Seán Brennan

Postdoc Researcher · Max Planck Institute for Extraterrestrial Physics, Munich, Germany

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Academic Experience

Postdoctoral Researcher *Munich, Germany*

Max Planck Institute for Extraterrestrial Physics *2025 – Present*

- Lead research on high-energy transients using multi-wavelength photometry (MPI 2.2m, GROND) and X-ray instruments (eROSITA, Einstein Probe).
- Developed and implemented photometric reduction and calibration software for the GROND instrument, as well as the Campus Observatory Garching (COG) telescope.
- Pioneered methods to identify pre-supernova activity for the LSST survey, with focus on interacting transients, mass loss processes, and spectral evolution.

Visiting Researcher *Cambridge, MA, USA*

Harvard & Smithsonian Center for Astrophysics *Oct – Dec 2024*

- Collaborated with Dr. V. A. Villar on Monte Carlo radiation transfer simulations using eSCATTER for interacting transients.
- Developed an emulator for eSCATTER in partnership with Harvard PhD students and postdocs; contributed to preparation of related publications.
- Performed spectral modelling to investigate mass loss and its influence on transient evolution.

Postdoctoral Researcher *Stockholm, Sweden*

Oskar Klein Centre, Stockholm University *2022 – 2025*

- Collaborated with Dr. Ragnhild Lunnan on spectral modelling and precision photometry of interacting transients and pre-supernova candidates.
- Analysed mechanisms of mass loss affecting stellar evolution and explosion outcomes.

Research Intern *Dublin, Ireland*

Trinity College Dublin *Summer 2017*

- Worked with Dr. José Groh utilising MESA and CMFGEN to model the effects of mass loss on early supernova spectra.

Research Intern *Dublin, Ireland*

Trinity College Dublin *Summer 2016*

- Assisted Dr. Brian Espey in analysing Irish light pollution and developing urban mitigation strategies using NASA VIIRS data.

Education

PhD in Astronomy & Astrophysics *Dublin, Ireland*

University College Dublin *2018 – 2022*

- Supervisor: Dr. Morgan Fraser
- Thesis Title: Observational Constraints on Supernovae and Supernova Impostors

Bachelor's Degree in Physics & Astrophysics *Dublin, Ireland*

Trinity College Dublin *2014 – 2018*

- Supervisor: Dr. José Groh
- Thesis Title: Investigation and Modelling of Metal-Free, Massive Stars Using MESA and CMFGEN
- Grade: First Class with Honours

Awarded Telescope Time

2025	***Testing the Dual Core-Collapse Supernova Hypothesis using GTC+EMIR*** – PI (DDT)	*GTC/EMIR*
2025 – 2026	***PRE-Supernova Targeted Observations (PRESTO) during the Rubin Era*** – Co-PI (PI. M. Stritzinger, 20 hr)	*NOT/ALFOSC*
2025 – 2026	***Pre-Supernova Targeted Observations during the Rubin Era*** – PI (LSST In-Kind, 20 hr)	*NOT/ALFOSC*
2024 – 2025	***Pilot for the Pre-Supernova Targeted Observations (PRESTO) Program*** – PI (LSST In-Kind, 20 hr)	*NOT/ALFOSC*
2024	***Pre-Supernova Targeted Observations of an Erupting Massive Star*** – PI (DDT)	*VLT/X-Shooter*
2024	***Uncovering the Power Source of the Luminous, Long-lived, H-rich Supernova 2023nly*** – Co-I (PI: R. Lunnan)	*VLT/FORS2*
2024	***Nebular Spectrum of an Extremely Bright Superluminous Supernova*** – Co-I (PI: S. Bartmentloo, DDT)	*VLT/FORS2*
2024	***Double Trouble: The Birth Site of an Extraordinary Twin-Peaked Supernova*** – Co-I (PI: A. Angus)	*VLT/MUSE*
2024	***Dissecting the Peculiar Superluminous Supernova SN2024dde*** – Co-I (PI: R. Lunnan)	*VLT/FORS2 & X-Shooter*
2023	***An Unprecedented Opportunity to Observe a Massive Star with X-Shooter Weeks Before it Goes Supernova*** – PI (DDT)	*VLT/X-Shooter*
2023	***What Powers the Longest-Rising H-rich Superluminous Supernova 2023iop*** – Co-I (PI: S. Schulze)	*VLT/MUSE*
2023	***Zooming in on the Innermost 100-pc of the Interaction-Powered SLSN 2021adxl*** – PI (Time not used due to telescope repair)	*VLT/MUSE*
2021–Now	***New Opportunities for the Counterparts of Gravitational Wave Sources at the VLT*** – Co-I (PI: ENGRAVE Collaboration)	*VLT*
2020–Now	***ePESSTO/ePESSTO+*** – Co-I & On-Site Observer (PI: C. Inserra)	*NTT/EFOSC2*
2019	***MUSE-ing on the Environments of Type Ibn Supernovae*** – Co-I (PI: E. Callis)	*VLT*

