Thomas Binnie

LinkedIn : www.linkedin.com/in/thomas-binnie-10410a94

Git repository : www.bitbucket.org/binnietom/

t.binnie16@imperial.ac.uk

(+44) 7549855776

BIOGRAPHIC

Date of Birth: 19th October 1992   *citizenship:* British, Australian

RESEARCH INTERESTS

Cosmology, Astrostatistics, Reionization theory, high redshift observations (the cosmological 21cm line, and (IR/UV) galactic luminosity functions at different frequencies), Astroparticle physics.

RESEARCH EXPERIENCE

Imperial College, London, UK   October 2016 - *present*
Ph.D. researcher in theoretical astrophysics.
• Applying Bayesian model selection to the Epoch of Reionisation with up and coming high redshift observations. Supervisor: Dr. Jonathan Pritchard.

OPMD, Oxford, UK   October 2015 - June 2016
MPhys project, Masters research in experimental particle physics. Testing prototype tracking calorimeter pixels (HV/HR-CMOS) for ATLAS at the LHC. Supervisor: Prof. Daniela Bortoletto.

University of Oxford   June - July 2014
Cosmology intern, 3rd year summer project using Planck data to fit the frequency dependence of CMB absorption by galactic dust. Supervisor: Prof. Jo Dunkley.

EDUCATION

Imperial College   October 2016 - Expected August 2020
Research Ph.D. in Astrophysics.

University of Oxford, St Edmund Hall   October 2012 - June 2016
Master in Physics *MPhys* 2.1. Module options: astrophysics, particle physics.

EF, Beijing   January- June 2012
One semester in conversational Mandarin.

SKILLS

Coding Languages :   Python, C, C++ (intermediate in IDL, Fortran90, ROOT).

Courses Attended :   Yandex Machine Learning Data analysis school (Imperial 2018), ICIC Data analysis school (Imperial 2016), Lab Laser Safety Training (Oxford University 2015).

General :   MCMC, Model selection statistics, Data Analysis, Data Structure, Big Data, Algorithms, Object Oriented Programming, Machine Learning & Neural Network programming.

TEACHING

Imperial College - *Tutorial Assistant*   October 2016 - 2019
Supervised tutorial classes and marked problems for 2nd year undergraduate courses in electromagnetism, thermodynamics, statistics and article writing.

ICIC - *Course demonstrator*   September 2018
Covered Bayesian statistics and MCMC methods in cosmology.

Pegasus, London - *Private tutoring*   October 2016 - *present*
www.pegasustutors.co.uk/tutors/tom

University of Oxford - *Teaching research*   October 2013 - 2014
Misconceptions in the Learning of Science: 'The Effects of Gravity in Space. Data was taken by quizzing 9 to 18-year-olds at Cheney School.

SCIENCE OUTREACH	**Imperial Planetarium**	October 2017 - *present*

Organising shows at state schools in London, Imperial's Science festival and the Science Museum Night Owls (events for autistic children). Astrophysics PhD students voluntarily put on planetarium shows (for 10 to 17-year-olds) in an attempt to inspire them into Science and Maths at University.

Science Museum Lates, London   October 2018 - *present*
Dark Matter Multi-Sensory Experience - A collaboration between Prof. R. Trotta (Imperial Astrophysics) and Prof. M. Obrist (Sussex Computer Human Interaction Lab). www.greatexhibitionroadfestival.co.uk/event/multisensory-dark-matter-experience/

Imperial Lates   December 5th 2019
Temperature fluctuations in the early Universe with Planck's Infra-red imaging.

Pint of Science, London   25th May 2019
Public science festival held in pubs across the UK. Talk title: *'A brief history of our universe'*.

Royal Observatory Greenwich, London   26th February 2019
Think Space - public lecture and podcast entitled: 'Observing the cosmic dawn with radio waves'.

Royal Albert Hall, London   June-July 2018
The Sound of Space - Visited state schools in London to talk about the connections of physics and music.

