CURRICULUM VITAE: Timothy E. Dolch

last updated 19-Jan 2022

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HOMEPAGE (CLICKABLE; LINKS TO PUBLICATION LIST)

https://www.hillsdale.edu/faculty/timothy-dolch/

RESEARCH INTERESTS

Radio Astronomy, Pulsars, Gravitational Waves, Interstellar Medium, Pulsar Wind Nebulae, Low-Frequency Radio Telescope Instrumentation, Extragalactic Backgrounds, Galaxy Evolution, Education and Public Outreach

APPOINTMENTS

Hillsdale College *Hillsdale, MI* 2015 – Present
Associate Professor of Physics (2021 – present)
Assistant Professor of Physics (2015 – 2021)

University of New Mexico *Albuquerque, NM* Summer 2021
Faculty Visitor (Sabbatical)

Cornell University *Ithaca, NY (Supervisor: Prof. James M. Cordes)* 2013 – 2015
NSF Partnerships for International Research and Education (PIRE) Postdoctoral Research Associate

Oberlin College *Oberlin, OH (Supervisor: Prof. Daniel R. Stinebring)* 2011 – 2013
PIRE Postdoctoral Scholar

EDUCATION

Johns Hopkins University *Baltimore, MD* *2012*
Ph. D. in Physics and Astronomy
Advisors: Henry C. Ferguson and Timothy M. Heckman

Johns Hopkins University *2008*
M.A. in Physics and Astronomy

California Institute of Technology (Caltech) *Pasadena, CA* *2003*
B.S. in Physics

SCIENTIFIC COLLABORATION MEMBERSHIPS

- **North American Nanohertz Observatory for Gravitational Waves (NANOGrav), Senior Personnel (2015 – present), Member (2012 – present)** primary working groups: Noise Budget, Timing, Education and Public Outreach

  Elected within NANOGrav: **Education and Public Outreach Working Group Chair (2019 – 2021), Co-Chair (2021 – present)**

- **International Pulsar Timing Array (IPTA)** 2012 – present
- **Green Bank North Celestial Cap Survey (GBNCC)** 2021 – present
- **The Cosmic Assembly Near-infrared Deep Extragalactic Legacy Survey (CANDELS)** 2010 – present

AWARDS, FELLOWSHIPS, SCHOLARSHIPS, AND OTHER FUNDS GRANTED

- **Senior Investigator on NSF Physics Frontier Center "North American Nanohertz Observatory for Gravitational Waves" (2021 – 2025, PI: Xavier Siemens): $17M** awarded for team of collaborators based at Oregon State University

- **Senior Investigator on NSF Astronomy and Astrophysics "Construction of a Pulsar Interstellar Medium Array Detector" (2021 – 2023, PI: Michael Lam): $346,753** awarded for team of collaborators based at Rochester Institute of Technology
- **Co-Investigator on NASA Hubble Space Telescope proposal "SUPERCAL: Unified Reprocessing of the Large HST Cosmology Survey Fields - New Science, Archival Legacy, and Pathfinder for JWST" (2021 – 2023, PI: Anton Koekoemoer):** awarded for team of collaborators based at STScI
- **Collaborator on NSF Windows on the Universe: the Era of Multi-messenger Astronomy "Improving Gravitational Wave Sensitivity through Real-Time Cyclic Spectroscopy" (2021, PI: Ryan Lynch): ∼$1M** awarded for new receiver on the Green Bank Telescope at Green Bank Observatory
- **Hillsdale College Summer Leave Grants (2017 – 2021):** applied for and received **$17,300** for student research and professional development travel
- **Hillsdale College Emily Daugherty Award for Teaching Excellence (2020)** awarded to junior faculty member and to department
- **Co-Investigator on NSF proposal International Research Experiences for Students (IRES) (2017 – 2020, PI: Maura McLaughlin): $250k** awarded for international student travel for West Virginia University-based program
- **Xilinx Corporation Donation (2018):** received **∼$3,000** FPGA processor for on campus Low-Frequency All-Sky Monitor Telescope (see Startup Project)
- **NANOGrav Seed-Funding Awards (2015, 2016):** applied for and received **$4,700** in supplemental collaboration funding for travel
- **AAPT New Faculty Workshop Travel Award (2015)**
- **Amazon Web Services "AstroCompute in the Cloud" Grant (2015):** applied for and received **$10,000** in funding for scientific computing on the Amazon Web Services cloud cluster in support of radio astronomy big-data projects related to the Square Kilometer Array (SKA) telescope
- **Runner-Up Prize, IPTA Steering Committee Award (2014)**
- **NSF PIRE Postdoctoral Fellowship (2011 – 2015)**
- **Maryland Space Grant Graduate Fellowship (2009 – 2011)**
- **Graduate Research and Teaching Assistantships, Johns Hopkins University (2004 – 2009, 2011):** included full tuition coverage
- **Caltech Summer Undergraduate Research Fellowships (2000, 2002)**
- **Caltech Alcorn Undergraduate Scholarship (2000 – 2003)**

