# Early Science with the LSST

The First Annual Scialog Conference
November 14–17, 2024

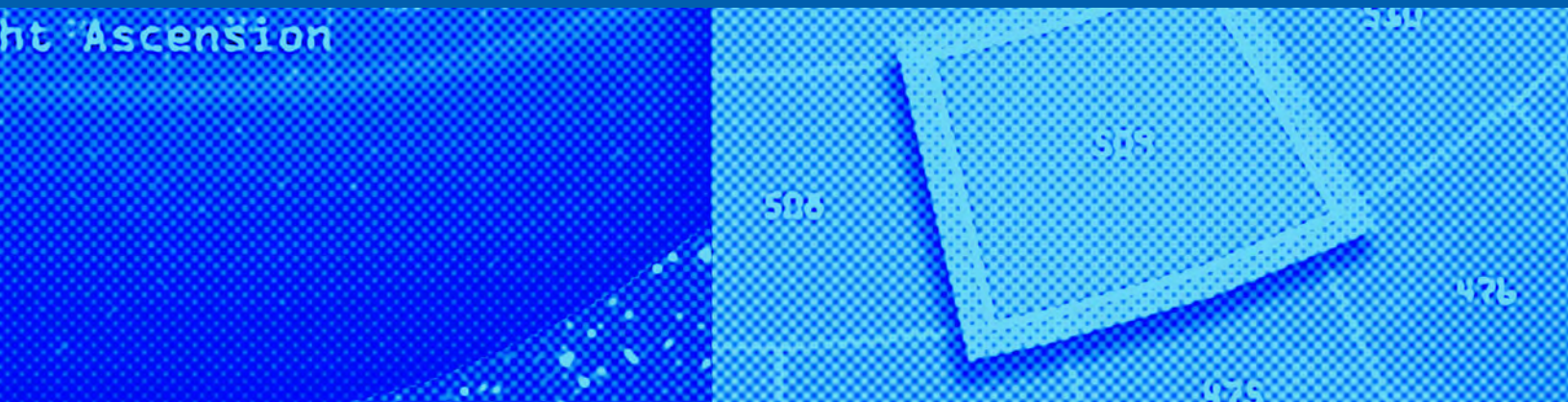
**scialog**2024®

HEISING-SIMONS FOUNDATION

RESEARCH CORPORATION *for* SCIENCE ADVANCEMENT

The Brinson Foundation

LEINWEBER FOUNDATION



# Scialog: Early Science with the LSST

## Objectives

1. Engage in dialogue with the goal of accelerating high-risk, high-reward research.
2. Analyze challenges, and overcome bottlenecks, to fully utilize early science with the Ruben Observatory, with the goal of maximizing the value of the Legacy of Survey of Space and Time. We seek to promote basic science that supports the greatest advances that can be made with this incredible new telescope.
3. Build a creative, better-networked community of scientists that crosses all astronomy and astrophysics.
4. Form new teams to write proposals to seed novel projects based on innovative ideas that emerge from the dialogue.
5. Most importantly, enjoy the discussions about where this field should go and how we can work together to get there.

## Process

Brainstorming is welcome; don't be afraid to say what comes to mind.

Consider the possibility of unorthodox or unusual ideas without immediately dismissing them.

Discuss, build upon and constructively criticize each other's ideas —in a spirit of cooperative give and take.

Make comments concise to avoid monopolizing the dialogue.

## Diversity, Inclusion and No Harassment

Research Corporation for Science Advancement fosters an inclusive and respectful environment for listening in which the different identities, backgrounds, and perspectives of all participants are valued, and in which everyone is empowered to share ideas as fellow scientists.

RCSA does not tolerate any form of harassment, which could include verbal or physical conduct that has the purpose or effect of substantially interfering with anyone else's participation or performance at this conference, or of creating an intimidating, hostile, or offensive environment; any such harassment may result in dismissal from the conference.

**Read RCSA's Code of Conduct**

## From the President

Welcome to the 2024 ***Scialog: Early Science with the LSST*** meeting, cosponsored by Research Corporation and the Heising-Simons Foundation, with additional support from the Brinson Foundation, the Leinweber Foundation, and the PCLB Foundation. This is the first of three Scialog meetings on this theme and the third Scialog that we have cosponsored with the Heising-Simons Foundation.

The goal of this Scialog is to catalyze collaboration across the subdisciplines of astronomy, astrophysics, and related fields on fundamental science projects targeted to make the greatest advances with the Vera C. Rubin Observatory's LSST, including in conjunction with other observatories and space missions.

Scialog's overarching purpose is to advance cutting-edge science of great significance to humanity by catalyzing innovative, basic research. Our focus is on scientists in the early years of their independent careers. Through the unique Scialog process, we seek to lay the foundation for an ongoing, highly creative, cross-disciplinary community of scientists that will prove adept at identifying exciting areas for research advances for decades to come.

