

Dr. JAMES R. BEATTIE

updated: 7-April-2026, website: <https://astrojames.github.io>

PERSONAL INFORMATION

NATIONALITY: · Australia · New Zealand
POSITIONS: · Joint Princeton Postdoctoral Research Associate & CITA Postdoctoral Fellow
EMAIL: · beattie@ias.edu
Online Profiles · [Google Scholar](#) · [ResearchGate](#) · [OrcID](#) · [Twitter](#)
INTERESTS: · MHD / HD turbulence · plasma astrophysics · multiphase interstellar medium
· high-performance computing · supernovae remnants · magnetogenesis
· cosmic ray propagation · fluid dynamics · shocks · magnetic dynamos
· laboratory astrophysics · statistical modelling · magnetic reconnection
· relativistic MHD · neutron star mergers · star formation · interdisciplinary research

EMPLOYMENT

Sep. 2026-2030 **Title:** Hubble Fellow
Institute: Institute for Advanced Study
Faculty mentor: [Prof. James Stone](#)
Sep. 2026-2030 **Title:** Member
Institute: Institute for Advanced Study
Faculty mentor: [Prof. James Stone](#)
2023-2027 **Title:** Postdoctoral Research Associate
Institute: Department of Astrophysical Sciences, Princeton University
Research group: [Prof. Amitava Bhattacharjee](#)
2023-2027 **Title:** CITA Fellow
Institute: Canadian Institute for Theoretical Astrophysics, University of Toronto
Faculty Mentor: [Prof. Bart Ripperda](#)

EDUCATION

2019-2024 **Doctor of Philosophy**, Australian National University, Australia
Specialisation: Computational / theoretical astrophysics, magnetohydrodynamics.
Thesis: The statistics of magnetised interstellar turbulence
Advisor: Christoph Federrath
2018-2019 **Honours (First Class)**, Australian National University, Australia
Major: Astrophysics
Thesis: Supersonic Turbulent Molecular Clouds: Filaments and Anisotropies
(with University Medal, Chancellor's Commendations, Bok Prize)
2013-2018 **Bachelor of Mathematics**, Queensland University of Technology, Australia
Major: Applied and Computational Mathematics
2013-2018 **Bachelor of Science**, Queensland University of Technology, Australia
Major: Physics
2008-2013 **Bachelor of Education**, Queensland University of Technology, Australia
Major: Biology & Computing
2003-2007 **High school diploma**, Tannum Sands State High School, Australia

Exchange and Summer Programmes
2022-23 Fulbright Exchange at the University of California, Santa Cruz, United States
2017-18 Cross Institutional Exchange at the University of Queensland, Australia
WINTER 2017 Summer Science Programme at The University of Cambridge, United Kingdom
FALL 2015 Exchange Semester at Simon Fraser University, Canada

SCHOLARSHIPS, AWARDS & GRANTS

Selected Scholarships & Fellowships
2026 Hubble Fellow, NASA Hubble Fellowship Program
2026 Member, Institute for Advanced Study

2023 CITA Fellow, Canadian Institute for Theoretical Astrophysics
 2023 Research Associate, Princeton University
 2023 Stanford Science Fellow, Stanford (declined)
 2022 Fulbright PhD Fellowship
 2020 [Joan Duffield Research Supplementary Scholarship](#)
 2020 [Deakin PhD Scholarship](#)
 2020 [Dean's Merit \(theoretical physics\) HDR Supplementary Scholarship](#)
 2019 [Bok Honours Astrophysics Scholarship](#)
 2016, 2017 [ANU Summer Research Scholarship](#)

Selected Significant Awards

2025 [Top HPC-Enabled Scientific Achievement, HPCwire](#)
 2020 [Chancellor's Letter of Commendation: 7.0/7.0 Honours GPA](#)
 2020 [ASA Bok Prize: Best Astronomy Honours Thesis in Australia](#)
 2020 Best Student Talk at [ANITA](#), 2020
 2019 [University Medal](#) (top in graduating science cohort)
 2018 Admission to the Dean's List of Students with Excellent Academic Performance
 2018 [Vice Chancellor's Performance Award](#)
 2018 [Nominated for 2018 Vice-Chancellor's Awards for Excellence](#)
 2016 [Vice Chancellor's Performance Award: Best Sessional Teaching in Science & Engineering Faculty](#)
 2016 Admission to the Dean's List of Students with Excellent Academic Performance
 2015 Admission to the Dean's List of Students with Excellent Academic Performance
 2014 Admission to the Dean's List of Students with Excellent Academic Performance

