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# LSST CORPORATION

## HELPING SCIENTISTS USE RUBIN'S LSST

OCTOBER 17, 2022



# THIS SLIDE DECK

- What is LSST Corporation (LSSTC)
- LSSTC programs supporting Rubin LSST Science
- How you can be involved



# THE LSST ECOSYSTEM

Rubin Project  
Science Collaborations  
LSST Corporation



# THE LSST ECOSYSTEM

The **Rubin Project** is building and will operate the observatory system that will conduct the **Legacy Survey of Space and Time**.

The **Science Collaborations** is a community of individuals working on LSST science.

**LSSTC** is a coalition of 33 member institutions that are invested in LSST.



# THE LSST ECOSYSTEM

The **Rubin Project** is primarily funded by the U.S. government

The **Science Collaborations** (aside from DESC) do not have steady funding.

**LSSTC** is privately funded, through member dues, foundations, and private donors.



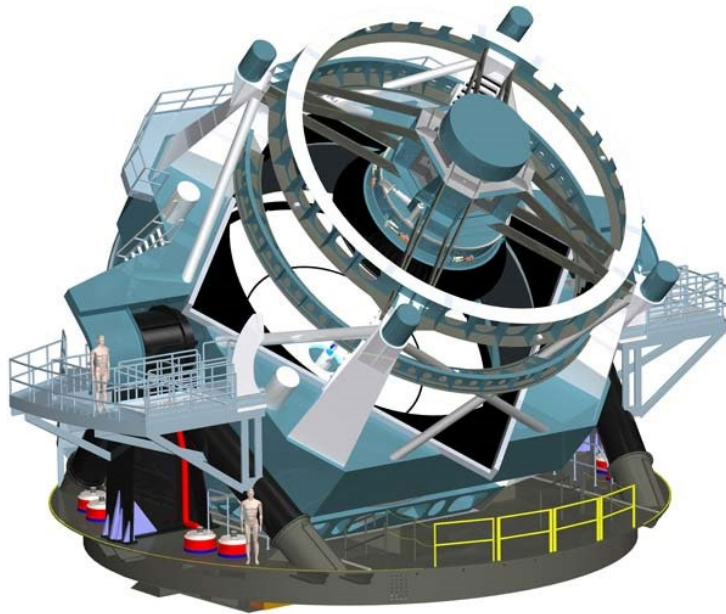
# RUBIN PROJECT: CONSTRUCTION AND OPERATIONS

- Simonyi Telescope facility in Chile
- Data Management System
- Annual data releases
- Alerts
- Access to data and basic tools for data-rights holders

- Construction Director: Zeljko Ivezić
- Project Manager: Victor Krabbendam
- Operations Director: Bob Blum



# RUBIN OBSERVATORY LEGACY SURVEY OF SPACE AND TIME (LSST)



- ▶ Largest camera ever built (3.2 Gpix; 40 full moons)
- ▶ 8.4-m mirror
- ▶ Image of the sky every few nights for 10 years (ugrizy filters): deepest 3D map, and movie
- ▶ 20 billion stars and 20 billion galaxies
- ▶ 15 Tb and 10 million alerts / night



