

# KATHERINE J. MACK

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## PRIMARY RESEARCH AREAS

Dark matter; astroparticle physics; high-redshift 21-cm astronomy; early-universe cosmology

## EDUCATION AND CAREER

<b>University of Melbourne</b> , Astronomy Group, School of Physics	2015 –
CAASTRO-CoEPP Postdoc Research Fellowship, Theoretical Cosmology (Level B)	
<b>University of Melbourne</b> , Astronomy Group, School of Physics	2012 –
ARC Discovery Early Career Researcher Award (Postdoctoral Fellowship)	
<b>University of Cambridge</b> , Kavli Inst. for Cosmology/Inst. of Astronomy	2009 – 2012
STFC Postdoctoral Fellowship	
<b>Princeton University</b> , Ph.D., Astrophysical Sciences	Sept 2009
<b>California Institute of Technology</b> , B.S., Physics	June 2003

## GRANTS AND SCHOLARSHIPS

ARC Discovery Early Career Researcher Award	2012 –
A\$375,000; University of Melbourne	
STFC Postdoctoral Fellowship	2009 – 2012
£226,726; University of Cambridge	
National Science Foundation Graduate Research Fellowship	2005 – 2008
Full stipend, 3 years; Princeton University	
Caltech Merit Scholarship	1999 – 2003
Full tuition, 4 years; California Institute of Technology	

## REFEREED PUBLICATIONS

386 total citations; average 30 citations per paper

- Holwerda, B.W., Keel, W.C., Kenworthy, M.A & **Mack, K.J.** (2015) The dependence of the AV prior for SN Ia on host mass and disc inclination. *Monthly Notices of the Royal Astronomical Society*, **451**, 2390. [arxiv:1505.03949]
- Koopmans, L.V.E. & 43 authors including **Mack, K.J.** (2014) The Cosmic Dawn and Epoch of Reionization with the Square Kilometre Array. *Proceedings of Science*, **AASKA14**, 001. In press. [arXiv: 1505.07568]
- Schon, S., **Mack, K.J.**, Avram, C., Wyithe, J.S.B., & Barberio, E. (2014) Dark Matter Annihilation in the First Galaxy Halos. *Monthly Notices of the Royal Astronomical Society*, **451**, 2840. [arxiv:1411.3783]
- Ciardi, B., Inoue, S., **Mack, K.J.**, Xu, Y. & Bernardi, G. (2014) 21cm Forest with the SKA. *Proceedings of Science*, **AASKA14**, 006. In press. [arXiv:1501.04425]
- **Mack, K.J.** (2014) Known Unknowns of Dark Matter Annihilation Over Cosmic Time. *Monthly Notices of the Royal Astronomical Society*, **439**, 2728. [arXiv:1309.7783]
- **Mack, K.J.** & Wyithe, J.S.B. (2012) Detecting the redshifted 21cm forest during reionization. *Monthly Notices of the Royal Astronomical Society* **425**, 2988. [arXiv:1101.5431]

- **Mack, K.J.** (2011) Axions, inflation, and the anthropic principle. *The Journal of Cosmology and Astroparticle Physics* **1107**, 021. [arXiv:0911.0421]
- **Mack, K.J.** & Steinhardt, P.J. (2011) Cosmological problems with multiple axion-like fields. *The Journal of Cosmology and Astroparticle Physics* **1105**, 001. [arXiv:0911.0418]
- Ricotti, M., Ostriker, J.P. & **Mack, K.J.** (2008) Effect of primordial black holes on the cosmic microwave background and cosmological parameter estimates. *The Astrophysical Journal* **680**, 829. [arXiv:0709.0524]
- **Mack, K.J.**, Wesley, D.H. & King, L.J. (2007) Observing cosmic string loops with gravitational lensing surveys. *Physical Review D* **76**, 123515. [arXiv:astro-ph/0702648]
- **Mack, K.J.**, Ostriker, J.P. & Ricotti, M. (2007) Growth of structure seeded by primordial black holes. *The Astrophysical Journal* **665**, 1277. [arXiv:astro-ph/0608642]
- Efstathiou, G. & **Mack, K.J.** (2005) The Lyth Bound revisited. *Journal of Cosmology and Astroparticle Physics* **0505**, 008. [arXiv:astro-ph/0503360]
- Oh, S.P. & **Mack, K.J.** (2003) Foregrounds for 21cm observations of neutral gas at high redshift. *Monthly Notices of the Royal Astronomical Society* **346**, 871. [arXiv:astro-ph/0302099]

#### PREPRINTS

- **Mack, K.J.** & Wesley, D.H. (2008) Primordial black holes in the Dark Ages: Observational prospects for future 21cm surveys. [arXiv:0805.1531]