Computing grants awarded (1 core hour $\approx$ \$0.13; total $\approx$ 251 million-core hours)

2026	(CO-PI) SciNet regular call: KHI dynamos and galactic turbulence	1.8e7 core hours
2026	(PI) LRZ regular call: turbulence & dynamos	4e7 core hours
2025	(CO-PI) SciNet regular call: KHI dynamos and galactic turbulence	1.8e7 core hours
2024	(PI) LRZ regular call: KHI dynamos	2e7 core hours
2024	(PI) LRZ large scale call: The world's largest MHD simulation	7e7 core hours
2022	(PI) LRZ large scale call extension	1.5e7 core hours
2021	(PI) LRZ large scale call: The world's largest MHD simulation	7e7 core hours

PROFESSIONAL ACTIVITIES & ORGANISATION AFFILIATIONS

Professional Referee Activities

(1 article) Science Advances
 (2 articles) Astronomy and Astrophysics
 (1 article) Open Journal of Astrophysics
 (2 articles) Astrophysical Journal
 (5 articles) Monthly Notices of the Astronomical Society
 (1 article) Monthly Notices of the Astronomical Society Letters
 (1 article) Journal of Plasma Physics
 (1 article) Publications of the Astronomical Society of the Pacific
 (first call 2024) LRZ SuperMUC-NG large-scale compute project calls

Other Professional Activities

2023-present Coordinator for the Canadian Institute of Astrophysics Astro-Plasma Group
 2022 [MSATT program](#) – connecting scientists with high school students
 2022 Sustainability Committee, Member, [RSAA](#)
 2021 Higher Degree Research Education Representative, [RSAA](#)
 2021 Giving Committee, Member, [RSAA](#)
 2020 President of the [RSAA](#) Student Seminar Committee

SUPERVISIONS & MENTORING (12 TOTAL)

2025 **Student:** [Khush Negandhi](#) (co-supervised w. Bart Ripperda), Undergrad. Student
Institute: University of Toronto
Project: [The MHD fluid and nonlinear vector Shrödinger correspondence](#)
 2025 **Student:** Jaden Cabral Cordeiro (co-supervised w. Bart Ripperda), Undergrad. Student
Institute: University of Toronto
Project: The transport of ideal invariants in magnetohydrodynamic turbulence
 2025 **Student:** Daniel Hagyard (co-supervised w. Bart Ripperda), Undergrad. Student
Institute: University of Toronto
Project: Understanding density gradient statistics for scintillation and laboratory astrophysics

- 2024-25 **Student:** [Isabelle Connor](#) (co-supervised w. Enrico Ramirez-Ruiz), Undergrad. Student
Institute: University of California, Santa Cruz
Project: [The universality of supernova-driven turbulence in different galaxies.](#)
- 2024 **Student:** [Max Sokolova](#) (co-supervised w. Bart Ripperda), Undergrad. Student
Institute: University of Toronto
Project: [The MHD fluid and nonlinear vector Shrödinger correspondence](#)
- 2024 **Student:** Juan Miguel L. Padilla (co-supervised w. Bart Ripperda), Undergrad. Student
Institute: University of Toronto
Project: Coherent vortices and eigen modes in MHD turbulence
- 2024 **Student:** [Louis Burnaz](#) (co-supervised w. Bart Ripperda), Undergrad. Student
Institute: École normale supérieure de Lyon
Project: Compression-triggered fast reconnection in relativistic, resistive MHD
- 2023-24 **Student:** Shashvat Varma (co-supervised w. Bart Ripperda), Undergrad. Student
Institute: University of Toronto
Project: The diffusion-free growth in the small-scale dynamo
- 2023 **Student:** Sam Lakerdas-Gayle (co-supervised w. Bart Ripperda), Undergrad. Student
Institute: University of Toronto
Project: The secret-life of over-dense regions in magnetised, turbulent clouds
- 2021 **Student:** [Neco Kriel](#) (co-supervised w. Christoph Federrath), Honours Student
Institute: Australian National University
Project: [Fundamental scaling relations in the turbulent dynamo.](#)
- 2021 **Student:** [Matthew Sampson](#) (co-supervised w. Mark Krumholz), Honours Student
Institute: Australian National University
Project: [Cosmic ray transport in compressible ionised MHD turbulence.](#)
- 2022 **Student:** Adrian Lehane
Institute: Telopea Park School / Narrabundah College (high school)
Project: Automated phase detection of Venus.

