

Sarah J. Vigeland

CONTACT INFORMATION	University of Wisconsin-Milwaukee Department of Physics P. O. Box 413 Milwaukee, WI 53201 USA 414-251-6610 vigeland@uwm.edu	
EDUCATION	Ph.D., Physics , Massachusetts Institute of Technology, Cambridge, MA, USA	May 2012
	B.A., Physics <i>Summa cum laude</i> , Carleton College, Northfield, MN, USA	Jun 2006
EMPLOYMENT	NASA Marshall Faculty Fellow , Marshall Space Flight Center	Jun 2020–Aug 2020
	Assistant Professor of Physics , UWM	2019–
	NSF Physics Frontiers Center Postdoctoral Fellow , UWM	2015–2019
	NASA Postdoctoral Program Fellow , Jet Propulsion Laboratory	2012–2014
	Graduate Teaching Assistant , MIT	2008–2010
	Graduate Research Assistant , MIT	2006–2012
	Undergraduate Research Assistant , Carleton College	2004–2006
	Teaching and Lab Assistant , Carleton College	2004–2006
HONORS AND AWARDS	Whiteman Graduate Fellow , MIT	2006–2007
	Phi Beta Kappa , Carleton College	2006
	Sigma Xi , Carleton College	2006
	Mike Ewers Award in Astrophysics , Carleton College	2005
	Dean’s List , Carleton College	2003–2005
FUNDED GRANTS AND PROPOSALS	Principal Investigator of every grant and proposal is underlined. Total of \$615,836 in external funding as Principal Investigator (+\$807,257 as Co-I or Senior Personnel).	
	NSF WoU-MMA: Enabling Multimessenger Astrophysics with Pulsar Timing Arrays. <u>Vigeland</u> , \$239,113.	2023–2026
	NASA FINESST: Searches for Gravitational Waves from Supermassive Black Hole Binaries using Hamiltonian Monte Carlo. <u>Vigeland</u> and Freedman, \$146,623.	2022–2025
	UWM SURF: Investigating the Effect of Telescope Noise on Gravitational Wave Detection with Pulsar Timing Arrays. <u>Vigeland</u> and student Roch, \$2,880.	2022
	NSF: NANOGrav Physics Frontiers Center. <u>Siemens</u> , McLaughlin, Burke-Spolaor, Cordes, Ransom, \$17,000,000 (UWM sub-award \$1,614,514).	2021–2026
	XSEDE NANOGrav: Gravitational Wave Detection with Pulsar Timing Arrays. <u>Vigeland</u> , Witt, Taylor, Brazier, Gültekin, 18,140,400 core-hours on Bridges-2.	2021–2022
	XSEDE NANOGrav: Gravitational Wave Detection with Pulsar Timing Arrays. <u>Witt</u> , Vigeland, Gültekin, Brazier, 50,000 core-hours on Bridges (startup allocation).	2020–2021

NSF WOU-MMA: Probing Binary Black Holes with Pulsar Timing Arrays. **2020–2023**
 Vigeland, \$230,100.

UWM DIG: Probing black hole spacetimes with LISA. Vigeland, \$83,384. **2020–2022**

PSR J1640+2224: A challenge to binary evolution models. Vigeland, Romero, **2018**
 Tayno, Deller, Istrate, Tauris. Gemini Proposal GS-2018A-Q-102, 3.8 hrs.

