Joel Meyers

CONTACT INFORMATION

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RESEARCH INTERESTS

Early Universe Cosmology, Cosmic Microwave Background, Theoretical High Energy Physics

RESEARCH EXPERIENCE

Southern Methodist University

Department of Physics, 2018 - Present
Assistant Professor

Canadian Institute for Theoretical Astrophysics (CITA)

University of Toronto, 2012 - 2018
Senior Research Associate, Theoretical Cosmology

Weinberg Theory Group and Texas Cosmology Center

University of Texas at Austin, 2006 - 2012
Theoretical Cosmology, Dissertation research conducted with Prof. Steven Weinberg

EDUCATION

The University of Texas at Austin, Austin, Texas, USA

Ph.D. in Physics, August 2012

- Dissertation Topic: *Inflation: Connecting Theory to Observation*
- Advisor: Professor Steven Weinberg

University of Wisconsin, Madison, Wisconsin, USA

B.S. in Physics and Mathematics, May 2006

- Thesis Topic: *Cosmic Superstrings*
- Thesis Advisor: Professor Gary Shiu

COLLABORATIONS

- **CMB-S4**, 2015 - present, (Science Council Co-Chair 2020 - 2022, Light Relics Working Group Co-Lead 2018 - 2019)
- **Simons Observatory**, 2016 - present
- **PICO**, 2016 - present
- **CCAT-Prime**, 2016 - present

HONORS AND AWARDS

- Robert S. Hyer Award for Undergraduate Research (Faculty Supervisor), 2020
- Beatrice and Vincent Tremaine Fellowship, 2016 - 2017
- Texas Cosmology Center Summer Research Fellowship, 2010
- A.D. Hutchison Student Endowment Fellowship, 2009 - 2010
- Phi Beta Kappa, University of Wisconsin, 2006

Invited Talks

- Illinois Institute of Technology, Physics Colloquium (Virtual), November 2020
- Michigan State University, High Energy Physics Seminar (Virtual), November 2020
- *CCAT-prime Collaboration Meeting*, Virtual Meeting, April 2020
- *Cosmology and Astro-particle Physics Workshop: CAP@Rice*, Rice University, October 2019
- *Topics in Cosmic Neutrino Physics*, Fermilab, October 2019
- Institute for Advanced Study Astrophysics Seminar, Princeton, NJ, May 2019
- *CMB-S4 Collboration Workshop, Fermilab-2019*, Fermilab, March 2019
- *Building Astronomy in Texas Symposium 2019*, Dallas, TX, January 2019
- *CMB in HD*, Flatiron Institute, December 2018
- *nu Physics in the CMB*, University of California, San Diego, November 2018
- University of Texas at Dallas Physics Colloquium, October 2018
- University of Texas at Austin Theory Group Seminar, October 2018
- *CMB-S4 Collboration Workshop, Princeton-2018*, Princeton University, September 2018
- PICO Collaboration Science Meeting, University of Minnesota May 2018
- YITP Seminar, Stony Brook University, April 2018
- Rice University Physics Colloquium, Houston, TX, February 2018
- Southern Methodist University Physics Colloquium, Dallas, TX, February 2018
- *Lake Louise Winter Institute 2018*, Lake Louise, Alberta, February 2018
- Cosmology Lunch, Institute for Advanced Study, Princeton, November 2017
- *Kavli CMB Lensing Workshop*, Stanford University, September 2017
- *CMB-S4 Collboration Workshop, Harvard-2017*, Harvard University, August 2017
- *SLAC Summer Institute 2017*, SLAC, August 2017
- *Phenomenology 2017 Symposium*, Plenary Talk, University of Pittsburgh, May 2017
- University of California Riverside Seminar, March 2017
- University of Illinois Theory Seminar, February 2017
- University of Texas at Austin Theory Group Seminar, January 2017
- Boston University Theory Seminar, October 2016
- *CMB-S4 / Future Cosmic Surveys*, University of Chicago, September 2016
- *Cosmology with CMB-S4*, University of Chicago, September 2016
- *US Radio/Millimeter/Submillimeter Science Futures II*, Baltimore, Maryland, August 2016
- *Neutrinos and Light Particles in Cosmology*, University of California Berkeley, June 2016
- Lawrence Berkeley National Laboratory Cosmology Lunch, March 2016
- *Cosmology with CMB-S4 Workshop*, Lawrence Berkeley National Laboratory, March 2016
- Johns Hopkins University Theory Seminar, Novebmer 2015
- *Cosmology with CMB-S4*, University of Michigan, September 2015
- California Institute of Technology TAPIR Seminar, June 2015
- Perimeter Institute Seminar, May 2015
- *Testing Inflation with Large Scale Structure*, CITA, October 2014
- University of Texas at Austin Theory Group Seminar, May 2014
- Istituto Nazionale di Fisica Nucleare Theory Seminar, April 2014
- St. Mary's University Astrophysics Seminar, February 2014
- University of Nevada, Las Vegas Theory Seminar, December 2013
- University of British Columbia Cosmology Seminar, August 2013
- Kavli Institute for Cosmological Physics Seminar, University of Chicago, May 2013
- University of Nottingham Cosmology Seminar, April 2013
- Kavli Institute for the Physics and Mathematics of the Universe Seminar, November 2012
- CITA Seminar, University of Toronto, July 2012