TALKS & MEETINGS (64 TOTAL)

Colloquium (1 total)

- MAR. 2026 Supernova remnants as engines of non-Kolmogorov galactic turbulence (and why we need to throw away old ideas applied to ISM turbulence), ITC Colloquium, CFA, Harvard University, United States

Collaboration Meetings (2 total)

- FEB. 2026 (Invited) [Simons Collaboration for Extreme Electrodynamics of Compact Sources](#), New York, United States
Presented (poster): [Can you create a large-scale vertical field from the KHI? Yup.](#)
- FEB. 2025 (Invited) [Simons Collaboration for Extreme Electrodynamics of Compact Sources](#), New York, United States
Presented (poster): [The Three Phases of the Kelvin Helmholtz Instability Dynamo](#)

Invited (32 total)

- APR. 2026 KIPAC Seminar, Stanford, United States
- MAR. 2026 What do the world's largest simulations of cold phase interstellar medium turbulence tell us? Luncheon CFA talk, Harvard, United States
- MAR. 2026 A large-scale, vertical field driven dynamo from the Kelvin-Helmholtz instability: implications for merging compact objects and other thoughts, Blackhole Institute, Harvard, United States
- FEB. 2026 Supernova remnants as engines of non-Kolmogorov galactic turbulence, Astronomy Seminar, Michigan State University, United States
- FEB. 2026 Supernova remnants as engines of non-Kolmogorov galactic turbulence, Astronomy Seminar, Michigan State University, United States
- OCT. 2025 Why interstellar turbulence is non-Kolmogorov and how structures fit into turbulence phenomenology, Scintillometry 2025, Montreal, Canada
- SEP. 2025 So long Kolmogorov – a new supernova-driven turbulence phenomenology
MIST2025 - Cosmic turbulence and Magnetic fields: physics of baryonic matter, France, Corsica
- SEP. 2025 Fundamental Results from the World's Largest Simulation of Compressible MHD Turbulence
Presented at: AAPPs, Plasma Division, Fukuoka, Japan

- AUG. 2025 The chronology of high- k magnetic modes from dynamo to stationary turbulence, Presented at: Frontiers of Relativistic Plasmas Physics in Astrophysics and Laboratory, KITP, Santa Barbara
- JULY. 2025 Magnetized supersonic turbulence with unprecedented dynamical range, Presented at: ASTRONUM, University of Wisconsin, Madison
- APRIL. 2025 No phenomenology is safe: surprises from extreme Reynolds number MHD turbulence simulations. Presented at: Caltech tea talk.
- DEC. 2024 Supernova-driven turbulence in a multiphase ISM. Presented at: CITA blackboard talk.
- NOV. 2024 Unravelling the workings of the compressible turbulent dynamo with $10,080^3$ simulations. Presented at: Princeton Plasma Physics Lab, Heliophysics Seminar.
- SEP. 2024 The energy cascade II: supernova-driven turbulence. Goutelas, France.
- SEP. 2024 The energy cascade I: the world's largest MHD turbulence box. Goutelas, France.
- APR. 2024 Growing a magnetic field in a turbulent plasma. Presented at: CITA Blackboard Seminar.
- APR. 2024 Supersonic magnetised turbulence at extreme Reynolds numbers. Presented at: CITA Theory Seminar
- MAR. 2024 Unravelling the fast growth stages of the turbulent dynamo. Presented at: University Maryland Computational and Theory Seminar
- FEB. 2024 Numerical resistivity and viscosity. KITP blackboard Talk.
- FEB. 2024 A large compressible MHD turbulence simulation with no net magnetic flux. KITP Talk.
- NOV. 2023 The most fascinating part of interstellar turbulence: the energy cascade Presented at: TASTY Seminar Series, University of Toronto.
- MAY 2023 The World's Largest Compressible MHD Turbulence Simulation on SuperMUC-NG Presented at: SuperMUC-NG Status and Results Workshop.
- SEP. 2022 KIPAC Tea talk: Peta-scale magnetised interstellar medium turbulence simulations. Presented at: SLAC / Stanford University.
- SEP. 2022 Magnetised interstellar medium turbulence: dynamics & energetics. Presented at: Susan Clark's research group, Stanford.
- SEP. 2022 Astro-coffee: Streaming cosmic rays ion Alfvén velocity statistics. Presented at: Institute for Advanced Study.
- SEP. 2022 Bachall lunch discussion: peta-scale simulations & turbulent dynamics. Presented at: Institute for Advanced Study.
- APR. 2022 Streaming cosmic rays ion Alfvén velocity statistics. Presented at: Siang Peng Oh's research group, UC Santa Barbara.
- NOV. 2021 Ubiquitous magnetic field fluctuations driven by large-scale supersonic turbulence. Presented at: Star formation and ISM Physics Seminar, Princeton.
- JAN. 2021 Ubiquitous magnetic field fluctuations driven by large-scale supersonic turbulence. Presented at: Research School of Astronomy and Astrophysics seminar, [ANU](#).
- AUG. 2020 The Anisotropic Density Variance for Highly-Magnetised Molecular Clouds. Presented at: University of Macquarie Colloquium.
- JUL. 2020 The Anisotropic Density Variance for Highly-Magnetised Molecular Clouds. Presented at: Astronomical Society of Australia Bok Prize talk.
- JUN. 2020 Turbulence at the parsec scale of the Universe. Presented at: Research highlight talk at [RSAA](#) full school meeting.
- AUG. 2018 The Fractal Geometry of the Supersonic Turbulence in the Interstellar Medium. Presented at: [QUT](#) research highlights.
- MAY 2018 The Fractal Geometry of Turbulence. Presented at: [QUT](#) Physics Society Meeting.
- NOV. 2017 The University of Cambridge and Quantum Mechanics. Presented at: School of Chemistry, Physics and Engineering Seminar, [QUT](#).