TEACHING
 EXPERIENCE

Assistant Professor, UWM

ASTRON 103 Survey of Astronomy **Fall 2020, Fall 2021, Fall 2022**

PHYSICS 411 Mechanics **Spring 2022**

PHYSICS 711 Theoretical Physics-Dynamics **Fall 2019, Spring 2021, Spring 2023**

Instructor, UWM

ASTRON 103 Survey of Astronomy **Fall 2017**

MENTORING

Postdocs

Abhimanyu Susobhanan, UWM (co-advised with Prof. Kaplan) **2022–**

Aaron Johnson, UWM **2020–2022**

Tingting Liu, UWM (co-advised with Prof. Kaplan) **2019–2022**

Graduate students

Gabriel Freedman, UWM **2020–**

Shashwat Sardesai, UWM **2020–**

Undergraduate students

Lucas Patron, UWM **2022–**

Sparrow Roch, UWM **2021–2023**

Miki Kurihara, UWM (co-advised with Dr. Tingting Liu) **2019–2020**

Mohit Garg, UWM **2019–2020**

Jacob Turner, UWM **Fall 2017**

PROFESSIONAL
 AFFILIATIONS AND
 COLLABORATIONS

American Physical Society **2009–**

Division of Gravitational Physics Member-at-Large **2020–2023**

American Astronomical Society **2011–**

NANOGrav Collaboration **2013–**

Chair of the Detection Working Group **2020–**

Management Team **2020–2021**

Equity & Climate Committee **2018–2019, 2021–**

IPTA Collaboration **2013–**

SERVICE AND
OUTREACH**Committee Assignments**

Climate & Equity Committee (Chair)	2023–
Colloquium Committee (Chair)	2023–
Graduate Admissions Committee	2023–
Graduate Academic Committee	2019–2023
Graduate Finance Committee	2019–2023

Conference Organizer

Chair of the Local Organizing Committee, Fall 2022 NANOGrav Meeting, UWM	Oct 2022
Scientific Organizing Committee, Spring 2020 NANOGrav Student Workshop, University of Central Florida	Mar 2020
Chair of the Scientific Organizing Committee, Spring 2019 NANOGrav Meeting, University of Washington-Bothell	Mar 2019
Scientific Organizing Committee, Fall 2018 NANOGrav Meeting, Green Bank Observatory	Oct 2018
Scientific Organizing Committee, Spring 2018 NANOGrav Meeting, NRAO	Mar 2018
Co-Organizer, 2013 Pasadena Postdoc Retreat	Apr 2013

CGCA Seminar Organizer

Spring 2016, Fall 2016

MIT Graduate Women in Physics

2006–2012

Co-Chair

2007–2012

Organizer of the Undergraduate Mentorship Program

2006–2007

Journal referee for *Physical Review D*, *Physical Review Letters*, *Astrophysical Journal***Selection Committee** for the GWIC and Braccini Thesis Prizes

2018, 2019

Outreach and Media

Interviewed about the NANOGrav results for Central Time on Wisconsin Public Radio	Jul 2023
Interviewed about the NANOGrav results by CBS 58	Jun 2023
Interviewed by Associated Press, National Geographic, Quanta Magazine, Scientific American, Symmetry Magazine, and the Wall Street Journal about the NANOGrav 15-year gravitational wave background results	Jun 2023
Interviewed by CBS 58 about NANOGrav research being done at UWM	Nov 2022
Interviewed for the Curious Campus podcast	Oct 2021
Public talk at the University of Central Florida	Mar 2020
Invited talk at the Milwaukee Astronomical Society	Feb 2016
Member of Coffeeshop Astrophysics	2015–2019
Outreach group made up of members of the CGCA at UWM	
Public talks given once a month at a local coffeeshop	

PUBLICATIONS

Many of my publications are connected to my membership in the NANOGrav collaboration. I have been a member since 2013 and a full member since 2017, which is a reflection of my scientific and service contributions. My most significant service contribution is chairing the Gravitational Wave Detection Working Group since 2020, which manages all gravitational wave searches and methods development. The NANOGrav collaboration is part of the International Pulsar Timing Array (IPTA) collaboration, and as such I am also an author on several IPTA collaboration papers. Many NANOGrav and IPTA collaboration papers are alphabetical, in recognition of the fact that large collaborations require many types of contributions from a large number of people. Others use a two-tiered author list: the authors in the first tier are those who made the most significant contributions and are listed in order of their contributions, and the authors in the second tier are listed alphabetically.