Conference Contributions

- April APS Meeting, Virtual Meeting, April 2020
- *COSMO-16*, University of Michigan, August 2016
- *Rencontres de Moriond Cosmology*, March 2016
- *Cosmology on Safari*, January 2015
- *New Challenges for Early Universe Cosmologists*, Lorentz Center, August 2013
- *The Universe as Seen by Planck*, European Space Agency/European Space Research and Tech-

nology Centre, April 2013
- *Gravity and Cosmology 2012*, Yukawa Institute for Theoretical Physics, December 2012
- *Critical Tests of Inflation Using Non-Gaussianity*, Max Planck Institute for Astrophysics, November 2012
- *Inflationary Theory and its Confrontation with Data in the Planck Era*, Aspen Center for Physics, February 2012
- *DEUS: Current and Future Challenges of the Dark and Early Universes*, Dark Cosmology Centre, Niels Bohr Institute, August 2011
- *Cosmological Non-Gaussianity: Observations Confront Theory Workshop*, University of Michigan, May 2011
- *Primordial Features and Non-Gaussianities*, Harish-Chandra Research Institute, May 2011
- *Texas Cosmology Network Meeting*, University of Texas at Austin, October 2009

Students Supervised

- **Eric Guzman**, Ph.D. Student at SMU, October 2018 - present
- **Noah Pearson**, Undergraduate at Southern Methodist University, May 2019 - present
- **Selim Hotinli**, Co-supervision with Andrew Jaffe, Ph.D. Student at Imperial College London, October 2016 - present
- **Victor Chan**, Co-supervision with Renée Hložek and Alex van Engelen, Ph.D. Student at University of Toronto, Summer 2018 - present
- **Connor Sheere**, Co-supervision with Alex van Engelen and Daan Meerburg, Summer 2016 - present
- **Alex Laguë**, Ph.D. Student at University of Toronto, Summer 2018 - Fall 2019
- **Brayden Mon**, Co-supervision with Daan Meerburg and Alex van Engelen, Summer Undergraduate Research Program 2017 at CITA
- **Matthew Wilson**, Co-supervision with Dick Bond, Master's student in University of Toronto Physics Department, January - August 2016
- **Harrison Winch**, Co-supervision with Daan Meerburg and Alex van Engelen, Summer Undergraduate Research Program 2016 at CITA
- **Vivian Britto**, Summer Undergraduate Research Program 2014 at CITA
- **Derek Inman**, Co-supervision with Ue-Li Pen, Ph.D. Student at CITA, September 2013 - August 2014
- **Shenglin Jing**, Co-supervision with Ido Ben-Dayan, Undergraduate Student at CITA, September 2012 - August 2013

Postdocs Supervised

- **Cynthia Trendafilova**, Southern Methodist University, September 2019 - present

Teaching Experience

Instructor
- Cosmology, Quantum Field Theory, Quantum Mechanics, General Physics, January 2019 - present, SMU
- SLAC Summer Institute 2017, August 2017, SLAC
- Scientific Computing - Symbolic Computing, May 2016 and May 2017, CITA
- MCAT Physics, June 2007 - March 2009, Princeton Review, Austin, Texas