To that end, under the guidance of Program Directors **Richard Wiener, Andrew Feig, Eileen Spain** and **Silvia Ronco** (Research Corporation), and with assistance from our initiative partners **Gabriele Betancourt-Martinez** and **JP O'Brien** (Heising-Simons Foundation), **Jamie Bender** (The Brinson Foundation), and **Larry Leinweber** and **Ashley Leinweber** (Leinweber Foundation), we hope you will be engaged in passionate discussions with colleagues, many of whom you will meet for the first time at Scialog. The process is designed to stimulate new ideas that you might not be able to pursue on your own but become possible to try out in collaborative teams. The result we expect will be a meeting unlike others that you attend. We are confident that you will find the next few days to be extremely worthwhile.

This is your opportunity to air that wild idea you have been reluctant to share with others, or to discuss a nagging hunch that does not yet have sufficient supporting data, or to take a leap on a high-impact, high-risk project instead of concentrating all your effort on incremental studies. This is the time to come up with, and be open to, completely new ideas that may truly change the world and to find new colleagues and collaborators with whom to pursue them.

We hope this first meeting on this topic yields a crop of outstanding team proposals, which will make our job of determining who receives funding very challenging. For all Fellows, whether you develop a funded project, we are sure that this Scialog network will provide long-term benefits. I wish you every success in exploring new and compelling ideas throughout Scialog and beyond.

Have a terrific meeting!

**Daniel Linzer**
President
Research Corporation for Science Advancement

## From the Program Director

Research Corporation's highly interactive Scialog meetings seek to catalyze new collaborations among Scialog Fellows who constitute a highly select group of exemplary early career scientists from the U.S. and Canada. The emphasis is on dialogue, networking, and pursuit of novel, high-risk discovery research based on blue-sky ideas.

Research Corporation, the Heising-Simons Foundation, the Brinson Foundation, the Leinweber Foundation, and the PCLB Foundation chose to focus on Early Science with the LSST because we believe the Vera C. Rubin Observatory offers an incredible and unique opportunity to advance our understanding of the Universe. However, to fully maximize this opportunity, we need to build a strong network of early career researchers who will be best positioned to make great scientific advances with the LSST over the next several decades. And we need out-of-the-box thinking to ideate high-risk, high-reward collaborative projects.

We have two outstanding keynote speakers, **David Hogg,** New York University and Flatiron Institute, and **Jackie Faherty,** American Museum of Natural History, to set the stage for breakout discussions. They will be joined by a terrific group of senior scientists to round out the team of facilitators:

**Fred Adams**, University of Michigan
**Eric Bellm**, University of Washington and LSST
**Rebecca Bernstein**, Giant Magellan Telescope
**Lars Bildsten**, Kavli Institute for Theoretical Physics
**Xiaohui Fan**, University of Arizona
**Enrico Ramirez-Ruiz**, University of California, Santa Cruz
**Jeno Sokoloski**, Columbia University and LSST Discovery Alliance
**Beth Willman**, LSST Discovery Alliance

Scialog meetings focus on dialogue and team building with the goal of creating novel strategies and collaborative approaches. An important feature is the opportunity for Scialog Fellows to form teams and write proposals to pursue particularly creative ideas that emerge through the dialogue. We hope this competition is exciting, but regardless of which proposals are funded, the primary purpose is to catalyze a deeper and more meaningful exchange of ideas than ordinarily occurs at scientific conferences. Our intent is for this process to help participants gain new insights and connections that significantly advance the fundamental science needed to make the most of a dataset enabled by one of the most powerful observational machines ever built.

We hope each participant finds the Scialog experience of great value. Please do not hesitate to provide feedback on how to make the conference better. My fellow Program Directors, **Andrew Feig, Silvia Ronco**, and **Eileen Spain**, the RCSA staff, and I are here to help make the meeting a great experience!

**Richard Wiener**
Senior Program Director
Research Corporation for Science Advancement

# Conference Agenda

## Thursday, November 14

| | | |
|---|---|---|
| 2:00 pm | **Registration Opens** | Sonoran Foyer |
| 2:00 – 5:00 pm | **Snacks & Informal Discussions** | Sonoran Foyer |
| 5:00 – 6:30 pm | **Poster Session and Reception** | Javelina/Sonoran Terrace |
| 6:00 – 6:30 pm | **Meeting for Discussion Facilitators** | Sonoran Ballroom |
| 6:30 – 7:30 pm | **Dinner** | Sonoran Rooftop Patio |
| 7:30 – 8:30 pm | **Welcoming Remarks**<br>**Conference Overview**<br>**Introductions** | Sonoran Ballroom |
| 8:30 – 11:00 pm | **Starlight Cafe** | Sonoran Rooftop Patio |

