Joel Meyers

Contact Information

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Research Interests

Theoretical Cosmology, Cosmic Microwave Background, Fundamental Physics

Research Experience

Southern Methodist University (SMU)

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

Collaborations

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

Funding and Awards

- Department of Energy High Energy Theory Grant, 2019 - present
- 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

POSTDOCS SUPERVISED
- **Joseph Ryan**, SMU, September 2021 - present
- **Cynthia Trendafilova**, SMU, September 2019 - August 2022; (CAPS Fellow at UIUC)

GRADUATE STUDENTS SUPERVISED
- **Brandon Stevenson**, Ph.D. Student, SMU, May 2020 - present
- **Eric Guzman**, Ph.D. Student, SMU, October 2018 - present
- **Victor Chan**, (Co-supervisor), Ph.D. Student, University of Toronto, Summer 2018 - present
- **Alex Laguë**, Ph.D. Student, University of Toronto, Summer 2018 - Fall 2019
- **Selim Hotinli**, (Co-supervisor), Ph.D. Student, Imperial College London, October 2016 - May 2020
- **Matthew Wilson**, (Co-supervisor), MS student, University of Toronto, January - August 2016
- **Derek Inman**, (Co-supervisor), Ph.D. Student, CITA, September 2013 - August 2014

UNDERGRADUATE STUDENTS SUPERVISED
- **Joshua Ange**, SMU, August 2022 - present
- **Noah Pearson**, SMU, May 2019 - August 2021
- **Connor Sheere**, (Co-supervisor), CITA, Summer 2016 - Summer 2018
- **Brayden Mon**, (Co-supervisor), CITA, Summer 2017
- **Harrison Winch**, (Co-supervisor), CITA, Summer 2016
- **Vivian Britto**, CITA, Summer 2014
- **Shenglin Jing**, (Co-supervisor), CITA, September 2012 - August 2013

INVITED TALKS
- Seminar / Colloquium: 28
- Conference / Workshop Plenary Talk: 30
- Summer School Lecturer: 1

WORKSHOPS ORGANIZED
- *Theoretical Astroparticle and Cosmology Symposium (TACOS) in Texas*, SMU, August 2022
- *CMB-S4 Summer 2022 Collaboration Meeting*, U. Chicago, August 2022
- *13th CMB-S4 Workshop: 2021 Summer Collaboration Meeting*, August 2021
- *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

TEACHING EXPERIENCE

Instructor
- Cosmology, Quantum Field Theory, Quantum Mechanics, Modern Physics, 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 Curriculum Task Force:** Member, Fall 2020 - Spring 2021
- **SMU Graduate Committee:** Member, 2018 - 2020
- **SMU Faculty Hiring Committee:** Member, 2018 - 2019
- **CMB-S4:** Science Council Co-Chair 2020 - present, Executive Team Member 2020 - present, Light Relics Working Group Co-Lead 2018 - 2019
- **CCAT-prime:** Rayleigh Scattering Working Group Deputy Lead 2020 - present
- **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

PUBLICATIONS

Note: Conventions for author ordering vary significantly within the field of cosmology. The typical practice for researchers with a background in high energy theory (including me) is to use alphabetical author lists by default. Exceptions are often made to boost visibility of students or junior researchers by placing them first in the list. In this section, author lists are alphabetical except those labeled with an asterisk (*).

