

Research Interests

Numerical analysis: Finite-difference schemes, geometric numerical integration

Scientific computing: Splitting techniques, symplectic integrators

Computational physics: Particle-in-cell codes, ray tracing

Education

Aug 2023 – present	PhD Applied Mathematics Thesis: Geometric particle-in-cell methods for relativistic electrodynamics Supervisor: Dr. Alan Hegarty Funding: Research Ireland (grant no. SFI 18/CRT/6049) University of Limerick, Ireland
Sep 2021 – Aug 2023	MSc Experimental Physics Thesis: Gradient-index lenses: Symplectic ray tracing and optical testing Supervisor: Dr. Alexander Goncharov Funding: University of Galway (College of Science and Engineering Scholarship) University of Galway, Ireland
Aug 2017 – Aug 2021	BSc Mathematics and Physics Thesis: Numerical analysis of symplectic integrators with applications in astrodynamics Supervisor: Dr. Alan Hegarty Final grade: First class honours University of Limerick, Ireland

Experience

Jun 2024 – Aug 2024	Analog Devices International, Inc. Wrote and tested a Python package to identify and remove systematic errors in the device fabrication process, keeping unit performance in line with an established statistical model. Supervisor: Mr. Dennis Dempsey Limerick, Ireland
Jan 2020 – Aug 2020	Automated acquisition and analysis of experiment data in the New Technology Quality Lab, eliminating the requirement for multiple on-site engineers during the COVID-19 pandemic. Supervisor: Dr. Mary McSherry
Sep 2021 – Dec 2022	CSIRO Parkes Observatory Coordinated with colleagues in Australia and the USA to conduct remote observations of nearby stars and the galactic centre on behalf of the Breakthrough Listen initiative. Supervisor: Dr. Howard Isaacson NSW, Australia (online)
Jun 2021 – Aug 2021	I-LOFAR Radio Telescope Developed Python tools to detect anomalous signals in data collected by LOFAR stations in Birr, Ireland and Onsala, Sweden, paving the way for future dual-site astrophysical surveys. Supervisor: Dr. Evan Keane Birr, Ireland

Publications

- **McKeon, B.** and Goncharov, A.V., 2023. [Symplectic numerical methods in optics and imaging: ray tracing in spherical gradient-index lenses and computer-generated image rendering](#). Applied Optics, 62(32), pp.8621-8631
- **McKeon, B.** and Goncharov, A.V., 2023. [Performance Considerations for Ray Tracing in Gradient-index Optics with Symplectic Numerical Methods](#). In London Imaging Meeting (Vol. 4, pp. 35-39). Society for Imaging Science and Technology
- Johnson, O.A., Gajjar, V., Keane, E.F., McKenna, D.J., Giese, C., **McKeon, B.**, Carozzi, T.D., Alcaria, C., Brennan, A., Brzycki, B. and Croft, S., 2023. [A Simultaneous Dual-site Technosignature Search Using International LOFAR Stations](#). The Astronomical Journal, 166(5), p.193

Awards

PhysiGIST Graduate Research Communication Competition 2021: 3rd prize

Irish National Astronomy Meeting 2021: Peter Curran Award (shared with Owen Johnson)

Skills

General computing: Linux CLI, SSH, Vim, Git
Parallelism & virtualisation: OpenMP, MPI, Docker
Programming: C++, Python, Julia, Mathematica, MATLAB

Professional Associations & Memberships

Irish Mathematical Society (IMS): Student Member
Society for Industrial and Applied Mathematics (SIAM): Student Member
Institute of Physics (IOP): Member
Optica: Certified Reviewer

Undergraduate Tutoring

University of Limerick <i>Academic Year 2025/26</i>		University of Galway <i>Academic Year 2022/23</i>	
Semester 1	Linear Algebra 1 Course leader: Dr. Kevin Moroney	Semester 2	Experimental & Computational Physics Course leader: Dr. Alexander Goncharov
<i>Academic Years 2023/24 & 2024/25</i>		<i>Academic Year 2021/22</i>	
Semester 1	Engineering Mathematics 3 Course leader: Dr. Alan Hegarty	Semester 2	Introduction to Physics Course leader: Dr. Liz Coleman
Semester 2	MA4602 – Science Mathematics 2 Course leader: Dr. Alan Hegarty		

Conferences Organised

May 2025	IMS & Irish SIAM Student Chapter Conference 2025 Annual meeting of IMS student members and Irish SIAM student chapters	University of Limerick, Ireland
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Conference Presentations

Dec 2025	Christmas High Power Laser Science Community Meeting <i>Comparing and Evaluating a Selection of Implicit Particle Pushers</i>	Abingdon School, UK
Jun 2025	30th Biennial Numerical Analysis Conference <i>Pauli Matrices: A Better Basis for Relativistic Electrodynamics?</i>	University of Strathclyde, UK
Aug 2024	Penn State SETI Center Symposium <i>Comparing Numerical Ray Tracing Methods in the Presence of Strong Gravitational Lensing</i>	Green Bank Observatory, USA
Jun 2023	London Imaging Meeting <i>Performance Considerations for Ray Tracing in Gradient-index Optics with Symplectic Numerical Methods</i>	Institute of Physics, UK
Sep 2021	Irish National Astronomy Meeting <i>Are We Alone? A LOFAR SETI Survey of TESS-Selected Exoplanets</i>	Online
Jun 2021	Conference of Astronomy and Physics Students <i>Modelling Altitude and Energy of the International Space Station in Python</i>	Online
Mar 2021	All-Ireland Conference of Undergraduate Research <i>Orbit Modelling of the International Space Station Using Symplectic Integrators in Python</i>	University of Limerick, Ireland

Public Engagement & Outreach

Nov 2025	Science Week Secondary school outreach event: <i>Careers in Maths & Stats</i>	Ardscoil Mhuire, Limerick, Ireland
Nov 2024	Open Science Lunch Seminar Public lecture: <i>Code for Collaboration: Bridging Open Science and FOSS</i>	University of Limerick, Ireland
Oct 2024	Maths Week Secondary school outreach event: <i>Maths in Courses You Might Not Expect!</i>	Villiers School, Limerick, Ireland
Mar 2024	Irish Astronomy Week Primary school outreach event: <i>The Search for Extraterrestrial Intelligence</i>	Dooradoyle Library, Limerick, Ireland
Jan 2024	Galway Astrofest Invited talk: <i>Super Resolution of Galaxy Survey Data</i>	Menlo Park Hotel, Galway, Ireland
Feb 2023	Python Ireland Monthly meetup: <i>Ready, SETI, Go! Python and the Search for E.T.</i>	Workday, Dublin, Ireland
Feb 2022	Irish Astronomical Association Monthly lecture: <i>SETI and Adaptive Optics: A Match Made in the Heavens</i>	Online