For short-author papers, I have bolded the names of students and postdocs who I advised while working on the paper.

SUBMITTED
PUBLICATIONS

58. G. Agazie, Z. Arzoumanian, P. T. Baker *et al.* (88 authors including S. J. Vigeland), “The NANOGrav 12.5-year data set: Multi-messenger targeted search for gravitational waves from an eccentric supermassive binary in 3C 66B,” submitted to *Astrophysical Journal* [[arXiv:2309.17438](#)].
57. B. Bécsy, N. J. Cornish, P. M. Meyers *et al.* (96 authors including S. J. Vigeland), “How to Detect an Astrophysical Nanohertz Gravitational-Wave Background,” submitted to *Astrophysical Journal* [[arXiv:2309.04443](#)].
56. G. Agazie, J. Antoniadis, A. Anumalapudi *et al.* (The International Pulsar Timing Array Collaboration, 244 authors including S. J. Vigeland), “Comparing recent PTA results on the nanohertz stochastic gravitational wave background,” submitted to *Astrophysical Journal* [[arXiv:2309.00693](#)].
55. S. Valentina Sosa Fiscella, M. T. Lam, Z. Arzoumanian *et al.* (31 authors including S. J. Vigeland), “The NANOGrav 12.5-Year Data Set: Dispersion Measure Mis-Estimation with Varying Bandwidths,” submitted to *arXiv e-prints* [[arXiv:2307.13248](#)].
54. G. Agazie, Z. Arzoumanian, P. T. Baker *et al.* (90 authors including S. J. Vigeland), “The NANOGrav 12.5-year Data Set: Search for Gravitational Wave Memory,” submitted to *Astrophysical Journal* [[arXiv:2307.13797](#)].
53. A. D. Johnson, P. M. Meyers, P. T. Baker *et al.* (96 authors including S. J. Vigeland), “The NANOGrav 15-year Gravitational-Wave Background Analysis Pipeline,” submitted to *Physical Review D* [[arXiv:2306.16223](#)].
52. **S. C. Sardesai**, and S. J. Vigeland, “Generalized optimal statistic for characterizing multiple correlated signals in pulsar timing arrays,” submitted to *Physical Review D* [[arXiv:2303.09615](#)].
51. R. J. Jennings, J. M. Cordes, S. Chatterjee *et al.* (44 authors including S. J. Vigeland), “An unusual pulse shape change event in PSR J1713+0747 observed with the Green Bank Telescope and CHIME,” submitted to *Astrophysical Journal* [[arXiv:2210.12266](#)].

REFEREED
PUBLICATIONS

50. G. Agazie, A. Anumalapudi, A. M. Archibald *et al.* (NANOGrav collaboration, 93 authors including S. J. Vigeland), “The NANOGrav 15 yr Data Set: Search for Anisotropy in the Gravitational-wave Background,” *Astrophysical Journal Letters* **956**, L3 (2023).
49. G. Agazie, A. Anumalapudi, A. M. Archibald *et al.* (NANOGrav Collaboration, 114 authors including S. J. Vigeland), “The NANOGrav 15 yr Data Set: Constraints on Supermassive Black Hole Binaries from the Gravitational-wave Background,” *Astrophysical Journal Letters* **952**, L37 (2023).
48. G. Agazie, A. Anumalapudi, A. M. Archibald *et al.* (NANOGrav Collaboration, 98 authors including S. J. Vigeland), “The NANOGrav 15 yr Data Set: Bayesian Limits on Gravitational Waves from Individual Supermassive Black Hole Binaries,” *Astrophysical Journal Letters* **951**, L50 (2023).