## Friday, November 15

| | | |
|---|---|---|
| 7:00 – 8:00 am | **Breakfast** | Sonoran Rooftop Patio |
| 8:00 – 8:45 am | **Keynote Presentation**<br>*How We Will (and How We Won't) use Machine Learning in the LSST era*<br>David Hogg, New York University | Sonoran Ballroom |
| 8:45 – 9:00 am | **Breakout Session Overview and Instructions** | Sonoran Ballroom |
| 9:00 – 10:15 am | **Breakout Session I** | Wayne or Vigas Patio, Mesa, Canyon, Desert or Javelina Terrace, Sonoran Ballroom |
| 10:15 – 10:35 am | **Report Out** | Sonoran Ballroom |
| 10:35 – 11:15 am | **Conference Photo and Morning Break** | Stairs Near the Main Pool |
| 11:15 – 11:45 am | **Mini Breakout Session I** (Fellows)<br><br>**Facilitator Meeting** | All Spaces<br><br>Sonoran Ballroom |
| 11:45 – 12:45 pm | **Lunch** | Sonoran Rooftop Patio |
| 12:45 – 1:30 pm | **Keynote Presentation**<br>*The Stellar and Substellar Revolution with the Rubin Observatory*<br>Jackie Faherty, American Museum of Natural History | Sonoran Ballroom |
| 1:30 – 2:45 pm | **Breakout Session II** | Wayne or Vigas Patio, Mesa, Canyon, Desert or Javelina Terrace, Sonoran Ballroom |
| 2:45 – 3:05 pm | **Report Out** | Sonoran Ballroom |
| 3:05 – 3:35 pm | **Mini Breakout Session II** (Fellows) | All spaces |
| 3:35 – 5:30 pm | **Afternoon Break, Informal Discussions and Leisure Time** | Sonoran Foyer |
| 5:30 – 6:45 pm | **Poster Session and Reception** | Javelina/Sonoran Terrace |
| 6:45 – 7:45 pm | **Dinner** | Sonoran Rooftop Patio |
| 7:45 – 11:00 pm | **Starlight Cafe** | Sonoran Rooftop Patio |

## Saturday, November 16

| | | |
|---|---|---|
| 6:45 – 7:30 am | **Optional Guided Nature Walk** | Meet on Vigas Patio |
| 7:00 – 8:00 am | **Breakfast** | Sonoran Rooftop Patio |
| 8:00 – 8:30 am | **LSST Data-Analysis Tools** | Sonoran Ballroom |
| 8:30 – 8:45 am | **Information on Proposal Writing and Pitches** | Sonoran Ballroom |
| 8:45 – 9:15 am | **Mini Breakout Session III** (Fellows) | All Spaces |
| 9:15 – 9:45 am | **Morning Break** | Sonoran Foyer |
| 9:45 – 11:00 am | **Breakout Session III** | Wayne or Vigas Patio, Mesa, Canyon, Desert or Javelina Terrace, Sonoran Ballroom |
| 11:00 – 11:20 am | **Report Out** | Sonoran Ballroom |
| 11:20 – 11:50 am | **Mini Breakout Session IV** (Fellows) | All Spaces |
| | **Facilitator and Funding Partners Discussion** | Sonoran Ballroom |
| 11:50 – 1:00 pm | **Lunch** | Sonoran Rooftop Patio |
| 1:00 – 5:45 pm | **Team Formation, Informal Discussions and Proposal Writing** | All Spaces |
| 5:45 – 6:30 pm | **Reception** | Sonoran Terrace |
| 6:30 – 7:30 pm | **Dinner** | Sonoran Rooftop Patio |
| 7:30 – 11:00 pm | **Starlight Cafe** | Sonoran Rooftop Patio |

## Sunday, November 17

| | | |
|---|---|---|
| 6:30 – 7:30 am | **Breakfast** | Sonoran Rooftop Patio |
| 7:30 – 11:00 am | **Presentation of Proposals** | Sonoran Ballroom |
| | **Assessment Survey and Wrap-up** | |
| 10:00 – 12:00 pm | **Lunch** (available to go) | Sonoran Foyer |

## Keynote Presentations

### *How We Will (and How We Won't) Use Machine Learning in the LSST Era*

**David W. Hogg**
*New York University*

**Abstract**:
Machine learning is both necessary and useful in the development of LSST science. But like all powerful tools, ML can do damage or good, and even more so because we don't understand in detail how or why the most powerful methods work. I discuss how we will use ML such that it supports discovery, precision measurement, and accurate scientific inferences with LSST data, even if it remains uninterpretable or untrusted.

**Biography**:

David W. Hogg is a Professor of Physics and Data Science at NYU, and Senior Research Scientist at the Flatiron Institute. He develops open-source software and produces open data sets useful for computational data analysis and precision measurement. He is involved in management of the Sloan Digital Sky Surveys and the Terra Hunting Experiment, and he is an active participant in the Gaia scientific community.

## *The Stellar and Substellar Revolution with the Rubin Observatory*

**Jackie Faherty**
*American Museum of Natural History*

**Abstract:**
The Rubin Observatory is slated to repeatedly scan the southern sky for ten years, producing 20 TB of raw data every evening across six filter bands covering 350 - 1050 nm. The volume and cadence of information on stars and brown dwarfs presents an opportunity to investigate the ever-changing sky with a precision, depth and quantity we have never seen before. In this talk I will outline major areas of revolution that are ahead of us using Rubin data in fields that focus on stars, brown dwarfs and exoplanets. From large scale precision astrometry, to short and long term rotation rate investigation, to serendipitous discovery space I will detail big picture concepts you should think about over the next few days of the Scialog. I will also highlight resources for how to measure, share, and maintain the stellar/brown dwarf/exoplanet parameters which will be output from Rubin including how to maintain open source databases that can be shared with the community and how to engage with citizen scientists who can help with the data volume.

