

# Will Handley

## Summary

[willhandley.co.uk/CV](http://willhandley.co.uk/CV)

Cosmologist and statistician whose research programme weaves theory, observation & inference: *Nested sampling; Bayesian machine learning; cosmological model selection, parameter estimation & tension quantification; likelihood-free inference; early universe cosmology; CMB; 21cm; gravitational waves; exoplanets.*

## Education

- 2012–2016 **University of Cambridge**, *PhD Astrophysics*, Prof. A. Lasenby & Prof. M. Hobson
- 2008–2012 **University of Cambridge**, *MSci, MA: Natural Sciences*, Gonville & Caius College
- 2001–2008 **Alleyn's School**, *A levels, GCSEs*, London

## Employment & Research

- Oct 2024– **Associate Professor**, *Institute of Astronomy*, University of Cambridge
- Oct 2020– **Royal Society University Research Fellow**, *IoA*, University of Cambridge  
Bayesian machine learning and tensions in cosmology (Cavendish Lab 2020–2024)
- May 2021– **Teaching Fellow**, *Gonville & Caius College*, University of Cambridge
- 2017– **Chief Technical Officer**, *PolyChord Ltd*, polychord.co.uk
- 2021–2023 **Turing Fellow**, *Alan Turing Institute*
- 2016–2020 **Research fellow**, *Gonville & Caius College*, University of Cambridge  
Funded by Gonville & Caius College and an STFC IPS grant.
- Jul-Sep 2016 **Postdoctoral researcher**, *Prof. H. Peiris*, University College London  
Searching for features in the primordial power spectrum.
- 2012–2016 **PhD Astrophysics**, *Prof. A. Lasenby & Prof. M. Hobson*, University of Cambridge  
Kinetic initial conditions for inflation: Theory, observations & methods.
- 2011–2012 **Part III Dissertation**, *Prof. P. Alexander*, University of Cambridge  
Investigating the origins of cosmic magnetism.
- Summer 2011 **Summer Research Student**, *Prof. M. Faulkes & Dr. J. Spencer*, Imperial College  
Folded spectrum full configuration interaction quantum Monte Carlo.
- Summer 2011 **Summer Research Student**, *Dr. R. Blumenfeld*, University of Cambridge  
Geometry and field equations of granular systems.
- 2010–2011 **Research Review**, *Prof. S. Gull*, University of Cambridge  
Literature Survey of the Physics-Philosophy crossover field of measurement theory.
- Summer 2010 **iGEM Team Physicist**, *Dr. J. Haseloff*, University of Cambridge  
E-glowli 2010 iGEM team (placed in final 6) <http://2010.igem.org/Team:Cambridge>

---

## Grants won (£4.3m)

### Cosmology

- £1.3m **ERC starting grant** ⇒ **UKRI frontier research**, *Resolving cosmological tensions with diverse data, novel theories and Bayesian machine learning*, Horizon Europe ERC STG 2021, invited for grant preparation, converted to UKRI frontier research guarantee  
Start date: October 2024 [willhandley.co.uk/ERC.pdf](http://willhandley.co.uk/ERC.pdf)
- £240k **Royal Society Enhancement**, *Next generation nested sampling for cosmological inference*
- £170k **Royal Society Enhancement**, *Likelihood-free inference and Bayesian neural networks*
- 52MCPUH **DiRAC Resource Allocation Committee 15<sup>th</sup> call 2023**,  
≡ £520k *New frontiers in particle cosmology*
- 30MCPUH **DiRAC Resource Allocation Committee 13<sup>th</sup> call 2021**,  
≡ £300k *Next generation cosmological analysis with nested sampling*
- £723k **Royal Society URF 2020**, *Bayesian machine learning and tensions in cosmology*
- 2MCPUH **DiRAC directors discretionary award 2020**,  
≡ £20k *Bayesian model comparison of inflation and spatial curvature*
- £15k **KICC Workshop 2023**, *GAMBIT at the KICC*
- £15k **KICC Workshop 2019**, *AstroHackWeek 2019*
- \$6k **George Southgate Visiting Fellowship 2020**, *GAMBIT visit*
- £2k **KICC visitors 2019**, *Likelihood free inference workshop*
- £2k **KICC visitors 2017**, *Class and MontePython workshop*

### PolyChord

- £260k **MSCA DTN 2023**, *GLITTER: Gnss-r sateLIITe earTh obsERvation*, PC Ltd et al
- £100k **DASA GAN 2023**, *Optimal dynamic manoeuvring & adaptation of communications networks driven by the MIDAS information-advantage mathematical framework*, PC Ltd
- £25k **DSTL CEME 2023**, *MIDAS: Maximum information data acquisition strategies*, PC Ltd
- £100k **DSTL CEME 2022**, *Further optimisation of sensor location*, PC Ltd & QML
- £60k **DSTL CEME 2021**, *Optimisation of sensor location*, PC Ltd & QML
- £10k **DSTL CEME 2020**, *Optimising a search route for constrained network discovery*
- £50k **Amadeus Seed capital**, *PolyChord for protein folding*, PC Ltd
- £225k **STFC IPS 2019**, *PolyChord and Bayesian sparse facial recognition*
- £42k **STFC IAA 2018**, *PolyChord and Bayesian neural network facial recognition*
- £25k **STFC IAA 2016**, *Interfacing PolyChord 2.0*

---

## Awards & Prizes

- |             |  |                                     |
|-------------|--|-------------------------------------|
| Jul. 2022   | Pacific Institute of Theoretical Physics visitor   | University of British Columbia      |
| Feb. 2020   | George Southgate visiting Fellow                   | University of Adelaide              |
| Jul. 2019   | Guiseppe and Vanna Cocconi Prize (WMAP and Planck) | EPS-HEPP Division                   |
| Dec. 2013   | Best presentation                                  | Cavendish grad. students conference |
| Jun. 2012   | Best theoretical part III project                  | University of Cambridge             |
|             | Physics prize                                      | Gonville & Caius College            |
| Summer 2011 | Undergraduate Research Bursary                     | Nuffield Foundation                 |
|             | UROP Studentship                                   | Imperial College                    |
| Summer 2010 | iGEM Studentship                                   | Wellcome Trust                      |
| 2009–12     | Junior and Senior Scholarships                     | Gonville & Caius College            |

---

## Current students & postdocs

[handley-lab.co.uk/group](http://handley-lab.co.uk/group)

Postdoc	David Yallup	2021-present
PhD	Namu Kroupa	2023-present
	Metha Prathaban, Wei-Ning Deng, Sinah Legner	2022-present
	Adam Ormondroyd	2021-present
	George Carter, Kilian Scheutwinkel	2020-present

---

## Previous students & postdocs

### PhD

- Mar 2024 **Thomas Gessey-Jones**, *Probing the First Stars with the 21-cm Signal: Theory, Methods, and Forecasts*  
co-supervised with Eloy de Lera Acedo & Anastasia Fialkov
- Dec 2023 **Ian Roque**, *EXCALIBRATE: Calibration for astrophysical experimentation*  
co-supervised with Nima Razavi-Ghods
- Jun 2023 **Harry Bevins**, *A Machine Learning-enhanced Toolbox for Bayesian 21-cm Data Analysis and Constraints on the Astrophysics of the Early Universe*  
co-supervised with Eloy de Lera Acedo and Anastasia Fialkov
- Jul 2022 **Dominic Anstey**, *Data Analysis in Global 21cm Experiments: Physically Motivated Bayesian Modelling Techniques*  
co-supervised with Eloy de Lera Acedo
- Sep 2021 **Fruzsina Agocs**, *Primordial evolution of cosmological perturbations: Theory and computation*  
co-supervised with Mike Hobson & Anthony Lasenby
- Aug 2021 **Will Barker**, *Gauge Theories of Gravity*  
co-supervised with Mike Hobson & Anthony Lasenby
- Dec 2020 **Lukas Hergt**, *Constraining the kinetically dominated Universe*  
co-supervised with Mike Hobson & Anthony Lasenby
- Oct 2018 **Ed Higson**, *Bayesian Methods and machine Learning in Astrophysics*  
co-supervised final year with Mike Hobson & Anthony Lasenby
- Individual projects Thomas McAloone (2020-21), Isidro Gómez Vargas (2020), Ayngaran Thavenesan (2021-22)

