed when evaluating the Evans function numerically*.
Technical report HWM 06-43, Dept of Mathematics, Heriot–Watt University. 22 pages, 2006.
- ★ JN. *On the Global Error of Discretization Methods for Ordinary Differential Equations*.
PhD thesis, University of Cambridge, 2004.
- ★ JN. *Automatic Generation and Differentiation of Partial Differential Equation Solvers with Index-Free Scripts*.
Master’s thesis, Dept of Computer Science, University of Twente, the Netherlands, 1999.
- ★ JN. *The Generalized WDVV-System*.
Master’s thesis, Dept of Applied Mathematics, University of Twente, the Netherlands, 1998.

TALKS

- ★ *Spectral deferred correction in particle-in-cell methods.*
Plasma Physics Day, Isaac Newton Institute, Cambridge, UK, October 2019.
- ★ *Solving differential equations with Fourier extensions.*
The Future of Structure-Preserving Algorithms, ICMS, Edinburgh, UK, October 2019.
- ★ *Convergence modified Hamiltonians for integrable discretization schemes.*
Internat. Conf. Sci. Comput. Diff. Equations (SciCADE), Innsbruck, Austria, July 2019.
- ★ *Oscillons in Faraday wave experiments.*
Inst. Comput. Maths & Sci./Eng. Comput., Chinese Acad. Sci., Beijing, China, August 2017.
- ★ *Snaking on a network.*
Inst. Comput. Maths & Sci./Eng. Comput., Chinese Acad. Sci., Beijing, China, April 2016.
- ★ *Exponential integrators for semi-discretized PDEs.*
Seminar, Department of Mathematics, Henan Polytechnic University, Jiaozuo, China, April 2016.
- ★ *Snaking on a network.*
Seminar, Centre for Networks and Collective Behaviour, University of Bath, UK, April 2016.
- ★ *Simulating a particle in a magnetic field.*
Numerical Analysis seminar, University of Auckland, New Zealand, May 2015.
- ★ *Snaking on a network.*
Seminar, Department of Mathematics, Massey University, New Zealand, May 2015.
- ★ *Preserving Taylor's constraint in magnetohydrodynamics.*
Inst. Comput. Maths & Sci./Eng. Comput., Chinese Acad. Sci., Beijing, China, April 2015.
- ★ *Preserving Taylor's constraint in magnetohydrodynamics.*
Internat. Conf. Sci. Comput. Diff. Equations (SciCADE), Valladolid, Spain, September 2013.
- ★ *Pattern formation in small-world networks (poster).*
SIAM Conference on Applications of Dynamical Systems, Snowbird, UT, USA, May 2013.
- ★ *Exponential integrators for parabolic PDEs.*
Num. Solution of Diff. and Diff.-Alg. Equations (NUMDIFF), Halle, Germany, September 2012.
- ★ *Preserving Taylor's constraint in magnetohydrodynamics.*
Meeting in celebration of Arie Iserles's 65th birthday, Lom, Norway, September 2012.
- ★ *A Krylov subspace method for option pricing.*
Internat. Congress on Computational and Applied Mathematics, Ghent, Belgium, July 2012.
- ★ *Modified equations for Hamiltonian systems.*
Num. Analysis & Sci. Comput. Seminar, University of Manchester, UK, December 2011.
- ★ *Modified equations for Hamiltonian systems.*
Inst. Comput. Maths & Sci./Eng. Comput., Chinese Acad. Sci., Beijing, China, August 2011.
- ★ *On the numerical computation of the modified energy.*
Foundations of Computational Mathematics (FoCM), Budapest, July 2011.
- ★ *The Evans function and the stability of travelling waves.*
Patterns, Nonl. Dyn. and Appl. (PANDA), University of Nottingham, UK, September 2010.
- ★ *The Evans function and the stability of travelling waves.*
Staff colloquium, Department of Mathematics, Universiteit Utrecht, Netherlands, May 2010.

TALKS (CONTINUED)

