

Henry Whitehead

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 Personal Website

 NASA ADS

Academic History

- 2022-  **DPhil, University of Oxford** Astrophysics
Supervised by Professor Bence Kocsis, studying black hole-gas interactions in AGN discs by use of hydrodynamic simulations
- 2017-2021  **MSci, University of Cambridge** Natural Sciences - First Class
Astrophysics specialisation, recipient of college scholarship and two college prizes including Foundress Prize & Foundation Award

Research Interests

Active Galactic Nuclei; Black Holes; Hydrodynamics; Binaries; Gravitational Waves; Object-Disc Interactions; Computational and Theoretical Astrophysics; High Performance Computing; Astrophysical Data Visualisation

Research Publications

First Author

- 1 **H. Whitehead**, C. Rowan, and B. Kocsis, "Hydrodynamic simulations of black hole evolution in AGN discs II: inclination damping for partially embedded satellites", *MNRAS*, vol. 543, no. 4, pp. 3768–3782, Nov. 2025.  DOI: 10.1093/mnras/staf1686. arXiv: 2505.23899 [astro-ph.HE].
- 2 **H. Whitehead**, C. Rowan, and B. Kocsis, "3D adiabatic simulations of binary black hole formation in AGN discs", *MNRAS*, vol. 542, no. 2, pp. 1033–1055, Sep. 2025.  DOI: 10.1093/mnras/staf1271. arXiv: 2502.14959 [astro-ph.HE].
- 3 **H. Whitehead**, C. Rowan, T. Boekholt, and B. Kocsis, "Disc novae: thermodynamics of gas-assisted binary black hole formation in AGN discs", *MNRAS*, vol. 533, no. 2, pp. 1766–1781, Sep. 03 2024.  DOI: 10.1093/mnras/stae1866. arXiv: 2312.14431 [astro-ph.HE].
- 4 **H. Whitehead**, C. Rowan, T. Boekholt, and B. Kocsis, "Gas assisted binary black hole formation in AGN discs", *MNRAS*, vol. 531, no. 4, pp. 4656–4680, Jul. 05 2024.  DOI: 10.1093/mnras/stae1430. arXiv: 2309.11561 [astro-ph.GA].
- 5 **H. Whitehead** and J. H. Matthews, "Studying the link between radio galaxies and AGN fuelling with relativistic hydrodynamic simulations of flickering jets", *MNRAS*, vol. 523, no. 2, pp. 2478–2497, Aug. 06 2023.  DOI: 10.1093/mnras/stad1582. arXiv: 2305.19328 [astro-ph.HE].

Latter Author

- 1 C. Rowan, **H. Whitehead**, and B. Kocsis, "Black hole merger rates in AGN: contribution from gas-captured binaries", *MNRAS*, Nov. 2025.  DOI: 10.1093/mnras/staf1896.
- 2 K. V. S. Gasealahwe, K. Savard, I. M. Monageng, I. Heywood, R. P. Fender, P. A. Woudt, J. English, J. H. Matthews, **H. Whitehead**, F. J. Cowie, A. K. Hughes, P. Saikia, and S. E. Motta, "A relativistic jet from a neutron star breaking out of its natal supernova remnant", *MNRAS*, Jul. 2025.  DOI: 10.1093/mnras/staf1216.
- 3 C. Rowan, **H. Whitehead**, G. Fabj, P. Kirkeberg, M. E. Pessah, and B. Kocsis, "Hydrodynamic simulations of black hole evolution in AGN discs I: orbital alignment of highly inclined satellites", *MNRAS*, Sep. 2025.  DOI: 10.1093/mnras/staf1449. arXiv: 2505.23739 [astro-ph.HE].
- 4 C. Rowan, **H. Whitehead**, G. Fabj, P. Saini, B. Kocsis, M. Pessah, and J. Samsing, "Prompt gravitational-wave mergers aided by gas in active galactic nuclei: the hydrodynamics of binary-single black hole scatterings", *MNRAS*, vol. 539, no. 2, pp. 1501–1515, May 2025.  DOI: 10.1093/mnras/staf547. arXiv: 2501.09017 [astro-ph.GA].
- 5 C. Rowan, **H. Whitehead**, T. Boekholt, B. Kocsis, and Z. Haiman, "Black hole binaries in AGN accretion discs - II. Gas effects on black hole satellite scatterings", *MNRAS*, vol. 527, no. 4, pp. 10 448–10 468, Feb. 04 2024.  DOI: 10.1093/mnras/stad3641.

Grants & Research Scholarships

July 2024

- UKRI OPP503: PI for Project APP35272 “3D Radiative Simulations of Black Hole Binary/Triple Interactions in AGN Discs” awarded 3.65 million CPUh on CSD3 (Cambridge Service for Data Driven Discovery)

Professional Activities

Referee for various astrophysical journals

- Monthly Notices of the Royal Astronomical Society (MNRAS)
- The Astrophysical Journal (ApJ) & The Astrophysical Journal Letters (ApJ Letters)
- Astronomy and Astrophysics (A&A)

Conference Presentations

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| November 2025 | ■ <i>Hydrodynamic Simulations of Black Holes Embedded in AGN Discs</i> ,
Special Seminar, University of Zürich (Invited) |
| | ■ <i>Hydrodynamic Simulations of Black Holes Embedded in AGN Discs</i> ,
ITC Luncheon (video), Center for Astrophysics, Harvard University (Invited) |
| | ■ <i>Hydrodynamic Simulations of Black Holes Embedded in AGN Discs</i> ,
Astroparticle Seminar, Niels Bohr Institute (Invited) |
| October 2025 | ■ <i>Hydrodynamic Simulations of Black Holes Embedded in AGN Discs</i> ,
Thunch Seminar, Department of Astrophysical Sciences, Princeton University (Invited) |
| June 2025 | ■ <i>Inclination Damping of BH Satellites in AGN Discs</i> ,
DYNAMIX Conference, Institute of Astronomy, University of Cambridge (Contributed) |
| April 2025 | ■ <i>Hydrodynamic Simulations of Binary Black Hole Formation in the Discs of AGN</i> ,
SPIMAX Seminar, University of Oxford (Invited) |
| August 2024 | ■ <i>Cyclonic Winds: 3D Outflows from Black Holes Embedded in AGN Discs</i> ,
The Origin of Black Hole Mergers Conference, Niels Bohr Institute (Contributed) |
| December 2023 | ■ <i>Disc Novae: Thermodynamics of Gas Assisted Binary Black Hole Formation in AGN Discs</i> ,
RESCEU-NBIA workshop, University of Tokyo (Contributed) |
| July 2023 | ■ <i>Gas Assisted Binary Black Hole Formation in AGN Discs</i> ,
National Astronomy Meeting, Cardiff University (Contributed) |

Skills and Experience

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| Coding | ■ Proficient in Python, C/C++ and CUDA, with a strong interest to improve further |
| Simulation | ■ Current user of Athena++, previous experience with PLUTO, MESA and Arepo |
| Clusters | ■ Experienced user of various High Performance Computing clusters, including Oxford’s Advanced Research Computing Service (ARC) and the Cambridge Center for Data Driven Discovery (CSD3) |
| Internships | ■ 8-week research internship performing hydrodynamic simulations of flickering relativistic AGN jets (2021, Institute of Astronomy, Cambridge)
■ 8-week research internship modelling the convective envelopes of massive stars (2019, Institute of Astronomy, Cambridge) |
| Teaching | ■ 100+ hours personal tutoring in Maths and Physics, ranging from primary school to university students |

Principle referee Bence Kocsis (bkocsis@gmail.com), others available upon request