### MPhil

- Sep 2023 **Danielle Dineen**, *Cosmological Matching Conditions for Primordial Perturbations*
- Jan 2023 **Allahyar Sahibzada**, *Machine Learning and Nested Sampling: in the context of data intensive science and cosmology*
- Nov 2022 **Sam Leeney**, *Data science in early universe Cosmology: a novel Bayesian RFI mitigation approach using numerical sampling techniques*  
co-supervised with Eloy de Lera Acedo
- Aug 2020 **Emma Shen**, *Ionospheric Effects in the Global 21-cm Experiment*  
co-supervised with Eloy de Lera Acedo & Anastasia Fialkov
- Aug 2019 **Ian Roque**, *Bayesian Techniques for the Calibration of 21 cm Global Experiments*  
co-supervised with Nima Razavi-Ghods
- Aug 2018 **Panagiotis Mavrogiannis**, *Wheeler–Feynman absorber theory of radiation: Establishing the cosmological electrodynamic arrow of time*  
co-supervised with Anthony Lasenby

### MSci

- 2024 Nicolas Mediato Diaz, Samuel Hewson, Felicity Ibrahim, Patrick Lau, Tze Goh

- 2023 Zixiao Hu, Cole Meldorf, Sankalan Bhattacharyyan, Toby Lovick
- 2022 Yoann Launay, Oliver Normand, Xy Wang, Carola Zanoletti
- 2021 Yi Jer Loh, Metha Prathaban
- 2020 Thomas Gessey-Jones, Aleks Petrosyan
- 2019 Deaglan Bartlet, Jamie Bamber, Ian Roque
- 2018 Ward Haddadin, Jessica Rigley
- 2017 Fruzsina Agocs, Robert Knighton, Stephen Pickman, Daniel Manela

### Summer students

- 2024 Charlotte Priestley
- 2023 Zixiao Hu, Toby Lovick, Namu Kroupa
- 2022 Mary Letey, Beichen Xu, Artyom Baryshnikov
- 2021 Zak Shumaylov, Mattia Varrone
- 2019 Denis Werth, Maxime Jabarian, Liam Lau
- 2018 Elizabeth Guest, Ward Haddadin, Shu-Fan Chen

### Postdocs

- 2024 Thomas Gessey-Jones
- 2020 Jianghui Lui
- 2018-19 Kamran Javid

### Lecturing

- |           |   |                                  |
|-----------|---|----------------------------------|
| 2021-2023 | Part III Physics: Relativistic Astrophysics & Cosmology | <i>MSci 24 lecture course</i>    |
| 2017-2021 | Bayesian Statistics                                     | <i>Graduate 2 lecture course</i> |

### Workshops

- 2023 **Monte Carlo Methods**, *For Cosmology and Particle Physics*, UNAM, Mexico  
[github.com/handley-lab/workshop-monte-carlo-methods](https://github.com/handley-lab/workshop-monte-carlo-methods)
- 2022 **ICCS**, *Training Machine Learning models*, Cambridge, UK  
[github.com/handley-lab/2022-cambridge-iccs](https://github.com/handley-lab/2022-cambridge-iccs)
- 2018 **CosmoTools**, *Introduction to Statistics*, Aachen, Germany  
[indico.cern.ch/e/CosmoTools2018](https://indico.cern.ch/e/CosmoTools2018)
- 2017 **CosmoTools**, *Cosmological statistics & sampling*, IFT Madrid, Spain  
[workshops.ift.uam-csic.es/cosmotools2017](https://workshops.ift.uam-csic.es/cosmotools2017)

### Small group teaching

- |              |   |   |
|--------------|---|---|
| 2020–present | Part III Physics: Relativistic Astrophysics and Cosmology | <i>Supervising (24 hours)</i>                             |
| 2013–present | Part II Physics: General relativity                       | <i>Supervising (156 hours)</i>                            |
| 2023–present | Part II Physics: Statistical Mechanics                    | <i>Supervising (28 hours)</i>                             |
| 2012–2017    | Part IA Mathematics for NatSci                            | <i>Tripes classes (20 hours), Supervising (580 hours)</i> |
| 2015-2016    | Part IA Physics   | <i>Supervising (20 hours)</i>                             |
| 2013         | Part II Theoretical Physics 1 & 2                         | <i>Demonstrating (8 hours)</i>                            |
| 2006–2012    | Maths and Science Tuition                                 | <i>Individual coaching, key stage 1 – STEP</i>            |

### Academic Talks

[willhandley.co.uk/talks](https://willhandley.co.uk/talks)

† = remote

- Jan. 2025 **Theory meets experiment 2025: New frontiers in particle cosmology**, *Rencontres du Vietnam*, Quy Nhon, Vietnam

- Dec. 2024 **Next-generation statistical inference tools: Simulation-based inference, marginal statistics & accelerated nested sampling**, *Towards a realistic detection of Primordial Gravitational Wave Backgrounds*, Madrid, Spain
- Sep. 2024 **PolySwyft: a sequential simulation-based nested sampler**, *Global 21cm conference*, Raman Research Institute, Bangalore, India
- Sep. 2023 **lsbi: linear simulation based inference**, *PhyStat: Statistics meets ML*, Imperial college London, UK
- Aug. 2023 **Nested sampling: powering next-generation inference and machine learning tools for astrophysics, cosmology, particle physics and beyond**, *University of Sydney*, Sydney, Australia
- Aug. 2023 **Sampling methods for high energy physics & particle astrophysics**, *XVIth Quark Confinement and the Hadron Spectrum*, Cairns, Australia
- Aug. 2023 **Nested sampling: powering next-generation inference and machine learning tools for astrophysics, cosmology, particle physics and beyond**, *University of Queensland*, Brisbane, Australia
- Jul. 2023 **Nested sampling: powering next-generation inference and machine learning tools for astrophysics, cosmology, particle physics and beyond**, *RWTH*, Aachen, Germany
- Jul. 2023 **PolySwyft: a sequential simulation-based nested sampler**, *Cosmoverse*, Krakow, Poland
- Jul. 2023 **The scaling frontier of nested sampling**, *Maxent 2024*, Ghent, Belgium
- Jun. 2023 **Resonant or asymmetric: The status of sub-GeV dark matter**, *Sub-GeV dark matter, Dark Matter in Astrophysical Laboratories*, Cambridge, UK
- May. 2023 **Next generation astrophysical inference across the interdisciplinary frontier**, *UCL job talk*, UCL, UK<sup>†</sup>
- May. 2023 **PolySwyft: a sequential simulation-based nested sampler**, *PHYSTAT SBI*, Munich, Germany
- May. 2023 **Next generation astrophysical inference across the interdisciplinary frontier**, *IoA job talk*, Cambridge, UK
- Mar. 2023 **Nested sampling: powering next-generation inference and machine learning tools for cosmology, particle physics and beyond**, *Gatsby computational unit*, UCL, UK
- Feb. 2024 **Sampling techniques in high-dimensional parameter spaces with ScannerBit 2.0**, *ORIGINS data science cluster*, Munich, Germany
- Jan. 2024 **Next-generation inference tools for cosmology and beyond**, Oxford, UK
- Jan. 2024 **Simulation Based Inference: theory, sampling & model comparison**, *RAS*, London, UK
- Dec. 2023 **Nested sampling: powering next-generation inference and machine learning tools for cosmology, particle physics and beyond**, *UNAM*, Mexico City, Mexico
- Nov. 2023 **Bayesian OODA loops with MIDAS: Augmented decision making in a complex future electromagnetic environment**, *OFEME 2023*, Nottingham, UK
- Oct. 2023 **unimpeded: Universal model comparison and parameter estimation distributed over every dataset**, *Oscar Klein Center*, Stockholm, Sweden
- Oct. 2023 **Nested sampling: powering next-generation inference and machine learning tools for cosmology, particle physics and beyond**, *Manchester*, UK
- Sep. 2023 **Nested sampling tools**, *REACH AGM*, Malta
- Sep. 2023 **Nested sampling: powering next-generation inference and machine learning tools for cosmology, particle physics and beyond**, *UCL*, UK
- Aug. 2023 **Nested sampling: powering next-generation inference and machine learning tools for cosmology, particle physics and beyond**, *KCL*, UK