1. (*) J. Ryan, B. Stevenson, C. Trendafilova and J. Meyers,
Beyond Fisher Forecasting for Cosmology,
arXiv:2211.06534 [astro-ph.CO], Submitted to PRD.
2. (*) Y. Zhu, B. Beringue, S. K. Choi, N. Battaglia, P. D. Meerburg and J. Meyers,
Estimating the Impact of foregrounds on the Future Detection of Rayleigh scattering,
JCAP **09** (2022), 048 arXiv:2205.04496 [astro-ph.CO].
3. (*) S. C. Hotinli, J. Meyers, C. Trendafilova, D. Green and A. van Engelen,
The Benefits of CMB Delensing,
JCAP **04**, no.04, 020 (2022) arXiv:2111.15036 [astro-ph.CO].
4. D. Green and J. Meyers,
Cosmological Implications of a Neutrino Mass Detection,
arXiv:2111.01096 [astro-ph.CO], Submitted to PRD.
5. (*) T. Namikawa, A. B. Lizancos, N. Robertson, B. D. Sherwin, A. Challinor, D. Alonso, S. Azzoni, C. Baccigalupi, E. Calabrese and J. Carron, *et al.*
The Simons Observatory: Constraining inflationary gravitational waves with multi-tracer B-mode delensing,
Phys. Rev. D **105**, no.2, 023511 (2022) arXiv:2110.09730 [astro-ph.CO].
6. E. Guzman and J. Meyers,
Reconstructing Cosmic Polarization Rotation with ResUNet-CMB,
JCAP **01**, no.01, 030 (2022) arXiv:2109.09715 [astro-ph.CO].
7. M. Aravena *et al.* [CCAT-Prime],
CCAT-prime Collaboration: Science Goals and Forecasts with Prime-Cam on the Fred Young Submillimeter Telescope,
arXiv:2107.10364 [astro-ph.CO], Accepted to ApJS.
8. M. J. Bustamante-Rosell, J. Meyers, N. Pearson, C. Trendafilova and A. Zimmerman,
Gravitational Wave Timing Array,
Phys. Rev. D **105**, no.4, 044005 (2022) arXiv:2107.02788 [gr-qc].
9. P. C. Breysse, S. Foreman, L. C. Keating, J. Meyers and N. Murray,
Mapping the Universe in HD,
Phys. Rev. D **105**, no.8, 083009 (2022), **Editor's Suggestion** arXiv:2104.06422 [astro-ph.CO].
10. E. Guzman and J. Meyers,
Reconstructing Patchy Reionization with Deep Learning,
Phys. Rev. D **104**, no.4, 043529 (2021) arXiv:2101.01214 [astro-ph.CO].
11. (*) N. Pearson, C. Trendafilova and J. Meyers,
Searching for Gravitational Waves with Strongly Lensed Repeating Fast

Radio Bursts,
Phys. Rev. D **103**, no.6, 063017 (2021) arXiv:2009.11252 [astro-ph.CO].

12. K. Abazajian *et al.* [CMB-S4 Collaboration],
CMB-S4: Forecasting Constraints on Primordial Gravitational Waves,
Astrophys. J. **926**, no.1, 54 (2022) arXiv:2008.12619 [astro-ph.CO].
13. (*) B. Beringue, P. D. Meerburg, J. Meyers and N. Battaglia,
Cosmology with Rayleigh Scattering of the Cosmic Microwave Background,
JCAP **01**, 060 (2021) arXiv:2008.11688 [astro-ph.CO].
14. S. C. Hotinli, M. C. Johnson and J. Meyers,
Optimal filters for the moving lens effect,
Phys. Rev. D **103**, no.4, 043536 (2021) arXiv:2006.03060 [astro-ph.CO].
15. 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].
16. K. Abazajian *et al.* [CMB-S4 Collaboration],
CMB-S4 Science Case, Reference Design, and Project Plan,
arXiv:1907.04473 [astro-ph.IM].
17. (*) S. Hanany *et al.* [NASA PICO Collaboration],
PICO: Probe of Inflation and Cosmic Origins,
arXiv:1902.10541 [astro-ph.IM].
18. (*) 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].
19. (*) 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].
20. J. Aguirre *et al.* [Simons Observatory Collaboration],
The Simons Observatory: Science goals and forecasts,
JCAP **1902**, 056 (2019) arXiv:1808.07445 [astro-ph.CO].
21. (*) G. J. Stacey *et al.*,
CCAT-prime: Science with an Ultra-widefield Submillimeter Observatory at Cerro Chajnantor,
arXiv:1807.04354 [astro-ph.GA].
22. 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].
23. 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].