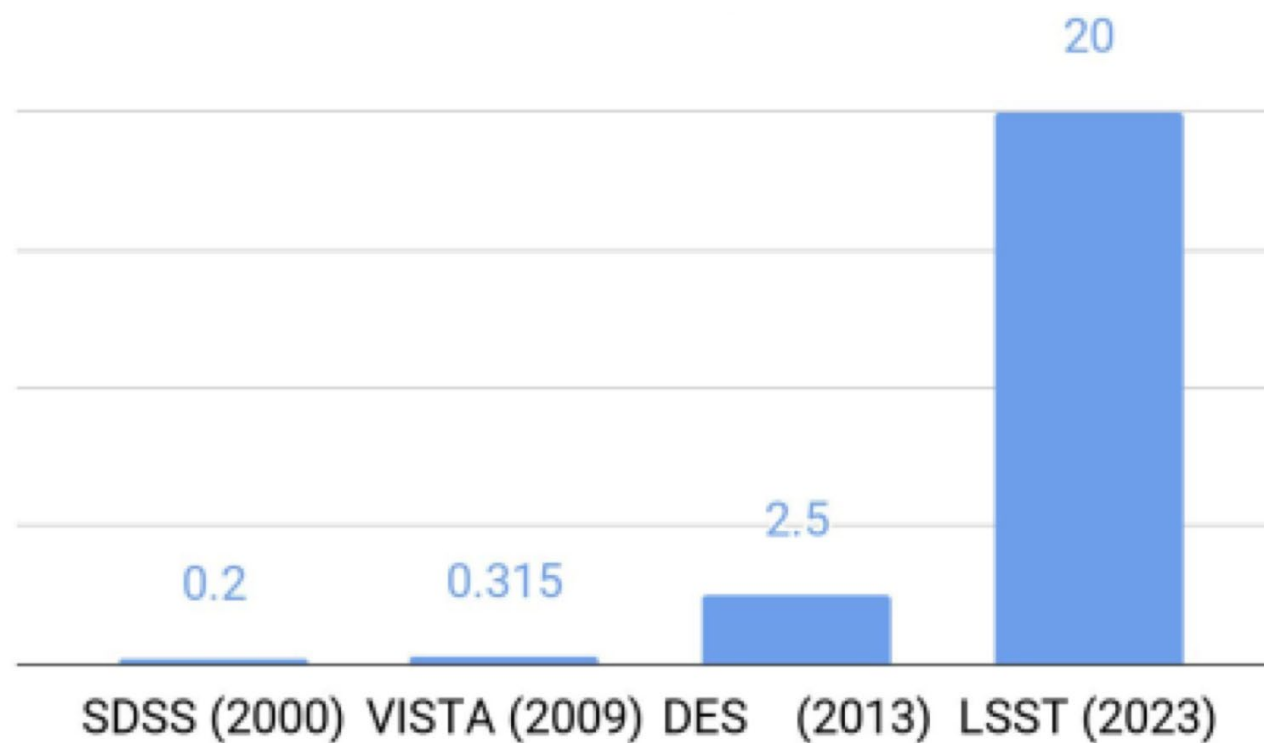
# LSST SCIENCE

- ▶ Dark matter and dark energy
- ▶ Cataloging the solar system
- ▶ Exploring the changing sky
- ▶ Milky Way structure and formation