- Jul. 2023 **The scaling frontier of nested sampling: Summary talk**, *MaxEnt*, Munich, Germany
- Jun. 2023 **Gradients and Nested Sampling: the present state of the art**, *MIAPbP*, Munich, Germany
- Mar. 2023 **Nested Sampling: A multi-purpose numerical tool for science and machine learning**, *ETH Zurich*, Switzerland
- Jan. 2023 **Nested sampling: powering the next-generation of Bayesian inference tools for cosmology, particle physics and beyond**, *Cavendish job talk*, Cambridge, UK
- Jan. 2023 **High dimensional nested sampling**, *Simulation based inference with swyft*, Amsterdam, Netherlands
- Jan. 2023 **What is the benefit of adversarial systems?**, *Mathematical Challenges in the Electromagnetic Environment*, London, UK
- Dec. 2022 **Theory, observation & cosmological inference**, *KICC christmas*, Cambridge, UK
- Sep. 2022 **Next generation cosmological analysis with nested sampling**, *KICC Symposium*, Cambridge, UK
- Sep. 2022 **Next generation cosmological analysis with nested sampling**, *Corfu2022: Tensions in Cosmology*, Corfu, Greece
- Aug. 2022 **Dark matter, cosmology and likelihood-free Inference**, *GAMBIT XIV*, Kelowna, Canada
- Jul. 2022 **Nested Sampling: An efficient and robust Bayesian inference tool for particle physics and cosmology**, *TRIUMF & UBC*, Vancouver, Canada
- Jul. 2022 **Frontiers of Nested Sampling**, *MaxEnt 2022*, Paris, France
- Apr. 2022 **Nested Sampling and Likelihood-free inference**, *Likelihood-free in Paris*, Paris, France
- Apr. 2022 **Statistical methods in Cosmology**, *Obs. and Theor. 21-cm Cosmology*, Cambridge, UK
- Jan. 2022 **PolyChord: Next generation nested sampling**, *UK Atomic Energy Authority*, UK<sup>†</sup>
- Nov. 2021 **Review on Statistical Tools and Samplers**, *TOOLS 2021*, IP2I, Lyon, France<sup>†</sup>
- Jul. 2021 **Success Story 2 — Optimum Sensor Placement**, *Mathematical Challenges in the Electromagnetic Environment*, Isaac Newton Institute, Cambridge, UK
- Jul. 2021 **Success Story 1 — Detecting Illicit Mesh Networks**, *Mathematical Challenges in the Electromagnetic Environment*, Isaac Newton Institute, Cambridge, UK
- Mar. 2021 **PolyChord: Novel Bayesian Machine Learning**, *Cambridge Data Science Fair*, UK<sup>†</sup>
- Feb. 2021 **Bayesian methods for quantifying global parameter tensions between cosmological datasets**, *Tehran meeting on cosmology at the crossroads*, Tehran, Iran<sup>†</sup>
- Jan. 2021 **Bayesian information fusion**, *Mathematical Challenges in the Electromagnetic Environment*, Isaac Newton Institute, Cambridge, UK<sup>†</sup>
- Oct. 2020 **Nested Sampling: an efficient and robust Bayesian inference tool for 21cm cosmology**, *3rd Global 21-cm Workshop*, Cambridge, UK<sup>†</sup>
- Sep. 2020 **Nested Sampling for optimising sensor location**, *Mathematical Challenges in the Electromagnetic Environment*, Isaac Newton Institute, Cambridge, UK<sup>†</sup>
- Feb. 2020 **Nested Sampling: an efficient and robust Bayesian inference tool for physics and machine learning**, *Physics Colloquium*, Adelaide, Australia
- Jan. 2020 **Nested Sampling: an efficient and robust Bayesian inference tool for astrophysics and cosmology**, Oxford, UK
- Jan. 2020 **PolyChord: next generation nested sampling**, *Mathematical Challenges in the Electromagnetic Environment*, Isaac Newton Institute, Cambridge, UK
- Dec. 2019 **Quantised primordial power spectra**, *Texas 2019*, Portsmouth, UK
- Nov. 2019 **Nested Sampling: an efficient and robust Bayesian inference tool for Machine Learning and Data Science**, *CDT talk*, Cambridge, UK

Aug. 2019 **Curvature tension: evidence for a closed universe(?)**, ICG Portsmouth, UK  
 Jul. 2019 **Quantifying cosmological tensions**, University College London, UK  
 Jun. 2019 **Likelihood free inference**, *GAMBIT X*, Germany  
 Mar. 2019 **Compromise-free Bayesian sparse reconstruction**, *LFI workshop*, Flatiron institute, US  
 Dec. 2018 **Inflation, curvature and kinetic dominance**, *Future uses of Planck data*, ESAC, Spain  
 Nov. 2018 **BAMBI Resurrection: Blind Accelerated Multimodal Bayesian Inference**, *Dark Machines*, Worldwide<sup>†</sup>  
 Nov. 2018 **Nested Sampling: an efficient and robust Bayesian inference tool for cosmology and particle physics**, *Dark Machines*, Worldwide<sup>†</sup>  
 Oct. 2018 **Bayesian Statistics**, *Third Asterics-Obelics workshop*, Cambridge, UK  
 May. 2018 **Planck, inflation and the future of inflationary constraints**, *Consistency of Cosmological Datasets*, Cambridge, UK  
 May. 2018 **MaxEnt priors with derived parameters in a specified distribution**, Cambridge, UK  
 May. 2018 **Nested Sampling: an efficient and robust Bayesian inference tool for astrophysics and cosmology**, ICIC, UK  
 April. 2018 **Introduction to statistics**, *CosmoTools 18*, RWTH Aachen, Germany  
 Jan. 2018 **Advances in Nested Sampling & astrophysical application**, Cambridge, UK  
 Aug. 2017 **PolyChord 2.0: Fast inference & nested sampling**, *Cosmo17*, Paris, France  
 Jun. 2017 **Modern Bayesian Inference: Theory and Practice**, RWTH Aachen, Germany  
 Mar. 2017 **Parameter estimation and Model comparison**, *CosmoTools 17*, Madrid, Spain  
 Feb. 2017 **PolyChord 2.0: Advances in Nested Sampling & astrophysical application**, Flatiron institute, US  
 Sep. 2016 **PolyChord 2.0 & the future of nested sampling**, University College London, UK  
 May. 2016 **PolyChord 2.0 & the future of nested sampling**, University of Sussex, UK  
 Mar. 2016 **PolyChord & the future of nested sampling**, Edinburgh, UK  
 Dec. 2015 **PolyChord: next generation nested sampling**, *MPA Bayes Forum*, Munich, Germany  
 Feb. 2015 **PolyChord: next generation nested sampling**, University of Sussex, UK  
 Dec. 2013 **Kinetic dominance in the pre-inflationary universe**, Cavendish grad. conference