47. Z. Arzoumanian, P. T. Baker, L. Blecha *et al.* (NANOGrav Collaboration, 78 authors including S. J. Vigeland), “The NANOGrav 12.5 yr Data Set: Bayesian Limits on Gravitational Waves from Individual Supermassive Black Hole Binaries,” *Astrophysical Journal Letters* 951, L28 (2023).
46. A. Afzal, G. Agazie, A. Anumarpudi *et al.* (NANOGrav Collaboration, 123 authors including S. J. Vigeland), “The NANOGrav 15 yr Data Set: Search for Signals from New Physics,” *Astrophysical Journal Letters* 951, L11 (2023).
45. G. Agazie, A. Anumarpudi, A. M. Archibald *et al.* (NANOGrav Collaboration, 91 authors including S. J. Vigeland), “The NANOGrav 15 yr Data Set: Detector Characterization and Noise Budget,” *Astrophysical Journal Letters* 951, L10 (2023).
44. G. Agazie, M. F. Alam, A. Anumarpudi *et al.* (NANOGrav Collaboration, 100 authors including S. J. Vigeland), “The NANOGrav 15 yr Data Set: Observations and Timing of 68 Millisecond Pulsars,” *Astrophysical Journal Letters* 951, L9 (2023).
43. G. Agazie, A. Anumarpudi, A. M. Archibald *et al.* (NANOGrav Collaboration, 114 authors including S. J. Vigeland), “The NANOGrav 15 yr Data Set: Evidence for a Gravitational-wave Background,” *Astrophysical Journal Letters* 951, L8 (2023).
42. M. Falxa, S. Babak, P. T. Baker *et al.* (IPTA Collaboration, 127 authors including S. J. Vigeland), “Searching for continuous Gravitational Waves in the second data release of the International Pulsar Timing Array,” *Monthly Notices of the Royal Astronomical Society* 521, 5077-5086 (2023).
41. **T. Liu**, T. Cohen, C. McGrath, P. B. Demorest, and S. J. Vigeland, “Multi-messenger Approaches to Supermassive Black Hole Binary Detection and Parameter Estimation. II. Optimal Strategies for a Pulsar Timing Array,” *Astrophysical Journal* 945, 78 (2023).
40. **G. E. Freedman**, **A. D. Johnson**, R. van Haasteren, and S. J. Vigeland, “Efficient gravitational wave searches with pulsar timing arrays using Hamiltonian Monte Carlo,” *Physical Review D* 107, 043013 (2023).
39. A. R. Kaiser, N. S. Pol, M. A. McLaughlin, S. Chen, J. S. Hazboun, L. Z. Kelley, J. Simon, S. R. Taylor, S. J. Vigeland, and C. A. Witt, “Disentangling Multiple Stochastic Gravitational Wave Background Sources in PTA Data Sets,” *Astrophysical Journal* 938, 115 (2022).
38. **A. D. Johnson**, S. J. Vigeland, X. Siemens, and S. R. Taylor, “Gravitational-wave Statistics for Pulsar Timing Arrays: Examining Bias from Using a Finite Number of Pulsars,” *Astrophysical Journal* 932, 105 (2022).
37. J. Antoniadis, Z. Arzoumanian, S. Babak *et al.* (IPTA Collaboration, 126 authors including S. J. Vigeland), “The International Pulsar Timing Array second data release: Search for an isotropic gravitational wave background,” *Monthly Notices of the Royal Astronomical Society* 510, 4873-4887 (2022).
36. Z. Arzoumanian, P. T. Baker, H. Blumer *et al.* (NANOGrav Collaboration, 65 authors including S. J. Vigeland), “Searching for Gravitational Waves from Cosmological Phase Transitions with the NANOGrav 12.5-Year Dataset,” *Physical Review Letters* 127, 251302 (2021).
35. Z. Arzoumanian, P. T. Baker, H. Blumer *et al.* (NANOGrav Collaboration, 71 authors including S. J. Vigeland), “The NANOGrav 12.5-year Data Set: Search for Non-Einsteinian Polarization Modes in the Gravitational-wave Background,” *Astrophysical Journal Letters* 923, L22 (2021).
34. **T. Liu**, and S. J. Vigeland, “Multi-messenger Approaches to Supermassive Black Hole Binary Detection and Parameter Estimation: Implications for Nanohertz Gravitational Wave Searches with Pulsar Timing Arrays,” *Astrophysical Journal* 921, 178 (2021).
33. J. E. Turner, M. A. McLaughlin, J. M. Cordes *et al.* (36 authors including S. J. Vigeland), “The NANOGrav 12.5 Year Data Set: Monitoring Interstellar Scattering Delays,” *Astrophysical Journal* 917, 10 (2021).
32. Z. Arzoumanian, P. T. Baker, A. Brazier *et al.* (NANOGrav Collaboration, 56 authors including S. J. Vigeland), “The NANOGrav 11 yr Data Set: Limits on Supermassive Black Hole Binaries in Galaxies within 500 Mpc,” *Astrophysical Journal* 914, 121 (2021).