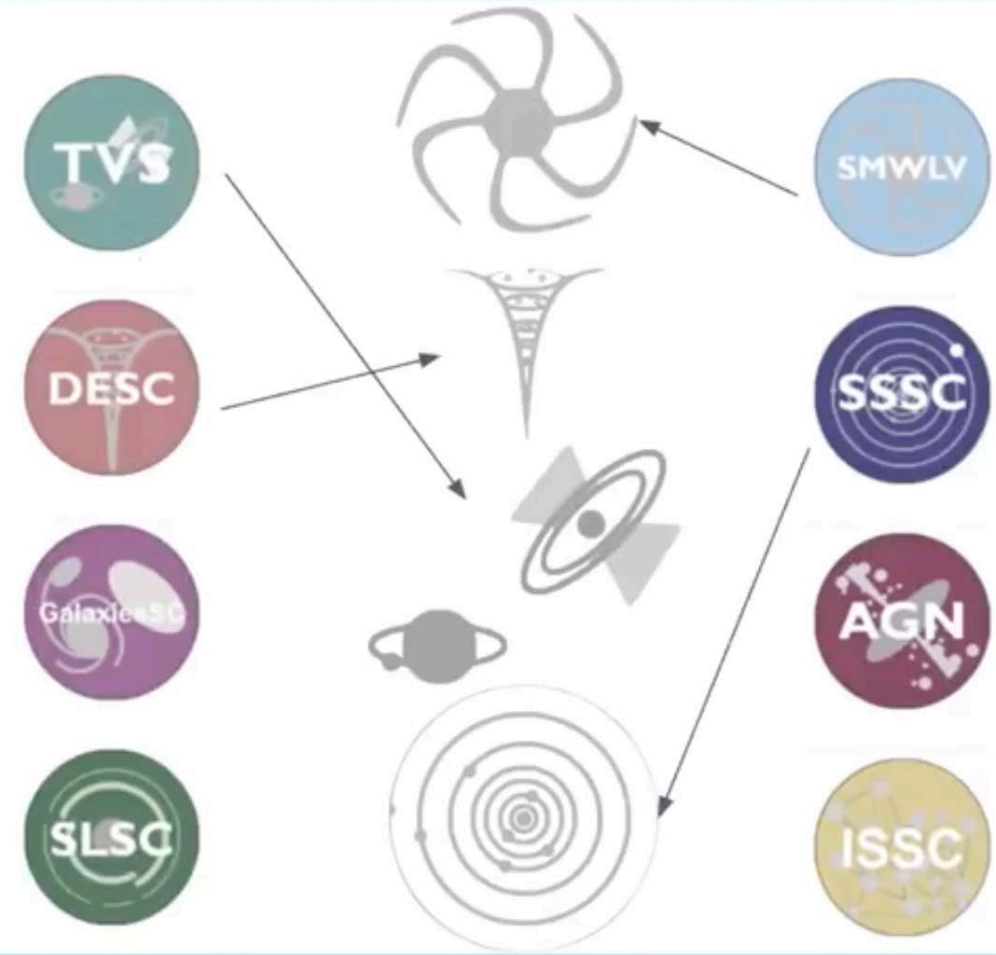


# BIG DATA WITH LSST TRANSFORMATIONAL, NOT INCREMENTAL



# LSST SCIENCE COLLABORATIONS

- Galaxies
  - Stars, Milky Way, and Local Volume
  - Active Galactic Nuclei
- Transients and Variable Stars
  - Solar System
- Dark Energy
  - Strong Lensing
  - Informatics and Statistics



# WHAT IS LSST CORPORATION (LSSTC)?

A privately-funded, non-profit organization

Working towards a future where resources are available to realize the full scientific potential of LSST, through programs and advocacy for the LSST community.

Working towards a future where networks and partnerships create a new-normal of inclusive participation in astrophysics.



- Adler Planetarium
- Breakthrough Listen, Berkeley
- California Institute of Technology
- Carnegie Mellon University
- Chile
- Columbia University
- IN2P3
- Istituto Nazionale Di Astrofisica (INAF)
- Johns Hopkins University
- KIPAC — Stanford University
- Kavli IPMU (Japan)
- Kentucky Association for Research with LSST
- Las Cumbres Observatory
- Lawrence Livermore National Lab (LLNL)
- LineA (Brazil)
- MPA, Heidelberg
- NSF's NOIRLab
- Northwestern University
- Princeton University
- Purdue University
- Rutgers University
- Schmidt Futures
- SLAC National Accelerator Lab
- Texas A&M University
- The Inst of Physics, Acad of the Czech Republic
- The Penn State University
- The University of Arizona
- University of Illinois at Urbana-Champaign
- University of Oxford
- University of Pennsylvania
- University of Pittsburgh
- University of Washington
- Yale University

# HOW DOES LSSTC ACCOMPLISH OUR GOALS?

We organize member departments and institutes across the world to achieve something that a single institution would have trouble achieving alone.

Coordinated approaches to philanthropists and foundations

Balance community-wide preparation with individual awards and support.



# LSSTC TODAY

- 33 member institutions
- Nearly \$25M in foundation funds for LSST Corp programs committed through 2026 (\$9M managed by LSSTC).
- Investing more science \$ than ever into the community.



# TRANSITIONING TO A NEW ERA

Direct Community Support from LSSTC

- Enabling Science Small Grants
- Data Science Fellowship Program
- Cadence Hackathon



## LINCC Programs:

- Catalyst Fellowship
- LINCC Frameworks
- Data Science Fellowship Program



Image credit: J. Sokoloski

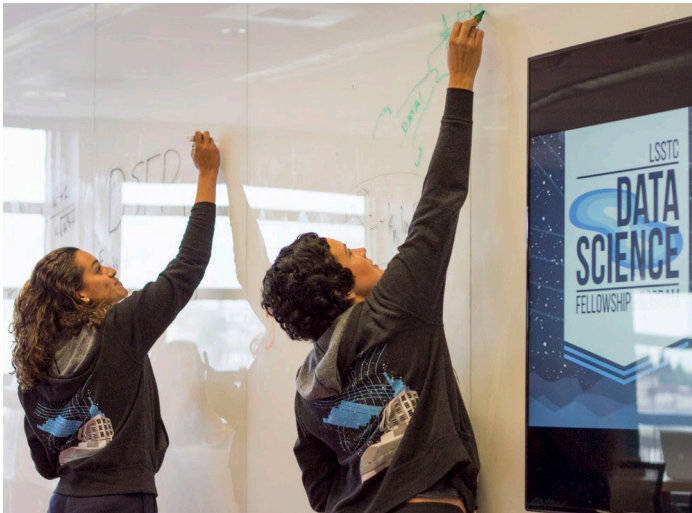
# CURRENT LSSTC PROGRAM FUNDING - FOUNDATIONS





# PROGRAMS FOR STUDENTS – TRAINING AND BUILDING COMMUNITY

## DATA SCIENCE FELLOWSHIP PROGRAM



## UNDERGRADS AT PCW



Priority access for students from LSSTC member institutions.  
4 DSFP fellowships for international students each year.

