DR. ALEX COOPER

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Astrophysics, The University of Oxford, Keble Road, Oxford OX1 3RH, UK

RESEARCH POSITIONS

Hintze Prize Fellow *2023*-present
University of Oxford

Christ Church Postdoctoral Fellow *2023*-present
Christ Church College, Oxford

PhD Researcher *2018*-2022
University of Amsterdam

EDUCATION

PhD Astrophysics *2018-2022*
University of Amsterdam
Thesis: Multi-messenger and Multi-wavelength Signatures of Compact Object Transients
Supervisors: Prof. Ralph Wijers & Dr. Antonia Rowlinson

MSc Astrophysics (Gravitation and Astroparticle track) *2016-2018*
University of Amsterdam
Thesis: Cosmic Rays from X-ray Binary Jets
Supervisor: Prof. Sera Markoff
Grade: 8.1/10 (Dutch grading scale)

BSc Physics and Philosophy *2013-2016*
University of Nottingham
Thesis: Object Permanence in Minkowski Space-time
Grade: First class

RESEARCH INTERESTS

I am primarily interested in the physical processes powering emission from black holes and neutron stars, to better understand these compact objects and the extreme physics that governs them. This includes work on:

- Sources of fast radio bursts and long period transients
- The radio pulsar emission mechanism and magnetars
- Black hole powered astrophysical jets
- Pre-merger emission of neutron star coalescences
- The origin of high-energy cosmic rays and neutrinos
- Observations of cataclysmic and jetted transients

FIRST AUTHOR PUBLICATIONS

Beyond the Rotational Deathline: Radio Emission from Ultra-long Period Magnetars
Cooper, A. J. & Wadiasingh, Z., (2024)
MNRAS, 2024, 533, 2133

Pulsar Revival in Neutron Star Mergers: multi-messenger prospects for the discovery of pre-merger coherent radio emission
Cooper, A. J., Gupta, O., Wadiasingh, Z., Wijers, R.A.M.J., Boersma, O., Andreoni, I., Rowlinson, A., Gourdji, K. (2023)
MNRAS, 2023, 519, 3923

Testing Afterglow Models of FRB 200428 with Early Post-burst Observations of SGR 1935+2154
Cooper, A. J., Rowlinson, A., Wijers, R. A. M. J., Bassa, C., Gourdji, K., Hessels, J., van der Horst, A., Kondratiev, V., Michilli, D., Pleunis, Z., Shimwell, T., ter Veen, S. (2022)
MNRAS, 2022, 517, 5483

Coherent Curvature Radiation: Maximum Luminosity and High-energy Emission
Cooper, A. J. & Wijers, R. A. M. J. (2021)
MNRAS Letters, 2021, 508, L32

High-energy Cosmic Rays from X-ray Binary Jets
Cooper, A. J., Gaggero, D., Markoff, S., Zhang, S. (2020)
MNRAS, 2020, 493, 3212

CO-AUTHOR PUBLICATIONS

Contemporaneous optical-radio observations of a fast radio burst in a close galaxy pair
Hanmer, K., Pastor-Marazuela, I., Brink, J., Malesani, D., Stappers, B., Groot, P., **Cooper, A. J.**, Tejos, N., Buckley, D., Barr, E., Bezuidenhout, M., Bloemen, S., Caleb, M., Driessen, L., Jankowski, F., Kramer, M., Pieterse, D., Rajwade, K., Tian, J., Vreeswijk, P., Woudt, P
MNRAS, in review

A probe of the maximum energetics of fast radio bursts through a prolific repeating source
Ould-Boukattine, O., Chawla, P., Hessels, J., **Cooper, A. J.**, Gawronski, M., Herrmann, W., Kirsten, F., Hewitt, D., Konijn, D., Nimmo, K., Pleunis, Z., Puchalska, W., Snelders, M. (2024)
Nature Astronomy, in review