## Selected Outreach

Over the course of my career I have given 19 public outreach talks including:

May 2015 **Intro. to Astronomy: Beyond the Milky Way**, *IoA Public Talk*, Cambridge  
 May 2015 **To infinity and beyond: Dark Energy**, *Pint of Science*, Cambridge Brewhouse  
 Feb 2014 **The Physics of Juggling**, *CCPE*, Cavendish Laboratory  
 Jan 2014 **The first 3 yocto-pico seconds**, *Three minute wonder*, Cavendish Laboratory

## Institutional responsibilities

2024–present	CASU steering committee	<i>Institute of Astronomy</i>
2024–present	Teaching committee	<i>Institute of Astronomy</i>
2024–present	CPAC committee	<i>University of Cambridge</i>
2020–present	Convener of CosmoBit	<i>GAMBIT</i>
2020–2024	Leader of data analysis team	<i>REACH</i>
2021–present	Center for data-driven discovery (C2D3) steering committee	<i>University of Cambridge</i>
2022–present	KICC Scientific Strategy Committee	<i>KICC</i>
2022–present	KICC Visitor and Lecturer committee	<i>KICC</i>



2018–present	Science Research Fellowships committee	<i>Gonville &amp; Caius college</i>
2018–present	Investments committee	<i>Gonville &amp; Caius college</i>
2016–present	Undergraduate Admissions	<i>Gonville &amp; Caius college</i>
2020–present	Wine Committee (WSET3)	<i>Gonville &amp; Caius college</i>
2019–2022	Gonville & Caius College Council	<i>Gonville &amp; Caius college</i>
2021–2023	CDT in data intensive science executive committee	<i>University of Cambridge</i>
2018–2020	Education and research committee	<i>Gonville &amp; Caius college</i>
2017–2022	Organiser of weekly group seminars	<i>Cavendish astrophysics group</i>

## Examination

2024–	<b>Senior Examiner</b> , <i>Astrophysics</i> , Part II
2024–	<b>CATAM coordinator</b> , <i>Astrophysics</i> , Part II
2021–2023	<b>Exam setting</b> , <i>Relativistic Astrophysics and Cosmology</i> , Part III Physics
2020–2022	<b>Masters exam checking</b> , <i>Astrostatistics</i> , Part III Maths

## PhD

May 2024	<b>Stefan Heimersheim</b> , <i>Constraining reionization: Evidence from 21 cm limits and predictions for fast radio bursts</i>
Dec 2023	<b>Lester Sandles</b> , <i>Star-forming Galaxies and Quenched Systems throughout Cosmic Time</i>
Dec 2021	<b>Wu Hyun Sohn</b> , <i>High-resolution CMB bispectrum estimator</i>

## MPhil

Sep 2020	<b>Kyriakos Stylianiopoulos</b> , <i>Machine Learning Applied to Gaia and Other Survey Data: Applications Supporting a Polarisation Survey</i>
----------	--

## Organisation of scientific meetings

2024	Cosmological Inference in High Dimension	<i>KICC</i>
2023	GAMBIT at the KICC	<i>KICC</i>
2023	Frontiers of nested sampling	<i>Munich</i>
2023	Simulation based inference workshop (delayed from 2019)	<i>KICC</i>
2020	Scientific organising committee member of 3 <sup>rd</sup> Global 21-cm Workshop	<i>KICC</i>
2019	Local organising committee member of KICC 10 <sup>th</sup> anniversary symposium	<i>KICC</i>
2019	Helped secure funding and organised AstroHack week 2019	<i>KICC</i>
2018	Secured funding for and organised CLASS+MontePython software workshop	<i>KICC</i>

## Peer review

Performed 78 reviews for journals including Physical Review D and Physical Review Letters;

<https://www.webofscience.com/wos/author/record/S-9134-2018>

PRD (34), MNRAS (7), JCAP (8), PRL (8), JOSS (2), APJ (2), EPJC (1), PLB (6), RASTI (2) Entropy (4), Astronomy & Computing (2), Physics of the Dark Universe (2)

Review for fellowship awards:

2022	C2D3 Early Career Researcher Seed Fund
2022	ABTA UK Doctoral Research Award
2022	Blavatnik fellowship
2021–	Gonville & Caius Junior Research Fellowships

## Collaborations



2018–present	REACH	<a href="https://astro.phy.cam.ac.uk/research/research-projects/reach">astro.phy.cam.ac.uk/research/research-projects/reach</a>
2018–present	GAMBIT	<a href="https://gambit.hepforge.org">gambit.hepforge.org</a>
2018–2020	DarkMachines	<a href="https://darkmachines.org">darkmachines.org</a>
2017–2018	Terra Hunter Experiment	<a href="https://terra hunting.org">terra hunting.org</a>
2016–2017	CORE	<a href="https://core-mission.org">core-mission.org</a>
2015–2016	AMI	<a href="https://astro.phy.cam.ac.uk/research/research-projects/AMI">astro.phy.cam.ac.uk/research/research-projects/AMI</a>
2015–2019	Planck	<a href="https://cosmos.esa.int/web/planck">cosmos.esa.int/web/planck</a>

## Software

[willhandley.co.uk/software](https://willhandley.co.uk/software)

PolyChord	Sole author and maintainer: <a href="https://github.com/PolyChord/PolyChordLite">github.com/PolyChord/PolyChordLite</a>
anesthetic	Principle author and maintainer: <a href="https://github.com/handley-lab/anesthetic">github.com/handley-lab/anesthetic</a>
lsbi	Principle author and maintainer: <a href="https://github.com/handley-lab/lsbi">github.com/handley-lab/lsbi</a>
unimpeded	Principle author and maintainer: <a href="https://github.com/handley-lab/unimpeded">github.com/handley-lab/unimpeded</a>
fgivenx	Sole author and maintainer: <a href="https://github.com/handley-lab/fgivenx">github.com/handley-lab/fgivenx</a>
pyBAMBI	Team maintainer: <a href="https://github.com/DarkMachines/pyBAMBI">github.com/DarkMachines/pyBAMBI</a>
MultiNest	Maintainer: <a href="https://github.com/farhanferoz/MultiNest">github.com/farhanferoz/MultiNest</a>
primordial	Sole author and maintainer: <a href="https://github.com/williamjameshandley/primordial">github.com/williamjameshandley/primordial</a>
ModeCode	Maintainer: <a href="https://modecode.org">modecode.org</a>
Open source	scipy: Weighted kernel density estimation in <code>scipy.stats.gaussian_kde</code> matplotlib: Vertical slider in <code>matplotlib.widgets.Slider</code>

## Interaction with industry

PolyChord	2017–: Founded start-up company PolyChord Ltd. to bring Bayesian methods & tools from cosmology to Machine Learning & Biotech industries: <a href="https://polychord.co.uk">polychord.co.uk</a>
CMAM	2017–2023: Consulted for finance spin-out on Bayesian algorithmic trading
Shell	2016: Worked with department postdocs in the department applying nested sampling to geophysics
AnyVision	2019–2020: Worked collaboratively as part of STFC grant to apply Bayesian sparse reconstruction to facial recognition

## Interaction with Government

2020–	DSTL: Consult for government defence research using Bayesian inference
2024	Workshop participant in national security resilience in the future electromagnetic environment