Contributed (19 total)

- APRIL 2026 Dynamos. Presented at: CITA blackboard talk.
- NOV. 2024 Magnetic dynamos and turbulence: from the cosmos to the lab Presented at: [Simons Collaboration for Extreme Electrodynamics of Compact Objects](#), 2024 meeting, Wisconsin, Madison
- SEP. 2024 From Fast Growth to the Saturation of the Intracluster Medium Dynamo Presented at: [Galaxy Clusters and Radio Relics II](#) 2024 Workshop, Harvard, Boston
- MAY. 2024 Interstellar medium turbulence and turbulence-regulated star formation theory Presented at: [Globular Clusters and Their Tidal Tails: From the Milky Way to the Local Group](#), Toronto, Canada
- MAY. 2024 The Supersonic Turbulent Dynamo Presented at: [HEDLA](#) 2024 Workshop, Tallahassee, Florida
- FEB. 2022 Petascale magnetised interstellar medium turbulence simulations Presented at: [ANITA](#) 2022 Workshop.

- DEC. 2021 Understanding the nature of magnetic field fluctuations driven by large-scale supersonic turbulence.
Presented at: [Australian Institute of Physics](#) Congress, [QUT](#).
- OCT. 2021 Understanding the nature of magnetic field fluctuations driven by large-scale supersonic turbulence.
Presented at: Royal Astronomical Society: Galactic magnetic fields meeting.
- FEB. 2021 Steps towards anisotropic star formation theory: A multi-shock model for the density variance of anisotropic MHD turbulence.
Presented at: [ANITA](#) 2021 Workshop.
- DEC. 2020 Multi-shock model for the density variance of anisotropic, highly-magnetised ISM turbulence.
Presented at: The Magnetic Field Awakens: A new era of star formation.
- NOV. 2020 Recent progress on anisotropic, magnetised, supersonic turbulence.
Presented at: Mount Stromlo Student Seminars, 2020.
- SEP. 2020 Is the Starry Night Turbulent?
Presented at: [RSAA](#) Feast of Facts.
- FEB. 2020 Density, velocity and magnetic structures and correlations in sub-Alfvénic, supersonic turbulence.
Accepted* for contributed talk: Magnetic Fields in the Universe 7, Vietnam.
- FEB. 2020 Anisotropy in the column density of highly-magnetised supersonic turbulence.
Presented at: [ANITA](#) 2020 Workshop, [UNSW](#), Canberra.
- DEC. 2019 Anisotropic structures in highly-magnetised, observed turbulent clouds.
Presented at: Universality: Turbulence across vast scales, Flatiron Inst., New York
- NOV. 2019 Reconstructing the 3D Density PDF from the 2D Column Density.
Presented at: Cosmic turbulence and magnetic fields : physics of baryonic matter across time and scales in Cargèse, France, 2019.
- DEC. 2018 Mach number - fractal dimension relation for turbulent, molecular clouds.
Poster presented at: [AIP](#) Congress 2018, Perth, Australia.
- JAN. 2018 The Fractal Geometry of the World's Largest Turbulence Simulation.
Presented at: Research School of Astronomy and Astrophysics, [ANU](#).
- JAN. 2017 The Analysis of Novel Magnetic Field Configurations in the H-1 NF Stellarator.
Presented at: Research School of Physics and Engineering, [ANU](#).