Teaching & Mentoring

2024–2025	**Master's Thesis main Supervisor** – *NLTE Spectral Modelling of the Nearby Stripped-Envelope Supernova 2024ehs* (A&A submitted, under review)	*SU*
2023–2024	**Master's Thesis main Supervisor** – *Pre-Supernova Precursor Activity: Correlations & Identification*	*SU*
2021–2022	**Introductory Physics for Engineering** – Teaching Assistant, Led experimental labs and in-person tutorial class for 150 students; designed assessments, grading	*UCD*
2019–2021	**Introductory Physics** – Teaching Assistant, Led hands-on experimental labs for 65 students; developed teaching materials, grading	*UCD*
2021–2022	**Information Skills for Health & Agri. Sciences** – Led in-person computer labs for 80 students; created interactive modules	*UCD*

Collaborations

2025–Now	**extended ROentgen Survey with an Imaging Telescope Array (eROSITA) consortium**	–
2024–Now	**Pre-Supernova Targeted Observations (PRESTO)** - PI	–
2022–Now	**Zwicky Transient Facility (ZTF) Collaboration** - leading the Precursor emission and Interacting Supernova internal group	–
2022–Now	**LSST Transient & Variable Science (TVS) Group**	–
2018–2022	**Nordic Optical Telescope Unbiased Transient Survey 2 (NUTS2) Collaboration**	–
2018–Now	**Public ESO Spectroscopic Survey of Transient Objects (ePESSTO+)**	–
2018–Now	**Electro-magnetic counterparts of Gravitational waves at the Very Large Telescope (ENGRAVE) Collaboration**	–

Awards & Grants

2025	**Certificate of Seal of Excellence: *PRESTO* Project #101199193** – awarded by the European Commission and Marie Skłodowska-Curie Action	–
2024	**Wenner-Gren Grant** – awarded by The Wenner-Gren Foundation	*6,600 kr*
2023	**Dahlmark Travel Grant** – awarded by Alva and Lennart Dahlmark research grants	*7,300 kr*
2022	**Dahlmark Research Grant** – awarded by Alva and Lennart Dahlmark research grants	*8,200 kr*
2022	**Honourable Mention: Peter Curran Presentation Award** at the Irish National Astronomy Meeting	–

Outreach

2026	**Astronomy on Tap** – "Exploring Exploding Stars with Europe's Largest Telescopes" – Public talk engaging 100+ attendees (expected)	*Munich, Germany*
2024	**Nobel Prize Museum** – "From Photons to Supernova: How Light Reveals the Secrets of Stars" – Public talk engaging 200+ attendees	*Stockholm, Sweden*
2024	**Online article** – "How to Catch a Star Before it Explodes" by *The Conversation*; 5,000+ reads	*UK*
2024	**Pint of Science Talk** – "How to Blow Up a Massive Star" – Public lecture with 80+ attendees	*Stockholm, Sweden*
2018–2020	**UCD Student Open Day** – Science Communicator promoting Astronomy and Astrophysics at UCD	*Dublin, Ireland*
2016–2018	***iWISH* (Inspiring Women in STEM)** – STEM outreach promoting women in science; workshops and talks	*Dublin, Ireland*

