

Kris Pardo

(he/him/his)

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RESEARCH INTERESTS

astrophysical tests of physics beyond the Standard Model ◦ gravitational waves ◦ particle dark matter theories ◦ dark energy theories, ◦ galactic dynamics ◦ active galactic nuclei

PROFESSIONAL EXPERIENCE

University of Southern California Assistant Professor of Physics & Astronomy	Jan. 2023 – present
California Institute of Technology Postdoctoral Scholar in Theoretical Physics	Sept. 2022 – Dec. 2022
Jet Propulsion Laboratory Postdoctoral Research Scholar	Sept. 2019 – Aug. 2022

EDUCATION

Princeton University <i>Ph.D. in Astrophysical Sciences, Advisor: David Spergel</i>	2019
Furman University <i>B.Sc. in Physics & Mathematics, Summa Cum Laude</i>	2014

HONORS, AWARDS, & FELLOWSHIPS

NSF Graduate Student Research Fellowship	2014 – 2019
Balzan Fellow, New College, Oxford University	2018

EXTERNAL FUNDING

Co-I, NASA Roman Space Telescope Research Opportunities PI: T. Chang (JPL), “Detecting Microhertz Gravitational Waves with the Roman Space Telescope”	2023
PI, NASA Astrophysical Data Analysis Program (22-ADAP22-0160) “Detecting Gravitational Waves from Supermassive Black Holes with Kepler”	2022

PUBLICATION SUMMARY

Refereed & submitted publications: 13 (10 first or second author)

A full list of my publications is included below and [online](#).

STUDENT MENTORING

Graduate Students

Mya Do (1st year, USC)	2023 – present
Eleanor Stuart (2nd year, USC)	2023 – present
Benjamin Zhang (2nd year, USC)	2022 – present
Dimple Sarnaaiik (3rd year, USC)	2022 – present
Yijun Wang (5th year, Caltech)	2019 – present
Co-advisor with Olivier Doré & Tzu-Ching Chang on Phys. Rev. D., 103, 8, (2021) & Phys. Rev. D, 106, 8, (2022)	

Undergraduate Students

Jaime Alvarez (Fullerton College)	2023
Leah Vazsonyi (Caltech; now a PhD student at UNC-Chapel Hill)	2021 - 2022

Graduate Student Committees

Paul Menker (USC, Candidacy Committee, 2023) • Trey Driskell (USC, Candidacy Committee, 2023)

TEACHING EXPERIENCE

University of Southern California

PHYS 430, <i>General Relativity & Gravitation</i> Upper-level undergraduate class for majors	Spring 2024
ASTR 100, <i>The Universe</i> Introductory undergraduate class for non-majors	Spring 2023
Guest Lecturer for: BISC 483 (Spring 2023), PHYS 190 (Fall 2022, Fall 2023)	

SERVICE & INCLUSION EFFORTS

Research mentor for USC's JumpStart Program	2023 – present
Caltech Cosmology Journal Club Co-Organizer	2019 – 2022
Listening Session Facilitator, Jet Propulsion Laboratory Co-host diversity & inclusion discussions within the astrophysics section.	2020 – 2021
Co-Organizer Cosmology with the Roman Space Telescope Virtual Seminar (previously AAS 239 splinter session)	2022
Co-Organizer NASA Fundamental Physics Program Atomic Interferometry Measurements in Space Workshop	2021

Co-Organizer NASA Fundamental Physics Program Virtual Townhall and Direct Detection of Dark Energy Splinter Session	2020
MIT Summer Research Program Application Review Committee Member	2017 – 2023
Gender Group Facilitator, LGBT Center, Princeton University	2018 – 2019
Resident Graduate Student, Forbes College, Princeton University	2015 – 2019
Resident advisor to 30 undergraduates per year. Encouraged a supportive residential environment; hosted star-gazing nights and social events.	
Princeton Astro Representative to Society for the Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS) Annual Conference	2015

TELESCOPE TIME

Co-I, Magellan/FOURSTAR (Princeton), 2 nights	2019
<i>Probing the growth and build-up of the most massive black holes across cosmic time</i>	
PI, Magellan/FOURSTAR (Princeton), 1 night	2019
<i>Finding supermassive black hole pairs that can contribute to the gravitational wave background</i>	
Co-I, Hubble Space Telescope/WFC3, Cycle 24, 2 orbits	2016
<i>High spatial resolution imaging of AGN-driven super-bubbles in two low-redshift quasars</i>	
PI, Chandra X-Ray Observatory/ACIS-S, Cycle 17, 66 ks	2015
<i>Probing AGN Feedback on Nuclear and Galaxy-wide Scales</i>	

SCIENCE COMMUNICATION & OUTREACH

Popular science articles/videos that feature my research:

<i>To explain away dark matter, gravity would have to be really weird, cosmologists say</i>	
Adrian Cho, Science	11/20/20
<i>An Alternative to Dark Matter Passes Critical Test</i>	
Charlie Wood, Quanta Magazine	07/28/20
<i>Scientists Just Detected Two Supermassive Black Holes on a Collision Course</i>	
Seeker Media, YouTube video	09/16/19
<i>How to Detect Extra Dimensions</i>	
PBS Space Time, YouTube video	10/03/18
<i>If Extra Dimensions Do Exist, They Must Be Really, Really Small</i>	
Mara Johnson-Groh, Live Science	09/25/18
<i>Are We Closer to Finding a Fifth Dimension?</i>	
Matthew Francis, Daily Beast	02/08/18

<i>Researchers Check Space-Time to See if It's Made of Quantum Bits</i> Ramin Skibba, Quanta Magazine	06/21/17
Worked with a choreographer and professional dancers to create a dance based on gravitational waves, Awe & Wonder , Review	2023
Wrote a popular science article about Carolyn Herschel <i>Caroline Herschel was England's first female professional astronomer, but still lacks name recognition two centuries later</i> , The Conversation	Aug. 2023
USC Peaks & Professors Faculty Participant	2023 – present
Public Observing Host (English & Spanish), Princeton University	2014 – 2019
Public Talk for Princeton Area Alumni Association (<i>Invited</i>)	Nov. 2018

PROFESSIONAL ACTIVITIES

NSF grant proposal review panel member

NASA ROSES grant proposal review panel member

Referee for *Monthly Notices of the Royal Astronomical Society*, *Physical Review D*, and
Physical Review Letters

American Astronomical Society (AAS) member

TECHNICAL SKILLS

Coding: Proficient in Python, C++, Mathematica. Experience with packages: emcee,
pymc3, cobaya, CLASS, CAMB, scikit-learn. My open source code is available on [my
github page](#).

Instruments: Experience with FOURSTAR (IR imager), MAGE (optical spectrograph),
and IMACS (multi-object spectrograph) on the Magellan Telescopes at Las Campanas
Observatory.

PUBLICATIONS ([ADS](#) | [INSPIRE HEP](#) | [Google Scholar](#))

† indicates papers that use particle physics (alphabetical) author ordering.

Published & Submitted

† Du, Yufeng; Murgui, Clara; **Pardo, Kris**; Wang, Yikun; Zurek, Kathryn M., *Contrast
Loss from Astrophysical Backgrounds in Space-Based Matter-Wave Interferometers*,
[arXiv:2308.02634](#)

† Mitridate, Andrea; **Pardo, Kris**; Trickle, Tanner; [Zurek, Kathryn M.](#), *Effective Field
Theory for Dark Matter Absorption on Single Phonons*, [Phys. Rev. D, 109, 1, 015010
\(2024\)](#)

- † Du, Yufeng; Murgui, Clara; **Pardo, Kris**; Wang, Yikun; Zurek, Kathryn M., *Atom Interferometer Tests of Dark Matter*, [Phys. Rev. D, 106, 9, 095041 \(2022\)](#)
- Wang, Yijun; **Pardo, Kris**; Chang, Tzu-Ching; Doré, Olivier, *Constraining the Stochastic Gravitational Wave Background with Photometric Surveys*, [Phys. Rev. D, 106, 8, 084006 \(2022\)](#)
- Casey-Clyde, J. Andrew; Mingarelli, Chiara M. F.; Greene, Jenny E.; **Pardo, Kris**; Nañez, Morgan; Goulding, Andy D., *A Quasar-based Supermassive Black Hole Binary Population Model: Implications for the Gravitational Wave Background*, [ApJ, 924, 2, 93 \(2022\)](#)
- Pardo, Kris**; Doré, Olivier, *Detecting dark matter subhalos with the Nancy Grace Roman Space Telescope*, [Phys. Rev. D, 104, 10, 103531 \(2021\)](#)
- Wang, Yijun; **Pardo, Kris**; Chang, Tzu-Ching; Doré, Olivier, *Gravitational wave detection with photometric surveys*, [Phys. Rev. D, 103, 8, 084007 \(2021\)](#)
- Pardo, Kris**, *Testing emergent gravity with isolated dwarf galaxies*, [J. Cosmology Astropart. Phys., 2020, 12, 012 \(2020\)](#)
- Pardo, Kris**; Spergel, David N., *What is the Price of Abandoning Dark Matter? Cosmological Constraints on Alternative Gravity Theories*, [Phys. Rev. Lett., 125, 21, 211101 \(2020\)](#)
- Pardo, K.**; Desmond, H.; Ferreira, P. G., *Testing self-interacting dark matter with galaxy warps*, [Phys. Rev. D, 100, 12, 123006 \(2019\)](#)
- Goulding, Andy D.; **Pardo, Kris**; Greene, Jenny E.; Mingarelli, Chiara M. F.; Nyland, Kristina; Strauss, Michael A., *Discovery of a Close-separation Binary Quasar at the Heart of a $z \sim 0.2$ Merging Galaxy and Its Implications for Low-frequency Gravitational Waves*, [ApJL, 879, 2, L21 \(2019\)](#)
- Pardo, Kris**; Fishbach, Maya; Holz, Daniel E.; Spergel, David N., *Limits on the number of spacetime dimensions from GW170817*, [J. Cosmology Astropart. Phys., 2018, 7, 048 \(2018\)](#)
- Pardo, K.**; Goulding, A. D.; Greene, J. E.; Somerville, R. S.; Gallo, E.; Hickox, R. C.; Miller, B. P.; Reines, A. E.; Silverman, J. D., *X-Ray Detected Active Galactic Nuclei in Dwarf Galaxies at $0 < z < 1$* , [ApJ, 831, 2, 203 \(2016\)](#)