# LSSTC WORKSHOPS - EXAMPLES

CADENCE HACKATHON - 2018

DATA TO SOFTWARE TO SCIENCE - 2022

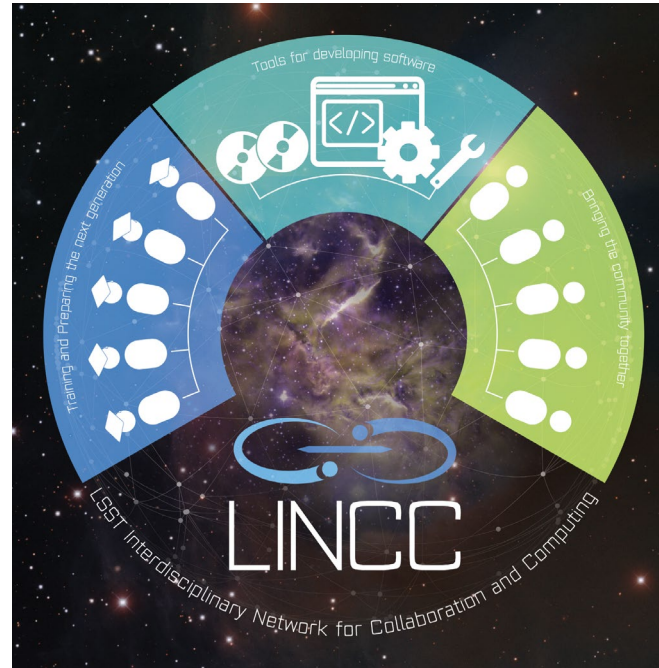
- ▶ Cross-disciplinary
- ▶ Collaboration with Rubin Project
- ▶ Honoraria to authors (Hackathon)
- ▶ Travel costs covered for members
- ▶ Publications and new collaborations resulted



Priority access for scientists from LSSTC member institutions.

# LSSTC INTERDISCIPLINARY NETWORK FOR COLLABORATION AND COMPUTING (LINCC)

- Estimated cost to prepare the community for LSST: **\$70M**
- LINCC is our attempt to meet this need.



- Pillars: 1) training; 2) software and tool development and 3) community building.
- Administered through a network of data science centers at a set of LSSTC member institutions that we expect to grow over time.

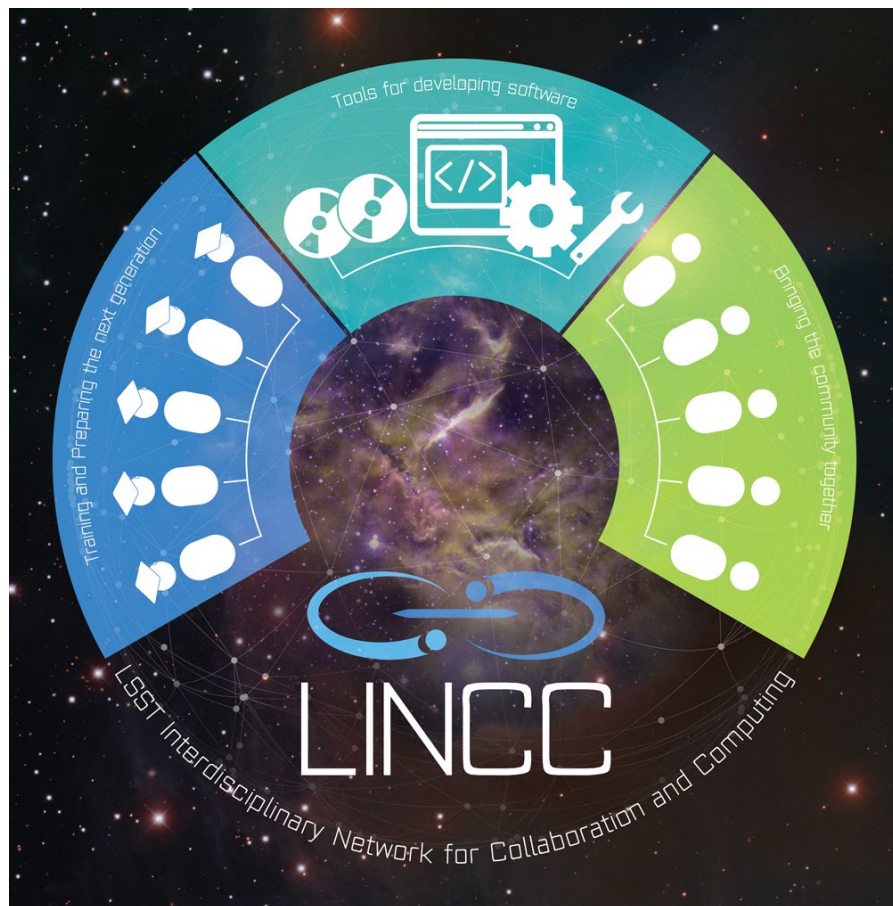
The first new LINCC programs now have funding! Frameworks and Catalyst  
Postdoctoral Fellowship