Open Source Contributions

- AutoPhOT – Automated pipeline for rapid, publication-quality photometry of transients; cited 50+ times
- TransientTriangulator – 2D triangulation code for transient source alignment
- eScatter – Monte Carlo simulations of electron scattering and radiative transfer in interacting supernovae
- finder_chart – Script generating finder charts to assist spectroscopic observations

Relevant Experience

2025	**Organiser for AAS 246 Special Session #32** – *"Origins to Outcomes: Explosive Transients with Circumstellar Material"*	*Anchorage, USA*
2024–Now	**Journal Referee** for Astrophysical Journal, Astrophysical Journal Letters, Astronomy & Astrophysics, Monthly Notices of the Royal Astronomical Society	–
2024–2025	**Time Allocation Committee** for Liverpool Telescope	–
2024	**Time Allocation Committee** for Devasthal Optical Telescope	–
2023–2025	**Co-Founder of sustainity LTD** – Sustainability consulting company with EU support	*Dublin, Ireland*
2023–Now	**ESO Data Products Review Panel (DPR) Reviewer** for P112–P117	
2019–2022	**Local Organizing Committee Member** for IAU Symposium 361: Massive Stars Near & Far	*Cavan, Ireland*
2019	**On-Site Observer** at New Technology Telescope (NTT), 21 nights	*La Silla, Chile*
2019	**On-Site Observer** at William Herschel Telescope (WHT), 11 nights	*La Palma, Spain*

Skills

Data Reduction & Pipelines	**Photometric/spectroscopic reduction, transient analysis**: PESSTO PIPELINE, PYPEIT, PYNOT, LCOGTSNPIPE, AUTOPHOT, ASTROPY, PHOTUTILS, SPECUTILS, ESOREFLEX
Rad. Transfer & Hydrodynamics	**Spectral modeling, light curve simulation**: CMFGEN, SNEC, SUMO, MESA, REDBACK, MOSFIT
Programming	**Trained with the ICHEC (Irish Centre for High-Performance Computing)**: OPENMP, Parallel Performance, MPI, SLURM, and cluster computing in C, Fortran
–	**NVIDIA Deep Learning Institute training**: Fundamentals of deep learning, neural network training, and model optimization. Earned NVIDIA DLI certification.TENSORFLOW, PYTORCH, Neural Networks, Transfer Learning

Presentations

INVITED

- ***Tracing Massive Stars Toward Supernovae: Upcoming Facilities and Novel Strategies*** – HEAD Seminar, Max Planck Institute for Extraterrestrial Physics, Garching, Germany, 2025
- ***Extreme Mass Loss in the Final Years of a Massive Star: Targeted Surveys & Spectroscopic Modelling*** – Supernova Seminar, Max Planck Institute for Astrophysics, Garching, Germany, 2025
- ***Progenitor Activity Preceding Interacting Supernovae*** – SESTA Seminar, Max Planck Institute for Astrophysics, Garching, Germany, 2025
- ***Catch a Falling Star: Connecting Supernovae and Their Progenitors*** – Harvard University, Cambridge, MA, USA, 2024
- ***Early Warning Signs: Precursor Eruptions Preceding Supernovae*** – Albert Einstein Institute, Potsdam, Germany, 2024
- ***Understanding Massive Stars Shortly Before Their Explosive Supernova*** – Uppsala University, Uppsala, Sweden, 2023
- ***Mass Loss and Shock Interaction in Massive Stars*** – Trinity College Dublin, Dublin, Ireland, 2023
- ***Using Hubble to Reveal the Impostor*** – Open University Space Society, UK (online), 2022
- ***Insight into SN Impostors and the Release of a Novel Automated Photometry Tool*** – Stockholm University, Stockholm, Sweden, 2021
- ***An Impostor Among Us? Suspicious Supernova Impostors*** – University of Auckland, Auckland, New Zealand (online), 2021