Tutor
- General Physics, Astronomy, June 2011 - August 2012, Austin, Texas
- MCAT Physics, August 2008 - January 2009, Princeton Review, Austin, Texas
- Calculus, Fall 2007, Austin, Texas

Teaching Assistant

- General physics, History of Science, Undergraduate Quanum Mechanics, Graduate Quantum Mechanics, Quantum Field Theory, Fall 2006 - Spring 2012, University of Texas at Austin

Service and Leadership

- **SMU Astrophysics Discussion:** Co-organizer, 2019 - present
- **SMU Theoretical HEP Discussion:** Co-organizer, 2018 - present
- **SMU Undergraduate Committee:** Member, 2020 - present
- **SMU Graduate Committee:** Member, 2018 - 2020
- **SMU Faculty Hiring Committee:** Member, 2018 - 2019
- **CMB-S4:** Science Council Co-Chair 2020 - present, Light Relics Working Group Co-Lead 2018 - 2019
- **CITA Cosmology Discussion:** Co-organizer, 2012 - 2018
- **CITA Blackboard Discussion:** Co-organizer, 2013 - 2018
- **CITA Postdoc Hiring Committee:** Member, 2013 - 2018
- **CITA Jamboree:** Co-organizer, 2014 - 2015
- **Journal Referee:**
  - Physical Review Letters
  - Physical Review D
  - Physical Review X
  - Journal of Cosmology and Astroparticle Physics

Workshops Organized

- *11th CMB-S4 Workshop: Cosmology and Astrophysics in the Next Decade, July 2020*
- *CMB in HD*, Flatiron Institute, December 2018
- *Neutrinos and (G)astrophysics in Large-Scale Structure*, CITA, December 2016

PUBLICATIONS **Note**: Author lists are alphabetical except those with an asterisk (*).

1. E. Guzman and J. Meyers,
Reconstructing Patchy Reionization with Deep Learning,
arXiv:2101.01214 [astro-ph.CO].
2. (*) N. Pearson, C. Trendafilova and J. Meyers,
Searching for Gravitational Waves with Strongly Lensed Repeating Fast Radio Bursts,
arXiv:2009.11252 [astro-ph.CO],
Submitted to PRD.
3. K. Abazajian *et al.* [CMB-S4 Collaboration],
CMB-S4: Forecasting Constraints on Primordial Gravitational Waves,
arXiv:2008.12619 [astro-ph.CO].
4. (*) B. Beringue, P. D. Meerburg, J. Meyers and N. Battaglia,
Cosmology with Rayleigh Scattering of the Cosmic Microwave Background,
arXiv:2008.11688 [astro-ph.CO],
Accepted to JCAP.
5. S. C. Hotinli, M. C. Johnson and J. Meyers,
Optimal filters for the moving lens effect,
arXiv:2006.03060 [astro-ph.CO],
Submitted to PRD.
6. A. Laguë and J. Meyers,
Prospects and Limitations for Constraining Light Relics with Primordial Abundance Measurements,
Phys. Rev. D **101** (2020) no.4, 043509 arXiv:1908.05291 [astro-ph.CO].
7. K. Abazajian *et al.* [CMB-S4 Collaboration],
CMB-S4 Science Case, Reference Design, and Project Plan,
arXiv:1907.04473 [astro-ph.IM].
8. (*) S. Hanany *et al.* [NASA PICO Collaboration],
PICO: Probe of Inflation and Cosmic Origins,
arXiv:1902.10541 [astro-ph.IM].
9. (*) S. C. Hotinli *et al.*,
Transverse Velocities with the Moving Lens Effect,
Phys. Rev. Lett. **123**, no. 6, 061301 (2019) arXiv:1812.03167 [astro-ph.CO].
10. (*) S. Foreman, P. D. Meerburg, J. Meyers and A. van Engelen,
Cosmic variance mitigation in measurements of the integrated Sachs-Wolfe effect,
Phys. Rev. D **99**, 083506 (2019) arXiv:1811.00529 [astro-ph.CO].
11. J. Aguirre *et al.* [Simons Observatory Collaboration],
The Simons Observatory: Science goals and forecasts,
JCAP **1902**, 056 (2019) arXiv:1808.07445 [astro-ph.CO].
12. (*) G. J. Stacey *et al.*,
CCAT-prime: Science with an Ultra-widefield Submillimeter Observatory at Cerro Chajnantor,
arXiv:1807.04354 [astro-ph.GA].