**Biography**:

Jackie Faherty is a senior scientist and senior education manager at the American Museum of Natural History (AMNH). Her research group entitled “Brown Dwarfs in New York City (BDNYC)” is at the forefront of low mass star, brown dwarf and giant exoplanet characterization studies. She has co-founded the popular citizen science project entitled Backyard Worlds: Planet 9, which invites the general public to help scan the solar neighborhood for previously missed cold worlds. Aside from a love of scientific research, Dr. Faherty is a passionate educator and can often be found giving public lectures in the Hayden Planetarium. She holds a unique position at the American Museum of Natural History that allows her to pursue scientific research at the forefront of exoplanet characterization studies while mentoring and advising education programs for students and general public alike.

## 2024 Proposal Guidelines

1. Awards are intended to provide seed funding for teams of two to three Scialog Fellows formed at this conference for high-risk, high-impact projects.

2. The application package should be submitted as a single PDF file. Pages one and two should describe the project and role of each team member. A third page may be used for references. No budget is necessary.

3. Awards will be in the amount of $60K direct funding per team member, plus a small percentage for overhead. Grant duration will be one year.

4. No Scialog Fellow can be a member of more than two teams. If a Scialog Fellow is a member of two teams, other members of the teams must be different. No team can submit more than one proposal.

5. No Scialog Fellow who previously has won a Scialog: LSST Collaborative Award can be a member of more than one team. The other team members must be different from the members of the previously awarded team. [Does not apply in Year 1 of the initiative.]

6. Scialog Fellows who have previously won two Scialog LSST Collaborative Awards are not eligible to be funded members of a team, but they can participate as a non-funded team member. [Does not apply in Year 1 of the initiative.]

7. Teams cannot include members who have previously collaborated with one another. If you are unsure of your status (e.g., prospective team members were part of a large collaboration but did not significantly interact), please check for clarification with an RCSA Program Director.

8. Teams are encouraged (but not required) to:
    a. Include members with different research approaches and methods.
    b. Include members from different disciplines.

9. Proposals must be submitted electronically by **6:00 a.m. PST Sunday, November 17, 2024**. Instructions for submission will be provided at the meeting.

10. Awards are anticipated to start **February 1, 2025**.

## Scialog Fellows

**Igor Andreoni** Igor.andreoni@gmail.com
Physics and Astronomy, University of North Carolina at Chapel Hill
*My main research focuses are observational time-domain and multi-messenger astronomy. I use wide-field telescopes to study extreme transient and variable sources.*

**Darcy Barron** dbarron2@unm.edu
Physics and Astronomy, University of New Mexico
*I work on cosmology and instrumentation. My current research focuses on precision measurements of the cosmic microwave background (CMB), including building instruments to study the faint pattern known as B-mode polarization.*

**Ana Bonaca** abonaca@carnegiescience.edu
Carnegie Observatories, Carnegie Institution for Science
*My group is mapping the small-scale structure of dark matter in the Milky Way galaxy with stellar streams -- tidally dissolved globular clusters and dwarf galaxies. To complement LSST, we are building a new high-resolution, multi-object spectrograph for Magellen.*

**Floor Broekgaarden** fbroekgaarden@ucsd.edu
Astronomy & Astrophysics, University of California, San Diego
*Populations of massive stars, red luminous novae, supernovae, gravitational waves, star formation history, mergers, mass transfer outputs, radio transients*

**Chihway Chang** chihway@kicp.uchicago.edu
Astronomy and Astrophysics, University of Chicago
*I am an observational cosmologist who seeks to answer fundamental questions in cosmology using cosmic surveys. My group works on all aspects of a galaxy survey from the pixel level to cosmological inference. I work on the Dark Energy Survey and LSST.*

**Yumi Choi** yumi.choi@noirlab.edu
Astronomy, National Optical-Infrared Astronomy Research Laboratory
*My research focuses on the Magellanic Clouds (MCs). My findings reveal key insights into LMC-SMC interactions. I aim to extend this work with LSST data and synthesize stellar photometry from Rubin and space telescopes to enhance our understanding of the MCs.*

**Charlotte Christensen** christenc@grinnell.edu
Physics, Grinnell College
*I am interested in the evolution of the Milky Way and its dwarf satellites. My research has primarily involved using zoom-in hydrodynamic galaxies to analyze this evolution, but I am eager to expand my research to include analysis of substructure in the observed Milky Way halo.*

**Eric Coughlin** ecoughli@syr.edu
Physics, Syracuse University
*I am a theoretical astrophysicist with interests in a range of transient phenomena, including tidal disruption events, supernovae, and quasi-periodic eruptions, and modeling the physics that gives rise to these systems.*

## Scialog Fellows Continued

**Michael Coughlin** cough052@umn.edu
Physics and Astronomy, University of Minnesota Twin Cities
*I work on the interplay between gravitational-wave and electromagnetic signals to characterize binary neutron star mergers. I am the developer of a number of software packages to facilitate follow-up and analyze observations of gravitational-wave events for telescope networks.*

**Tansu Daylan** tansu.daylan@gmail.com
Physics, Washington University in St. Louis
*I am interested in indirect detection of dark matter via astrophysical signatures and the discovery and characterization of exoplanets using time-series photometric (e.g., TESS, Roman, LSST) and radial velocity data (Magellan/PFS and Keck/KPF).*

