

Steward Observatory
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EMPLOYMENT

since 2022 **Associate Professor of Astronomy with tenure**, University of Arizona
Associate Professor of Physics, University of Arizona

2018 - 2022 **Assistant Professor of Astronomy**, University of Arizona
Assistant Professor of Physics, University of Arizona

2017 - 2018 **Postdoctoral Researcher**, California Institute of Technology

2014 - 2017 **Kavli Fellow**, KIPAC, Stanford University/SLAC

2012 - 2014 **Postdoctoral Researcher**, University of Pennsylvania

EDUCATION

June 2012 **PhD in Astrophysics**, California Institute of Technology

Sept 2007 **Diplom in Physics**, University of Bonn, Germany

AWARDS & HONORS

2022 Early Career Award, Universities Research Association

One award annually, "*For developing crucial theoretical tools for multi-probe cosmology analyses and providing scientific leadership to the Dark Energy Survey (DES) collaboration.*"

2022 Curie Award, University of Arizona

Two awards annually to "*junior faculty, whose innovative work is not only advancing science, but also adding to the diversity within the scientific community.*"

2021 Kavli Frontiers Fellow, National Academy of Sciences

2021 Sloan Research Fellowship, Alfred P. Sloan Foundation

2020 Packard Fellowship, David and Lucile Packard Foundation

2020 Maria Goeppert-Mayer Award, American Physical Society (APS)

One award annually, "*For contributions to theoretical cosmology and astrophysics, in particular, pioneering approaches to modeling key observables and extracting cosmological constraints from large galaxy surveys.*"

2019 Early Career Research Award, Department of Energy

2018 Young Scientist Award, International Union of Pure and Applied Physics (IUPAP), Commission on Astrophysics

One award annually, "*For pioneering contributions to the extraction of cosmological insights from large galaxy surveys, including modeling key observables, covariance matrix estimation, and the development of cosmological analysis tools, which have ushered in a new era of multi-probe cosmology and set a new standard for forthcoming experiments.*"

Kavli Postdoctoral Fellowship, Stanford University (2014-17)

German National Academic Foundation Scholarship 2003-2007

European Space Agency Student Parabolic Flight Campaign 2005

Designed, installed, and conducted experiment on *Surface Deformations of Ferrofluids in Weightlessness*

Junior Prize of the German Astronomical Society, 2002**1st prize at German National Science Contest for High-School Students, 2002**

Wrote and analyzed N-body simulations of galaxy encounters on home computers

SCIENCE LEADERSHIP**Dark Energy Survey (DES)**

- **Science Committee Co-Chair**, Sept 2018 – May 2021
scientific co-lead of an international collaboration with > 400 participants, responsibilities include setting of scientific goals, selection of working group coordinators, representation of the collaboration to funding agencies
- **Coordinator**, Theory and Combined Probes Working Group, Sept 2016 – Feb 2020
- Builder with data rights

Nancy Grace Roman Space Telescope

- **PI of Wide Field Science Program** *Kinematic Lensing with Roman*, 2023-2027
- **Project Infrastructure Team co-I** *Maximizing Cosmological Science with the Roman High Latitude Imaging Survey* (PI: O. Doré), 2023-2028
- **Science Investigation Team co-I** *Cosmology with the High Latitude Survey* (PI: O. Doré), 2016-2022

Spectrophotometer for the History of the Universe, Epoch of Reionization, and Ices Explorer (SPHEREx, PI: J. Bock)

- **Co-Investigator**, NASA 2016 Astrophysics MIDEX proposal (selected)
- **Co-lead**, Level-4 Inflation Science work packages

Vera Rubin Observatory - Dark Energy Science Collaboration (DESC)

- **Convener**, LSST-DESC Theory and Joint Probes Working Group, July 2015 – Feb 2018
- **Key author**, DESC Science Road Map: developed five-year vision for Theory group
- **Project Initiator & Co-Lead**, Core Cosmology Library, March 2015 – Feb 2018
- **Project Lead**, TJPCosmo (Joint Probes Cosmology Likelihood), Feb 2018 – Jan 2020

INTERDISCIPLINARY ACTIVITIES

- **Lead Organizer & SOC chair**, “Blind Analysis in High-Stakes Survey Science: When, Why, and How?” workshop held at SLAC, March 13-15, 2017, bringing together interdisciplinary blinding experts and critics; participants from dark matter direct detection, AMO experiment, gravitational waves, survey cosmology and social sciences. www.kipac.github.io/Blinding/
- **Co-Chair of the Science Committee**, Dark Energy Survey (10/2018 – 05/2021) Co-led a Fermilab-based experiment, which bridges experimental high-energy physics and astronomy research communities and facilitates broad range of scientific analyses from solar system and Milky Way science to transient follow-up, galaxy evolution and cosmology.