#### LEADERSHIP

- Chair: Australian Supercomputer Time Allocation Committee (2014)
- Executive: Australian Astronomy Decadal Plan Working Group on High-Energy and Fundamental Astrophysics (2013-2014)
- Steering Committee: ASA Inclusion, Diversity, and Equity in Astronomy group (2015-present)
- Charter Member: Stawell Underground Physics Laboratory Collaboration (for SABRE dark matter detector project)
- Research Team Co-Investigator and Media and Outreach Director for SkyHopper Infrared Space Telescope CubeSat project (University of Melbourne; *proposed*)

#### PROFESSIONAL ACTIVITIES

- Member, SKA Epoch of Reionization Working Group; SKA Cosmology Working Group; Science Case Contributor
- Organization for *CAASTRO Dark Theme Workshop “Diving Into the Dark”* (2016), *ASA Women in Astronomy workshop* (2016), *Asia-Pacific Symposium on Cosmology and Particle Astrophysics* (2014), *CAASTRO/CoEPP Workshop* (2014), *Azores School on Observational Cosmology* (2011), *Phi in the Sky: The Quest for Cosmological Scalar Fields* (2004)
- Referee, *Journal of Cosmology and Astroparticle Physics*, *Astrophysical Journal*, *Monthly Notices of the Royal Astronomical Society*, *Marsden Fund*, *Australian Research Council (ARC)*
- Member, *American Astronomical Society*; *Institute of Physics*; *Planetary Society*; *Astronomical Society of Australia*; *Australian National Institute for Theoretical Astrophysics (ANITA)*; *ARC Centre of Excellence for All-Sky Astrophysics (CAASTRO)*; *ARC Centre of Excellence for Particle Physics at the Terascale (CoEPP)*

**KEY BROADER IMPACTS**

- Opening liaison initiating Stawell Underground Physics Laboratory project
- Highly influential engagement via Twitter as @AstroKatie (31,000 followers)
  - Worldwide 12<sup>th</sup> most-followed astronomer; 8<sup>th</sup> most-followed physicist
  - Followed by 65% of astronomers on Twitter (ranking 3<sup>rd</sup>, above @NASA)
  - Followed by 48% of professional science writers on Twitter
  - Listed on over 1500 public Twitter lists
- 30,000 views on YouTube (via astronomy web series “Pint in the Sky” and “Conversations with an Astrophysicist”)
- 35,000 page views on blog “The Universe, In Theory”; 98,000 on Reddit AMA
- Finalist, AAAS Early Career Award for Public Engagement with Science (2014)
- Monthly radio appearances on 3RRR Radio Melbourne “Genius Squad”
- Columnist, *Cosmos Magazine*

**TEACHING AND SUPERVISING**

PHYC10008: <i>From the Solar System to the Cosmos</i> (R. Webster), Melbourne	2013, 2014
Co-Supervising: University of Melbourne PhD student Cassandra Avram	2015-
Co-Supervising: University of Melbourne PhD candidate Sarah Schon	2013-
Co-Supervising: University of Cambridge Master's student Matthew Burgess	2011-2012
E2C3 <i>Dark Side of the Universe</i> , Catalunya Caixa Youth in Science Program	2012
AST 203, <i>The Universe</i> (A. Spitkovsky), Princeton	2009
AST 105, <i>Our Place in the Universe</i> (J.P. Ostriker & A.E. Shapley), Princeton	2005

**RECENT SEMINARS, COLLOQUIA, & INVITED TALKS**

ICRAR Colloquium, University of Western Australia (December 2015)  
 UNSW School of Physics Colloquium (October 2015)  
 Swinburne CAS Colloquium (August 2015)  
 CAASTRO Melbourne Area Meeting (August 2015)  
 Astrophysics Seminar, University of Sussex (July 2015)  
 Astronomical Society of Australia Meeting (July 2015)  
 Aspen Center for Physics Colloquium (June 2015)  
 CoEPP Lunch Seminar, University of Melbourne (April 2015)  
 Cospa Cosmology Conference, University of Auckland (December 2014)  
 RSAA Colloquium, Australian National University, Australia (November 2014)  
 CAASTRO/CoEPP Joint Workshop, Great Western, Australia (September 2014)  
 Cosmology Seminar, Imperial College London (August 2014)  
 SIFA Morning Tea Talk, University of Sydney (August 2014)  
 CASS Colloquium, CSIRO Sydney (June 2014)  
 Physics Colloquium, University of Melbourne (April 2014)  
 Astronomy Seminar, UCLA (March 2014)  
 Physics Colloquium, Occidental College (March 2014)  
 Cosmos Seminar, University of Texas at Austin (March 2014)  
 Particle Theory Seminar, University of Washington (March 2014)  
 Astronomy Lunch Talk, Columbia University (March 2014)  
 ITC Lunch Seminar, Harvard Center for Astrophysics (March 2014)  
 Astrophysics Brown Bag Lunch, MIT (March 2014)  
 CoEPP Annual Workshop, Wollongong (February 2014)  
 Physics Colloquium, University of Adelaide (November 2013)  
 Astronomy Seminar, Durham University Department of Physics (September 2013)  
 Physics Colloquium, University of Auckland (August 2013)  
 Astrophysics Science Division Colloquium, Goddard Space Flight Center (July 2013)  
 TAPIR Special Seminar, California Institute of Technology (June 2013)  
 MoCA Seminar, Monash University (May 2013)  
 SKA1-Low Science Assessment Workshop (March 2013)

