Harry T. J. Bevins, M.Phys.

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Education and Research Experience

October 2019 - September 2023	**PhD in Physics**, Cavendish Astrophysics, University of Cambridge. Development and application of novel data analysis techniques for 21-cm Cosmology experiments. Supervised by Dr Eloy de Lera Acedo, Dr Will Handley and Dr Anastasia Fialkov.
2015 - 2019	**M.Phys. Physics with Astrophysics, 1st Class**, University of Manchester. Dissertation involved producing an updated estimate of the Cosmic Radio Background from observations and theory. Performed with I.C. Nitu and supervised by Prof. Anna Scaife and Dr Justin Bray.
June-August 2018	**Summer Research Project:** Investigating estimates of the Cosmic Radio Background. Supervised by Prof. Anna Scaife and Dr Justin Bray. University of Manchester.
2008 - 2015	Churchdown School Academy, Gloucestershire. **A-Levels:** 3 A grades, **AS-levels:** 2 A grades, **GCSE:** 7 A* grades, 3 A grades and 1 B. Highest GCSE and A-Level grades in year group.

Publications

Citations: 76, h-index: 5, as of Dec 2022
arxiv.org/a/bevins_h_1
ADS Abstracts

First Author

January 2023	**H. T. J. Bevins**, S. Heimersheim, I. Abril-Cabezas, A. Fialkov, E. de Lera Acedo, W. J. Handley, S. Singh, R. Barkana. *Joint analysis constraints on the physics of the first galaxies with low frequency radio astronomy data.*, arXiv:2301.03298.
November 2022	**H. T. J. Bevins**, A. Fialkov, E. de Lera Acedo, W. J. Handley, S. Singh, R. Subrahmanyan, R. Barkana. *Astrophysical Constraints from the SARAS3 non-detection of the Cosmic Dawn Sky-Averaged 21-cm Signal.* **Nature Astronomy**, https://doi.org/10.1038/s41550-022-01825-6.
October 2022	**H. T. J. Bevins**, W. J. Handley, P. Lemos, P. Sims, E. de Lera Acedo, A. Failkov. *Marginal Bayesian Statistics Using Masked Autoregressive Flows and Kernel Density Estimators with Examples in Cosmology.* Physical Sciences Forum, Volume 5, Issue 1, proceedings to MaxEnt22, arXiv:2207.11457.
May 2022	**H. T. J. Bevins**, W. J. Handley, P. Lemos, P. Sims, E. de Lera Acedo, A. Fialkov, J. Alsing. *Removing the fat from your posterior samples with* MARGARINE, arXiv:2205.12841.
April 2022	**H. T. J. Bevins**, E. de Lera Acedo, A. Fialkov, W. J. Handley, S. Singh, R. Subrahmanyan, R. Barkana. *A comprehensive Bayesian re-analysis of the SARAS2 data from the Epoch of Reionization*, Monthly Notices of the Royal Astronomical Society, Volume 508, Issue 2, Pages 2923-2936, arXiv:2201.11531
September 2021	**H. T. J. Bevins**, W. J. Handley, A. Fialkov, E. de Lera Acedo and K. Javid. GLOBALEMU*: A novel and robust approach for emulating the sky-averaged 21-cm signal from the cosmic dawn and epoch of reionisation*, Monthly Notices of the Royal Astronomical Society, Volume 513, Issue 3, Pages 4507-4526, arXiv:2104.04336
April 2021	**H. T. J. Bevins**, W. J. Handley, A. Fialkov, E. de Lera Acedo, L. J. Greenhill, D. C. Price, MAXSMOOTH*: rapid maximally smooth function fitting with applications it Global 21-cm cosmology*, Monthly Notices of the Royal Astronomical Society, Volume 502, Issue 3, Pages 4405–4425, arXiv:2007.14970
November 2020	I.C. Nitu, **H.T.J. Bevins**, J.D. Bray, A.M.M. Scaife, *An updated estimate of the cosmic radio background and implications for ultra-high-energy photon propagation*, Astroparticle Physics, 126, 102532, arXiv:2004.13596, *Shared First Authorship.*
October 2020	**H. T. J. Bevins**, *maxsmooth: Derivative Constrained Function Fitting.* Journal of Open Source Software, 5(54), 2596

Contributing Author

July 2022	The REACH Collaboration. *The REACH radiometer for detecting the 21-cm hydrogen signal from redshift* $z \approx 7.5 - 28$. **Nature Astronomy**, 6, 984–998 (2022). https://doi.org/10.1038/s41550-022-01709-9. *Section lead on Detection of Unknown Systematics.*
February 2022	The REACH Collaboration. *Radio antenna design for sky-averaged 21 cm cosmology experiments: the REACH case*, Journal of Astronomical Instrumentation, Volume 11, Issue 1, arXiv:2109.10098.