31. N. S. Pol, S. R. Taylor, L. Z. Kelley *et al.* (NANOGrav Collaboration, 52 authors including S. J. Vigeland), “Astrophysics Milestones for Pulsar Timing Array Gravitational-wave Detection,” *Astrophysical Journal Letters* 911, L34 (2021).
30. S. Chakrabarti, P. Chang, M. T. Lam, S. J. Vigeland, and A. C. Quillen, “A Measurement of the Galactic Plane Mass Density from Binary Pulsar Accelerations,” *Astrophysical Journal Letters* 907, L26 (2021).
29. M. F. Alam, Z. Arzoumanian, P. T. Baker *et al.* (NANOGrav Collaboration, 70 authors including S. J. Vigeland), “The NANOGrav 12.5 yr Data Set: Wideband Timing of 47 Millisecond Pulsars,” *Astrophysical Journal Supplement* 252, 5 (2021).
28. M. F. Alam, Z. Arzoumanian, P. T. Baker *et al.* (NANOGrav Collaboration, 70 authors including S. J. Vigeland), “The NANOGrav 12.5 yr Data Set: Observations and Narrowband Timing of 47 Millisecond Pulsars,” *Astrophysical Journal Supplement* 252, 4 (2021).
27. Z. Arzoumanian, P. T. Baker, H. Blumer *et al.* (NANOGrav Collaboration, 61 authors including S. J. Vigeland), “The NANOGrav 12.5 yr Data Set: Search for an Isotropic Stochastic Gravitational-wave Background,” *Astrophysical Journal Letters* 905, L34 (2020).
26. Z. Arzoumanian, P. T. Baker, A. Brazier *et al.* (NANOGrav Collaboration, 59 authors including S. J. Vigeland), “Multimessenger Gravitational-wave Searches with Pulsar Timing Arrays: Application to 3C 66B Using the NANOGrav 11-year Data Set,” *Astrophysical Journal* 900, 102 (2020).
25. M. Vallisneri, S. R. Taylor, J. Simon *et al.* (NANOGrav Collaboration, 64 authors including S. J. Vigeland), “Modeling the Uncertainties of Solar System Ephemerides for Robust Gravitational-wave Searches with Pulsar-timing Arrays,” *Astrophysical Journal* 893, 112 (2020).
24. J. S. Hazboun, J. Simon, S. R. Taylor *et al.* (NANOGrav Collaboration, 63 authors including S. J. Vigeland), “The NANOGrav 11 yr Data Set: Evolution of Gravitational-wave Background Statistics,” *Astrophysical Journal* 890, 108 (2020).
23. K. Aggarwal, Z. Arzoumanian, P. T. Baker *et al.* (NANOGrav Collaboration, 61 authors including S. J. Vigeland), “The NANOGrav 11 yr Data Set: Limits on Gravitational Wave Memory,” *Astrophysical Journal* 889, 38 (2020).
22. K. Aggarwal, Z. Arzoumanian, P. T. Baker *et al.* (NANOGrav Collaboration, 63 authors with corresponding author S. J. Vigeland), “The NANOGrav 11 yr Data Set: Limits on Gravitational Waves from Individual Supermassive Black Hole Binaries,” *Astrophysical Journal* 880, 116 (2019).
21. L. O’Beirne, N. J. Cornish, S. J. Vigeland, and S. R. Taylor, “Constraining alternative polarization states of gravitational waves from individual black hole binaries using pulsar timing arrays,” *Physical Review D* 99, 124039 (2019).
20. J. S. Deneva, P. S. Ray, A. Lommen *et al.* (48 authors including S. J. Vigeland), “High-precision X-Ray Timing of Three Millisecond Pulsars with NICER: Stability Estimates and Comparison with Radio,” *Astrophysical Journal* 874, 160 (2019).
19. M. T. Lam, M. A. McLaughlin, Z. Arzoumanian *et al.* (NANOGrav Collaboration, 28 authors including S. J. Vigeland), “The NANOGrav 12.5 yr Data Set: The Frequency Dependence of Pulse Jitter in Precision Millisecond Pulsars,” *Astrophysical Journal* 872, 193 (2019).
18. K. Stovall, P. C. C. Freire, J. Antoniadis *et al.* (33 authors including S. J. Vigeland), “PSR J2234+0611: A New Laboratory for Stellar Evolution,” *Astrophysical Journal* 870, 74 (2019).
17. S. J. Vigeland, K. Islo, S. R. Taylor, and J. A. Ellis, “Noise-marginalized optimal statistic: A robust hybrid frequentist-Bayesian statistic for the stochastic gravitational-wave background in pulsar timing arrays,” *Physical Review D* 98, 044003 (2018).
16. M. T. Lam, J. A. Ellis, G. Grillo *et al.* (37 authors including S. J. Vigeland), “A Second Chromatic Timing Event of Interstellar Origin toward PSR J1713+0747,” *Astrophysical Journal* 861, 132 (2018).