Teaching

RESEARCH STUDENTS ADVISED

- **Shane Smith '22 (see Physics Senior Thesis Projects Advised)**: *published Nature Astronomy paper on Breakthrough Listen signal BLC1–* http://seti.berkeley.edu/blc1/
- **Sashabaw Niedbalski '21 (see LAUREATES-supported Summer Research Advised)** *currently in Astronomy Ph.D. program at Cornell University, Ithaca, NY*
- **Philip Andrews '21 (see Physics Senior Thesis Projects Advised)** *currently in Aeronautical Engineering Ph.D. program at Notre Dame University, South Bend, IN*
- **David Forman '21 (see LAUREATES-supported Summer Research Advised)** *currently in Computer Science Ph.D. program at Massachusetts Institute of Technology, Cambridge, MA*
- **Caleb Ramette '21 (see LAUREATES-supported Summer Research Advised)** *currently in Materials Science and Engineering Ph.D. program at University of Utah, Salt Lake City, UT*
- **Laura Salo '19 (see LAUREATES-supported Summer Research Advised)** *currently in Astrophysics Ph.D. program at University of Minnesota, Minneapolis, MN.* DGRAV Student Travel Award also granted for 2018 April APS Meeting.
- **Christos Giannakopoulos '19 (see Physics Senior Thesis Projects Advised)** *Currently in Physics Ph.D. program at the University of Cincinnati, Cincinnati, OH.* DGRAV Student Travel Award also granted for 2018 April APS Meeting.
- **Charles (Jay) Rose '18 (see Physics Senior Thesis Projects Advised)** *currently employed by the Martinrea International Inc., and in Masters program in Mechanical Engineering at the University of Cincinnati*

- **Daniel Halmrast '17 (see Physics Senior Thesis Projects Advised)** *currently in Mathematics Ph.D. program at University of California, Santa Barbara.* Thesis work on string theory.
- **Joseph Kutil '17 (see Physics Senior Thesis Projects Advised)** *currently employed by Michigan Air Products*
- **Cody Jessup '16 (see Physics Senior Thesis Projects Advised)** *currently in Physics Ph.D. program at Montana State University, Bozeman, MT*
- **Katherine Knecht, Hillsdale Academy '20** *currently at Cornell University, Ithaca, NY*

HILLSDALE COLLEGE COURSES TAUGHT

- **Physics 393, General Relativity (Spring 2016, Spring 2021)**
- **Physics 460, Electricity and Magnetism (Spring 2017 – Spring 2021)**
- **Physics 100, Great Principles of Physics (Fall 2016 – Spring 2021)**
- **Collegiate Scholars Program 258, Physics & Philosophy Through Science Fiction (Spring 2021)**
- **Physics 201, University Physics (Fall 2017 – Fall 2020)**
- **Physics 597-01, Physics Seminar (Fall 2018 – Fall 2020)**
- **Physics 575, Senior Thesis (Fall 2016 – Fall 2020)**
- **Physics 350, Computational Physics (Spring 2020, 2019)**
- **Physics 597-01, Relativity (Spring 2020)**
- **Collegiate Scholars Program 252/257, Physics & Philosophy in Cinematic Science Fiction (Fall 2017, Fall 2019):**
- **Physics 304, Theoretical Physics II (Spring 2019)**
- **Physics 311, Experimental Physics II (Spring 2017 – Spring 2019)**
- **Physics 120, Astronomy (Spring 2018)**
- **Physics 101, College Physics (Fall 2016)**
- **Science 101 (Fall 2015 – Spring 2016)**
- **Physics 490, Quantum Mechanics (Fall 2015)**

JOHNS HOPKINS UNIVERSITY COURSES

- **Teaching Assistant (2004 – 2005):** Physics for Biological Science Majors and General Physics Laboratory

Research

GENERAL AUDIENCE PUBLICATIONS

- **"Catching Gravitational Waves with Pulsars" (AstroBeat, 2018)**: at request of the Astronomical Society of the Pacific, wrote article on pulsar timing arrays for an audience of amateur astronomers. (`http://nanograv.org/assets/files/ab2018-161%20May2018-Dolch.pdf`)
- **CANDELS Blog (2012 – 2014):** periodic contributions to an official Hubble Space Telescope public outreach blog (see `https://candels-collaboration.blogspot.com`; my entries here: `http://goo.gl/FSKVGe`)

FIRST-AUTHORED REFEREED PUBLICATIONS (STUDENT AUTHORS UNDERLINED)

- **(7) Deconvolving Pulsar Signals with Cyclic Spectroscopy: A Systematic Evaluation** (2021) *Dolch, T.*, Stinebring, D. R., et al., Astrophysical Journal, 913, 98
- **(6) First Light for Station V of the Low-Frequency All-Sky Monitor Radio Telescope** (2020) *Dolch, T.*, Andrews, P. ...Dulemba, A. ...Niedbalski, S., Ramette, C., Smith, S. Radio Science Meeting (APS/URSI), 2020 US National Committee of URSI National
- **(5) Pulsars at Low Radio Frequencies, Cyclic Spectroscopy, and Pulsar Timing Arrays** (2019) *Dolch, T.*, Radio Science Meeting (USNC-URSI NRSM), 2018 US National Committee of URSI National

- **(4) Noise Budget and Interstellar Medium Mitigation Advances in the NANOGrav Pulsar Timing Array** (2018), *Dolch, T.*, for the NANOGrav Collaboration, S. Chatterjee, J. M. Cordes, et al., Journal of Physics Conference Series, 957, 012007 (Proceedings of the 12th Edoardo Amaldi Conference on Gravitational Waves, Pasadena, CA)
- **(3) Recent H-alpha Results on Pulsar B2224+65's Bow-Shock Nebula, the "Guitar"** (2016), *Dolch, T.*, Chatterjee, S., Clemens, D. P., Cordes, J. M., Cashmen, L. R., Taylor, B. W. Journal of Astronomy and Space Sciences, 33, 167
- **(2) Single-Source Gravitational Wave Limits From the J1713+0747 24-hr Global Campaign** (2016) *Dolch, T.*, Ellis, J. E., et al., Journal of Physics: Conference Series, Volume 716, 012014 (Proceedings of the 11th Edoardo Amaldi Conference on Gravitational Waves, Gwangju, South Korea)
- **(1) A 24 hr Global Campaign to Assess Precision Timing of the Millisecond Pulsar J1713+0747** (2014) *Dolch, T.*, Lam, M. T., Cordes, J. M., et al. Astrophysical Journal, 794, 21