Discovery of the optical counterpart of the fast X-ray transient EP240414a
Srivastav, S., Chen, T., Gillanders, J., Rhodes, L., Smartt, S., Huber, M., Aryan, A., Yang, S., Beri, A., **Cooper, A. J.**, Nicholl, M., Smith, K., Stevance, H., Carotenuto, F., Chambers, K., Aamer, A., Angus, C., Fulton, M., Moore, T., Smith, I., Young, D., de Boer, T., Gao, H., Lin, C., Lowe, T., Magnier, E., Minguez, P., Pan, Y., Wainscoat, R. (2024)
ApJL, in review

Constraining the physical properties of large-scale jets from black hole X-ray binaries and their impact on the local environment with blast-wave dynamical models
Carotenuto, F,. Fender, R., Tetarenko, A., Corbel, S., Zdziarski, A., Shaik, G. **Cooper, A. J.**, Di Palma, I., (2024)
MNRAS, 2024, 533, 4188

Discovery of the optical and radio counterpart to the fast X-ray transient EP 240315a
Gillanders, J. H., Rhodes, L., Srivastav, S., Carotenuto, F., Bright, J., Huber, M. E., Stevance, H. F., Smartt, S. J., Chambers, K. C., Chen, T. W., Fender, R., Andersson, A., **Cooper, A. J.**, Jonker, P. G., Cowie, F. J., de Boer, T., Erasmus, N., Fulton, M. D., Gao, H., Herman, J., Lin, C. C., Lowe, T., Magnier, E. A., Miao, H. Y., Minguez, P., Moore, T., Ngeow, C. C., Nicholl, M., Pan, Y. C., Pignata, G., Rest, A., Sheng, X., Smith, I. A., Smith, K. W., Tonry, J. L., Wainscoat, R. J., Weston, J., Yang, S., Young, D. R. (2024)
ApJL, 2024, 969, 14

GW190425: Pan-STARRS and ATLAS coverage of the skymap and limits on optical emission associated with FRB 20190425A
Smartt, S. J., Nicholl, M., Srivastav, S., Huber, M. E., Chambers, K. C., Smith, K. W., Young, D. R., Fulton, M. D., Tonry, J. L., Stubbs, C. W., Denneau, L., **Cooper, A. J.**, Aamer, A., Anderson, J. P., Andersson, A.,

Bulger, J., Chen, T. W., Clark, P., de Boer, T., Gao, H., Gillanders, J. H., Lawrence, A., Lin, C. C., Lowe, T. B., Magnier, E. A., Minguez, P., Moore, T., Rest, A., Shingles, L., Siverd, R., Smith, I. A., Stalder, B., Stevance, H. F., Wainscoat, R., Williams, R. (2024)
MNRAS, 2024, 528, 2299

MWA rapid follow-up of gravitational wave transients: Prospects for detecting prompt radio counterparts
Tian, J., Anderson, G. E., **Cooper, A. J.**, Gourdji, K., Sokolowski, M., Rowlinson, A., Williams, A., Sleap, G., Dobie, D., Kaplan, D. L., Murphy, T., Tingay, S. J., Panther, F. H., Lasky, P. D., Bahramian, A., Miller-Jones, J. C. A., James, C. W., Meyers, B. W., McSweeney, S. J., Hancock, P. J. (2023)
PASA, 2023, 40, 50

Exploring neutrino and cosmic ray production in X-ray binary jets using multi-wavelength case studies
Kantzas, D., Markoff, S., **Cooper, A. J.**, Gaggero, D., Petropoulou, M., De La Torre Luque, P. (2023)
MNRAS, 2023, 524, 1326