15. Z. Arzoumanian, P. T. Baker, A. Brazier *et al.* (NANOGrav Collaboration, 61 authors including S. Vigeland), “The NANOGrav 11 Year Data Set: Pulsar-timing Constraints on the Stochastic Gravitational-wave Background,” *Astrophysical Journal* 859, 47 (2018).
 14. Z. Arzoumanian, A. Brazier, S. Burke-Spolaor *et al.* (NANOGrav Collaboration, 56 authors including S. J. Vigeland), “The NANOGrav 11-year Data Set: High-precision Timing of 45 Millisecond Pulsars,” *Astrophysical Journal Supplement* 235, 37 (2018).
 13. S. J. Vigeland, A. T. Deller, D. L. Kaplan, A. G. Istrate, B. W. Stappers, and T. M. Tauris, “Reconciling Optical and Radio Observations of the Binary Millisecond Pulsar PSR J1640+2224,” *Astrophysical Journal* 855, 122 (2018).
 12. S. J. Vigeland, and X. Siemens, “Supermassive black hole binary environments: Effects on the scaling laws and time to detection for the stochastic background,” *Physical Review D* 94, 123003 (2016).
 11. A. T. Deller, S. J. Vigeland, D. L. Kaplan *et al.* (12 authors), “Microarcsecond VLBI Pulsar Astrometry with PSR π . I. Two Binary Millisecond Pulsars with White Dwarf Companions,” *Astrophysical Journal* 828, 8 (2016).
 10. U. Ruangsri, S. J. Vigeland, and S. A. Hughes, “Gyroscopes orbiting black holes: A frequency-domain approach to precession and spin-curvature coupling for spinning bodies on generic Kerr orbits,” *Physical Review D* 94, 044008 (2016).
 9. S. J. Vigeland, and M. Vallisneri, “Bayesian inference for pulsar-timing models,” *Monthly Notices of the Royal Astronomical Society* 440, 1446-1457 (2014).
 8. S. Vigeland, N. Yunes, and L. C. Stein, “Bumpy black holes in alternative theories of gravity,” *Physical Review D* 83, 104027 (2011).
 7. S. J. Vigeland, “Multipole moments of bumpy black holes,” *Physical Review D* 82, 104041 (2010).
 6. S. J. Vigeland, and S. A. Hughes, “Spacetime and orbits of bumpy black holes,” *Physical Review D* 81, 024030 (2010).
 5. B. Abbott, R. Abbott, R. Adhikari *et al.* (LIGO Scientific Collaboration, 447 authors including S. Vigeland), “Einstein@Home search for periodic gravitational waves in LIGO S4 data,” *Physical Review D* 79, 022001 (2009).
 4. B. Abbott, R. Abbott, R. Adhikari *et al.* (LIGO Scientific Collaboration, 411 authors including S. Vigeland), “Searching for a Stochastic Background of Gravitational Waves with the Laser Interferometer Gravitational-Wave Observatory,” *Astrophysical Journal* 659, 918-930 (2007).
 3. S. Johnston, G. Hobbs, S. Vigeland, M. Kramer, J. M. Weisberg, and A. G. Lyne, “Evidence for alignment of the rotation and velocity vectors in pulsars,” *Monthly Notices of the Royal Astronomical Society* 364, 1397-1412 (2005).
 2. R. Umstätter, N. Christensen, M. Hendry, R. Meyer, V. Simha, J. Veitch, S. Vigeland, and G. Woan, “LISA source confusion: identification and characterization of signals,” *Classical and Quantum Gravity* 22, S901-S911 (2005).
 1. R. Umstätter, N. Christensen, M. Hendry, R. Meyer, V. Simha, J. Veitch, S. Vigeland, and G. Woan, “Bayesian modeling of source confusion in LISA data,” *Physical Review D* 72, 022001 (2005).
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- NON-REFEREED PUBLICATIONS
2. S. Ransom, A. Brazier, S. Chatterjee *et al.* (NANOGrav Collaboration, 15 authors including S. J. Vigeland), “The NANOGrav Program for Gravitational Waves and Fundamental Physics,” *Bulletin of the American Astronomical Society* 51, 195 (2019).
 1. S. Taylor, S. Burke-Spolaor, P. T. Baker, M. Charisi, K. Islo, L. Z. Kelley, D. R. Madison, J. Simon, and S. Vigeland, “Supermassive Black-hole Demographics & Environments With Pulsar Timing Arrays,” *Bulletin of the American Astronomical Society* 51, 336 (2019).