CONTRIBUTED

- ***Precursor Eruptions Preceding Supernovae: Upcoming Observations and Theoretical Challenges*** – *An Extraordinary Journey Into The Transient Sky*, University of Padova, Padova, Italy, 2025
- ***Early Warning Signs: Precursor Eruptions Preceding Supernovae*** – *Bruno65 Conference*, Ludwig Maximilian University, Munich, Germany, 2025
- ***Catch a Falling Star: How to Spot a Soon-to-Explode Massive Star*** – *Astronomdagarna*, Lund University, Lund, Sweden, 2024
- ***Progenitor Activity & Interacting Transients*** – *Cosmic Transients in the Era of Large Surveys*, Stockholm University, Stockholm, Sweden, 2024
- ***Early Warning Signs: Precursor Eruptions Preceding Supernovae*** – *Transients Down Under*, Monash University, Melbourne, Australia, 2024
- ***Using X-Shooter to Reveal the Explosion, Progenitor, and Host of a Nearby Super-Luminous Type IIn Supernova*** – European Astronomical Society Meeting, Jagiellonian University, Kraków, Poland, 2023
- ***Early Warning Signs: Precursor Eruptions Preceding Supernovae*** – ePESSTO+ Meeting, Nicolaus Copernicus University, Warsaw, Poland, 2023
- ***Revealing the Shock Structure of the Very Nearby Super-Luminous Type IIn Supernova*** – *Transient & Variable Universe*, University of Chicago, Chicago, IL, USA, 2023

- ***An Impostor Among Us? Interacting Supernova and Supernova Impostors*** – National Astronomy Meeting, University of Warwick, Warwick, UK, 2022
- ***Observing SN 2016jbu at +5 Years with HST*** – ePESSTO+ Annual Meeting, University of Barcelona, Barcelona, Spain, 2022
- ***SN 2018bsz: Significant Dust Formation in a Nearby Super-Luminous Supernova*** – Irish National Astronomy Meeting, Birr, Ireland, 2021
- ***An Impostor Among Us? The Suspicious Activity of the Interacting Transient AT 2016jbu*** – European Astronomical Society Meeting, Online, 2021

Publications

First-author papers: 7 | h-index: 15 | Total number of papers: 38
Total number of citations: 599 (716 including non-refereed, alerts & classifications)

Metrics and publications from NASA ADS - 26 / 11 / 2025

First Author Publications

- **Brennan, S. J.**, Barmentloo, S., et al. 2025 - *Precursor Activity Preceding Interacting Supernovae I: Bridging the Gap with SN 2022mop* - submitted, pre-print available at arXiv:2503.08768
- **Brennan, S. J.**, Schulze, S., et al. 2024 - *SN 2021adxl: A luminous nearby interacting supernova in an extremely low-metallicity environment* - Astronomy and Astrophysics 690, A259
- **Brennan, S. J.**, Sollerman, J., et al. 2024 - *Spectroscopic observations of progenitor activity 100 days before a Type Ibn supernova* - Astronomy and Astrophysics 684, L18
- **Brennan, S. J.**, Fraser, M. - *The Automated Photometry of Transients pipeline (AUTOPHOT)* - Astronomy and Astrophysics 667, A62
- **Brennan, S. J.**, Elias-Rosa, N., et al. 2022 - *The impostor revealed: SN 2016jbu was a terminal explosion* - Astronomy and Astrophysics 664, L18
- **Brennan, S. J.**, Fraser, M., et al. 2022 - *Progenitor, environment, and modelling of the interacting transient AT 2016jbu (Gaia16cfr)* - Monthly Notices of the Royal Astronomical Society 513, 5666
- **Brennan, S. J.**, Fraser, M., et al. 2022 - *Photometric and spectroscopic evolution of the interacting transient AT 2016jbu (Gaia16cfr)* - Monthly Notices of the Royal Astronomical Society 513, 5642