**Kishalay De** kde1@mit.edu
Kavli Institute for Astrophysics and Space Research, Massachusetts Institute of Technology
*Interested in using optical and infrared time domain surveys to discover eruptions from accreting binaries at all mass scales -- from low mass X-ray binaries, merging stars and planetary engulfment events to stars being tidally disrupted by supermassive black holes.*

**Mia de los Reyes** mdelosreyes@amherst.edu
Physics and Astronomy, Amherst College
*As an observer, I study dwarf galaxies in the local universe. Most of my research involves spectroscopy, so I'm especially interested in bridging the gap between photometric and spectroscopic measurements.*

**Benedikt Diemer** diemer@umd.edu
Astronomy, University of Maryland, College Park
*Cosmological simulations (hydro and N-body), halo structure and dynamics, alternative dark matter models, ISM modeling, subhalos and satellites, multi-wavelength observations of clusters*

**Siegfried Eggl** eggl@illinois.edu
Aerospace Engineering / Astronomy, University of Illinois at Urbana-Champaign
*I am interested in Planetary Science and Planetary Defense as well as the impact of Satellite Constellations with LSST.*

**Kareem El-Badry** kelbadry@caltech.edu
Astronomy, California Institute of Technology
*Binary stars, stellar-mass black holes, neutron stars, ultracompact binaries, hypervelocity stars*

**Carl Fields** carlnotsagan@gmail.com
Astronomy, University of Arizona
*Computational and nuclear astrophysics of massive stars, stellar explosions, and multi-messenger signals.*

**Maya Fishbach** fishbach@cita.utoronto.ca
Canadian Institute for Theoretical Astrophysics, University of Toronto
*Gravitational-wave astrophysics and cosmology, black holes and neutron stars, massive stars, stellar deaths, counterparts to gravitational-wave sources, host galaxies of gravitational-wave sources and their progenitors*

## Scialog Fellows Continued

**Adi Foord** foord@umbc.edu
Physics, University of Maryland, Baltimore County
*I am interested in the growth and evolution of SMBHs through galaxy mergers. I use multi-wavelength data to find and study pairs of merging SMBHs, connecting their accretion properties (via X-rays) to their large-scale environmental properties (via optical and IR).*

**K. Decker French** deckerkf@illinois.edu
Astronomy, University of Illinois at Urbana-Champaign
*Tidal disruption events, galaxy evolution, galaxy - supermassive black hole co-evolution, transient - host galaxy connections, active galactic nuclei*

**Vera Gluscevic** vera.gluscevic@usc.edu
Physics and Astronomy, University of Southern California
*Dark matter (thermal relic, DM-baryon interactions, SIDM); substructure in the Milky Way and near-field cosmology; small-scale probes of new physics; dark energy, cosmic acceleration, and cosmological tensions; inference and joint likelihood analyses of cosmological data.*

**Sarah Greenstreet** sarahjg@uw.edu
Astronomy, University of Washington
*I study Solar System small body orbital dynamics and physical characterization to inform our understanding of planet formation and evolution through implications from their origins, dynamical stability, and impact probabilities by combining theory, computation, and observations.*

**JJ Hermes** jjhermes@bu.edu
Astronomy, Boston University
*My primary research interests converge on white dwarf stars, and using observations of stellar remnants to constrain the endpoints of stars, binary, and planetary systems.*

**Anna Ho** annayqho@cornell.edu
Astronomy, Cornell University
*Stellar death (supernovae, gamma-ray bursts); optical surveys (particularly fast transients), radio and submillimeter observations*

**Erika Holmbeck** holmbeck1@llnl.gov
Nuclear and Chemical Sciences, Lawrence Livermore National Laboratory
*Galactic archaeology, nuclear astrophysics, heavy-element nucleosynthesis*

**Alex Ji** alexji@uchicago.edu
Astronomy & Astrophysics, University of Chicago
*First stars and galaxies, the origin of the elements, the history of the Milky Way galaxy, the nature of dark matter, stellar spectroscopy and surveys, connecting LSST supernova with stellar chemical abundances*

## Scialog Fellows Continued

**Meridith Joyce** mjoyce8@uwyo.edu
Physics and Astronomy / School of Computing, University of Wyoming
*Stellar structure and evolution; variable, oscillating, and pulsating stars; stellar age determinations; Galactic archaeology; convection and mixing in stellar interiors; astronomy software development; statistical and numerical methods*

**Leonardo Krapp** lkrapp@udec.cl
Universidad de Concepción
*Planet formation and solar system dynamics; disk dynamics; planet disk interaction; Kuiper belt objects; computational astrophysics*

**Tanmoy Laskar** tanmoylaskar@gmail.com
Physics & Astronomy, University of Utah
*Exploring the physics of energetic, engine-driven, or jet-powered astrophysical transients (in particular, the structure, composition, and dynamics of transient, relativistic jets) via multi-wavelength follow-up, theoretical modeling, and interpretive machine learning.*

**Ting Li** ting.li@astro.utoronto.ca
Astronomy & Astrophysics, University of Toronto
*Leveraging large scale survey data together with deep tailored follow-up observations, my research is focused on advancing our understanding of galaxy formation and unraveling the nature of dark matter.*