SERVICE

- **Reviewer** Chilean Science Foundation; Department of Energy *Comparative Review, SCGSR*; European Research Council *Consolidator Grants*; NASA: *Astrophysics Theory Program, Hubble Fellowship Program, HST TAC, NESSF*; NSF: Astronomy Division *Early Career, AAG*
- **Lead Organizer & SOC chair**, “Blind Analysis in High-Stakes Survey Science: When, Why, and How?” SLAC, March 2017
- **SOC chair** Dark Energy Survey Collaboration meetings 12/2018, 05/2019, 11/2019, 05/2020, 05/2021
- **SOC** Aspen Center for Physics Workshop “Large scale structure cosmology beyond 2-point statistics” , June 2022
- **SOC** IAU General Assembly Focus Meeting “Consensus Cosmic Shear in the 2020s” , July 2022, Busan, South Korea
- **SOC** “Understanding cosmological observations” August 2023, Benasque, Spain
- **Program co-chair and LOC** “Conference for Undergraduate Women in Physics 2021/2/4” , University of Arizona (postponed, due to COVID19)

RESEARCH GRANTS**as Principle Investigator**

- NASA Roman Wide Field Science Large Program: “Kinematic Lensing with the Roman Space Telescope”
2023-2027, \$2M
- CNRS – University of Arizona International Partnership, co-PIs Elisabeth Krause, Karim Benabed: “A Sharper View of the Late-Time Universe: Joint Analyses of Cosmic Microwave Background and Galaxy Surveys”
2021-2024, two full PhD fellowships (one at Arizona, one at CNRS)
- NASA Contract for SPHEREx L4 Inflation Pipeline Development at UArizona (single PI)
2021-2026, \$1.6M
- Sloan Research Fellowship (single PI)
2021-2023, \$75K
- Packard Foundation Fellowship for Science and Engineering “The multi-probe revolution in cosmology” (single PI)
2020-2025, \$875K
- Department of Energy Early Career Research Award “Joint analyses of lensing, clustering, and galaxy clusters with DES and LSST” (single PI)
2019-2024, \$750K (single PI)

as co-Investigator

- NASA Roman Project Infrastructure Team: “Maximizing Cosmological Science with the Roman High Latitude Imaging Survey”
PI Olivier Doré + 24 co-Is (incl. EK)
2023-2028, \$2.8M to UA
- Department of Energy AI for HEP “Accelerating cosmological inference for LSST and DESI

with neural networks"

PI Tim Eifler, co-Is Elisabeth Krause, Peter Behroozi

2022-2026, \$354K

- NASA ROSES ADAP "Weak Gravitational Lensing with Galaxy Kinematics"
PI Eric Huff, co-I Elisabeth Krause
2021-2024, \$650K (\$265K to UA)
- NASA Medium Explorer Program 2016 "SPHEREx"
PI James Bock + 20 co-Is
2019-2025, \$250M
- NASA WFIRST Science Investigation Team "Cosmology with the High-Latitude Survey"
PI Olivier Doré + 29 co-Is (incl. EK)
2016-2022, \$8.1M (\$549K to UA)