Second Author Publications

- Elias-Rosa, N., **Brennan, S. J.**, et al. 2024 - *SN 2020pvb: A Type IIn-P supernova with a precursor outburst* - Astronomy and Astrophysics 686, A13
- Chen, T. -W., **Brennan, S. J.**, et al. 2021 - *SN 2018bsz: significant dust formation in a nearby superluminous supernova* - submitted, pre-print available at arXiv:2109.07942
- Altamura, E., **Brennan, S. J.**, et al. 2020 - *Serendipitous Discovery of a Physical Binary Quasar at z = 1.76* - The Astronomical Journal 159, 122

Contributing Author

- Matilainen, K. K., et al. 2025 incl. **Brennan, S. J. (9th)** - *Long-term evolution of the SN 2009ip-like transient SN 2016cvk* - Astronomy and Astrophysics 703, A62
- Gkini, A., et al. 2025 incl. **Brennan, S. J. (10th)** - *Eruptive mass loss less than a year before the explosion of superluminous supernovae. II. A systematic search for pre-explosion eruptions with VLT/X-shooter* - submitted, pre-print available at arXiv:2510.11799
- Pessi, P. J., et al. 2025 incl. **Brennan, S. J. (19th)** - *The ambiguous AT2022rze: changing-look AGN mimicking a supernova in a merging galaxy system* - Monthly Notices of the Royal Astronomical Society 542, 3354
- Terwel, Jacco H., et al. 2025 incl. **Brennan, S. J. (3rd)** - *A real-time search for Type Ia Supernovae with late-time interactions with circumstellar material in ZTF data* - Astronomy and Astrophysics 702, A21