24. (*) 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].

25. (*) 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].

26. (*) 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].

27. 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].

28. 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].

29. (*) 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].

30. K. N. Abazajian *et al.* [CMB-S4 Collaboration],
CMB-S4 Science Book, First Edition,
arXiv:1610.02743 [astro-ph.CO].

31. 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].

32. 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].

33. (*) 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].

34. 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].

35. (*) 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].

36. M. Alvarez *et al.*,
Testing Inflation with Large Scale Structure: Connecting Hopes with Re-

ality,
arXiv:1412.4671 [astro-ph.CO].

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

38. 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].

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

40. 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].

41. 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].

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

Snowmass 2021 Papers

The papers in this section were written for the Snowmass 2021 DPF Community Planning Exercise. Papers in this section do not have alphabetical authors lists. Those which I co-led are indicated by (‡), and those for which I was among the primary authors are indicated by (†).

43. R. X. Adhikari, *et al.*
Report of the Topical Group on Cosmic Probes of Fundamental Physics for for Snowmass 2021,
arXiv:2209.11726 [hep-ph].

44. B. Flaugher, V. Miranda, D. J. Schlegel *et al.*
Report of the Topical Group on Dark Energy and Cosmic Acceleration: Complementarity of Probes and New Facilities for Snowmass 2021,
arXiv:2209.08654 [astro-ph.CO].

45. A. Drlica-Wagner, C. Prescod-Weinstein, H. B. Yu *et al.* **Report of the Topical Group on Cosmic Probes of Dark Matter for Snowmass 2021**,
arXiv:2209.08215 [hep-ph].

46. D. Green, J. T. Ruderman, B. R. Safdi, J. Shelton *et al.* **Snowmass Theory Frontier: Astrophysics and Cosmology**,
arXiv:2209.06854 [hep-ph].
47. J. A. Blazek *et al.*
Snowmass2021 Cosmic Frontier White Paper: Enabling Flagship Dark Energy Experiments to Reach their Full Potential,
arXiv:2204.01992 [astro-ph.CO].
48. (†) R. Brito *et al.*
Snowmass2021 Cosmic Frontier White Paper: Probing dark matter with small-scale astrophysical observations,
arXiv:2203.15954 [hep-ph].
49. (†) C. L. Chang, K. M. Huffenberger *et al.*
Snowmass2021 Cosmic Frontier: Cosmic Microwave Background Measurements White Paper,
arXiv:2203.07638 [astro-ph.CO].
50. (†) K. Abazajian *et al.* [CMB-S4 Collaboration],
Snowmass 2021 CMB-S4 White Paper,
arXiv:2203.08024 [astro-ph.CO].
51. (‡)(†) C. Dvorkin, J. Meyers *et al.*
The Physics of Light Relics,
arXiv:2203.07943 [hep-ph].
52. (†) C. Dvorkin, R. Hlozek, *et al.*
Dark Matter Physics from the CMB-S4 Experiment,
arXiv:2203.07064 [hep-ph].
53. (†) K. N. Abazajian *et al.*
Synergy between cosmological and laboratory searches in neutrino physics: a white paper,
arXiv:2203.07377 [hep-ph].
54. (†) E. J. Baxter, C. Chang, A. Hearin *et al.*
Snowmass2021: Opportunities from Cross-survey Analyses of Static Probes,
arXiv:2203.06795 [hep-ex].
55. S. Aiola *et al.* [CMB-HD],
Snowmass2021 CMB-HD White Paper,
arXiv:2203.05728 [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 in this section do not have alphabetical authors lists, and those for which I was among the primary authors are indicated by (†).

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

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

58. 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].

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

60. 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].

61. 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].

62. (†) 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].

63. (†) 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].

64. 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].

65. P. D. Meerburg *et al.*,
Primordial Non-Gaussianity,
Bull. Am. Astron. Soc. **51**, no. 3, 107 (2019) arXiv:1903.04409 [astro-ph.CO].

66. 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

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