New Scientist Live, The Excel, London   28th September - 1st October 2017
Public science festival, voluntarily helped run the SKA organisation stand.

COLLOQIUA

University of Melbourne, Australia   26th June 2019
Swinburne University of Technology, Melbourne   27th June 2019
Presented *'How feasibly can we distinguish EoR models with up and coming experiments?'* and hosted discussions afterwards.

Royal Astronomical Society, London   29th November 2018
Presented *'The Feasibility of EoR model selection with up and coming Interferometric Experiments'* at the Λ-CDM meeting.

Imperial College   7th February 2019
Hosted *London-21cm*, a journal club for London and nearby based EoR researchers.

CONFERENCES

The University of Amsterdam,   1st - 4th December 2020
"The Morlet power spectrum in 21cm parameter estimation". Talk on the epoch of reionization and the cosmic dawn at *'Science at Low Frequency VII'*.

University of Cambridge, UK   19th - 22nd October 2020
"Bayesian model selection". Talk on special methods for EoR science at the *'3rd 21-cm Global Workshop'*.

Sexten Centre for Astrophysics, Italy   27th - 31st January 2020
"Bayesian model selection in the EoR". Invited to talk on statistics and inference at *'Next-Generation Cosmology with Next-Generation Radio Telescopes: II'* .

University of Queensland, Brisbane, Australia   8th - 12th July 2019
Poster presentation for the *ASA Annual Scientific Meeting*.

Fitzroy Island, Cairns, Australia   15-19 July 2019
Poster at *'Barefoot EoR: Exploring The First Billion Years of the Universe'*.

Strasbourg University, France   18th - 22nd Jun 2018.
Attended *Rise and Shine: galaxies in the epoch of reionization*.

Alan Turing Institute, London   17th - 18th September 2018
Attended *AI at CERN and SKA*.

PUBLICATIONS   S. Murray, **T. Binnie**, B. Greig, C. Trott 'Constraining EoR Astrophysics Using Wide-Band Observations: 21cMMC With Wavelets.' (in prep)

S. C. Hotinli, **T. Binnie**, M. Kamionkowski, B. R. Dinda, & J. B. Muñoz, 'Probing Compensated Iso-curvature Fluctuations in the Cosmic-Dawn with the 21cm Power-Spectrum' (draft available)

T.Binnie, J. R. Pritchard, & B. Greig, 'Can Bayesian Model Selection Distinguish the Number of Astrophysical Epoch of Reionisation Parameters?' (draft available)

T. Binnie & J. R. Pritchard, 'Bayesian Model Selection with Future 21cm Observations of the Epoch of Reionization' MNRAS 487, 1160 (2019). [https://arxiv.org/abs/1903.09064v2]

EXTRA   • Fellow of the Royal Astronomical Society *FRAS* • Member of the 21cMFast organisation https://github.com/21cmfast • SKA enthusiast • Diploma in classical saxophone *dip.ABRSM* • BE at Tonbridge School, Linguistic summer school teacher for 8-10 year olds from Shanghai, (2014).

ACADEMIC REFERENCES   **Jonathan Pritchard**,
Reader in Astrostatistics,
Imperial College,
Astrophysics Group,
Blackett Laboratory,
Prince Consort Road,
London,
SW7 2AZ,
UK,
Tel: +44 (0)207 594 7557,
email: j.pritchard@imperial.ac.uk

Bradley Greig,
ASTRO 3d - Postdoc Research Fellow,
University of Melbourne,
03, 361,
David Caro Building (Physics),
Parkville,
Melbourne,
Victoria 3010,
Australia,
email: greigb@unimelb.edu.au

Alan Heavens,
Director, Imperial Centre for Inference and Cosmology,
Professor of Astrophysics,
Imperial College,
Astrophysics Group,
Blackett Laboratory,
Prince Consort Road,
London,
SW7 2AZ,
UK,
Tel: +44 (0)20 7594 2930,
email: a.heavens@imperial.ac.uk