CO-AUTHORED REFEREED PUBLICATIONS (STUDENT AUTHORS UNDERLINED)

- **(63) The International Pulsar Timing Array second data release: Search for an isotropic Gravitational Wave Background** (2022) Antoniadis, J., Arzoumanian, Z., Babak, S., ...*Dolch, T.*, et al., Monthly Notices of the Royal Astronomical Society, 510, 4873
- **(62) Bayesian Solar Wind Modeling with Pulsar Timing Arrays** (2021) Hazboun, J. S., ...*Dolch, T.*, et al., submitted to the Astrophysical Journal, arXiv e-prints, `https://arxiv.org/abs/2111.09361`
- **(61) The NANOGrav 12.5-year data set: Search for Non-Einsteinian Polarization Modes in the Gravitational-Wave Background** (2021) Arzoumanian, Z., Baker, P. T.,, ...*Dolch, T.*... Laal, N., et al., Astrophysical Journal Letters, 923, L22
- **(60) An In Situ Study of Turbulence Near Stellar Bow Shocks** (2021) Ocker, S. K., Cordes, J. M., Chatterjee, S., *Dolch, T.*, Astrophysical Journal, 922, 233
- **(59) Searching For Gravitational Waves From Cosmological Phase Transitions With The NANOGrav 12.5-year dataset** (2021) Arzoumanian, Z., Baker, P. T.,, ...*Dolch, T.*... Mitridate, A., ...Taylor, S. R., et al., Physical Review Letters, 127, 251302
- **(58) The NANOGrav 12.5-Year Data Set: Polarimetry, Rotation Measures, and Galactic Magnetic Field Strengths from NANOGrav Observations with the Green Bank Telescope** (2021) Wahl, H. M., McLaughlin, M. A., Gentile, P. A., ...*Dolch, T.*, et al., accepted for publication in the Astrophysical Journal, arXiv e-prints, `https://arxiv.org/abs/2104.05723`
- **(57) Refined Mass and Geometric Measurements of the High-Mass PSR J0740+6620** (2021) Fonseca, E., Cromartie, H. T., Pennucci, T. T. ...*Dolch, T.*, et al., Astrophysical Journal, 915, 12
- **(56) The NANOGrav 11yr Data Set: Limits on Supermassive Black Hole Binaries in Galaxies within 500Mpc** (2021) Arzoumanian, Z., Baker, P. T., ...Charisi, M., ...*Dolch, T.*, et al., Astrophysical Journal, 914, 121
- **(55) The NANOGrav 12.5-year Data Set: Search For An Isotropic Stochastic Gravitational-Wave Background** (2020) Arzoumanian, Z., Baker, P. T., Blumer, H., Becsy, B., ...*Dolch, T.*... Simon, J., et al., Astrophysical Journal Letters, 905, L34
- **(54) The NANOGrav 12.5-Year Data Set: Monitoring Interstellar Scattering Delays** (2021) Turner, J. E., McLaughlin, M. A., Cordes, J. M., Lam, M. T., Shapiro-Albert, B. J., Stinebring, D. R.. ...*Dolch, T.*, et al., Astrophysical Journal, 917, 10
- **(53) Astrophysics Milestones For Pulsar Timing Array Gravitational Wave Detection** (2021) Pol, N. S., Taylor S. R., Kelley... *Dolch, T.*, et al., Astrophysical Journal Letters 911, L34
- **(52) The Space Public Outreach Team** (2020) Des Jardins, A... *Dolch, T.*, et al., Journal of Computers in Mathematics and Science Teaching, 39, 4
- **(51) Multi-Messenger Gravitational Wave Searches with Pulsar Timing Arrays: Application to 3C66B Using the NANOGrav 11-year Data Set** (2020) Arzoumanian, Z., Baker, P. T., Brazier, A...*Dolch, T.*... et al., Astrophysical Journal 900, 102
- **(50) The NANOGrav 12.5-year Data Set: Wideband Timing of 47 Millisecond Pulsars** (2021) Alam, M. F., Arzoumanian, Z., Baker, P. T, *Dolch, T.*... Halmrast, D.... Jessup, C.... Ramette, J.... Tripepi, M. et al., Astrophysical Journal Supplements 252, 5
- **(49) The NANOGrav 12.5-year Data Set: Observations and Narrowband Timing of 47 Millisecond Pulsars** (2021) Alam, M. F., Arzoumanian, Z., Baker, P. T... Halmrast, D.... Jessup, C.... Ramette, J.... Tripepi, M. et al., Astrophysical Journal Supplements 252, 4