- ★ *Krylov methods for the computation of matrix functions.*
Comput. Maths and Math. Biol. Seminar, Heriot-Watt University, Edinburgh, UK, March 2010.
- ★ *Computing the φ function of a matrix.*
SIAM Conference on Applied Linear Algebra, Monterey Bay-Seaside, USA, October 2009.
- ★ *Exponential integration of large systems of ODEs.*
Center for Computational Mathematics (CCoM) Seminars, UC San Diego, USA, October 2009.
- ★ *Exponential integration of large systems of ODEs.*
23rd Biennial Conference on Numerical Analysis, Glasgow, UK, June 2009.
- ★ *Exponential integrators using Krylov iteration.*
Internat. Conf. on Sci. Comput. and Diff. Equations (SciCADE), Beijing, China, May 2009.
- ★ *Computing the φ function of a matrix.*
Manifolds and Geometric Integration Colloquia (MaGIC), Hornsjø, Norway, March 2009.
- ★ *Stability Computations for Two-dimensional Fronts Using the Evans Function.*
Applied Nonlinear Dynamics Seminar, University of Leeds, UK, February 2009.
- ★ *Computing the φ function of a matrix.*
Num. Analysis & Sci. Comput. Seminar, University of Manchester, UK, December 2008.
- ★ *Stability Computations for Two-dimensional Fronts Using the Evans Function.*
SIAM Conference on Nonlinear Waves and Coherent Structures, Rome, Italy, August 2008.
- ★ *Exponential integrators using Krylov iteration.*
Inst. Comput. Maths & Sci./Eng. Comput., Chinese Acad. Sci., Beijing, China, May 2008.
- ★ *Exponential integrators for semi-discretized PDEs.*
Comput. Maths and Math. Biol. Seminar, Heriot-Watt University, Edinburgh, UK, May 2008.
- ★ *Exponential integrators for semi-discretized PDEs.*
Numerical Analysis Seminar, University of Bath, UK, March 2008.
- ★ *Exponential integrators using Krylov iteration.*
Manifolds and Geometric Integration Colloquia (MaGIC), Renon, Italy, February 2008.
- ★ *Solving partial differential equations with exponential integrators.*
Applied Mathematics Seminar, University of Leeds, UK, January 2008.
- ★ *Geometric integration methods for the computation of the Evans function.*
Internat. Conf. on Sci. Comput. and Diff. Equations (SciCADE), Saint Malo, France, July 2007.
- ★ *Stability computations for travelling waves using the Evans function.*
Theoretical Mechanics Seminar, University of Nottingham, UK, June 2007.
- ★ *Evans function calculations for a two-dimensional system.*
SIAM Conference on Applications of Dynamical Systems, Snowbird, UT, USA, May 2007.
- ★ *On the convergence of the Magnus series.*
Castellón Conference on Geometric Integration, Spain, September 2006.
- ★ *Geometric integration methods for the computation of the Evans function.*
Innovative Integrators for Diff. and Delay Equations, Innsbruck, Austria, September 2006.
- ★ *On the convergence of the Magnus series.*
Num. Solution of Diff. and Diff.-Alg. Equations (NUMDIFF), Halle, Germany, September 2006.

TALKS (CONTINUED)

- ★ *Stability computations for travelling waves using the Evans function.*
13th Biennial Comput. Techn. and Applic. Conf. (CTAC), Townsville, Australia, July 2006.
- ★ *Stability of travelling waves using the Evans function.*
Industrial and Appl. Maths Seminar, Heriot–Watt University, Edinburgh, UK, February 2006.
- ★ *Stability computations for travelling waves using the Evans function.*
21st Biennial Conference on Numerical Analysis, Dundee, UK, June 2005.
- ★ *Order reduction in stability computations using the Magnus method.*
Internat. Conf. on Sci. Comput. and Diff. Equations (SciCADE), Nagoya, Japan, May 2005.
- ★ *The Evans function review. Part II: Numerical computations.*
Applied Analysis Seminar, University of Strathclyde, Glasgow, UK, April 2005.
- ★ *On the stability of the Magnus method.*
Manifolds and Geometric Integration Colloquia (MaGIC), Ustaoset, Norway, February 2005.
- ★ *The stability of travelling wave solutions of the Gray–Scott equation.*
Mathematics Colloquium, Heriot–Watt University, UK, January 2005.
- ★ *Computing the Evans function using the Magnus expansion.*
Manifolds and Geometric Integration Colloquia (MaGIC), Røros, Norway, March 2004.
- ★ *Stability analysis of travelling wave solutions using the Evans function.*
e-Science / Numerical Analysis Seminar, University of Durham, UK, February 2004.
- ★ *How to choose the step size when integrating an ODE.*
20th Biennial Conference on Numerical Analysis, Dundee, UK, June 2003.
- ★ *Optimizing the step size subject to a bound on the global error.*
Manifolds and Geometric Integration Colloquia (MaGIC), Rondablikk, Norway, February 2003.
- ★ *Optimizing the step size of numerical integrators.*
Foundations of Computational Mathematics (FoCM), Minneapolis, USA, August 2002.
- ★ *Optimizing the step size of numerical integrators.*
X-th Summer School in Numerical Analysis, Durham, UK, July 2002.
- ★ *Optimal step size functions for numerical integrators.*
University of Tübingen, Germany, April 2002.
- ★ *On the global error committed by numerical integrators on nonautonomous oscillators.*
Manifolds and Geometric Integration Colloquia (MaGIC), Ustaoset, February 2002.
- ★ *A priori estimates for the global error of ODE solvers.*
19th Biennial Conference on Numerical Analysis, Dundee, UK, June 2001.
- ★ *On the global error committed by numerical integrators.*
Numerical Analysis Seminar, University of Cambridge, UK, February 2001.

PRIZES AND AWARDS

- 2014: International Exchanges (with NSFC China) Grant from the Royal Society.
- 2010: Scheme 2 (Visits to the UK) Grant from the London Mathematical Society.
- 2009: International Travel Grant from the Royal Society.
- 2001: Rayleigh–Knight prize, University of Cambridge.
- 1999: Scholarship from VSB Bank, the Netherlands.
- 1999: Scholarship from Talent Program, Dutch Ministry of Education.
- 1998: Prize in Dutch–Flemish Universities’ Mathematics Competition.
- 1996: Prize in Dutch Universities’ Mathematics Competition.
- 1993: Bronze medal at International Mathematics Olympiad, Turkey.
- 1992: Second place at Dutch Mathematics Olympiad.

ADMINISTRATION

- 2020: Organizer, PhD training hour, School of Mathematics.
- 2019–2020: Member, Phase 4 Space Planning Group, School of Mathematics.
- 2018–now: Member, Management Committee, MAGIC videoconferencing network.
- 2017: Member, School of Mathematics IT Committee.
- 2013–now: Member, Leeds Mathematics Study Abroad Committee.
- 2012–now: Leeds Node Officer, MAGIC videoconferencing network.
- 2009–2015: Organizer, Applied Mathematics seminar series.