INVITED TALKS

51. Particle Physics Seminar, University of Bristol	Oct 2023
50. Physics/Astronomy Colloquium, University of Rochester	Sep 2023
49. Physics Colloquium, University of Arizona	Sep 2023
48. Physics Colloquium, University of Mississippi	Aug 2023
47. Amaldi15 (virtual)	Jul 2023
46. Physics Colloquium, DePaul University	Mar 2023
45. OzGrav Seminar	Feb 2023
44. HEP Seminar, Academia Sinica	Dec 2022
43. ACFI Seminar, University of Massachusetts Amherst	Sep 2022
42. University of Balearic Islands Relativity and Gravitation Group Seminar	Feb 2022
41. Princeton Gravity Initiative Lunch Seminar	Feb 2022
40. DSA-2000 Science Workshop (virtual)	Jan 2022
39. Gravitational wave Astronomy Workshop III, University of California-Los Angeles	Nov 2021
38. Physics Colloquium, University of Wisconsin-Madison	Sep 2021
37. IPTA Virtual Science Meeting 2021	Jun 2021
36. IPTA Virtual Student Workshop 2021	Jun 2021
35. Physics Colloquium, West Virginia University	Mar 2021
34. Astronomy Colloquium, University of Chicago	Oct 2020
33. Gravity Group Seminar, University of Mississippi	Oct 2020
32. Models of Gravity Workshop, Universität Bielefeld	Oct 2020
31. Physics & Astronomy Colloquium, Oberlin College	Sep 2020
30. COEPMME (virtual)	Jul 2020
29. Gravity Seminar, Perimeter Institute	Mar 2020
28. CaJAGWR Seminar, California Institute of Technology	Feb 2020
27. Astronomy Seminar, CIERA, Northwestern University	Jan 2020
26. 235th AAS Meeting, Honolulu, USA	Jan 2020
25. Merging Visions Conference, Kavli Institute for Theoretical Physics	Jun 2019
24. IPTA Meeting, Pune, India	Jun 2019
23. Physics Colloquium, University of Wisconsin-Milwaukee	Mar 2019
22. Physics Colloquium, University of Mississippi	Feb 2019
21. Minnesota Institute for Astrophysics Colloquium, University of Minnesota	Feb 2019
20. Physics Colloquium, University of Vermont	Jan 2019
19. Physics Colloquium, University of Virginia	Jan 2019
18. Physics & Astronomy Colloquium, Montclair State University	Dec 2018
17. GWPAW, College Park, USA	Dec 2018
16. Astronomy Lunch Talk, University of Wisconsin Madison	Oct 2018
15. Astronomy Colloquium, Haverford College	Oct 2018
14. Astronomy Colloquium, University of Illinois Urbana-Champaign	Sep 2018
13. CGCA Seminar, University of Wisconsin-Milwaukee	Sep 2018
12. IPTA Student Week 2018, Albuquerque, USA	Jun 2018
11. PASCOS 2018, Cleveland, USA	Jun 2018
10. Research Seminar, University of Wisconsin Bothell	May 2018