Talks

Conference and Workshop Talks

February 2023	*Machine Learning for 21-cm Cosmology*, Development in Africa with Radio Astronomy REACH Workshop, University of Stellenbosch.
October 2022	*Astrophysics from the SARAS3 non-detection of the global 21-cm signal*, 5th Global 21-cm Workshop, University of California Berkeley.
July 2022	*Marginal Bayesian Statistics with Masked Autoregressive Flows and Kernel Density Estimators*, 41st MaxEnt22 Conference, Institut Henri Poincaré, Paris.
June 2022	*globalemu: Novel and robust emulation of 21-cm signals from the Epoch of Reionization*, Special Session - Towards the SKA Observatory:Artificial Intelligence in Radio Astronomy, **European Astronomical Society Annual Meeting**, Valencia.
April 2022	*Constraining the Astrophysics of the Early Universe using the SARAS Instrumentation*, Observational and Theoretical 21-cm Cosmology, Kavli Meeting, University of Cambridge
March 2022	*A comprehensive Bayesian re-analysis of the SARAS2 data from the Epoch of Reionization*, SAZERAC 21-cm Gulp (Online)
January 2022	*globalemu: A novel and robust approach to emulating the global 21-cm signal with neural networks*, SAZERAC-SIP:Learning the high-redshift universe (Online)
December 2021	*A Bayesian re-analysis of the sky-averaged 21-cm experimental data from SARAS2*, , Lightening talk, Science at Low Frequencies VIII (Online), University of Amsterdam
October 2021	*globalemu: novel and robust global 21-cm signal emulation*, 4th Global 21-cm Workshop (Online), University of Colorado
December 2020	*maxsmooth and its applications in science at low frequencies*, Lightening talk, Science at Low Frequencies VII (Online), University of Amsterdam
October 2020	*maxsmooth and its applications to 21-cm cosmology*, 3rd Global 21-cm Workshop (Online), University of Cambridge

Internal Talks

October 2021	*An extensive Bayesian re-analysis of the SARAS2 data from the Epoch of Reionization*, 21-cm Group Meeting (Online), Cavendish Astrophysics, University of Cambridge
February 2021	*maxsmooth and Maximally Smooth Functions*, Internal Coffee Talk (Online), Cavendish Astrophysics, University of Cambridge
February 2021	*GlobalEmu: A novel and robust approach to emulating the Global 21-cm signal and applications to data from SARAS2*, 21-cm Group Meeting (Online), Cavendish Astrophysics, University of Cambridge
July 2020	*maxsmooth: rapid maximally smooth function fitting with applications to 21-cm cosmology*, 21-cm Group Meeting, Cavendish Astrophysics, University of Cambridge
May 2020	*An updated estimate of the cosmic radio background and implications for ultra-high-energy photon propagation*, Internal Coffee Talk, Cavendish Astrophysics, University of Cambridge
May 2020	*An updated estimate of the cosmic radio background and implications for 21-cm Cosmology*, 21-cm Group Meeting, Cavendish Astrophysics, University of Cambridge

Awards

Fitzwilliam Society Trust Research Fund 2022	Financial support to help attend and present at the 5th Global 21-cm Workshop.
Fitzwilliam College Student Opportunities Award 2022	Financial support awarded to help attend and present at 41st MaxEnt22 Conference.
Fitzwilliam College Senior Scholarship 2022	Financial support awarded in recognition of excellent academic achievements.
Fitzwilliam College Senior Scholarship 2020	Financial support awarded in recognition of resilience, hard work and achievements in PhD studies during 2020.

Posters Presentations

March 2021	*globalemu: A novel and robust approach for emulating the sky averaged 21-cm signal from the cosmic dawn and epoch of reionization*, A Precursor View of the SKA Sky, Virtual Conference
December 2019	*REACH: Radio Experiment for the Analysis of Cosmic Hydrogen*, Science At Low Frequencies VI, Arizona State University
November 2019	*REACH: Radio Experiment for the Analysis of Cosmic Hydrogen*, Cavendish Graduate Conference, University of Cambridge

Peer Review

One paper for the Journal of Open Source Software (see Publons).

In the Media

November 2022	Non-detection of key signal allows astronomers to determine what the first galaxies were – and weren't – like. Press release for SARAS3 astrophysical constraints from the University of Cambridge. See also an article in The Independent and Altmetric for a summary of other articles.
July 2022	Astronomers develop novel way to 'see' first stars through fog of early Universe. Press release for the REACH mission paper lead by Eloy de Lera Acedo. See Altmetrics for a summary of other articles.

Teaching

October 2021 - April 2022	**Demonstration of Part IA Scientific Computing** for 32 hours, University of Cambridge.
October - December 2020	**Part II Relativity Supervision** of 16 students, University of Cambridge.
July - August 2020	**Formative Marking of Part II Relativity Papers** for 56 students, University of Cambridge.
October - December 2019	**Part II Relativity Supervision** of 6 students, University of Cambridge.

Computational Skills

Programming	Experienced: Python
Markup	Experienced: LATEX
Languages	Intermediate: HTML, CSS, reStructuredText, Markdown

Software

margarine	Main author and maintainer: Posterior Sampling and Marginal Bayesian Statistics.
globalemu	Main author and maintainer: Robust and fast emulation of the Global 21-cm signal.
maxsmooth	Main author and maintainer: Fast Derivative Constrained Function fitting.
anesthetic	Contributor: Added feature to plot shaded confidence regions under 1D posterior probability plots.
arXivSearcher	Main author and maintainer: Terminal based arXiv search tool.

Conference Organisation

Cavendish Graduate Conference November 2021	Member of Organising Committee, Cavendish Astrophysics, University of Cambridge.
3rd Global 21-cm Workshop October 2020	Member of Local Organising Committee, Cavendish Astrophysics, University of Cambridge.