Non-refereed

- Pardo, Kris**; Chang, Tzu-Ching; Doré, Olivier; Wang, Yijun, *Gravitational Wave Detection with Relative Astrometry using Roman's Galactic Bulge Time Domain Survey*, [arXiv:2306.14968](#)
- Ishak, Mustapha; Baker, Tessa; Bull, Philip; Pedersen, Eske M.; Blazek, Jonathan; Ferreira, Pedro G.; Leonard, C. Danielle; Lin, Weikang; Linder, Eric; **Pardo, Kris**;

Valogiannis, Georgios, *Modified Gravity and Dark Energy models Beyond $w(z)$ CDM Testable by LSST*, [arXiv:1905.09687](https://arxiv.org/abs/1905.09687)

TALKS

Invited

- Detecting Gravitational Waves in the Microhertz Regime with Relative Astrometry*
Colloquium, Columbia University Nov. 2023
Colloquium, Carnegie Observatories Sept. 2023
Astrophysics Seminar, IPMU, University of Tokyo Sept. 2023
- Gravitational Waves with Relative Astrometry*
Gravitational Wave Probes of Physics Beyond Standard Model 2
(International Online Conference) Dec 2022
- New Ways of Detecting Gravitational Waves & Dark Matter*
Astro Seminar, UC Davis May 2022
- Cosmology with Gravitational Waves & Gravitational Waves with Cosmology Data*
Seminar, UC Merced Mar. 2022
Special Seminar, Brown University Feb. 2022
Colloquium, University of North Carolina, Chapel Hill Oct. 2021
Colloquium, University of Southern California Feb. 2021
- Gravity Observation and Dark Energy Detection Explorer in the Solar System – a Mission Concept*
Atomic Interferometer White Paper Workshop,
NASA Biological & Physical Sciences Jun. 2021
- Update on the Nancy Grace Roman Space Telescope*
Cosmic Structure Science Interest Group Update, APS Meeting Apr. 2021
- Cosmology with the Roman Space Telescope’s Exoplanet Microlensing Survey*
Astronomy Seminar, University of Connecticut Feb. 2021
CosmoLab, University of Southern California Oct. 2020
- Astrophysical Tests of Gravitation and Dark Matter*
CCAPP Seminar, Ohio State University Sept. 2018
- AGN in Dwarf Galaxies as a Gateway to the Growth of the First Massive BHs*
Black Hole Workshop, Center for Computational Astrophysics (CCA) Dec. 2016

Contributed

- New Ways to Detect Gravitational Waves and Dark Matter*
HEP-astro seminar, University of Michigan, Ann Arbor Nov. 2022

<i>Gravitational Waves with Relative Astrometry</i>		
American Astronomical Society Meeting (Pasadena, CA)		Jun. 2022
<i>Cosmology with the Roman Space Telescope's Exoplanet Microlensing Survey</i>		
Postdoc Seminar Series, Jet Propulsion Lab		Nov. 2020
<i>Implications for the Stochastic Gravitational Wave Background from a Massive Binary Quasar</i>		
Physics Gravity Group Seminar, Princeton University		Apr. 2019
<i>Constraining Self-Interacting Dark Matter with Galaxy Warps</i>		
KICP Seminar, University of Chicago, IL		Feb. 2019
American Astronomical Society Meeting (Seattle, WA)		Jan. 2019
Tea & Talk, Stanford University, CA		Sept. 2018
<i>Astrophysical Tests of Gravitation and Dark Matter</i>		
BCCP Seminar, University of California at Berkeley, CA		Oct. 2018
Astrophysics Seminar, University of California at Irvine, CA		Oct. 2018
<i>Testing Modified Gravity with Dwarf Galaxies and Gravitational Waves</i>		
Astrophysics Thursday Lunch Seminar (Thunch), Princeton University		Apr. 2018
Physics Gravity Group Seminar, Princeton University		Mar. 2018
<i>Searching for Low-Mass AGN to $z < 1$</i>		
American Astronomical Society Meeting (Orlando, FL)		Jan. 2016
Northeast Regional Quasar and AGN Meeting, Dartmouth College		Jun. 2015