- **(48) On Frequency-dependent Dispersion Measures and Extreme Scattering Events** (2020) Lam, M. T., Lazio, T. J. W., *Dolch, T.*, et al., Astrophysical Journal, 892, 89
- **(47) Modeling the uncertainties of solar-system ephemerides for robust gravitational-wave searches with pulsar timing arrays** (2020) Vallisneri, M., Taylor, S. R., Simon, J. ...*Dolch, T.*... et al., Astrophysical Journal, 893, 112
- **(46) The NANOGrav 11-year Data Set: Constraints on Planetary Masses Around 45 Millisecond Pulsars** (2020) Behrens, E. A., Ransom, S. M., Madison, D. R. ...*Dolch, T.*... et al., Astrophysical Journal Letters, 893, L8
- **(45) The NANOGrav 11-Year Data Set: Limits on Gravitational Wave Memory** (2020) Aggarwal, K., Baker, P. T., ...*Dolch, T.*... et al., Astrophysical Journal, 889, 38
- **(44) A pulsar-based timescale from the international pulsar timing array** (2020) Hobbs, G., ...*Dolch, T.*... et al., Monthly Notices of the Royal Astronomical Society 491, 5951
- **(43) Relativistic Shapiro delay measurements of an extremely massive millisecond pulsar** (2020) Cromartie, H. T., Fonseca, E., Ransom, S. M., ...*Dolch, T.*... et al., Nature Astronomy, 439
- **(42) The NANOGrav 11-Year Data Set: Evolution of Gravitational Wave Background Statistics** (2020) Hazboun, J. S., Simon, J., Taylor, S. R., ...*Dolch, T.*... et al., Astrophysical Journal 890, 108
- **(41) The International Pulsar Timing Array: Second data release** (2019) Perera, B. B. P., DeCesar, M. E., Demorest, P. B., ...*Dolch, T.*... et al., Monthly Notices of the Royal Astronomical Society, 490, 4666
- **(40) The CANDELS/SHARDS Multiwavelength Catalog in GOODS-N: Photometry, Photometric Redshifts, Stellar Masses, Emission-line Fluxes, and Star Formation Rates** (2019) Barro, G., Pérez-González, P. G., Cava, A., ...*Dolch, T.*... et al., Astrophysical Journal, 243, 22
- **(39) The NANOGrav 11-Year Data Set: Limits on Gravitational Waves from Individual Supermassive Black Hole Binaries** (2019) Aggarwal, K., Arzoumanian, Z., Baker, P. T., ...*Dolch, T.*... et al., Astrophysical Journal, 880, 116
- **(38) The Astrophysics of Nanohertz Gravitational Waves** (2019) Burke-Spolaor, S., Taylor, S. R., Charisi, M., ...*Dolch, T.*... et al., Astronomy and Astrophysics Review, 27, 5
- **(37) High-Precision X-ray Timing of Three Millisecond Pulsars with NICER: Stability Estimates and Comparison with Radio** (2019) Deneva, J. S., Ray, P. S., Lommen, A., ...*Dolch, T.*... et al., Astrophysical Journal, 874, 160
- **(36) The NANOGrav 12.5-yr Data Set: The Frequency Dependence of Pulse Jitter in Precision Millisecond Pulsars** (2019) Lam, M. T., McLaughlin, M. A., Arzoumanian, Z., ...*Dolch, T.*... et al., Astrophysical Journal, 872, 193
- **(35) The NANOGrav 11 yr Data Set: Solar Wind Sounding through Pulsar Timing** (2019) Madison, D. R., Cordes, J. M., Arzoumanian, Z., ...*Dolch, T.*... et al., Astrophysical Journal, 872, 150
- **(34) Tests of gravitational symmetries with pulsar binary J1713+0747** (2019) Zhu, W. W., Desvignes, G., Wex, N., ...*Dolch, T.*... et al., Monthly Notices of the Royal Astronomical Society, 482, 3249
- **(33) Science with the Next-Generation VLA and Pulsar Timing Arrays** (2018) *The NANOGrav Collaboration*, `https://arxiv.org/abs/1810.06594`, to be published in the ASP Monograph Series, "Science with a Next-Generation VLA", ed. E. J. Murphy (ASP, San Francisco, CA)
- **(32) PSR J2234+0611: A New Laboratory for Stellar Evolution** (2019) Stovall, K., Freire, P. C. C., Antoniadis, J., ...*Dolch, T.*... et al., Astrophysical Journal, 870, 74
- **(31) Studying the Solar system with the International Pulsar Timing Array** (2018) Caballero, R. N., Guo, Y. J., Lee, K. J., ...*Dolch, T.*... et al., Monthly Notices of the Royal Astronomical Society, 481, 5501
- **(30) The NANOGrav 11-year Data Set: Pulse Profile Variability** (2018) Brook, P. R., Karastergiou, A., McLaughlin, M. A., ...*Dolch, T.*... et al., Astrophysical Journal, 868, 122
- **(29) The NANOGrav 11-Year Data Set: Polarimetry and Pulse Microcomponents** (2018) Gentile, P. A., McLaughlin, M. A., Demorest, P. B., ...*Dolch, T.*... et al., Astrophysical Journal, 862, 47
- **(28) The NANOGrav 11-year Data Set: Pulsar-timing Constraints On The Stochastic Gravitational-wave Background** (2018) Arzoumanian, Z.... *Dolch, T.*... et al. (NANOGrav Collaboration), Astrophysical Journal, 859, 47
- **(27) The NANOGrav 11-year Data Set: High-precision timing of 47 Millisecond Pulsars** (2018) Arzoumanian, A.... *Dolch, T.*... Halmrast, D.... Jessup, C. et al. (NANOGrav Collaboration + Hillsdale College students), Astrophysical Journal Supplement, 235, 37
- **(26) A Second Chromatic Timing Event of Interstellar Origin toward PSR J1713+0747** (2018) Lam, M. T... *Dolch, T.*, et al., Astrophysical Journal, 861, 132
- **(25) Solar-System Studies with Pulsar Timing Arrays** (2018) Caballero, R. N... *IPTA*... et al., Pulsar Astrophysics the Next Fifty Years, 337, 154