- Sharma, Yashvi, et al. 2025 incl. **Brennan, S. J. (10th)** - *Twin Peaks: SN 2021uvy and SN 2022hgk in the Landscape of Double-peaked Stripped Envelope Supernovae* - Publications of the Astronomical Society of the Pacific 137, 094101
- Stein, Robert, et al. 2025 incl. **Brennan, S. J. (15th)** - *SN 2023uqf: An Interacting Supernova Coincident with a High-Energy Neutrino* - submitted, pre-print available at arXiv:2508.08355
- Hu, Yang, et al. 2025 incl. **Brennan, S. J. (9th)** - *SN 2021aaev: a Hydrogen-Rich Superluminous Supernova with Early Flash and Long-Lived Circumstellar Interaction in an Unusual Host Environment* - submitted, pre-print available at arXiv:2508.11559
- Schulze, Steve, et al. 2025 incl. **Brennan, S. J. (16th)** - *Extremely stripped supernova reveals a silicon and sulfur formation site* - Nature 644, 634
- Rehemtulla, Nabeel, et al. 2025 incl. **Brennan, S. J. (13th)** - *The BTSbot-nearby Discovery of SN 2024jlf: Rapid, Autonomous Follow-up Probes Interaction in an 18.5 Mpc Type IIP Supernova* - The Astrophysical Journal 985, 241
- Valerin, G., et al. 2025 incl. **Brennan, S. J. (30th)** - *A study in scarlet: I. Photometric properties of a sample of intermediate-luminosity red transients* - Astronomy and Astrophysics 695, A42
- Valerin, G., et al. 2025 incl. **Brennan, S. J. (33rd)** - *A study in scarlet: II. Spectroscopic properties of a sample of intermediate-luminosity red transients* - Astronomy and Astrophysics 695, A43
- Pessi, P. J., et al. 2025 incl. **Brennan, S. J. (12th)** - *Sample of hydrogen-rich superluminous supernovae from the Zwicky Transient Facility* - Astronomy and Astrophysics 695, A142
- Gangopadhyay, Anjasha, et al. 2025 incl. **Brennan, S. J. (11th)** - *SN 2021foa: the bridge between SN IIn and Ibn* - Monthly Notices of the Royal Astronomical Society 537, 2898
- Gkini, A., et al. 2025 incl. **Brennan, S. J. (10th)** - *Eruptive mass loss less than a year before the explosion of superluminous supernovae: I. The cases of SN 2020xga and SN 2022xgc* - Astronomy and Astrophysics 694, A292
- Das, Kaustav K., et al. 2024 incl. **Brennan, S. J. (11th)** - *SN 2023zaw: An Ultrastripped, Nickel-poor Supernova from a Low-mass Progenitor* - The Astrophysical Journal 969, L11
- Gkini, A., et al. 2024 incl. **Brennan, S. J. (5th)** - *SN 2020zbf: A fast-rising hydrogen-poor superluminous supernova with strong carbon lines* - Astronomy and Astrophysics 685, A20
- Ferrari, Lucía, et al. 2024 incl. **Brennan, S. J. (15th)** - *The metamorphosis of the Type Ib SN 2019yvr: late-time interaction* - Monthly Notices of the Royal Astronomical Society 529, L33
- Li, Wenxiong, et al. 2023 incl. **Brennan, S. J. (10th)** - *Rapidly Evolving Transients in Archival ZTF Public Alerts* - The Astrophysical Journal 955, 144
- Agudo, I., et al. 2023 incl. **Brennan, S. J. (11th)** - *Panning for gold, but finding helium: Discovery of the ultra-stripped supernova SN 2019wxt from gravitational-wave follow-up observations* - Astronomy and Astrophysics 675, A201
- Deckers, M., et al. 2023 incl. **Brennan, S. J. (5th)** - *Photometric study of the late-time near-infrared plateau in Type Ia supernovae* - Monthly Notices of the Royal Astronomical Society 521, 4414
- Moran, S., et al. 2023 incl. **Brennan, S. J. (6th)** - *A long life of excess: The interacting transient SN 2017hcc* - Astronomy and Astrophysics 669, A51
- Pasham, Dheeraj R., et al. 2023 incl. **Brennan, S. J. (25th)** - *The Birth of a Relativistic Jet Following the Disruption of a Star by a Cosmological Black Hole* - Nature Astronomy 7, 88
- Pursiainen, M., et al. 2022 incl. **Brennan, S. J. (7th)** - *SN 2018bsz: A Type I superluminous supernova with aspherical circumstellar material* - Astronomy and Astrophysics 666, A30
- Eappachen, D., et al. 2022 incl. **Brennan, S. J. (16th)** - *Probing for the host galaxies of the fast X-ray transients XRT 000519 and XRT 110103* - Monthly Notices of the Royal Astronomical Society 514, 302
- Reguitti, A., et al. 2022 incl. **Brennan, S. J. (6th)** - *SN 2021foa, a transitional event between a Type IIn (SN 2009ip-like) and a Type Ibn supernova* - Astronomy and Astrophysics 662, L10
- Callis, E., et al. 2021 incl. **Brennan, S. J. (5th)** - *How low can you go? SN 2018zd as a low-mass Fe core-collapse supernova* - submitted, pre-print available at arXiv:2109.12943
- Fraser, Morgan, et al. 2021 incl. **Brennan, S. J. (3rd)** - *SN 2021csp – the explosion of a stripped envelope star within a H and He-poor circumstellar medium* - submitted, pre-print available at arXiv:2108.07278

- Cai, Y.-Z., et al. 2019 incl. **Brennan, S. J. (11th)** - *The transitional gap transient AT 2018hso: new insights into the luminous red nova phenomenon* - Astronomy and Astrophysics 632, L6

References

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