9. TAPIR Seminar, California Institute of Technology Dec 2017
8. CGCA Seminar, University of Wisconsin-Milwaukee Dec 2017
7. Astrophysics Colloquium, University of Minnesota Sep 2017
6. 2017 WAVES Meeting, Minneapolis, USA May 2017
5. What Physicists Do Seminar, Carleton College Apr 2016
4. CGCA Seminar, University of Wisconsin-Milwaukee Oct 2015
3. Astrophysics Lunch Seminar, Cornell University Nov 2013
2. LIGO Seminar, California Institute of Technology Sep 2012
1. Sigma Xi induction banquet, Carleton College Feb 2006

CONTRIBUTED
TALKS

25. IPTA Meeting, Port Douglas, Australia Jun 2023
24. International Astronomical Union General Assembly 2022 Aug 2022
23. APS April Meeting (virtual) Apr 2020
22. Midwest Relativity Meeting, Grand Rapids, USA Oct 2019
21. APS April Meeting, Denver, USA Apr 2019
20. 233th AAS Meeting, Seattle, USA Jan 2019
19. NANOGrav Fall Meeting, Green Bank, USA Oct 2018
18. 12th LISA Symposium, Chicago, USA Jul 2018
17. IPTA Meeting, Albuquerque, USA Jun 2018
16. APS April Meeting, Columbus, USA Apr 2018
15. NANOGrav Spring Meeting, Charlottesville, USA Mar 2018
14. Midwest Relativity Meeting, Ann Arbor, USA Oct 2017
13. Amaldi12, Pasadena, USA Jul 2017
12. APS April Meeting, Washington DC, USA Jan 2017
11. 229th AAS Meeting, Grapevine, USA Jan 2017
10. GWPAW, Hyannis, USA Jun 2016
9. NANGOrav Spring Meeting, Pasadena, USA May 2016
8. 223rd AAS Meeting, Washington DC, USA Jan 2014
7. NANGOrav Spring Meeting, Green Bank, USA May 2013
6. Pasadena Postdoc Retreat, Lake Arrowhead, USA Apr 2013
5. Eastern Gravity Meeting, Princeton, USA Jun 2011
4. The Ins and Outs of Black Holes Meeting, Annapolis, USA Nov 2010
3. APS April Meeting, Washington DC, USA Feb 2010
2. Eastern Gravity Meeting, Rochester, USA Jun 2009
1. APS April Meeting, Denver, USA May 2009