- **(24) The NANOGrav Nine-Year Data Set: Measurement and Interpretation of Variations In Dispersion Measures** (2017) Jones, M... *Dolch, T.*, et al., Astrophysical Journal, 841, 125
- **(23) CANDELS Multiwavelength Catalogs: Source Identification and Photometry in the CANDELS Extended Groth Strip** (2017) Stefanon, M... *Dolch, T....* et al., Astrophysical Journal Supplement, 229, 32
- **(22) CANDELS Multi-Wavelength Catalogs: Source Detection and Photometry in the COSMOS Field** (2017) Nayyeri, H... *Dolch, T....* et al., Astrophysical Journal Supplement, 228, 7
- **(21) The NANOGrav Nine-Year Data Set: Excess Noise in Millisecond Pulsar Arrival Times** (2017) Lam, M. T...*Dolch, T....* et al., Astrophysical Journal, 834, 35
- **(20) The NANOGrav Nine-year Data Set: Mass and Geometric Measurements of Binary Millisecond Pulsars** (2016) Fonseca, E... *Dolch, T.*, et al., Astrophysical Journal, 832, 167
- **(19) Statistical Analyses for NANOGrav 5-year Timing Residuals** (2016) Wang, Y... *Dolch, T.*, et al., Research in Astronomy and Astrophysics, 17, 19
- **(18) PSR J1024–0719: A Millisecond Pulsar in an Unusual Long-Period Orbit** (2016) Kaplan, D. L... *Dolch, T.*, et al., Astrophysical Journal, 826, 86
- **(17) The NANOGrav Nine-Year Data Set: Noise Budget For Pulsar Arrival Times on Intraday Timescales** (2016) Lam, M. T., Cordes, J. M., Chatterjee, S... *Dolch, T.*, et al., Astrophysical Journal, 819, 155
- **(16) The NANOGrav Nine-Year Data Set: Monitoring Interstellar Scattering Delays** (2016) Levin, L., McLaughlin, M. A., Jones, G... *Dolch, T.*, et al., Astrophysical Journal, 818, 166
- **(15) The NANOGrav Nine-Year Data Set: Astrometric Measurements of 37 Millisecond Pulsars** (2016) Matthews, A... *Dolch, T.*, et al., Astrophysical Journal, 818, 92
- **(14) From Spin-Noise to Systematics: Stochastic Processes in the First International Pulsar Timing Array Data Release** (2016) Lentati, L... *Dolch, T.*, et al. (IPTA Collaboration), Monthly Notices of the Royal Astronomical Society, 458, 2161
- **(13) The International Pulsar Timing Array: State, Data Challenges and Potential** (2016) Verbiest, J. P. W... *Dolch, T.*, et al. (IPTA Collaboration), Monthly Notices of the Royal Astronomical Society, 458, 1267
- **(12) NANOGrav Limits On the Isotropic Stochastic Gravitational Wave Background Using the 9-Year Data Release** (2016) Arzoumanian, Z... *Dolch, T.*, Ellis, J. A... et al. (NANOGrav Collaboration), Astrophysical Journal, 821, 13
- **(11) A Measurement of the UV Luminosity Density of the Universe During the Epoch of Reionization** (2015) Mitchell-Wynne, K... *Dolch, T.*, et al. Nature Communications 6, 7945
- **(10) The NANOGrav Nine-Year Data Set: Observations, Arrival Time Measurements, and Analysis of 37 Millisecond Pulsars** (2015) Arzoumanian, Z... Demorest, P. B., *Dolch, T.*, et al. (NANOGrav Collaboration), Astrophysical Journal, 810, 150
- **(9) NANOGrav Constraints On Gravitational Wave Bursts With Memory** (2015) Arzoumanian, Z... *Dolch, T.*, et al. (NANOGrav Collaboration), Astrophysical Journal, 810, 150
- **(8) Testing Theories of Gravitation Using 21-Year Timing of Pulsar Binary J1713+0747** (2015) Zhu, W. W... *Dolch, T.*, et al., Astrophysical Journal, 809, 41
- **(7) Pulsar Timing Errors from Asynchronous Multi-frequency Sampling of Dispersion Measure Variations** (2015) Lam, M. T., Cordes, J. M., Chatterjee, C., *Dolch, T.*, Astrophysical Journal, 801, 130
- **(6) NANOGrav Limits on Gravitational Waves From Supermassive Black Hole Binaries in Circular Orbits** (2014) Arzoumanian, Z... *Dolch, T.*, et al. (NANOGrav Collaboration), Astrophysical Journal, 794, 141
- **(5) Practical Application of Cyclic Spectroscopy to Pulsar Signals** (2013) Jones, G., Cordes, J. M., Demorest, P. B., *Dolch, T.*, McLaughlin, M. A., Palliyaguru, N., Stinebring, D. R. Radio Science Meeting (USNC-URSI NRSM), 2013 US National Committee of URSI National
- **(4) The International Pulsar Timing Array** (2013) Manchester, R. N. & *IPTA*, Classical and Quantum Gravity, 30, 224010
- **(3) CANDELS Multiwavelength Catalogs: Source Identification and Photometry in the CANDELS UKIDSS UDS Field** (2013) Galametz, A., Grazian, A., Fontana, A., *CANDELS Team* Astrophysical Journal Supplement, 206, 10
- **(2) CANDELS: The Cosmic Assembly Near-infrared Deep Extragalactic Legacy Survey – The Hubble Space Telescope Observations, Imaging Data Products, and Mosaics** (2011) Koekemoer, A. M., Faber, S., Ferguson, H. C., Riess A. ...*Dolch, T.*, et al. (CANDELS Collaboration), Astrophysical Journal Supplement, 197, 36
- **(1) CANDELS: The Cosmic Assembly Near-infrared Deep Extragalactic Legacy Survey** (2011) Grogin, N., Kocevski, D., Faber, S., Ferguson, H. C., ... Riess, A. ...*Dolch, T.*, et al. (CANDELS Collaboration), Astrophysical Journal Supplement, 197, 35

