Ben McKeon ![iD]

📞 +353 851-116-592   🌐 mckeon-ben.github.io   ✉ mckeon.ben@ul.ie   in ben-mckeon   ⌂ mckeon-ben

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** — **University of Limerick, Ireland**
Thesis: Geometric particle-in-cell methods for relativistic electrodynamics
Supervisor: Dr. Alan Hegarty
Funding: Research Ireland (grant no. SFI 18/CRT/6049)

Sep 2021 – Aug 2023 | **MSc Experimental Physics** — **University of Galway, Ireland**
Thesis: Gradient-index lenses: Symplectic ray tracing and optical testing
Supervisor: Dr. Alexander Goncharov
Funding: University of Galway (College of Science and Engineering Scholarship)

Aug 2017 – Aug 2021 | **BSc Mathematics and Physics** — **University of Limerick, Ireland**
Thesis: Numerical analysis of symplectic integrators with applications in astrodynamics
Supervisor: Dr. Alan Hegarty
Final grade: First class honours

Experience

Jun 2024 – Aug 2024 | **Analog Devices International, Inc.** — **Limerick, Ireland**
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

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** — **NSW, Australia (online)**
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

Jun 2021 – Aug 2021 | **I-LOFAR Radio Telescope** — **Birr, Ireland**
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

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
Academic Year 2025/26

| Semester 1 | **Linear Algebra 1** |
| | **Course leader:** Dr. Kevin Moroney |

Academic Years 2023/24 & 2024/25

| Semester 1 | **Engineering Mathematics 3** |
| | **Course leader:** Dr. Alan Hegarty |

| Semester 2 | **Science Mathematics 2** |
| | **Course leader:** Dr. Alan Hegarty |

University of Galway
Academic Year 2022/23

| Semester 2 | **Experimental & Computational Physics** |
| | **Course leader:** Dr. Alexander Goncharov |

Academic Year 2021/22

| Semester 2 | **Introduction to Physics** |
| | **Course leader:** Dr. Liz Coleman |

Conferences Organised

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

Conference Presentations

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

Public Engagement & Outreach

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