James Matthews

Astrophysicist

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Academic Career

2022–present **Royal Society University Research Fellow**, *University of Oxford.*
Project: "Extreme Cosmic Accelerators: High-energy particles and feedback from black hole jets and winds"

2019–2022 **Herchel Smith Fellow**, *Institute of Astronomy, University of Cambridge.*
Postdoctoral Fellowship, "The origin and physics of the highest energy particles in nature"

2016–2019 **Postdoctoral Researcher**, *University of Oxford.*
Project title: "The origin of ultra-high energy cosmic rays", PIs: Profs. A. R. Bell and K. M. Blundell

2012–2016 **PhD Physics**, *University of Southampton.*
Thesis: "Disc Winds Matter: Modelling Accretion and Outflow On All Scales", Supervisor: Prof. C. Knigge

2012 **Research Year Abroad**, *Harvard-Smithsonian CfA.*
Thesis: "Searching For Nearby Planets During Predicted Microlensing Events", Supervisor: Dr. R. Di Stefano

2008-2012 **MPhys Astrophysics**, *University of Southampton*, first-class honours.

Research Interests & Goals

- Understanding the origin of the highest energy cosmic rays (CRs).
- Building models for particle acceleration and transport in magnetised plasmas.
- Studying the physics and observational signatures of accretion discs and their associated outflows.
- Understanding the connection between outflows and galaxy evolution, including the impact of CRs.
- Developing state-of-the-art radiative transfer and MHD methods to complement observations.
- Testing exotic particle physics (e.g. axions) with astrophysical probes.

Programming Skills

Advanced Python, C, Fortran, git/github, travis-CI, LaTeX, OpenMPI Parallelisation, Visit.

Familiar IDL, Topcat, Bash, MCMC methods.

Astro (magneto)hydrodynamics, Monte Carlo radiative transfer, Cloudy, CRPropa, Pluto.

Developer Python (MCRT Code), MSynchro, ALPro, CR-var-jet, cr-reverb.

Awards, Grants & Successful Proposals

2022 **Royal Society URF Enhanced Research Expenses**, *PI*, £400K.

2022 **Royal Society URF**, *PI*, approx. £700K.

2019 **HST Prop., co-I**, *UV spectroscopy of a super-Eddington BHXT (abr.)*, PI: Castro-Segura.

2019 **Herchel Smith Fellowship**, approx. £150K.

2018 **LBS Prop., co-I**, *Laboratory model of particle acceleration in Supernova shocks*, PI: Chen.

2017 **HST Prop., co-I**, *Wide band spectra of nova-like variables*, PI: Long.

2016 **Springer Thesis Prize for Outstanding PhD Research**, *University of Southampton.*

2015 **SALT Proposal, PI**, *The spectra of nova-like variables.*

2013 **RAS Grant**, *Visit to Columbia University.*

2008-2012 **Academic Scholarship**, *Top 5 students in physics, University of Southampton.*

Responsibilities, Service and Outreach

2020-2022 IoA Student-Postdoc Liason Officer

2020-2022 IoA Forum on Racial Equality in Astronomy, Co-founder

2022 Swiss National Science Foundation, referee

2020-2022	IoA Equality & Diversity Committee Member
2016-present	Referee: ApJ, MNRAS, PASA, A&A, Nature Astronomy
2021	EAS 2021: Mentor
2021	EUCapt White Paper: Convener (Cosmic Accelerators)
2021	EUCapt White Paper: Contributor (Travelling Messengers)
2020	IoA Lunchtime Seminar Organiser
2020,2021	LPN Summer School Speaker (Physics)
2019	Oxford women in physics career advice panel
2018-2019	Oxford Astrophysics Outreach for the Homeless, Organiser and founder
2018-2019	Undergraduate Tutor, Astrophysics C1
2018	Invited reviewer for "100 years of jets" review anthology.
2018	Astrophysics summer project admissions and co-ordination
2017-2019	SPI-MAX seminar organiser
2017-2019	Galaxies coffee organiser
2017, 2018	Summer project supervisor: Ziyan Li, Andrew Sellek
2017	Local Organising Committee, Plasma Astrophysics Conference, Oxford
2016	AstroAirport Demonstrator
2015, 2016	SETI Cipher Challenge Helper
2015	Local Organising Committee, TORUS 2015, Winchester
2012-2016	Outreach Demonstrator, University of Southampton Astrodome
2012-2016	Teaching Demonstrator, University of Southampton

Talk Highlights

At least 35 talks (21 invited) at international conferences and colloquia in Europe, Asia, USA.

2021 **Invited Review**, *23rd European Cosmic Ray Symposium, Nijmegen.*
2021 **Invited Colloquium**, *University of Bristol (remote).*
2021 **Invited Review**, *HIRSAP Summer School (remote).*
2021 **Invited Talk**, *IoP UK CTA Meeting (remote).*
2021 **Invited Review**, *EUCapt Symposium, CERN (remote).*
2020 **Invited Colloquium**, *University of Amsterdam (remote).*
2020 **Invited Review**, *EAS 2020, Leiden (remote).*
2019 **Invited Review**, *A Centenary of Astrophysical Jets, Manchester.*
2019 **Invited Colloquium**, *University of Bath.*
2019 **Invited Colloquium**, *University of Glasgow.*
2018 **Invited Talk**, *Hillas Symposium, Heidelberg.*
2018 **Invited Talk**, *Particle Acceleration and Transport, Calabria.*
2018 **Invited Colloquium**, *Queen's University, Belfast.*
2018 **Contributed Talk**, *UHECR 2018, Paris.*
2018 **Invited Colloquium**, *University of Manchester.*
2017 **Invited Review**, *Broadband Astrophysical Processes, Southampton.*
2017 **Invited Colloquium**, *University of Southampton.*
2017 **Contributed Talk**, *AGN Winds on the Georgia Coast, Jekyll Island, GA.*
2015 **Contributed Talk**, *TORUS 2015, Winchester.*
2015 **Invited Talk**, *The Golden Age of CVs, Palermo.*
2015 **Contributed Talk**, *Black Hole Accretion and AGN feedback, Shanghai.*

Publications

45 articles published or in press, 11 first-author, H-index: 18, citations: 820 (ADS) 889(Google Scholar), *Please see ADS publication list*.

References

Prof. Tony Bell FRS, *University of Oxford*, tony.bell@physics.ox.ac.uk.
Connection: PI at Oxford.

Prof. Christopher Reynolds, *University of Cambridge*, csr12@ast.cam.ac.uk.
Connection: Collaborator at Cambridge.

Prof. Christian Knigge, *University of Southampton*, C.Knigge@phys.soton.ac.uk.
Connection: PhD Supervisor

Prof. Katherine Blundell OBE, *University of Oxford*, katherine.blundell@physics.ox.ac.uk.
Connection: PI at Oxford.

Dr. Knox Long, *STScI/Eureka Scientific*, long@stsci.edu.
Connection: Collaborator and co-supervisor.

Prof. Paul Hewett, *University of Cambridge*, phewett@ast.cam.ac.uk.
Connection: Collaborator at Cambridge.