RECENT WHITE PAPERS, MEMOS (STUDENT AUTHORS UNDERLINED)

- **The Future Of The Arecibo Observatory: The Next Generation Arecibo Telescope** (2021) Anish Roshi, D., ...*Dolch, T.*, et al., `https://arxiv.org/abs/2103.01367`
- **Investigating the Impact of Slicing on Fitted Timing Model Parameters** (2020) Andrews, P., Lam, M. T., *Dolch, T.*, et al., NANOGrav Memo Series #4, http://nanograv.org/assets/files/memos/NANOGrav-Memo-004.pdf
- **The Swarm Development Concept for the LWA** (2019) Taylor, G., Dowell, J., Pihlström, Y., ...*Dolch, T.*, et al., Bulletin of the American Astronomical Society, 51, 2
- **Pulsar Timing Arrays: Gravitational Waves from Supermassive Black Holes and More** (2019) Stairs, I., Kaspi, V., Demorest, P., ...*Dolch, T.*, et al., Canadian Long Range Plan for Astronony and Astrophysics White Papers, 2020, 16
- **Fundamental Physics with Pulsars** (2019) Fonseca, E., Stairs, I., Kaspi, V., ...*Dolch, T.*, et al., Canadian Long Range Plan for Astronomy and Astrophysics White Papers, 2020, 23
- **Twelve Decades: Probing the Interstellar Medium from kiloparsec to sub-AU scales** (2019) Stinebring, D. R., Chatterjee, S., Clark, S. E., et al., BAAS, 51, 492
- **The Virtues of Time and Cadence for Pulsars and Fast Transients** (2019) Lynch, R., Brook, P., Chatterjee, S., ...*Dolch, T....* et al., BAAS, 51, 461
- **Magnetic Fields of Extrasolar Planets: Planetary Interiors and Habitability** (2019) Lazio, J., Hallinan, G., Airapetian, A., ...*Dolch, T.*, et al., BAAS, 51, 135

STARTUP PROJECT

- **Low-Frequency All-Sky Monitor Telescope (2017 – present):** constructed radio telescope on the Hillsdale College campus using Science Division startup funds. Telescope consists of 13 LWA antennas, cabling, and backend electronics. Telescope operates with four other stations nationwide to form one 24-hr all-sky array. Seven students have worked on this project, including a senior thesis.

RECENT INVITED RESEARCH TALKS

Center for Astrophysics Research and Technology Seminar 11/2021
University of New Mexico, Albuquerque, NM (Remote)

LAASTRO Seminar 9/2021
Los Alamos National Laboratory, Los Alamos, NM (Remote)

Astrophysics Colloquium, Department of Physics & Astronomy 10/2019
Michigan State University, East Lansing, MI

Colloquium, Department of Physics 4/2019
College of Wooster, Wooster, OH

International Union of Radio Science (URSI) National Radio Science Meeting Special Session "Cosmology and Astrophysics at Low Radio Frequencies" 1/2019
University of Colorado, Boulder, CO

Friday Lunch Seminar Hour 10/2017
National Optical Astronomy Observatory, Tuscon, AZ

RECENT CONTRIBUTED RESEARCH TALKS (STUDENT AUTHORS UNDERLINED)

The Student Teams of Astrophysics ResearcherS (STARS) Undergraduate Program in the North American Nanohertz Observatory for Gravitational Waves 1/2022 (forthcoming)
American Astronomical Society Meeting, Salt Lake City, UT

The LWA-Swarm Radio Telescope: Bringing the Benefits of New Mexico's Long-Wavelength Array to Undergraduate-focused Academic Institutions 11/2021
New Mexico Symposium, Socorro, NM

The LWA Swarm and Pulsar Astrophysics 8/2021
LWA Users Meeting, Albuquerque, NM

Deconvolving Pulsar Signals with Cyclic Spectroscopy: A Systematic Evaluation 1/2021
American Astronomical Society Winter Meeting (remote)

The LWA and Pulsar Timing Arrays 7/2020
LWA Users Meeting, Albuquerque, NM (remote)

First Light for Station V of the Low-Frequency All-Sky Monitor Radio Telescope 7/2020
AP-S/URSI Meeting, Montreal, QC (remote)
Dolch, T., Andrews, P. ...Dulemba, A. ...Niedbalski, S., Ramette, C., Smith, S., et al.