13. R. de Putter, O. Doré, J. Gleyzes, D. Green and J. Meyers,
Dark Matter Interactions, Helium, and the CMB,
Phys. Rev. Lett. **122**, 041301, (2018) arXiv:1805.11616 [astro-ph.CO].
14. D. Green, P. D. Meerburg and J. Meyers,
Aspects of Dark Matter Annihilation in Cosmology,
JCAP **1904**, 025 (2019) arXiv:1804.01055 [astro-ph.CO].
15. (*) S. Foreman, P. D. Meerburg, A. van Engelen and J. Meyers,
Lensing reconstruction from line intensity maps: the impact of gravitational nonlinearity,
JCAP **1807**, no. 07, 046 (2018) arXiv:1803.04975 [astro-ph.CO].
16. (*) S. C. Hotinli, J. Frazer, A. H. Jaffe, J. Meyers, L. C. Price and E. R. M. Tarrant,
Effect of reheating on predictions following multiple-field inflation,
Phys. Rev. D **97**, no. 2, 023511 (2018) arXiv:1710.08913 [astro-ph.CO].
17. (*) J. Meyers, P. D. Meerburg, A. van Engelen and N. Battaglia,
Beyond CMB Cosmic Variance Limits on Reionization with the Polarized SZ effect,
Phys. Rev. D **97**, no. 10, 103505 (2018), **Editor's Suggestion** arXiv:1710.01708 [astro-ph.CO].
18. P. D. Meerburg, J. Meyers and A. van Engelen,
Reconstructing the Primary CMB Dipole,
Phys. Rev. D **96**, no. 8, 083519 (2017) arXiv:1704.00718 [astro-ph.CO].
19. P. D. Meerburg, J. Meyers, K. M. Smith and A. van Engelen,
Reconstructing CMB Fluctuations and the Mean Reionization Optical Depth,
Phys. Rev. D **95**, no. 12, 123538 (2017) arXiv:1701.06992 [astro-ph.CO].
20. (*) C. Sheere, A. van Engelen, P. D. Meerburg and J. Meyers,
Establishing the Origin of CMB B-mode Polarization,
Phys. Rev. D **96**, no. 6, 063508 (2017) arXiv:1610.09365 [astro-ph.CO].
21. K. N. Abazajian *et al.* [CMB-S4 Collaboration],
CMB-S4 Science Book, First Edition,
arXiv:1610.02743 [astro-ph.CO].
22. R. de Putter, O. Doré, D. Green and J. Meyers,
Single-Field Inflation and the Local Ansatz: Distinguishability and Consistency,
Phys. Rev. D **95**, no. 6, 063501 (2017) arXiv:1610.00785 [hep-th].
23. D. Green, J. Meyers and A. van Engelen,
CMB Delensing Beyond the B Modes,
JCAP **1712** (2017) no.12, 005 arXiv:1609.08143 [astro-ph.CO].
24. (*) P. D. Meerburg, J. Meyers, A. van Engelen and Y. Ali-Haïmoud,
CMB B-Mode Non-Gaussianity,
Phys. Rev. D **93**, 123511 (2016) arXiv:1603.02243 [astro-ph.CO].
25. D. Baumann, D. Green, J. Meyers and B. Wallisch,
Phases of New Physics in the CMB,
JCAP **1601**, 007 (2016) arXiv:1508.06342 [astro-ph.CO].
26. (*) P. D. Meerburg, R. Hložek, B. Hadzhiyska and J. Meyers,
Multiwavelength Constraints on the Inflationary Consistency Relation,
Phys. Rev. D **91**, no. 10, 103505 (2015) arXiv:1502.00302 [astro-ph.CO].

27. M. Alvarez *et al.*,
Testing Inflation with Large Scale Structure: Connecting Hopes with Reality,
arXiv:1412.4671 [astro-ph.CO].

28. V. Britto and J. Meyers,
Monthly Modulation in Dark Matter Direct-Detection Experiments,
JCAP **1511**, 006 (2015) arXiv:1409.2858 [astro-ph.CO].