* did not attend due to COVID19

Public Outreach Talks (10 total)

- AUG. 2021 Building the Universe, Brick-by-brick. Presented at: Young Stars, [ANU](#), Canberra.
- MAY. 2021 Understanding The Big Bang. Presented at: Young Stars, [ANU](#), Canberra.
- MAR. 2021 The Secret Life of Cells. Presented at: Young Stars, [ANU](#), Canberra.
- JAN. 2021 Mission to Mars. Presented at: Young Stars, [ANU](#), Canberra.
- JAN. 2021 The Jiggling Universe. Presented at: SciScouts Space Squad, Canberra.
- NOV. 2020 The Jiggling Universe. Presented at: Campbell Primary School STEM day, Canberra.
- OCT. 2020 Thinking Like An Atom. Presented at: Young Stars, Canberra.
- SEP. 2020 Simulating the Universe. Presented at: SciScouts Space Squad, Canberra.
- MAR. 2020 Modelling Pandemics. Presented at: Young Stars, Canberra.
- FEB. 2020 How do scientists test their ideas? Presented at: Young Stars, Canberra.

TEACHING (25 TOTAL)

Workshop lecturer (2 total)

- JULY 2026 WE-Heraeus Summer school: [From the interstellar medium to the formation of stars - Physics, tools and Methods](#), Les Houches, France
- JULY - AUG. 2026 [Plasma around Blackholes and Neutron Stars](#), SCECS Summer School, Baja California, Mexico

Guest Lectures

- OCT. 2022 ASTR8002 ([ANU](#)): Guest lecture on MHD turbulence theory for a graduate level gas dynamics class.
- OCT. 2020 ASTR8002 ([ANU](#)): [Guest lecture on linear MHD waves](#) for a graduate level gas dynamics class.

TA experience (Click on the "Semester" to see teacher evaluation reports)

2021	Australian National University , Canberra, Australia ASTR2013: Foundations of Astrophysics	Semester Two
2018	Queensland University of Technology , Brisbane, Australia PVB101: Physics of the Large MXB105: Calculus of One and Two Variables (wrote all assessment) MXB161: Computational Explorations SEB113: Quantitative Methods in Science SEB104: Grand Challenges in Science SEB115: Experimental Science	Semester Two Semester Two Semester One Semester One & Two Semester One Semester One
2017	Queensland University of Technology , Brisbane, Australia MXB105: Calculus of One and Two Variables PVB101: Physics of the Large (Lab Demonstrator) BVB204: Ecology SEB113: Quantitative Methods in Science SEB104: Grand Challenges in Science SEB115: Experimental Science (Lab Demonstrator) MXB161: Computational Explorations	Semester Two Semester Two Semester Two Semester One & Two Semester One Semester One Semester One
2016	Queensland University of Technology , Brisbane, Australia PVB101: Physics of the Large (Lab Demonstrator) BVB202: Plant Biology (Lab Demonstrator) BVB224: Plant Diversity (Lab Demonstrator) SEB113: Quantitative Methods in Science SEB104: Grand Challenges in Science SEB115: Experimental Science (Lab Demonstrator)	Semester Two Semester Two Semester Two Semester One & Two Semester One Semester One
2015	Queensland University of Technology , Brisbane, Australia SEB113: Quantitative Methods in Science	Semester One

PUBLICATIONS (39 TOTAL)

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- **First (and joint first) author:** 19 publications (15 refereed) · **Total:** 38 publications
 - **Citations:** 1,129 (4-May-2026) · **h index:** 19 (4-May-2026)

First Author (and joint first) Refereed (15 total)