## In the media

2022	<b>Cavendish Laboratory News</b> , <i>What can astrophysical data-intensive science do beyond the Universe?</i> , PolyChord, the next generation optimisation technology <a href="https://www.phy.cam.ac.uk/news/what-can-astrophysical-data-intensive-science-do-beyond-universe-polychord-next-generation">https://www.phy.cam.ac.uk/news/what-can-astrophysical-data-intensive-science-do-beyond-universe-polychord-next-generation</a>
2022	<b>BBC Radio 4</b> , <i>The Third Degree</i> , Astrophysics Don “Students vs Dons” BBC radio quiz aired July 2022
2020	<b>Quanta Magazine</b> , <i>Modified gravity in cosmology led by Will Barker</i> <a href="https://quantamagazine.org/why-is-the-universe-expanding-so-fast-20200427/">quantamagazine.org/why-is-the-universe-expanding-so-fast-20200427/</a>
2022	<b>KICC annual report</b> , <i>Bringing astrostatistics back to Earth</i> <a href="https://kicc.cam.ac.uk/aboutus/kicc-annual-reports">kicc.cam.ac.uk/aboutus/kicc-annual-reports</a>
2019	<b>KICC annual report</b> , <i>Compromise-free Bayesian cosmology &amp; AstroHack week</i>

## Computer skills

Programming MPI parallelisation, C++, FORTRAN, Mathematica, Maple, Python  
Computing Unix, Bash, zsh, vim, git, svn, L<sup>A</sup>T<sub>E</sub>X, TikZ, VMs, CI, LLMs (Claude, Gemini, GPT)  
OS Arch Linux & HPC supercomputing (Experienced), Windows & OSX (Familiar)

## References

Prof. Anthony Lasenby, +44 (0)1223 337293/4, a.n.lasenby@mrao.cam.ac.uk,  
Prof. Mike Hobson, +44 (0)1223 339992, mph@mrao.cam.ac.uk  
Prof. Ofer Lahav, +44 (0)203 5495813, o.lahav@ucl.ac.uk  
Prof. Alan Heavens, +44 (0)207 5942930, a.heavens@imperial.ac.uk  
Prof. Hiranya Peiris, +44 (0)203 5495831, h.peiris@ucl.ac.uk  
Prof. Julien Lesgourgues, +49 241 80 25724, lesgourg@physik.rwth-aachen.de  
Prof. Ben Wandelt, wandelt@iap.fr

- [1] Margret Westerkamp, Jakob Roth, Philipp Frank, **Will Handley**, and Torsten Enßlin. Towards a Field Based Bayesian Evidence Inference from Nested Sampling Data. *arXiv*, 2408.09889, August 2024.
- [2] Anchal Saxena, P. Daniel Meerburg, Christoph Weniger, Eloy de Lera Acedo, and **Will Handley**. Simulation-Based Inference of the sky-averaged 21-cm signal from CD-EoR with REACH. *arXiv*, 2403.14618, March 2024.
- [3] Metha Prathaban and **Will Handley**. Costless correction of chain based nested sampling parameter estimation in gravitational wave data and beyond. *MNRAS*, 533(2):1839–1851, September 2024.
- [4] Michael Pagano, Peter Sims, Adrian Liu, Dominic Anstey, **Will Handley**, and Eloy de Lera Acedo. A general Bayesian framework to account for foreground map errors in global 21-cm experiments. *MNRAS*, 527(3):5649–5667, January 2024.
- [5] M. I. Letey, Z. Shumaylov, F. J. Agocs, **W. J. Handley**, M. P. Hobson, and A. N. Lasenby. Quantum initial conditions for curved inflating universes. *PRD*, 109(12):123502, June 2024.
- [6] Pablo Lemos, Nikolay Malkin, **Will Handley**, Yoshua Bengio, Yashar Hezaveh, and Laurence Perreault-Levasseur. Improving gradient-guided nested sampling for posterior inference. In Ruslan Salakhutdinov, Zico Kolter, Katherine Heller, Adrian Weller, Nuria Oliver, Jonathan Scarlett, and Felix Berkenkamp, editors, *Proceedings of the 41st International Conference on Machine Learning*, volume 235 of *Proceedings of Machine Learning Research*, pages 27230–27253. PMLR, 21–27 Jul 2024.
- [7] Namu Kroupa, David Yallup, **Will Handley**, and Michael Hobson. Kernel-, mean-, and noise-marginalized Gaussian processes for exoplanet transits and  $H_0$  inference. *MNRAS*, 528(2):1232–1248, February 2024.
- [8] Zixiao Hu, Artem Baryshnikov, and **William Handley**. AEONS: approximating the end of nested sampling. *MNRAS*, 532(4):4035–4049, August 2024.
- [9] T. Gessey-Jones, S. Pochinda, H. T. J. Bevins, A. Fialkov, **W. J. Handley**, E. de Lera Acedo, S. Singh, and R. Barkana. On the constraints on superconducting cosmic strings from 21-cm cosmology. *MNRAS*, 529(1):519–536, March 2024.
- [10] T. Gessey-Jones and **W. J. Handley**. Fully Bayesian forecasts with evidence networks. *PRD*, 109(12):123541, June 2024.
- [11] D. D. Dineen and **W. J. Handley**. Analytic approximations for the primordial power spectrum with Israel junction conditions. *PRD*, 109(8):083513, April 2024.
- [12] Wei-Ning Deng and **Will Handley**. Predicting spatial curvature  $\Omega_K$  in globally *CPT*-symmetric universes. *arXiv*, 2407.18225, July 2024.
- [13] Harry T. J. Bevins, Stefan Heimersheim, Irene Abril-Cabezas, Anastasia Fialkov, Eloy de Lera Acedo, **William Handley**, Saurabh Singh, and Rennan Barkana. Joint analysis constraints on the physics of the first galaxies with low-frequency radio astronomy data. *MNRAS*, 527(1):813–827, January 2024.
- [14] Harry T. J. Bevins, **William J. Handley**, and Thomas Gessey-Jones. Calibrating Bayesian Tension Statistics using Neural Ratio Estimation. *arXiv*, 2407.15478, July 2024.
- [15] Sowmiya Balan, Csaba Balázs, Torsten Bringmann, Christopher Cappiello, Riccardo Catena, Timon Emken, Tomás E. Gonzalo, Taylor R. Gray, **Will Handley**, Quan Huynh, Felix Kahlhoefer, and Aaron C. Vincent. Resonant or asymmetric: The status of sub-GeV dark matter. *arXiv*, 2405.17548, May 2024.
- [16] David Yallup and **Will Handley**. Hunting for bumps in the margins. *Journal of Instrumentation*, 18(5):P05014, May 2023.
- [17] Margret Westerkamp, Jakob Roth, Philipp Frank, **Will Handley**, and Torsten Enßlin. Inferring Evidence from Nested Sampling Data via Information Field Theory. *arXiv*, 2312.11907, December 2023.
- [18] K. H. Scheutwinkel, **W. Handley**, and E. de Lera Acedo. Bayesian evidence-driven likelihood selection for sky-averaged 21-cm signal extraction. *PASA*, 40:e016, April 2023.
- [19] Anchal Saxena, P. Daniel Meerburg, Eloy de Lera Acedo, **Will Handley**, and Léon V. E. Koopmans. Sky-averaged 21-cm signal extraction using multiple antennas with an SVD framework: the REACH case. *MNRAS*, 522(1):1022–1032, June 2023.
- [20] REACH collaboration. Receiver design for the REACH global 21-cm signal experiment. *arXiv*, 2307.00099, June 2023.
- [21] A. N. Ormondroyd, **W. J. Handley**, M. P. Hobson, and A. N. Lasenby. Balancing ACT: weighing prior dependency and global tensions of DR6 lensing with other datasets. *arXiv*, 2310.08490, October 2023.
- [22] Toby Lovick, Suhail Dhawan, and **Will Handley**. Non-Gaussian Likelihoods for Type Ia Supernovae Cosmology: Implications for Dark Energy and  $H_0$ . *arXiv*, 2312.02075, December 2023.
- [23] S. A. K. Leeney, **W. J. Handley**, and E. de Lera Acedo. Bayesian approach to radio frequency interference mitigation. *PRD*, 108(6):062006, September 2023.
- [24] T. Gessey-Jones, A. Fialkov, E. de Lera Acedo, **W. J. Handley**, and R. Barkana. Signatures of cosmic ray heating in 21-cm observables. *MNRAS*, 526(3):4262–4284, December 2023.
- [25] et al. and Gábor Csányi. A foundation model for atomistic materials chemistry. *arXiv*, 2401.00096, December 2023.
- [26] Harry T. J. Bevins, **William J. Handley**, Pablo Lemos, Peter H. Sims, Eloy de Lera Acedo, Anastasia Fialkov, and Justin Alsing. Marginal post-processing of Bayesian inference products with normalizing flows and kernel density estimators. *MNRAS*, 526(3):4613–4626, December 2023.