**Wenbin Lu** wenbinlu@berkeley.edu
Astronomy, University of California, Berkeley
*I pursue theoretical understanding of physical processes related to various transients including fast radio bursts, tidal disruption events, quasi-periodic eruptions, gamma-ray bursts, compact object mergers.*

**Mat Madhavacheril** mathm@sas.upenn.edu
Physics and Astronomy, University of Pennsylvania
*I am interested in probes of the early universe, dark matter, dark energy and neutrinos. I work with CMB observables including mass (lensing) and gas (SZ effects). I also frequently use large-scale structure data from galaxy surveys and their cross-correlations with the CMB.*

**Ben Margalit** margalit@umn.edu
Physics and Astronomy, University of Minnesota Twin Cities
*I am interested in theoretical aspects of time-domain astronomy, and have worked on topics that include: compact binary mergers, fast radio bursts, fast blue optical transients, circumstellar interaction, shock breakout, superluminous supernovae, and gamma-ray bursts.*

**Raquel Martinez** raquelmartinez@SanDiego.edu
Physics and Biophysics, University of San Diego
*My research interests include the direct-imaging and spectroscopic study of brown dwarfs and exoplanets to understand their formation pathways and evolutionary histories, as well as their overall demographics.*

## Scialog Fellows Continued

**Kristen McQuinn** kristen.mcquinn@rutgers.edu
Physics and Astronomy, Rutgers University - New Brunswick
*The formation and evolution of low-mass galaxies; discovery and characterization of faint systems in the nearby universe; near-field cosmology; impact of reionization on galaxy growth; synergies between Roman/Rubin data*

**Aaron Meisner** aaron.meisner@noirlab.edu
NSF NOIRLab, National Optical Astronomy Observatory
*I'm broadly interested in processing and mining large optical/infrared astronomical data sets, with a focus on discovering and characterizing Milky Way ultracool dwarfs. I'd like to explore synergies between astronomical "big data," machine learning, and participatory science.*

**Adam Miller** amiller@northwestern.edu
Physics and Astronomy, Northwestern University
*My research group works at the intersection of time-domain astronomy and data science, where we focus on the development of useful machine learning models to improve the discovery efficiency of explosive transients and understand the origins of Type Ia supernovae.*

**Caroline Morley** cmorley@utexas.edu
Astronomy, University of Texas at Austin
*I work broadly in the field of atmosphere characterization, with interest and past work in planets spanning from terrestrial (~Earth-sized) planets to super-Jupiter-mass brown dwarfs. I work in theory and simulations, connected closely with JWST observational programs.*

**Burcin Mutlu-Pakdil** burcin.mutlu-pakdil@dartmouth.edu
Physics and Astronomy, Dartmouth College
*My main science focus is to understand the nature of dark matter and galaxy formation via observations of nearby galaxies. I lead several observational campaigns to discover and characterize dwarf galaxies within the Local Group and beyond.*

**Elisabeth Newton** Elisabeth.R.Newton@Dartmouth.edu
Physics and Astronomy, Dartmouth College
*I use photometry and spectroscopy to learn how stars and planets evolve over time and about the star-planet connection. I study rotation and magnetism in stars, especially M dwarfs; and I search for young exoplanets, which involves age-dating stars in young co-eval associations.*

**Becka Phillipson** rebecca.phillipson@villanova.edu
Physics, Villanova University
*I am generally interested in employing novel time domain techniques to study transient and variable phenomena and I am especially interested in accreting compact objects, such as X-ray binaries and AGN. My expertise is in nonlinear time series analysis and chaos theory.*

**Abigail Polin** abigail@purdue.edu
Physics and Astronomy, Purdue University
*I employ a combination of analytic, numerical and high-performance computing techniques to study the physics driving astrophysical explosions. I specialize in connecting that theory to observed transient phenomena.*

## Scialog Fellows Continued

**Malena Rice** malena.rice@yale.edu
Astronomy, Yale University
*Planetary orbital architectures; exoplanet demographics, outer solar system minor planet detection; exoplanet detection and characterization*

**Carl Rodriguez** carl.rodriguez@unc.edu
Physics and Astronomy, University of North Carolina at Chapel Hill
*Our work looks at both the transient and dynamic Universe: dynamics of star clusters -- including the formation of stellar streams. Transient astrophysics -- such as gravitational-wave sources, formed through either dynamical processes or binary stellar evolution.*

**Kevin Schlaufman** kschlaufman@jhu.edu
Physics & Astronomy, Johns Hopkins University
*Planet formation, exoplanets, Galactic/stellar archaeology, and metal-poor stars*

**Katelin Schutz** katelin.schutz@mcgill.ca
Physics, McGill University
*My research interests are at the intersection of astrophysics, particle physics and cosmology. A major focus of my work is considering how astrophysical systems would be affected with the addition of undiscovered particles and interactions.*

**Nora Shipp** norashipp@gmail.com
Astronomy, University of Washington
*I study populations of stellar streams in large survey datasets and cosmological and idealized simulations, in order to learn about the nature of dark matter, the structure and evolution of the Milky Way, and the physics of galaxy formation at the smallest scales.*