- Beattie, J. R.**, Federrath, C., Kriel, N., Hew, J. K. J., & Bhattacharjee, A. (2025). Taking control of compressible modes: bulk viscosity and the turbulent dynamo. *MNRAS*, *accepted*, Article arXiv:2312.03984, arXiv:2312.03984. <https://doi.org/10.48550/arXiv.2312.03984>
- Beattie, J. R.**, Kolborg, A. N., Ramirez-Ruiz, E., & Federrath, C. (2025). So Long Kolmogorov: The Forward and Backward Turbulence Cascades in a Supernovae-driven, Multiphase Interstellar Medium. *ApJ*, 994(2), Article 193, 193. <https://doi.org/10.3847/1538-4357/ae07cd>
- Beattie, J. R.** (2025). Supernovae drive large-scale, incompressible turbulence through small-scale instabilities. *arXiv e-prints*, *Accepted in ApJL*, Article arXiv:2509.07354, arXiv:2509.07354. <https://doi.org/10.48550/arXiv.2509.07354>
- Beattie, J. R.**, Federrath, C., Klessen, R. S., Cielo, S., & Bhattacharjee, A. (2025). The spectrum of magnetized turbulence in the interstellar medium. *Nature Astronomy*. <https://doi.org/10.1038/s41550-025-02551-5>
- Bandyopadhyay, R., **Beattie, J. R.**, & Bhattacharjee, A. (2025). Density fluctuation–mach number scaling in compressible, high plasma beta turbulence: In situ space observations and high-reynolds number simulations. *The Astrophysical Journal Letters*, 982(2), L45. <https://doi.org/10.3847/2041-8213/adbe3b>
- Beattie, J. R.**, Federrath, C., Kriel, N., Mocz, P., & Seta, A. (2023). Growth or Decay - I: universality of the turbulent dynamo saturation. *MNRAS*, 524(3), 3201–3214. <https://doi.org/10.1093/mnras/stad1863>
- Birch, M., **Beattie, J. R.**, Bennet, F., Rattenbury, N., Copeland, M., Travouillon, T., Ferguson, K., Cater, J., & Sayat, M. (2023). Availability, outage, and capacity of spatially correlated, australasian free-space optical networks. *J. Opt. Commun. Netw.*, 15(7), 415–430. <https://doi.org/10.1364/JOCN.480805>
- Beattie, J. R.**, Krumholz, M. R., Federrath, C., Sampson, M. L., & Crocker, R. M. (2022). Ion alfvén velocity fluctuations and implications for the diffusion of streaming cosmic rays. *Frontiers in Astronomy and Space Sciences*, 9. <https://doi.org/10.3389/fspas.2022.900900>
- Beattie, J. R.**, Mocz, P., Federrath, C., & Klessen, R. S. (2022). The density distribution and physical origins of intermittency in supersonic, highly magnetised turbulence with diverse modes of driving. *MNRAS*. <https://doi.org/10.1093/mnras/stac3005>

- Beattie, J. R.**, Krumholz, M. R., Skolidis, R., Federrath, C., Seta, A., Crocker, R. M., Mocz, P., & Kriel, N. (2022). Energy balance and Alfvén Mach numbers in compressible magnetohydrodynamic turbulence with a large-scale magnetic field. *MNRAS*. <https://doi.org/10.1093/mnras/stac2099>
- Beattie, J. R.**, Mocz, P., Federrath, C., & Klessen, R. S. (2021). A multishock model for the density variance of anisotropic, highly magnetized, supersonic turbulence. *MNRAS*, 504(3), 4354–4368. <https://doi.org/10.1093/mnras/stab1037>
- Beattie, J. R.**, Federrath, C., & Seta, A. (2020). Magnetic field fluctuations in anisotropic, supersonic turbulence. *MNRAS*, 498(2), 1593–1608. <https://doi.org/10.1093/mnras/staa2257>
- Beattie, J. R.**, & Federrath, C. (2020). Filaments and striations: anisotropies in observed, supersonic, highly magnetized turbulent clouds. *MNRAS*, 492(1), 668–685. <https://doi.org/10.1093/mnras/stz3377>
- Beattie, J. R.**, Federrath, C., Klessen, R. S., & Schneider, N. (2019). The relation between the turbulent Mach number and observed fractal dimensions of turbulent clouds. *MNRAS*, 488(2), 2493–2502. <https://doi.org/10.1093/mnras/stz1853>
- Beattie, J. R.**, Federrath, C., & Klessen, R. S. (2019). The relation between the true and observed fractal dimensions of turbulent clouds. *MNRAS*, 487(2), 2070–2081. <https://doi.org/10.1093/mnras/stz1416>