- [27] Harry Bevins, **Will Handley**, and Thomas Gessey-Jones. Piecewise Normalizing Flows. *arXiv*, 2305.02930, May 2023.
- [28] Dominic Anstey, Eloy de Lera Acedo, and **Will Handley**. Use of time dependent data in Bayesian global 21-cm foreground and signal modelling. *MNRAS*, 520(1):850–865, March 2023.
- [29] David Yallup, Timo Janßen, Steffen Schumann, and **Will Handley**. Exploring phase space with nested sampling. *European Physical Journal C*, 82(8):678, August 2022.
- [30] David Yallup, **Will Handley**, Mike Hobson, Anthony Lasenby, and Pablo Lemos. Split personalities in Bayesian Neural Networks: the case for full marginalisation. *arXiv*, 2205.11151, May 2022.
- [31] Zakhar Shumaylov and **Will Handley**. Primordial power spectra from  $k$ -inflation with curvature. *PRD*, 105(12):123532, June 2022.
- [32] K. H. Scheutwinkel, E. de Lera Acedo, and **W. Handley**. Bayesian evidence-driven diagnosis of instrumental systematics for sky-averaged 21-cm cosmology experiments. *PASA*, 39:e052, October 2022.
- [33] REACH collaboration. The REACH radiometer for detecting the 21-cm hydrogen signal from redshift  $z \approx 7.5$ –28. *Nature Astronomy*, 6:984–998, July 2022.
- [34] REACH collaboration. Radio Antenna Design for Sky-Averaged 21cm Cosmology Experiments: The REACH Case. *Journal of Astronomical Instrumentation*, 11(1):2250001–2058, January 2022.
- [35] Metha Prathaban and **Will Handley**. Rescuing palindromic universes with improved recombination modeling. *PRD*, 105(12):123508, June 2022.
- [36] Aleksandr Petrosyan and **William James Handley**. SuperNest: accelerated nested sampling applied to astrophysics and cosmology. *arXiv*, 2212.01760, December 2022.
- [37] A. N. Lasenby, **W. J. Handley**, D. J. Bartlett, and C. S. Negreanu. Perturbations and the future conformal boundary. *PRD*, 105(8):083514, April 2022.
- [38] L. T. Hergt, F. J. Agocs, **W. J. Handley**, M. P. Hobson, and A. N. Lasenby. Finite inflation in curved space. *PRD*, 106(6):063529, September 2022.
- [39] T. Gessey-Jones, N. S. Sartorio, A. Fialkov, G. M. Mirouh, M. Magg, R. G. Izzard, E. de Lera Acedo, **W. J. Handley**, and R. Barkana. Impact of the primordial stellar initial mass function on the 21-cm signal. *MNRAS*, 516(1):841–860, October 2022.
- [40] Gambit Collaboration and et al. Simple and statistically sound recommendations for analysing physical theories. *Reports on Progress in Physics*, 85(5):052201, May 2022.
- [41] Andrew Fowlie, Sebastian Hoof, and **Will Handley**. Nested Sampling for Frequentist Computation: Fast Estimation of Small  $p$ -Values. *PRL*, 128(2):021801, January 2022.
- [42] Harry Bevins, **Will Handley**, Pablo Lemos, Peter Sims, Eloy de Lera Acedo, and Anastasia Fialkov. Marginal Bayesian Statistics Using Masked Autoregressive Flows and Kernel Density Estimators with Examples in Cosmology. *arXiv*, 2207.11457, July 2022.
- [43] H. T. J. Bevins, A. Fialkov, E. de Lera Acedo, **W. J. Handley**, S. Singh, R. Subrahmanyan, and R. Barkana. Astrophysical constraints from the SARAS 3 non-detection of the cosmic dawn sky-averaged 21-cm signal. *Nature Astronomy*, 6:1473–1483, December 2022.
- [44] H. T. J. Bevins, E. de Lera Acedo, A. Fialkov, **W. J. Handley**, S. Singh, R. Subrahmanyan, and R. Barkana. A comprehensive Bayesian reanalysis of the SARAS2 data from the epoch of reionization. *MNRAS*, 513(3):4507–4526, July 2022.
- [45] D. J. Bartlett, **W. J. Handley**, and A. N. Lasenby. Improved cosmological fits with quantized primordial power spectra. *PRD*, 105(8):083515, April 2022.
- [46] Csaba Balázs, Sanjay Bloor, Tomás E. Gonzalo, **Will Handley**, Sebastian Hoof, Felix Kahlhoefer, Marie Lecroq, David J. E. Marsh, Janina J. Renk, Pat Scott, and Patrick Stöcker. Cosmological constraints on decaying axion-like particles: a global analysis. *JCAP*, 2022(12):027, December 2022.
- [47] Greg Ashton, Noam Bernstein, Johannes Buchner, Xi Chen, Gábor Csányi, Andrew Fowlie, Farhan Feroz, Matthew Griffiths, **Will Handley**, Michael Habeck, Edward Higson, Michael Hobson, Anthony Lasenby, David Parkinson, Livia B. Pártay, Matthew Pitkin, Doris Schneider, Joshua S. Speagle, Leah South, John Veitch, Philipp Wacker, David J. Wales, and David Yallup. Nested sampling for physical scientists. *Nature Reviews Methods Primers*, 2:39, May 2022.
- [48] Dominic Anstey, John Cumner, Eloy de Lera Acedo, and **Will Handley**. Informing antenna design for sky-averaged 21-cm experiments using a simulated Bayesian data analysis pipeline. *MNRAS*, 509(4):4679–4693, February 2022.
- [49] Ayngaran Thavanesan, Denis Werth, and **Will Handley**. Analytical approximations for curved primordial power spectra. *PRD*, 103(2):023519, January 2021.
- [50] Emma Shen, Dominic Anstey, Eloy de Lera Acedo, Anastasia Fialkov, and **Will Handley**. Quantifying ionospheric effects on global 21-cm observations. *MNRAS*, 503(1):344–353, May 2021.
- [51] I. L. V. Roque, **W. J. Handley**, and N. Razavi-Ghods. Bayesian noise wave calibration for 21-cm global experiments. *MNRAS*, 505(2):2638–2646, August 2021.
- [52] B. Joachimi, F. Köhlinger, **W. Handley**, and P. Lemos. When tension is just a fluctuation. How noisy data affect model comparison. *A&A*, 647:L5, March 2021.
- [53] L. T. Hergt, **W. J. Handley**, M. P. Hobson, and A. N. Lasenby. Bayesian evidence for the tensor-to-scalar ratio  $r$  and neutrino masses  $m_\nu$ : Effects of uniform versus logarithmic priors. *PRD*, 103(12):123511, June 2021.
- [54] **Will Handley** and Pablo Lemos. Quantifying the global parameter tensions between ACT, SPT, and Planck. *PRD*, 103(6):063529, March 2021.
- [55] **Will Handley**. Curvature tension: Evidence for a closed universe. *PRD*, 103(4):L041301, February 2021.