Student Teams of Astrophysics ResearcherS (STARS) in the North American Nanohertz Observatory for Gravitational Waves 6/2020
American Astronomical Society Summer Meeting, Madison, WI (remote)

Update on the North American Nanohertz Observatory for Gravitational Waves 6/2020
Compact Objects in Michigan and Ontario, Michigan State University (remote)

SELECTED POSTERS (RESEARCH STUDENT AUTHORS UNDERLINED)

- **Student Teams of Astrophysics ResearcherS (STARS) in the North American Nanohertz Observatory for Gravitational Waves** (2020) Dolch, T., Crawford, F., & Nanograv Physics Frontiers Center 2020, American Astronomical Society Meeting #235 102.07
- **Distinguishing Bright Pulses from RFI via Machine Learning Using Single-Pulse Data from PSR J1713+0747** (2019) Forman, D., *Dolch, T.*, Lewandowska, N., et al., American Astronomical Society Meeting #233, 153.15
- **Bow-Shock Pulsar Wind Nebulae Searches Aided by the North American Nanohertz Observatory for Gravitational Waves** (2018) Giannakopoulos, C.... *Dolch, T.*... Salo, L., et al., American Physical Society Meeting, L01.00015, Columbus, OH
- **Observations of the Guitar Nebula Pulsar with the Green Bank Telescope and the Long-Wavelength Array** (2018) Salo, L.... *Dolch, T.*, et al., American Physical Society Meeting, L01.00014, Columbus, OH
- **Characterizing Galactic Scintillations of Fast Radio Bursts using Radio Pulsars** (2017) Lam, M. T., Cordes, J. M., McLaughlin, M. A., *Dolch, T.*, Jessup, C., Chatterjee, S., Fast Radio Bursts: New Probes of Fundamental Physics and Cosmology, Aspen, CO
- **Upper Limits on High-Frequency Single-Source Gravitational Waves** (2017) Halmrast, D.... *Dolch, T.*, et al., American Astronomical Society Meeting #225, #242.18
- **Gravitational Wave Limits From Two Pulsar Datasets** (2017) Halmrast, D.... *Dolch, T.*, et al., LAUREATES poster symposium, Hillsdale College
- **Upper Limits on High-Frequency Single-Source Gravitational Waves** (2016) Halmrast, D.... *Dolch, T.*, et al., 2016 International Pulsar Timing Array Meeting, Stellenbosch, South Africa
- **Measuring Changes in Scattering Parameters of Millisecond Pulsar B1937+21 Over Multiple Epochs** (2016) Jessup, C.... *Dolch, T.*, et al., 2016 International Pulsar Timing Array Meeting, Stellenbosch, South Africa

ACCEPTED TELESCOPE OBSERVING-TIME PROPOSALS AS PI

- **Long-Wavelength Array (2019):** New Pulsar Detections with the LWA (20+ hr)
- **Green Bank Observatory 18B-321 (2018):** Continuing Monitoring DM Variations of PSR B2224+65, the "Guitar Nebula" Pulsar (12h). Also included simultaneous observations from the Long Wavelength Array.
- **Kitt Peak National Observatory WIYN Telescope (2018, 2019):** A KPNO Hα Search for Radio Pulsar Bow-Shock Nebula. 4 more nights awarded in 7/2018. 6 remote nights in 2019.
- **Arecibo Observatory P3178 (2017):** A Possible Pulsar: VLA J0636+1838. 4 hours awarded in 2017.
- **Kitt Peak National Observatory 4 m Mayall Telescope (2016, 2017):** A KPNO Hα Search for Radio Pulsar Bow-Shock Nebula. 24more nights awarded in 2017.
- **Green Bank Observatory 16B-366 (2016):** Monitoring DM Variations of PSR B2224+65, the "Guitar Nebula" Pulsar (12h). Also includes simultaneous observations from the Long Wavelength Array.
- **Arecibo Observatory P2800 (2012):** Redo After Equipment Problem (1hr)
- **Arecibo Observatory P2676 (2011):** NANOGrav Precision Timing: ISM Irregularities Toward Pulsar B1937+21 (10hr)

OBSERVING EXPERIENCE AND MANAGEMENT

- **Long-Wavelength Array (radio telescope) – Socorro, NM:** 15 hr
- **Kitt Peak National Observatory WIYN Telescope – Kitt Peak, AZ:** 4 nights on-site, 6 nights remotely
- **Palomar Observatory 200-inch Telescope – Palomar Mountain, CA:** 5 nights
- **Green Bank Telescope – Green Bank, WV:** 7 hr on-site, 146 hr remotely
- **Arecibo Observatory (radio telescope)– Arecibo, PR:** 11 hr on-site, 188.5 hr remotely
- **Kitt Peak National Observatory 4 m Mayall Telescope – Kitt Peak, AZ:** 4 nights
- **Project Leader for the 24 Hour Global Observational Campaign of Pulsar J1713+0747:** scheduled and managed a 24-hr long, nine-telescope observation with the Arecibo, Effelsberg, GBT, GMRT, Lovell, LOFAR, Nançay, Parkes, and WSRT radio telescopes
- **Kitt Peak National Observatory 2.1 m Telescope – Kitt Peak, AZ:** 2 nights

Service

Service to Hillsdale College

ADVISING

- **Core and Major Academic Advising (2016 – present)**
- **Society of Physics Students (SPS), Sigma Pi Sigma, and Astronomy Club (2016 – present):** faculty advisor. For 2020 – 2021, the Hillsdale College SPS Chapter received a 2021 Notable Chapter Award.
- **Phi Kappa Phi (2020 – present):** faculty treasurer

STUDENT RESEARCH SUMMARY

- Supervised 21 Hillsdale research students, including five senior undergraduate physics theses; involved 29 Hillsdale students in Student Teams of Astrophysics ResearcherS (STARS) group