Multifrequency observations of SGR J1935+2154
Bailes, M., Bassa, C. G., Bernardi, G., Buchner, S., Burgay, M., Caleb, M., **Cooper, A. J.**, Desvignes, G., Groot, P. J., Heywood, I., Jankowski, F., Karuppusamy, R., Kramer, M., Malenta, M., Naldi, G., Pilia, M., Pupillo, G., Rajwade, K. M. , Spitler, L., Surnis, M. Stappers, B. W., Addis, A., Bloemen, S., Bezuidenhout, M. C., Bianchi, G., Champion, D. J., Chen, W., Driessen, L. N., Geyer, M., Gourdji, K., Hessels, J. W. T., Kondratiev, V. I., Klein-Wolt, M., Körding, E., Le Poole, R., Liu, K., Lower, M. E., Lyne, A. G., Magro, A., McBride, V., Mickaliger, M. B., Morello, V., Parthasarathy, A., Paterson, K., Perera, B. B. P., Pieterse, D. L. A., Pleunis, Z., Possenti, A., Rowlinson, A., Serylak, M., Setti, G., Tavani, M., Wijers, R. A. M. J., ter Veen, S., Venkatraman Krishnan, V., Vreeswijk, P., Woudt, P. A. (2021)
MNRAS, 2021, 503, 5367

SUPERVISION & TEACHING

Jin Zheng - Oxford MSc Project (2024) - *Hunting the sources of ultra high-energy cosmic rays through neutrino-associated optical transients*

Alana Swain - Breakthrough Listen Summer Project (2024) - *Understanding and characterising natural and artificial signatures of coherent radio emission from nearby stars*

Isabel Stephens - Oxford Summer Project (2024, Primary: Dr. Lauren Rhodes) - *Does Scorpius X-1 produce fast jets?*

Alex Scott - UNIQ+ Summer Project (2024) - *Extreme jets from black holes and neutron stars*

Nicky Bacon - Oxford MSc Project (2023) - *Extreme particle acceleration in discrete black hole ejections*

Om Gupta - ASPIRE Summer Project (2022) - *Exploring electromagnetic interaction of highly magnetised binary systems*

Oxford Department of Physics Tutor of C1 Astrophysics MPhys course (2024)

Daily TA supervisor of a total of 6 MSc-level observing projects on a range of topics using the Anton Pannekoek Observatory (2018-2020)

TALKS

FRB 2025 - Invited Overview Talk

NASA Goddard Spaceflight Centre (2025) - Invited Colloquium

McGill University (2025) - Seminar

University of Edinburgh (2025) - Invited Colloquium

Fast Radio Bursts 2024 (2024) - Full talk

University of Alicante (2024) - Invited Colloquium

SPINS UK (2024) - Contributed Talk

International Magnetar Telecon (2024) - Invited Seminar

Marcel Grossman Meeting Pescara (2024) - Contributed Talk (FRBs)

Marcel Grossman Meeting Pescara (2024) - Invited Talk

Dialogue at Dream Field Conference at FAST (2024) - Invited Talk

University of Amsterdam (2024) - Invited Seminar

Fast Radio Bursts 2023 (2023; Online) - Contributed Talk

ThunderKAT Collaboration Meeting (2023) - Contributed Talk

National Astronomical Meeting (2023) - Contributed Talk

Oxford University (2022) - Invited SPIMAX Seminar

Istanbul University Observatory (2022) - Invited Seminar

Flatiron Institute (2022) - Invited Seminar

Harvard University (2022) - Invited Seminar

The George Washington University (2022) - Invited Seminar

IAU Symposium 363 (2021) - Lightening talk

Fast Radio Bursts 2021 (2021; Online) - Plenary talk

Istanbul Technical University (2021) - Seminar

Nederlandse Astronomenclub (2019) - Best poster finalist talk

SELECTED ATELS, GCNS & ASTRONOTES

ATLAS24por (AT2024yyu): discovery of a candidate SN in UGC 12288 (75 Mpc)
Cooper, A. J., Smith, K., Young, D., Nicholl, M., Fulton, M., McCollum, M., Moore, T., Weston, J., Sheng, X., Aamer, A., Angus C., Ramsden, P., Shingles, L., Smartt, S., Srivastav, S,. Gillanders, J., Stevance, H., Stoppa, F., Rhodes, L., Denneau, L., Tonry, J., Weiland, G., Siverd, R., Erasmus, N., Koorts, W., Jordan, A., Suc, V., Rest, A., Chen, T., Stubbs, C., Sommer, J., Schmidt, B. (2024)
AstroNote 2134