- [56] W. I. J. Haddadin and **W. J. Handley**. Rapid numerical solutions for the Mukhanov-Sasaki equation. *PRD*, 103(12):123513, June 2021.
- [57] T. Gessey-Jones and **W. J. Handley**. Constraining quantum initial conditions before inflation. *PRD*, 104(6):063532, September 2021.
- [58] Gambit Cosmology Workgroup. Strengthening the bound on the mass of the lightest neutrino with terrestrial and cosmological experiments. *PRD*, 103(12):123508, June 2021.
- [59] Gambit Cosmology Workgroup. CosmoBit: a GAMBIT module for computing cosmological observables and likelihoods. *JCAP*, 2021(2):022, February 2021.
- [60] Gambit Collaboration. Thermal WIMPs and the scale of new physics: global fits of Dirac dark matter effective field theories. *European Physical Journal C*, 81(11):992, November 2021.
- [61] Andrew Fowlie, **Will Handley**, and Liangliang Su. Nested sampling with plateaus. *MNRAS*, 503(1):1199–1205, May 2021.
- [62] DarkMachines High Dimensional Sampling Group. A comparison of optimisation algorithms for high-dimensional particle and astrophysics applications. *Journal of High Energy Physics*, 2021(5):108, May 2021.
- [63] Ethan Carragher, **Will Handley**, Daniel Murnane, Peter Stangl, Wei Su, Martin White, and Anthony G. Williams. Convergent Bayesian global fits of 4D composite Higgs models. *Journal of High Energy Physics*, 2021(5):237, May 2021.
- [64] 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 reionization. *MNRAS*, 508(2):2923–2936, December 2021.
- [65] H. T. J. Bevins, **W. J. Handley**, A. Fialkov, E. de Lera Acedo, L. J. Greenhill, and D. C. Price. MAXSMOOTH: rapid maximally smooth function fitting with applications in Global 21-cm cosmology. *MNRAS*, 502(3):4405–4425, April 2021.
- [66] W. E. V. Barker, A. N. Lasenby, M. P. Hobson, and **W. J. Handley**. Nonlinear Hamiltonian analysis of new quadratic torsion theories: Cases with curvature-free constraints. *PRD*, 104(8):084036, October 2021.
- [67] Dominic Anstey, Eloy de Lera Acedo, and **Will Handley**. A general Bayesian framework for foreground modelling and chromaticity correction for global 21 cm experiments. *MNRAS*, 506(2):2041–2058, September 2021.
- [68] Justin Alsing and **Will Handley**. Nested sampling with any prior you like. *MNRAS*, 505(1):L95–L99, July 2021.
- [69] E. Ahrer, D. Queloz, V. M. Rajpaul, D. Ségransan, F. Bouchy, R. Hall, **W. Handley**, C. Lovis, M. Mayor, A. Mortier, F. Pepe, S. Thompson, S. Udry, and N. Unger. The HARPS search for southern extra-solar planets - XLV. Two Neptune mass planets orbiting HD 13808: a study of stellar activity modelling’s impact on planet detection. *MNRAS*, 503(1):1248–1263, May 2021.
- [70] F. Lienhard, D. Queloz, M. Gillon, A. Burdanov, L. Delrez, E. Ducrot, **W. Handley**, E. Jehin, C. A. Murray, A. H. M. J. Triaud, E. Gillen, A. Mortier, and B. V. Rackham. Global analysis of the TRAPPIST Ultra-Cool Dwarf Transit Survey. *MNRAS*, 497(3):3790–3808, September 2020.
- [71] Pablo Lemos, Fabian Köhlinger, **Will Handley**, Benjamin Joachimi, Lorne Whiteway, and Ofer Lahav. Quantifying Suspiciousness within correlated data sets. *MNRAS*, 496(4):4647–4653, August 2020.
- [72] Kamran Javid, **Will Handley**, Mike Hobson, and Anthony Lasenby. Compromise-free Bayesian neural networks. *arXiv*, 2004.12211, April 2020.
- [73] Andrew Fowlie, **Will Handley**, and Liangliang Su. Nested sampling cross-checks using order statistics. *MNRAS*, 497(4):5256–5263, October 2020.
- [74] W. E. V. Barker, A. N. Lasenby, M. P. Hobson, and **W. J. Handley**. Systematic study of background cosmology in unitary Poincaré gauge theories with application to emergent dark radiation and  $H_0$  tension. *PRD*, 102(2):024048, July 2020.
- [75] W. E. V. Barker, A. N. Lasenby, M. P. Hobson, and **W. J. Handley**. Mapping Poincaré gauge cosmology to Horndeski theory for emergent dark energy. *PRD*, 102(8):084002, October 2020.
- [76] W. E. V. Barker, A. N. Lasenby, M. P. Hobson, and **W. J. Handley**. Addressing  $H_0$  tension with emergent dark radiation in unitary gravity. *arXiv*, 2003.02690, March 2020.
- [77] Jamie Bamber and **Will Handley**. Beyond the Runge-Kutta-Wentzel-Kramers-Brillouin method. *PRD*, 101(4):043517, February 2020.
- [78] F. J. Agocs, M. P. Hobson, **W. J. Handley**, and A. N. Lasenby. Dense output for highly oscillatory numerical solutions. *arXiv*, 2007.05013, July 2020.
- [79] F. J. Agocs, L. T. Hergt, **W. J. Handley**, A. N. Lasenby, and M. P. Hobson. Quantum initial conditions for inflation and canonical invariance. *PRD*, 102(2):023507, July 2020.
- [80] F. J. Agocs, **W. J. Handley**, A. N. Lasenby, and M. P. Hobson. Efficient method for solving highly oscillatory ordinary differential equations with applications to physical systems. *Physical Review Research*, 2(1):013030, January 2020.
- [81] James S. Spencer, Nick S. Blunt, Seonghoon Choi, Jiri Etrych, Maria-Andreea Filip, W. M. C. Foulkes, Ruth S. T. Franklin, **Will J. Handley**, Fionn D. Malone, Verena A. Neufeld, Roberto Di Remigio, Thomas W. Rogers, Charles J. C. Scott, James J. Shepherd, William A. Vigor, Joseph Weston, RuQing Xu, and Alex J. W. Thom. The HANDE-QMC project: open-source stochastic quantum chemistry from the ground state up. *Journal of Chemical Theory and Computation*, 15(3):1728–1742, January 2019.
- [82] Edward Higson, **Will Handley**, Mike Hobson, and Anthony Lasenby. Dynamic nested sampling: an improved algorithm for parameter estimation and evidence calculation. *Statistics and Computing*, 29(5):891–913, September 2019.