**Krista Lynne Smith** kristalynnesmith@tamu.edu
Physics and Astronomy, Texas A&M University
*I study the high energy astrophysics of material accreting onto supermassive black holes, the relativistic jets launched by these black holes, and the effect of supermassive black hole accretion on the star formation and evolution of the host galaxy.*

**Niharika Sravan** niharika.sravan@gmail.com
Physics, Drexel University
*I am interested in designing systems that enable real-time decision-making. Specifically, I use reinforcement learning to train artificial agents to make optimal sequential decisions in the presence of incomplete information, stochasticity, and delayed returns.*

**Allison Strom** allison.strom@northwestern.edu
Physics and Astronomy, Northwestern University
*My research focuses on young galaxies that formed in the first 2-3 billion years of cosmic time, with a particular emphasis on their chemical abundance patterns. I am now exploring innovative methods to characterize the same galaxies' massive stars, which regulate their growth.*

## Scialog Fellows Continued

**Jamie Tayar** jtayar@ufl.edu
Astronomy, University of Florida
*stars, stellar physics, stellar evolution, rotation, mixing, convection, asteroseismology, spectroscopy, 1D models (mostly low-mass stars), data-model quantitative comparison, benchmarking, galactic archaeology, binary stars, binary interactions, stellar populations, stellar ages*

**Chris Theissen** ctheissen@ucsd.edu
Astronomy & Astrophysics, University of California, San Diego
*What types of planets and planetary systems are amenable to life? What types of stars are the most prevalent in hosting habitable planets? Can objects lower-mass than stars host planets? I am interested in building tools that will enable broader utilization of LSST.*

**Ashley Villar** ashley.villar@gmail.com
Astronomy, Harvard University
*I study supernovae and other extragalactic transients, primarily in the optical. I am particularly interested in the development of novel data-driven algorithms for the identification, classification and real-time physical inference of supernovae discovered in wide-field surveys.*

**Feige Wang** fgwang.astro@gmail.com
Astronomy, University of Michigan
*I have broad interests in studying supermassive black holes, galaxies, large-scale structures, and cosmic reionization in the early Universe. I am interested in exploring observations across the entire electromagnetic spectrum and mining big data using advanced techniques.*

**Songhu Wang** sw121@iu.edu
Astronomy, Indiana University, Indiana University Bloomington
*Exploring the architectures of planetary systems to understand their formation and dynamics*

**Jinyi Yang** jyyangas@umich.edu
Astronomy, University of Michigan
*My research mainly focuses on quasar/AGN and the early Universe, including imaging and spectroscopic surveys of high-redshift quasar, the study of growth and evolution of early supermassive black holes (SMBHs) and host galaxies, as well as the cosmic reionization history.*

## Discussion Facilitators

**Fred Adams** fca@umich.edu
Physics, University of Michigan
I work on theoretical astrophysics with a focus on star formation, planet formation, dynamics, and cosmology.

**Eric Bellm** ecbellm@uw.edu
Astronomy, University of Washington
Building and operating large time-domain surveys (ZTF, Rubin) and searching the resulting data for compact binaries.

**Rebecca Bernstein** rab@carnegiescience.edu
Carnegie Observatories, Carnegie Institution for Science
My research combines work on galaxy formation and evolution, focusing on chemical abundances of star clusters and metal-poor stars, with the design and development of instruments and the next-generation of ground-based telescopes.

**Lars Bildsten** bildsten@kitp.ucsb.edu
Physics, University of California, Santa Barbara
Theoretical astrophysics, especially stellar evolution and explosive phenomena.

**Jackie Faherty** jfaherty@amnh.org
Astrophysics, American Museum of Natural History
I study the local young neighborhood and focus on brown stars, giant exoplanets, and low mass stars.

**Xiaohui Fan** xfan@arizona.edu
Astronomy, University of Arizona
I am an observational extragalactic astronomer. My research focuses on the formation and evolution of early galaxies, supermassive black holes, the evolution of the intergalactic medium during the epoch of reionization, and survey astronomy in general.

**David Hogg** david.hogg@nyu.edu
Physics, New York University
Astronomy, precision measurement, computational data analysis, dark matter.

**Enrico Ramirez-Ruiz** enrico@ucolick.org
Astronomy and Astrophysics, University of California, Santa Cruz
I use computer simulations to explore transient phenomena such as collisions, mergers, and disruptions of stars -- especially those involving compact objects like black holes, neutron stars, and white dwarfs.

**Jeno Sokoloski** jeno@astro.columbia.edu
Astronomy, Columbia University
Within eruptive and interacting binary stars, my areas of interest include: 1) physics of white-dwarf accretion and jets in wide binaries; 2) nova eruptions; and 3) populations of interacting binary stars and progenitors of type Ia supernovae from wide-field, time-domain surveys.

**Beth Willman** bwillman@lsst-da.org
LSST Discovery Alliance
Near-field cosmology. Survey astronomy.

## Guests

**Jamie Bender** jamie.bender@brinsonfoundation.org
Scientific Research, The Brinson Foundation
The Brinson Foundation supports fundamental scientific research in key areas with a particular focus on early career scientists working in subfields of astrophysics and cosmology.