LIGO/Virgo/KAGRA S240413p: historical ATLAS and ZTF observations of the candidate AGN counterpart
Rhodes, L., Smartt, S., Gillanders, J., Srivastav, S., **Cooper, A. J.**, Fulton, M., Smith, K., Chen, T. (2024)
GCN Circular, 36149

A LOFAR high time resolution search for radio bursts from SGR 1935+2154
Bassa, C., Hessels, J., Kondratiev, V., Michilli, D., Pleunis, Z., **Cooper, A. J.**, Gourdji, K., Rowlinson, A., Wijers, R. (2020)
Astronomer's Telegram, 13707

SUCCESSFUL PROPOSALS & GRANTS AS PRINCIPAL INVESTIGATOR

1. LOFAR - single cycle - 2 triggers (8.8 hours) - Rapid follow-up of magnetar flares: the search for coherent radio emission

2. LOFAR - single cycle - 2 triggers (8.8 hours) - Rapid follow-up of magnetar flares: the search for coherent radio emission

3. LOFAR – DDT - 4 hours - Follow-up of SGR 1935+2145 as it enters an active phase

4. LOFAR – DDT - 4.4 hours - Low-frequency follow-up of SGR 1935+2154 as it enters a new phase

5. LOFAR - single cycle - 2 triggers (8.8 hours) - Rapid follow-up of magnetar flares: the search for coherent radio bursts

6. LOFAR - single cycle - 2 triggers (8.8 hours) - Rapid follow-up of magnetar flares: the search for coherent radio bursts

7. LOFAR - DDT - 16 hours - Low-frequency observations of new candidate black hole X-ray binary Swift J1727.8-1603 during state transition

8. 500EUR - Leids Kerkhoven-Bosscha Fonds - Conference funding

9. 1000EUR - Leids Kerkhoven-Bosscha Fonds - External visitor funding

10. 1000GBP - Lockey fund - Conference funding

11. 450GBP - Lockey fund - Academic visit

12. 1000GBP - Christ Church Research Centre - Academic visit

12. 1500GBP - Astor Grant - Academic visit funding

13. 1500GBP - Christ Church Research Centre - Academic visit

SERVICE, MEMBERSHIP, AND OUTREACH

Reviewer for the University of Malta Internal Research Grants Program

Referee for *Nature*, *MNRAS*, *ApJ*, & *A&A*

Organiser for Oxford SPIMAX Seminar Series

Member X-KAT, ATLAS Transients, and ENGRAVE Collaborations

Scientific Organising Committee of Dynamic Radio Sky Conference

Member of the *Landelijke Onderwijs Commissie/NOVA Onderwijs Commissie* (National Education Commission) overseeing Dutch BSc-PhD astronomy (2019 - 2022)

Organising Committee of the ASPIRE summer programme - Head of Admissions

Hosted and organised public outreach livestreams during the pandemic

Participated in Oxford Open Doors Astronomy events

Chair of Research Group meetings (2020-2022)

BSc Course Representative

SKILLS

Programming:
Python (numpy, scipy, astropy, pandas, sklearn), C++, Linux/Windows/Mac, Bash
Languages:
English (native), Spanish (intermediate), Dutch (beginner)

REFERENCES

Prof. Rob Fender - Head of Group and Sub-department - The University of Oxford, Oxford, UK
rob.fender@physics.ox.ac.uk

Prof. Ralph Wijers - PhD supervisor - University of Amsterdam, NL
r.a.m.j.wijers@uva.nl

Assistant Prof. Antonia Rowlinson - PhD co-supervisor - University of Amsterdam, NL
b.a.rowlinson@uva.nl

Prof. Sera Markoff - Collaborator and MSc supervisor - University of Amsterdam, NL
s.b.markoff@uva.nl

Assistant Prof. Alexander van der Horst - Collaborator - The George Washington University, USA
ajvanderhorst@gwu.edu