- [83] Edward Higson, **Will Handley**, Michael Hobson, and Anthony Lasenby. NESTCHECK: diagnostic tests for nested sampling calculations. *MNRAS*, 483(2):2044–2056, February 2019.
- [84] Edward Higson, **Will Handley**, Michael Hobson, and Anthony Lasenby. Bayesian sparse reconstruction: a brute-force approach to astronomical imaging and machine learning. *MNRAS*, 483(4):4828–4846, March 2019.
- [85] L. T. Hergt, **W. J. Handley**, M. P. Hobson, and A. N. Lasenby. Constraining the kinetically dominated universe. *PRD*, 100(2):023501, July 2019.
- [86] L. T. Hergt, **W. J. Handley**, M. P. Hobson, and A. N. Lasenby. Case for kinetically dominated initial conditions for inflation. *PRD*, 100(2):023502, July 2019.
- [87] **Will J. Handley**, Anthony N. Lasenby, Hiranya V. Peiris, and Michael P. Hobson. Bayesian inflationary reconstructions from Planck 2018 data. *PRD*, 100(10):103511, November 2019.
- [88] **Will Handley** and Marius Millea. Maximum-Entropy Priors with Derived Parameters in a Specified Distribution. *Entropy*, 21(3):272, March 2019.
- [89] **Will Handley** and Pablo Lemos. Quantifying tensions in cosmological parameters: Interpreting the DES evidence ratio. *PRD*, 100(4):043504, August 2019.
- [90] **Will Handley** and Pablo Lemos. Quantifying dimensionality: Bayesian cosmological model complexities. *PRD*, 100(2):023512, July 2019.
- [91] **Will Handley**, Anthony Lasenby, and Mike Hobson. Logolinear series expansions with applications to primordial cosmology. *PRD*, 99(12):123512, June 2019.
- [92] **Will Handley**. Primordial power spectra for curved inflating universes. *PRD*, 100(12):123517, July 2019.
- [93] **Will Handley**. anesthetic: nested sampling visualisation. *JOSS*, 4:1414, May 2019.
- [94] W. E. V. Barker, A. N. Lasenby, M. P. Hobson, and **W. J. Handley**. Static energetics in gravity. *JMAP*, 60(5):052504, May 2019.
- [95] Edward Higson, **Will Handley**, Mike Hobson, and Anthony Lasenby. Sampling Errors in Nested Sampling Parameter Estimation. *Bayesian Analysis*, 13(3):873–896, March 2018.
- [96] **Will Handley**. fgivex: A Python package for functional posterior plotting. *JOSS*, 3(28):849, August 2018.
- [97] Richard D. Hall, Samantha J. Thompson, **Will Handley**, and Didier Queloz. On the Feasibility of Intense Radial Velocity Surveys for Earth-Twin Discoveries. *MNRAS*, 479(3):2968–2987, September 2018.
- [98] A. J. K. Chua, S. Hee, **W. J. Handley**, E. Higson, C. J. Moore, J. R. Gair, M. P. Hobson, and A. N. Lasenby. Towards a framework for testing general relativity with extreme-mass-ratio-inspiral observations. *MNRAS*, 478(1):28–40, July 2018.
- [99] Gong-Bo Zhao, Marco Raveri, Levon Pogossian, Yuting Wang, Robert G. Crittenden, **Will J. Handley**, and et al. Dynamical dark energy in light of the latest observations. *Nature Astronomy*, 1:627–632, August 2017.
- [100] S. Hee, J. A. Vázquez, **W. J. Handley**, M. P. Hobson, and A. N. Lasenby. Constraining the dark energy equation of state using Bayes theorem and the Kullback-Leibler divergence. *MNRAS*, 466(1):369–377, April 2017.
- [101] Clare Rumsey, Malak Olamaie, Yvette C. Perrott, Helen R. Russell, Farhan Feroz, Keith J. B. Grainge, **Will J. Handley**, Michael P. Hobson, Richard D. E. Saunders, and Michel P. Schammel. AMI observations of 10 CLASH galaxy clusters: SZ and X-ray data used together to determine cluster dynamical states. *MNRAS*, 460(1):569–589, July 2016.
- [102] S. Hee, **W. J. Handley**, M. P. Hobson, and A. N. Lasenby. Bayesian model selection without evidences: application to the dark energy equation-of-state. *MNRAS*, 455(3):2461–2473, January 2016.
- [103] **W. J. Handley**, A. N. Lasenby, and M. P. Hobson. The Runge-Kutta-Wentzel-Kramers-Brillouin Method. *arXiv*, 1612.02288, December 2016.
- [104] **W. J. Handley**, A. N. Lasenby, and M. P. Hobson. Novel quantum initial conditions for inflation. *PRD*, 94(2):024041, July 2016.
- [105] **W. J. Handley**, M. P. Hobson, and A. N. Lasenby. POLYCHORD: next-generation nested sampling. *MNRAS*, 453(4):4384–4398, November 2015.
- [106] **W. J. Handley**, M. P. Hobson, and A. N. Lasenby. polychord: nested sampling for cosmology. *MNRAS*, 450:L61–L65, June 2015.
- [107] **W. J. Handley**, S. D. Brechet, A. N. Lasenby, and M. P. Hobson. Kinetic initial conditions for inflation. *PRD*, 89(6):063505, March 2014.

## CORE Collaboration

- [108] Exploring cosmic origins with CORE: The instrument. *JCAP*, 2018(4):015, April 2018.
- [109] Exploring cosmic origins with CORE: Survey requirements and mission design. *JCAP*, 2018(4):014, April 2018.
- [110] Exploring cosmic origins with CORE: Mitigation of systematic effects. *JCAP*, 2018(4):022, April 2018.
- [111] Exploring cosmic origins with CORE: Inflation. *JCAP*, 2018(4):016, April 2018.
- [112] Exploring cosmic origins with CORE: Gravitational lensing of the CMB. *JCAP*, 2018(4):018, April 2018.
- [113] Exploring cosmic origins with CORE: Extragalactic sources in cosmic microwave background maps. *JCAP*, 2018(4):020, April 2018.
- [114] Exploring cosmic origins with CORE: Effects of observer peculiar motion. *JCAP*, 2018(4):021, April 2018.
- [115] Exploring cosmic origins with CORE: Cosmological parameters. *JCAP*, 2018(4):017, April 2018.
- [116] Exploring cosmic origins with CORE: Cluster science. *JCAP*, 2018(4):019, April 2018.
- [117] Exploring cosmic origins with CORE: B-mode component separation. *JCAP*, 2018(4):023, April 2018.

## Planck Collaboration

- [118] Planck intermediate results. LVII. Joint Planck LFI and HFI data processing. *A&A*, 643:A42, November 2020.
- [119] Planck intermediate results. LVI. Detection of the CMB dipole through modulation of the thermal Sunyaev-Zeldovich effect: Eppur si muove II. *A&A*, 644:A100, December 2020.

- [120] Planck intermediate results. LV. Reliability and thermal properties of high-frequency sources in the Second Planck Catalogue of Compact Sources. *A&A*, 644:A99, December 2020.
- [121] Planck 2018 results. XII. Galactic astrophysics using polarized dust emission. *A&A*, 641:A12, September 2020.
- [122] Planck 2018 results. XI. Polarized dust foregrounds. *A&A*, 641:A11, September 2020.
- [123] Planck 2018 results. X. Constraints on inflation. *A&A*, 641:A10, September 2020.
- [124] Planck 2018 results. VIII. Gravitational lensing. *A&A*, 641:A8, September 2020.
- [125] Planck 2018 results. VII. Isotropy and statistics of the CMB. *A&A*, 641:A7, September 2020.
- [126] Planck 2018 results. VI. Cosmological parameters. *A&A*, 641:A6, September 2020.
- [127] Planck 2018 results. V. CMB power spectra and likelihoods. *A&A*, 641:A5, September 2020.
- [128] Planck 2018 results. IX. Constraints on primordial non-Gaussianity. *A&A*, 641:A9, September 2020.
- [129] Planck 2018 results. IV. Diffuse component separation. *A&A*, 641:A4, September 2020.
- [130] Planck 2018 results. III. High Frequency Instrument data processing and frequency maps. *A&A*, 641:A3, September 2020.
- [131] Planck 2018 results. II. Low Frequency Instrument data processing. *A&A*, 641:A2, September 2020.
- [132] Planck 2018 results. I. Overview and the cosmological legacy of Planck. *A&A*, 641:A1, September 2020.
- [133] Planck intermediate results. LIV. The Planck multi-frequency catalogue of non-thermal sources. *A&A*, 619:A94, November 2018.
- [134] Planck intermediate results. LIII. Detection of velocity dispersion from the kinetic Sunyaev-Zeldovich effect. *A&A*, 617:A48, September 2018.
- [135] Planck 2015 results. XX. Constraints on inflation. *A&A*, 594:A20, September 2016.
- [136] Planck 2015 results. I. Overview of products and scientific results. *A&A*, 594:A1, September 2016.