Second Author Refereed (8 total)

- Connor, I., **Beattie, J. R.**, Kolborg, A. N., & Ramirez-Ruiz, E. (2025). Cascading from the winds to the disk: The universality of supernovae-driven turbulence in different galactic interstellar mediums. *Accepted in The Astrophysical Journal*. <https://arxiv.org/abs/2509.01653>
- Kriel, N., **Beattie, J. R.**, Krumholz, M. R., Schober, J., & Armstrong, P. J. (2025). The growth of magnetic energy during the nonlinear phase of the subsonic and supersonic small-scale dynamo. *Accepted in PRD*, Article arXiv:2509.09949, arXiv:2509.09949.
- Sampson, M. L., **Beattie, J. R.**, Teyssier, R., Kempfski, P., Moseley, E. R., Commerçon, B., Dubois, Y., & Rosdahl, J. (2025). Cosmic ray and plasma coupling for isothermal supersonic turbulence in the magnetized interstellar medium. *Accepted in ApJ*, Article arXiv:2506.03768, arXiv:2506.03768. <https://doi.org/10.48550/arXiv.2506.03768>
- Kriel, N., **Beattie, J. R.**, Federrath, C., Krumholz, M. R., & Hew, J. K. J. (2025). Fundamental MHD scales - II: the kinematic phase of the supersonic small-scale dynamo. *MNRAS*. <https://doi.org/10.1093/mnras/staf188>
- Sampson, M. L., **Beattie, J. R.**, Krumholz, M. R., Crocker, R. M., Federrath, C., & Seta, A. (2023). Turbulent diffusion of streaming cosmic rays in compressible, partially ionized plasma. *MNRAS*, 519(1), 1503–1525. <https://doi.org/10.1093/mnras/stac3207>
- Kriel, N., **Beattie, J. R.**, Seta, A., & Federrath, C. (2022). Fundamental scales in the kinematic phase of the turbulent dynamo. *MNRAS*. <https://doi.org/10.1093/mnras/stac969>
- McCool, C., **Beattie, J. R.**, Milford, M., Bakker, J. D., J. L., Moore, & Firn, J. (2018). Automating analysis of vegetation with computer vision: Cover estimates and classification. *Ecology and Evolution*, 8(12), 6005–6015. <https://doi.org/10.1002/ece3.4135>
- McCool, C., **Beattie, J. R.**, Firn, J., Lehnert, C., Kulk, J., Bawden, O., Russell, R., & Perez, T. (2018). Efficacy of mechanical weeding tools: A study into alternative weed management strategies enabled by robotics. *IEEE Robotics and Automation Letters*, 3(2), 1184–1190. <https://doi.org/10.1109/LRA.2018.2794619>

Major Contributions Refereed (5 total)

Publications which involved a significant amount of student mentorship or major contributions from JRB.

- Grehan, M. P., Ghosal, T., **Beattie, J. R.**, Ripperda, B., Porth, O., & Bacchini, F. (2025). Comparison of magnetic diffusion and reconnection in ideal and resistive relativistic magnetohydrodynamics, ideal magnetodynamics, and resistive force-free electrodynamics. *Phys. Rev. D*, 112(6), Article 063046, 063046. <https://doi.org/10.1103/8xf2-x2nq>
- Risch, A. C., Page-Dumroese, D. S., Schweiger, A. K., **Beattie, J. R.**, Curran, M. P., Finér, L., Liu, Y., Schütz, M., Terry, T. A., Wang, W., & Jurgensen, M. F. (2022). Controls of initial wood decomposition on and in forest soils using standard material. *Frontiers in Forests and Global Change*, 5, 829810. <https://doi.org/10.3389/ffgc.2022.829810>.

Constructed the principle data set, developed and ran parallelised hierarchical Bayesian mixed effects models and model selection methods.

- Skolidis, R., Sternberg, J., **Beattie, J. R.**, Pavlidou, V., & Tassis, K. (2021). Why take the square root? An assessment of interstellar magnetic field strength estimation methods. *A&A*, 656, Article A118, A118. <https://doi.org/10.1051/0004-6361/202142045>.

Ran all MHD turbulence simulations and contributed to the theoretical development of the coupling term energy model and drafting the manuscript.