CORPORATION

LINCC Director: Jeno Sokoloski



# LINCC FRAMEWORKS



- LINCC Frameworks is a collaboration between University of Washington, Carnegie Mellon University, and LSSTC to support the LSST community in developing their analyses in collaboration with professional software engineers and data scientists.
- This program has been approved for \$15M of funding from Schmidt Futures.



## FRAMEWORKS INCUBATORS



Will provide support for researchers from LSSTC member institutions and the broader science community community to work directly with LINCC Frameworks software engineers.

You can apply new tools to research problems (precursor data, simulations) and have an immediate impact.

**Goal:** Establish long-term software development collaborations that help both the scientific user and LINCC Frameworks teams.



# FRAMEWORKS INCUBATORS - PROCESS



- Starting early 2023
- Open proposal process run by LSSTC
  - 6 projects selected per year
  - At least half will be awarded to teams led by researchers at LSSTC member institutions
- Resources provided:
  - ~\$20k USD for: travel, student salaries, faculty summer salaries, etc.
  - 3 months of access to software engineers, including collaboration on software to advance a compelling science project (value ~\$40k USD)
  - Computing resources to enable the project

# CATALYST POSTDOC FELLOWSHIP PROGRAM



- The first cohort of Catalyst Fellows has started!
- These scholars are now performing research at Rutgers, Princeton, Oxford, Columbia, Arizona, and Washington State
- Applications for the second cohort are now open. A second successful Catalyst Ideas Lab was implemented two weeks ago.



Arrykrishna  
Mootoovaloo



Azalee Bostroem



Christopher Carroll



Somayeh Khakpash



Tansu Daylan



Emily Cunningham

Catalyst Director: Jeno Sokoloski



Get to know our Current Fellows

# BASIC CATALYST POSTDOC FEATURES



## Competitive w/ other top fellowships

- Academic freedom
- Competitive stipend and research allowance
- Annual symposia
- Standard Fellowships carry 3-year terms.
- Cohorts of 5 astro fellows / yr (2 cohorts funded)
- Open to all: can apply from within or outside the US

## Delegate Status for LSST Data Previews

- Granted automatically
- To help Fellows serve as ambassadors for Rubin science
- No expectations of commissioning work

## Part of LINCC, the LSST Interdisciplinary Network for Collaboration and Computing

- Monthly topical LINCC group meetings
- Invitations to serve on Scientific Organizing Committees for LINCC events
- LINCC group meetings: both Fellow and local advisor encouraged to participate
- Support for using LINCC analysis software



# UNIQUE CATALYST POSTDOC FEATURES



## Focus on Diversity, Equity, and Inclusion throughout

- Concrete plans to create a welcoming, inclusive environment

## Structured Mentoring and Leadership Training

- Collaboration and Mentoring Committees
- Leadership training for cohort as a group
- Fellows will invite one senior scientist active in an SC and one at a small/underserved institution to join
- These 2 mentor/collaborators will receive small grants

## Cross-disciplinary

- 2 social-science Fellows with first 10 astro Fellows
- 4 senior social scientists
- Astro Fellows will have opportunity to participate in work of social scientists

## HOW CAN YOU GET INVOLVED?

- Are you excited about any of our programs?
- Is your department counting on LSST science?
- Do you think your department should get more involved in LSST?
- Do you want to show potential students and faculty hires that your department is invested in LSST and data science?

Consider joining LSSTC!

Reach out to us.

Beth Willman ([bwillman@lsstc.org](mailto:bwillman@lsstc.org), or in person during this meeting)

Kathryn Johnston, [kvj@astro.columbia.edu](mailto:kvj@astro.columbia.edu)

Ian Shipsey, [ian.shipsey@physics.ox.ac.uk](mailto:ian.shipsey@physics.ox.ac.uk)

## CONCLUDING PERSPECTIVE

- LSSTC is a member-based non-profit whose vision is to maximize the scientific output and societal impact of LSST.
- We work to direct private philanthropy to programs that help prepare the community for LSST. **We have ambitious plans!**
- Membership has numerous benefits, including:

- Increased access to LSSTC programs,
- A voice in shaping those programs, and
- Engagement of your department with LSST, the biggest astrophysics data-science project of the coming decade.