

# Duncan Joseph Watts

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## EMPLOYMENT:

2018–Present:  
Assistant Research Scientist  
Johns Hopkins University  
*Supervisors:* Tobias A. Marriage and Charles L. Bennett  
*Projects:* Data analysis for the CLASS experiment and quantifying cosmological discordances

## EDUCATION:

Johns Hopkins University  
2012–2018, Ph.D. Physics and Astronomy  
*Advisor:* Tobias A. Marriage  
*Thesis:* Methods and Projections for Joint Foreground and  
Cosmological Parameter Estimation for the CLASS Experiment  
2012–2014, M.A. Physics and Astronomy

Harvard University  
2008–2012, A.B. Departmental Honors, Physics and Astronomy  
*Advisor:* Douglas P. Finkbeiner  
*Thesis:* An Investigation of Gamma-Rays in the Galactic Center

## TEACHING AND OUTREACH

2012–2018, Volunteer, JHU Physics and Astronomy Graduate Student Public Outreach Group  
2013–2016, Maryland Space Grant Observatory Fellowship  
Fall 2016, Teaching Assistant/Lecturer, Graduate Cosmology  
Fall 2012, Teaching Assistant, Introductory Physics Recitation and Laboratory

## COLLABORATIONS:

2013–, The Cosmology Large Angular Scale Surveyor (CLASS) Collaboration

## CONFERENCE PRESENTATIONS AND TALKS

1. CMB-S4 Workshop, *Projected Constraints on Optical Depth to Reionization and Neutrino Mass from the CLASS Experiment*, August 2017
2. Great Lakes Cosmology Workshop, *Measuring CMB B-mode Polarization with Galactic Foregrounds on a Cut Sky*, June 2016
3. AAS Winter Meeting *Galactic foreground cleaning in support of a primordial CMB B-mode measurement*, January 2014

## ADVISING AND MENTORING

1. Keyi Chen (Undergraduate, Fall 2019–Present)
2. Rui Shi (Graduate, Fall 2019–Present)
3. Yunyang Wang (Graduate, Fall 2018–Present)
4. Mario Aguilar (Graduate, Fall 2018–Fall 2019)
5. Bingjie Wang (Graduate, Fall 2016–Spring 2019)
6. Keisuke Osumi (Graduate, Fall 2015–Spring 2018)
7. Yajing Huang (Graduate, Fall 2014–Spring 2016)

MAIN-AUTHOR PUBLICATIONS:

1. **Watts, D. J.**, Addison, G. A., Bennett, C. L. and Weiland, J. L., 2019, *Beyond optical depth: Future determination of ionization history from the CMB*, ApJ (in press), arXiv:1910.00590
2. **Watts, D. J.**, Wang, B., Ali, A. et al., 2018, *A Projected Estimate of the Reionization Optical Depth Using the CLASS Experiment's Sample Variance Limited E-mode Measurement*, ApJ, 863, 121
3. **Watts, D. J.**, Larson, D., Marriage, T. A. et al., 2015, *Measuring the Largest Angular Scale CMB B-mode Polarization with Galactic Foregrounds on a Cut Sky*, ApJ, 814, 103
4. Weiland, J. L., Osumi, K., Addison, G. E., Bennett, C. L., **Watts, D. J.**, Halpern, M. and Hinshaw, G., 2018, *Effect of Template Uncertainties on the WMAP and Planck Measures of the Optical Depth Due to Reionization*, ApJ, 863, 161
5. Addison, G. E., **Watts, D. J.**, Bennett, C. L., Halpern, M., Hinshaw, G. and Weiland, J. L., 2018, *Elucidating  $\Lambda$ CDM: Impact of Baryon Acoustic Oscillation Measurements on the Hubble Constant Discrepancy*, ApJ, 853, 119
6. Switzer, E. R. and **Watts, D. J.**, 2016, *Robust likelihoods for inflationary gravitational waves from maps of cosmic microwave background polarization*, Phys. Rev. D, 94, 063526
7. Addison, G. E., Huang, Y., **Watts, D. J.**, Bennett, C. L., Halpern, M., Hinshaw, G. and Weiland, J. L., 2016, *Quantifying Discordance in the 2015 Planck CMB Spectrum*, ApJ, 818, 132

ADDITIONAL REFEREED PUBLICATIONS:

8. Xu, Z., Brewer, M. K., Fluxa, P. et al., 2019, *Two-year Cosmology Large Angular Scale Surveyor (CLASS) Observations: 40 GHz Telescope Pointing, Beam Profile, Window Function, and Polarization Performance*, ApJ (in review), arXiv:1911.04499
9. Petroff, M. A., Eimer, J. R., Harrington, K. et al., 2019, *Two-year Cosmology Large Angular Scale Surveyor (CLASS) Observations: A First Detection of Atmospheric Circular Polarization at Q Band*, ApJ (in press), arXiv:1911.01016
10. Padilla, I. L., Eimer, J. R., Li, Y. et al., 2019, *Two-year Cosmology Large Angular Scale Surveyor (CLASS) Observations: A Measurement of Circular Polarization at 40 GHz*, ApJ (in press), arXiv:1911.00391
11. Appel, J. W., Xu, Z., Padilla, I. L. et al., 2019, *On-sky Performance of the CLASS Q-band Telescope*, ApJ, 876, 126
12. Chuss, D. T., Ali, A., Amiri, M. et al., 2016, *Cosmology Large Angular Scale Surveyor (CLASS) Focal Plane Development*, Journal of Low Temperature Physics, 184, 759–764
13. Miller, N. J., Chuss, D. T., Marriage, T. A. et al., 2016, *Recovery of Large Angular Scale CMB Polarization for Instruments Employing Variable-delay Polarization Modulators*, ApJ, 818, 151

CONFERENCE PROCEEDINGS:

14. Iuliano, J., Eimer, J., Parker, L. et al., 2018, *The Cosmology Large Angular Scale Surveyor receiver design*, in Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX, ed. J. Zmuidzinas and J.-R. Gao, Vol. 10708, International Society for Optics and Photonics (SPIE), 259–277
15. Dahal, S., Ali, A., Appel, J. W. et al., 2018, *Design and characterization of the Cosmology Large Angular Scale Surveyor (CLASS) 93 GHz focal plane*, in Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX, ed. J. Zmuidzinas and J.-R. Gao, Vol. 10708, International Society for Optics and Photonics (SPIE), 230–245
16. Harrington, K., Eimer, J., Chuss, D. T. et al., 2018, *Variable-delay polarization modulators for the CLASS telescopes*, in Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX, ed. J. Zmuidzinas and J.-R. Gao, Vol. 10708, International Society for Optics and Photonics (SPIE), 369–390
17. Harrington, K., Marriage, T., Ali, A. et al., 2016, *The Cosmology Large Angular Scale Surveyor*, in Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy VIII, ed. W. S. Holland and J. Zmuidzinas, Vol. 9914, International Society for Optics and Photonics (SPIE), 380 – 400
18. Appel, J. W., Ali, A., Amiri, M. et al., 2014, *The cosmology large angular scale surveyor (CLASS): 38-GHz detector array of bolometric polarimeters*, in Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy VII, ed. W. S. Holland and J. Zmuidzinas, Vol. 9153, International Society for Optics and Photonics (SPIE), 514–528
19. Essinger-Hileman, T., Ali, A., Amiri, M. et al., 2014, *CLASS: the cosmology large angular scale surveyor*,

in Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy VII, ed. W. S. Holland and J. Zmuidzinas, Vol. 9153, International Society for Optics and Photonics (SPIE), 491–513