Federrath, C., Klessen, R. S., Iapichino, L., & **Beattie, J. R.** (2021). The sonic scale of interstellar turbulence. *Nature Astronomy*, 5, 365–371. <https://doi.org/10.1038/s41550-020-01282-z>.

Measured the sonic scale position from the second order structure functions and contributed to writing the manuscript.

Thomas, M. L., Baker, L., **Beattie, J. R.**, & Baker, A. M. (2020). Determining the efficacy of camera traps, live capture traps, and detection dogs for locating cryptic small mammal species. *Ecology and Evolution*, 10(2), 1054–1068. <https://doi.org/10.1002/ece3.5972>.

Developed and applied the occupancy analysis models used to compare between the different detection methods and contributed to writing the manuscript.

Multi-author Refereed (5 total)

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MEDIA (32 TOTAL)

2026 NASA Awards Astrophysics Postdoctoral Fellowships for 2026, *IPAC, Caltech*

2026 NASA Awards Astrophysics Postdoctoral Fellowships for 2026, *NASA Science*

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2026 Incoming Scholar Receives 2026 NASA Astrophysics Postdoctoral Fellowship, *Institute for Advanced Study Newsletter*

2026 CITA Postdoctoral Fellow James Beattie Wins Hubble Fellowship to Decipher the Origin of Magnetic Fields in the Early Universe, *CITA*

- 2025 Magnétique ! Le nouveau spectacle de l'Univers, *Epsilon Magazine*
- 2025 Largest Turbulence Simulation Honored by HPCwire at SC25, *HPCwire*
- 2025 CITA Fellow James Beattie and Team Win Top Supercomputing Honour, *CITA*
- 2025 Nature Astronomy cover for August 2025 issue: Chaotic turbulence on multiple scales.
- 2025 Space Turbulence, *New Zealand National Geographic*
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- 2025 Astrophysicists are exploring our galaxy's magnetic turbulence in unprecedented detail using a new computer model, *University of Toronto*
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- 2025 Commentary for Scientists make 'rare advance' in tackling the oldest unsolved problem in physics, *CNN*
- 2024 The Hidden Science Swirling in The Starry Night, *Washington Post*
- 2024 CITA Fellow James Beattie was awarded close to 100-million-core-hours to explore the nature of turbulence and dynamos, *CITA*
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- 2024 Expert quoted in "Turbulent skies of Vincent Van Gogh's 'The Starry Night'", *CNN*
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- 2024 Plasma: beautiful chaos, *Leibniz Supercomputing Centre July Newsletter*
- 2024 The Beauty of Chaos, *New Scientist Magazine (in print and online)*
- 2024 The world's largest magnetohydrodynamic turbulence simulation, *Forschung Magazine*
- 2024 2024 Research Highlight Calendar (March visualisation), *German Research Foundation (DFG)*
- 2022 Unravelling magnetised turbulence in galaxies, *Lunations, Research Bytes*
- 2022 The Magic And Mystery Of Turbulence, *IFL Science*
- 2021 Extreme efficiency astrophysical turbulence simulations, *National Computing Infrastructure, Australia*
- 2021 Coffee, planes and magnetism. *Space Australia, TikTok*
- 2021 Unravelling the turbulent, magnetised dynamics of the interstellar medium. *Space Australia*
- 2021 Turbulence in the heavens, *Nature Astronomy, News & Views*
- 2021 Researchers Use LRZ HPC Resources to Perform Largest-Ever Supersonic Turbulence Simulation, *Gauss Centre for Supercomputing*
- 2021 The Role of Turbulence in the Birth of Stars, *University Heidelberg*
- 2021 Star-making motion, *COSMOS magazine*
- 2021 Study helps unlock secrets of star formation, *ANU Media*
- 2021 Stellar Simulation Reveals The Turbulent Nature of Star Birth, *Space Australia*
- 2021 The Need for (Sound) Speed, *Astrobite research highlight*
- 2019 Modelling Star Formation with a Supercomputer: Computational Astrophysics Research, *National Computing Infrastructure Australia*
- 2019 Feature article on turbulence depicted in Van Gogh's Starry Night in the Art's and Culture section of the American Physical Societies Magazine.
- 2018 QUT advertising photoshoot for the BSc and BMath degree on QUT's blackboard website.
- 2018 QUT media exposure, and photoshoot for our publication, Automating Analysis of Vegetation with Computer Vision: cover estimates.