### **RECENT CONTRIBUTED TALKS & POSTERS**

OzSKA Meeting (April 2015)  
 CAASTRO Annual Retreat (November 2013, November 2014, November 2015)  
 Synergistic Science with Euclid and the SKA, University of Oxford (September 2013)  
 Cosmo 2013, University of Cambridge (September 2013)  
 Reionization in the Red Center workshop (July 2013)  
 Synthetic Universes for Future Surveys workshop (March 2013)  
 Australian National Institute for Theoretical Astrophysics meeting (February 2013)  
 American Astronomical Society 221st Meeting (January 2013)  
 American Astronomical Society 219th Meeting (January 2012)

### **SELECTED POPULAR ARTICLES AND PUBLIC TALKS**

- “Big Bang Machines”, joint public talk with Dr Suzie Sheehy (Oxford), Melbourne University (September 2015)
- “Astrophysicist Katie Mack Explains the Universe”, Ada’s Books, Seattle (Jan 2015)
- “A Tour of the Universe (and Selected Cosmic Mysteries)”, Imperial College London (August 2014); Swinburne University of Technology (December 2014)
- “The Dark Matter Poltergeist,” Slate (February 2014)
- “Our Place in the Universe,” A Life in Science Lecture Series, University of Auckland (August 2013)
- “Space Station’s Detector Has Not Found Dark Matter, Despite What Some Media Reports Say,” Physics Focus Blog (April 2013)
- “Are We Alone? - Science at the Edge” Exobiology panel discussion sponsored by The Age, Melbourne, Australia (April 2013)
- “Becoming an Astronaut,” *Economist* Science and Tech Blog, *Babbage*, (Sept 2012)
- “Losing Neil Armstrong,” Foundational Questions Institute Blog, (September 2012)
- “Drawn to the Dark Side: The Enigma of Dark Matter in the Universe,” Institute of Physics Lecture Series, Royal Society of *Edinburgh* (January 2011)

### **RECENT PUBLIC OUTREACH/EDUCATION INVOLVEMENT**

- Pause Festival, “How Technology is Changing Our View of the Universe” (2015)
- National Science Week “Space Oddity” show, coordinated by ScienceAlert (2014)
- LabRats Science Club (Monash Science Centre 2014)
- World Science Fiction Convention (London 2014)
- University of Melbourne Science Discovery Day 2014
- Reddit Science “Ask Me Anything” (AMA) event (April 2014)
- Online Video series: “Pint in the Sky” & “Conversations with an Astrophysicist”
- Frequent podcasts, radio, and online appearances

### **REFERENCES**

- **Professor Joss Bland-Hawthorn**, Director and ARC Laureate Fellow, Sydney Institute for Astrophysics, University of Sydney, [jbh@physics.usyd.edu.au](mailto:jbh@physics.usyd.edu.au)
- **Professor Richard Easther**, Professor and Head of Department, Department of Physics, University of Auckland, [r.easther@auckland.ac.nz](mailto:r.easther@auckland.ac.nz)
- **Professor George Efstathiou** F.R.S., Director, Kavli Institute for Cosmology, Institute of Astronomy, University of Cambridge, [gpe@ast.cam.ac.uk](mailto:gpe@ast.cam.ac.uk)
- **Professor David Spergel**, Chair, Department of Astrophysical Sciences, Princeton University, [dns@astro.princeton.edu](mailto:dns@astro.princeton.edu)
- **Professor Paul Steinhardt**, Director, Center for Theoretical Science, Princeton University, [steinh@princeton.edu](mailto:steinh@princeton.edu)
- **Professor Raymond Volkas**, Head of School of Physics, University of Melbourne, [raymondv@unimelb.edu.au](mailto:raymondv@unimelb.edu.au)
- **Professor Stuart Wyithe**, ARC Laureate Fellow, School of Physics, University of Melbourne, [swyithe@physics.unimelb.edu.au](mailto:swyithe@physics.unimelb.edu.au)