29. J. Meyers and E. R. M. Tarrant,
Perturbative Reheating After Multiple-Field Inflation: The Impact on Primordial Observables,
Phys. Rev. D **89**, no. 6, 063535 (2014) arXiv:1311.3972 [astro-ph.CO].

30. J. Meyers,
Non-Gaussian Correlations Outside the Horizon in Local Thermal Equilibrium,
arXiv:1212.4438 [astro-ph.CO].

31. J. Meyers and N. Sivanandam,
Adiabaticity and the Fate of Non-Gaussianities: The Trispectrum and Beyond,
Phys. Rev. D **84**, 063522 (2011) arXiv:1104.5238 [astro-ph.CO].

32. J. Meyers and N. Sivanandam,
Non-Gaussianities in Multifield Inflation: Superhorizon Evolution, Adiabaticity, and the Fate of fnl,
Phys. Rev. D **83**, 103517 (2011) arXiv:1011.4934 [astro-ph.CO].

33. W. Fischler and J. Meyers,
Dark Radiation Emerging After Big Bang Nucleosynthesis?,
Phys. Rev. D **83**, 063520 (2011) arXiv:1011.3501 [astro-ph.CO].

Astro2020 Decadal Survey White Papers

The papers in this section were written for the Astro2020 Decadal Survey of Astronomy and Astrophysics. Papers for which I was among the primary authors are indicated by (†).

34. (*) N. Sehgal, *et al.*,
CMB-HD: Astro2020 RFI Response,
arXiv:2002.12714 [astro-ph.CO].

35. T. Herter *et al.*,
The CCAT-Prime Submillimeter Observatory,
Bull. Am. Astron. Soc. **51**, no. 7, 213 (2019) arXiv:1909.02587 [astro-ph.IM].

36. (*) S. Hanany *et al.*,
PICO: Probe of Inflation and Cosmic Origins,
Bull. Am. Astron. Soc. **51**, no. 7, 194 (2019) arXiv:1908.07495 [astro-ph.IM].

37. (*) J. Carlstrom *et al.*,
CMB-S4,
Bull. Am. Astron. Soc. **51**, no. 7, 209 (2019) arXiv:1908.01062 [astro-ph.IM].

38. (*) A. Lee *et al.* [Simons Observatory Collaboration],
The Simons Observatory,
Bull. Am. Astron. Soc. **51**, no. 7, 147 (2019) arXiv:1907.08284 [astro-ph.IM].
39. (*) N. Sehgal *et al.*,
CMB-HD: An Ultra-Deep, High-Resolution Millimeter-Wave Survey Over Half the Sky,
Bull. Am. Astron. Soc. **51**, no. 7, 6 (2019) arXiv:1906.10134 [astro-ph.CO].
40. (†)(*) E. B. Grohs, J. R. Bond, R. J. Cooke, G. M. Fuller, J. Meyers and M. W. Paris,
Big Bang Nucleosynthesis and Neutrino Cosmology,
Bull. Am. Astron. Soc. **51**, no. 3, 412 (2019) arXiv:1903.09187 [astro-ph.CO].
41. (†)(*) D. Green *et al.*,
Messengers from the Early Universe: Cosmic Neutrinos and Other Light Relics,
Bull. Am. Astron. Soc. **51**, no. 3, 159 (2019) arXiv:1903.04763 [astro-ph.CO].
42. (*) S. Shandera *et al.*,
Probing the origin of our Universe through cosmic microwave background constraints on gravitational waves,
Bull. Am. Astron. Soc. **51**, no. 3, 338 (2019) arXiv:1903.04700 [astro-ph.CO].
43. (*) P. D. Meerburg *et al.*,
Primordial Non-Gaussianity,
Bull. Am. Astron. Soc. **51**, no. 3, 107 (2019) arXiv:1903.04409 [astro-ph.CO].
44. (*) N. Sehgal *et al.*, *Science from an Ultra-Deep, High-Resolution Millimeter-Wave Survey*,
Bull. Am. Astron. Soc. **51**, no. 3, 43 (2019) arXiv:1903.03263 [astro-ph.CO].

Conference Proceedings

45. J. Meyers,
Cosmic Neutrinos and Other Light Relics,
arXiv:1605.05575 [astro-ph.CO].