

## Research Interests

**Numerical analysis:** Geometric numerical integration, Runge-Kutta methods

**Scientific computing:** Finite element analysis, symplectic integrators

**Computational physics:** Particle-in-cell algorithms, ray tracing

## Education

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

## Experience

Jun 2024 – Aug 2024	<b>Analog Devices International, Inc.</b> 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. <b>Supervisor:</b> Mr. Dennis Dempsey <b>Limerick, Ireland</b>
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. <b>Supervisor:</b> Dr. Mary McSherry
Sep 2021 – Dec 2022	<b>CSIRO Parkes Observatory</b> 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. <b>Supervisor:</b> Dr. Howard Isaacson <b>NSW, Australia (online)</b>
Jun 2021 – Aug 2021	<b>I-LOFAR Radio Telescope</b> 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. <b>Supervisor:</b> Dr. Evan Keane <b>Birr, Ireland</b>

## 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 Teaching

Sep 2023 – present	<b>Engineering Mathematics 3</b>	
Jan 2024 – present	<b>Science Mathematics 2</b>	<ul style="list-style-type: none"><li>Facilitate tutorial sessions for students (40-50 students, 4-6 contact hours/week)</li><li>Create step-by-step solutions for all practice problems (11 sheets, 5-7 problems/sheet)</li><li>Responsible for marking 150-200 scripts and submitting grades at the end of each semester</li></ul>
Jan 2022 – Apr 2022	<b>Introduction to Physics</b>	
Sep 2022 – Apr 2023	<b>Experimental and Computational Physics</b>	<ul style="list-style-type: none"><li>Supervised laboratory sessions (25-30 students, 4 contact hours/week)</li><li>Assessed and graded all students during end-of-semester examinations</li></ul>

Conferences Organised

May 2025	<b>IMS &amp; Irish SIAM Student Chapter Conference 2025</b>	<b>University of Limerick, Ireland</b>
	Annual meeting of IMS student members and Irish SIAM student chapters	

Conferences Attended

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

## Public Engagement & Outreach

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