MENTORING AND ADVISING

- **PhD students**
 - Yu-Hsiu Huang** 2021-current (Arizona, primary PhD adviser) Environment dependence of galaxy scaling relations as intrinsic-alignment-like systematics for kinematic lensing
 - Maria Gabriela Cota** 2021-2022 (Arizona, 1st year adviser) Deep learning of foreground systematics for precision clustering measurements
 - Anne Moore** 2020-current (Arizona, primary PhD adviser) GR effects for precision modeling of galaxy clustering with SPHEREx
 - Magarete Smith** 2020-2022 (Arizona, 1st year adviser) Kinematic lensing systematics with IllustrisTNG
 - Pranjal RS** 2019-current (Arizona, primary PhD adviser) A pilot study for kinematic lensing measurements – 1 lead-author publication
 - Paul Rogozenski** 2018-current (Arizona, primary PhD adviser) Beyond LCDM-cosmology analyses with DES – 1 co-lead-author publication, major contributions to DES-Y3 constraints on extended models
 - Shivam Pandey** 2017-2022 (UPenn → Columbia, co-adviser) Galaxy bias and small-scale non-linearity modeling with DES – 2 lead-author publications
 - Lucas Secco** 2017-2020 (UPenn → KICP Fellow, co-adviser) Theoretical modeling for weak lensing cosmology with DES – 1 lead-author publication
- **Adviser to PhD students on a research project**
 - Chun-Hao To* (Stanford)
 - Emmanuel Schaan* (Princeton)
 - Youngsoo Park* (University of Chicago)
- **Postdoc Mentees**
 - Tomomi Sunayama*, 2022-current (JSPS fellow)
 - Yosuke Kobayashi*, 2021-current
 - Joyce Byun*, 2020-2022
 - Xiao Fang*, 2018-2021 (Arizona → BCCP Fellow, Berkeley)
 - Vivian Miranda*, 2018-2021 (Arizona → junior faculty, Stony Brook)

- **Coding Tutor** lead 6-week long introduction to scientific computing sessions for 18 beginning MS students at ICTP-EAIFR, Rwanda

TEACHING EXPERIENCE

- Fall 20, 21, 22, 23 **Physics 305A**, *Computational Physics* (undergraduate, major course)
Instructor of Record
- Spring 2022 **Astr 541**, *Cosmology* (graduate core course), Instructor of Record
- Spring 2021 **Physics 589**, *Advanced cosmology* (grad elective), Instructor of Record
- Fall 2019 **Physics 105A**, *Introduction to Scientific Computing* (undergraduate, non-major course)
Instructor of Record
- Fall 2015 **Physics 366**, *Special Topics in Astrophysics: Statistical Methods* (graduate course)
Co-Instructor and co-developer for new course

PUBLICATION RECORD

>170 refereed publications, >20,000 citations, h-index 68 (statistics from google scholar)

SELECTED SIGNIFICANT PUBLICATIONS (° indicates student/postdoc mentees)

1. Krause, E. & Eifler, T.: *CosmoLike – cosmological likelihood analyses for photometric surveys*. MNRAS 470, 2100 (2017)
Significance: introduced consistent multi-probe analysis framework.
2. Krause, E. et al.: *Dark Energy Survey Year 1 Results: Multi-Probe Methodology and Simulated Likelihood Analyses*. arXiv:1706.09359 (2017)
Significance: Developed and validated model for DES-Y1 analyses.
3. The DES Collaboration (Abbott et al.): *Dark Energy Survey year 1 results: Cosmological constraints from galaxy clustering and weak lensing*. PRD 98, 043528 (2018)
Significance: Key cosmology constraints for DES Year 1.
4. °To, C.-H., Krause, E. et al. : *Dark Energy Survey Year 1 Results: Cosmological Constraints from Cluster Abundances, Weak Lensing, and Galaxy Correlations*. PRL 126, 141301 (2021)
Significance: First joint and consistent analysis of clusters, weak lensing and clustering; featured on physics.aps.org.
5. ° R.S, P., Krause, E. et al.: *Kinematic Lensing Inference I: Characterizing Shape Noise with Simulated Analyses*. arXiv:2209.11811, MNRAS submitted (2022)
Significance: Calibrated shape noise for kinematic lensing inference using simulated data, demonstrating feasibility of weak lensing inference on a per-galaxy basis.

SCIENTIFIC PRESENTATIONS (INVITED ONLY)

more than 120 invited scientific presentations

- **plenary talks at major conference series**, incl. ICHEP2016, EPS-HEP2017, TeVPA2017, Dark Matter2018, 234th meeting of American Astronomical Society (2019), Phenomenology 2021, Cosmo' 21
- **recent colloquia** UCSC, SLAC, Yale, Munich, Trieste, Edinburgh, UC Riverside, Amsterdam, UWashington, USC, Aspen Center for Physics