PHYSICS SENIOR THESIS PROJECTS ADVISED

- **Nicholas West Senior Thesis**: "Short-Timescale Gravitational Waves in the North American Nanohertz Observatory for Gravitational Waves" (2022, expected). Based on 2021 summer LAUREATES project at Hillsdale.
- **Shane Smith Senior Thesis**: "The Breakthrough Listen Search for Intelligent Life: A Wideband Radio Technosignature Search Toward Proxima Centauri" (2021). Based on 2020 summer REU program at Berkeley SETI Institute.
- **Philip Andrews Senior Thesis**: "Investigating the Impact of Data Slicing on Pulsar Timing Model Fit Parameters" (2020). Based on 2020 LAUREATES program, with Prof. Michael Lam (RIT) and me. Writeup published in official NANOGrav memo series: http://nanograv.org/assets/files/memos/NANOGrav-Memo-004.pdf
- **Joseph Harvey Senior Thesis**: "Developing a Climatometer: Toward an Objective Metric for Climate Replication with Machine Learning" (2020). Based on 2020 summer REU program.
- **David Forman Senior Thesis**: "A Classification Approach To Identify Seabed Geoacoustic Profiles via Deep Learning" (2020). Based on 2019 summer REU program.
- **Christos Giannakopoulos Senior Thesis**: "Identifying New Possible Bow-Shock Nebulae And Surface Brightness Upper Limit Determination" (2020). Supported from LAUREATES fund. Poster at APS April Meeting in Columbus, OH.
- **Charles (Jay) Rose Senior Thesis**: "Backend Electronics for the Low-Frequency All-Sky Monitor" (2019). Supported from LAUREATES fund.
- **Daniel Halmrast Senior Thesis:** "Detecting High Frequency Gravitational Waves" (2017). While LAUREATES student, presented poster at IPTA meeting in South Africa, and poster at American Astronomical Society meeting (see Selected Posters section).
- **Joseph Kutil Senior Thesis:** "Polarization Phase Shifts and Other Anomalies in Pulsar B1133+21" (2017).

- **Cody Jessup Senior Thesis:** "Measuring Changes in Scattering Parameters of Millisecond Pulsar B1937+21 over Multiple Epochs" (2016). Also a summer research project supported from LAUREATES fund. Presented poster at IPTA meeting in South Africa (see Selected Posters section).

HILLSDALE (NON-THESIS) LAUREATES-SUPPORTED SUMMER RESEARCH ADVISED

- **Alexander Dulemba:** "Machine Learning and Transient Astronomy with the Low-Frequency All-Sky Monitor V and the North American Nanohertz Observatory for Gravitational Waves" (2020)
- **Low-Frequency All-Sky Monitor Summer Research Students**: In Summer 2018 and Summer 2019, Philip Andrews, Sashabaw Niedbalski, Caleb Ramette, Alex Dulemba, Shane Smith, Nathaniel Birzer and I constructed the on-campus radio telescope.
- **Nathaniel Jones and Christopher Scheithauer:** "Epoch-dependent Interstellar Scintillations and Timing Variations for the Millisecond Pulsar B1937+21" (2018).
- **David Forman:** "Processing Single Pulses from the 1713 24-Hr Global Campaign with Machine Learning" (2018). With Prof. Natalia Lewandowska (Haverford) and me. Poster at 2019 AAS Meeting, Seattle, WA.
- **Laura Salo:** "Dual Telescope Observations of the Guitar Nebula Pulsar, PSR B2224+65" (2017). Poster at APS April Meeting in Columbus, OH.
- **Daniel O'Dette:** "First Light for the RadioJove Telescope" (2017).

Selected Service to the Scientific Community and the Public

JOURNAL/PROPOSAL REFEREEING

- **Referee for the Astrophysical Journal, Monthly Notices of the Royal Astronomical Society, American Journal of Physics**
- **Observing Proposal Reviewer for Long-Wavelength Array, Giant Metrewave Radio Telescope**

PUBLIC OUTREACH SERVICE (HILLSDALE UNLESS OTHERWISE NOTED)

- **Science Olympiad (2016 – 2021):** Ran and wrote exams for "Astronomy" and "Reach for the Stars." The second involved StarLab. 2020 event deferred due to COVID.
- **Regional Girl Scout Astronomy Day (2016, 2020)**: Ran an afternoon astronomy event assisted by an undergraduate physics major in Pioneer, OH. Featured 7 stations: StarLab presentation (inflatable planetarium), solar sunspot observation, make-a-telescope, solar system distance model, spectral lines, constellation coloring, and NANOGrav SPOT (Space Public Outreach Team) presentation on pulsars. ∼50 people reached. 2020 event planned, but canceled due to COVID.
- **Scouting Astronomy Night (2019)**: Gave StarLab program and Low-Frequency All-Sky Monitor telescope tour in Hayden Park for local Scout troops and Cub Scout packs. With assistance of physics majors.
- **Aktion Club Astronomy Night (2017)**
- **"Cosmic Resonances" Pulsar Astronomy Choreography Presentation (2017):** Consultant for Prof. Holly Hobbs' choreography to Prof. Dawn Erb's (UW–Milwaukee) musical composition "Lighthouses II" made from pulsar tones. Hobbs and I gave a public presentation in which I talked about pulsar astrophysics. Developed pulsar-related images and movies that were shown in the background during the performance.
- **Periodic Telescope Nights (2015 – present):** ∼150 people reached.
- **StarLab Presentations (2016 – 2018)**: for local Cub Scout packs and Hillsdale Academy
- **Special Telescope Events (2015 – 2017):** Venus occultation, Mercury Transit, Parents' Weekends, the "Supermoon" and a solar observation. ∼300 people reached.
- **Astronomy Merit Badge Counselor (2015 – 2020)**
- **Lunar Eclipse Observation (2015):** ∼300 people reached.
- **MD Space Grant Observatory (Johns Hopkins, Summer 2009 – Winter 2010):** Ran weekly public open houses + training sessions for JHU's Morris Offit Telescope, totaling ∼40 nights. Gave special tours to school groups and Cub Scout packs, including solar observations. ∼500 people reached.