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Science, Heising-Simons Foundation
X-ray instrumentalist/experimental laboratory astrophysicist-turned Science Program Officer at the Heising-Simons Foundation.

**Andrew Golnar** agolnar@sciphil.org
Science Philanthropy Alliance
The Science Philanthropy Alliance aims to increase philanthropic support for discovery science and make science philanthropy more impactful and effective.

**Ashley Leinweber** ashley.leinweber@leinweberfoundation.org
Leinweber Foundation
The Leinweber Foundation seeks to support innovative and impactful research, with a focus on theoretical physics and cosmology, and believes that research is key to deepening our understanding of the universe and improving the health and wellbeing of humankind.

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**John O'Brien** jobrien@hsfoundation.org
Science, Heising-Simons Foundation
Climate extremes; ENSO; climate variability; co-occurring extremes; atmospheric rivers, extra-tropical cyclones and anticyclones; multivariate and non-stationary statistics; drought; climate-ecosystem interactions; forest health; climate adaptation and mitigation

**Elizabeth Weiss** eweiss@sciphil.org
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The Science Philanthropy Alliance aims to increase philanthropic support for discovery science and make science philanthropy more impactful and effective.

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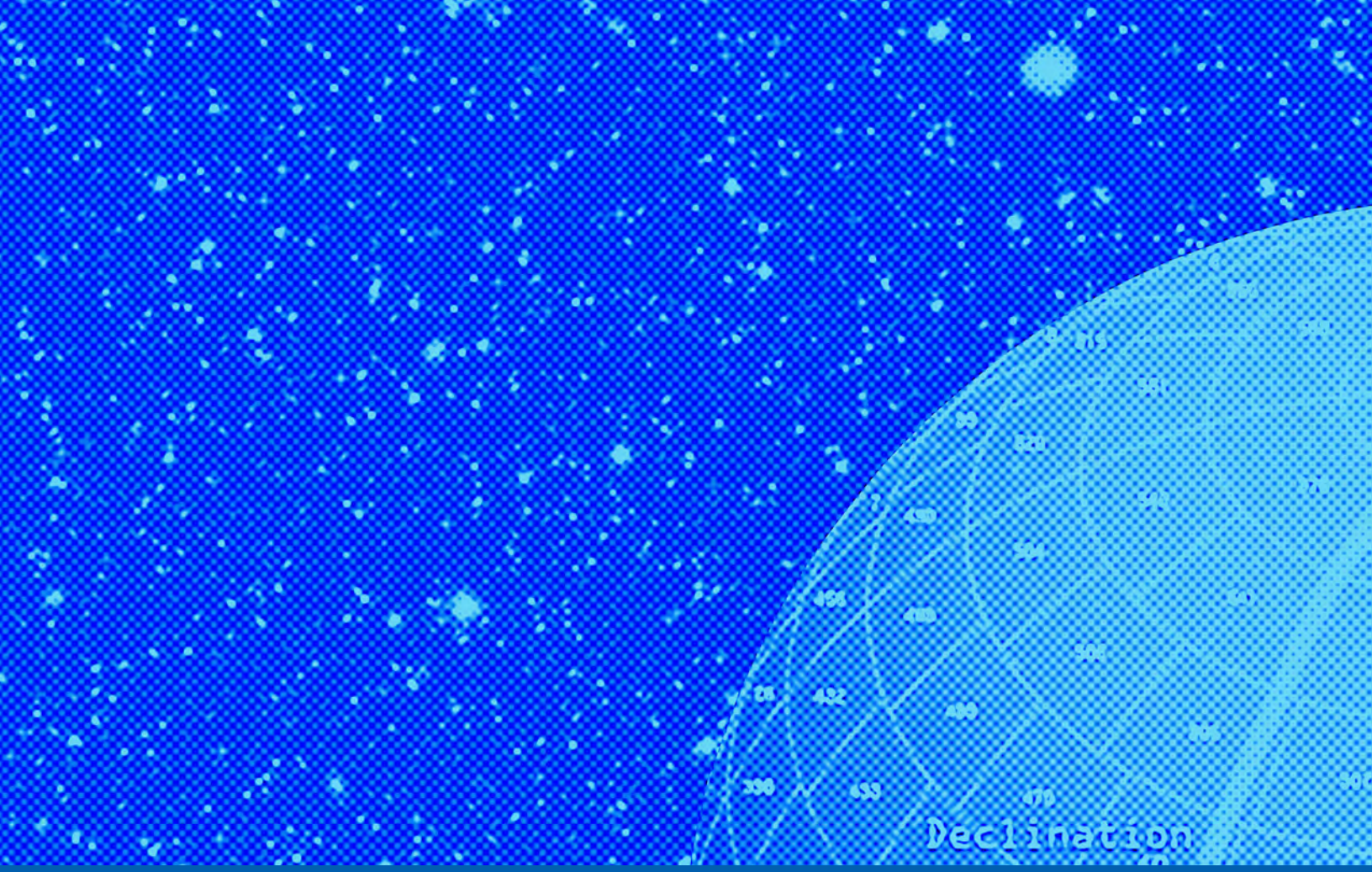


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