VERA C. RUBIN OBSERVATORY

Rubin Town Hall

Tuesday 10 January 2023

NSF AURA U.S. DEPARTMENT OF ENERGY SLAC CHARLES AND LISA SIMONYI FUND FOR ARTS AND SCIENCES LSST CORPORATION

Today's speakers and Panel members

Zeljko Ivezic	Rubin Construction Director
Bob Blum	Rubin Operations Director
Beth Willman	CEO, LSSTC (bwillman@lsstc.org)
Melissa Graham	Lead Community Scientist (MLG3K@UW.EDU)
Stephanie Deppe	EPO Astronomy Content Strategist
Gloria Fonseca Alvarez	Postdoc, Rubin DEI (gloria.fonseca@noirlab.edu)
Federica Bianco	Rubin Construction Deputy Project Scientist
Victor Krabbendam	Rubin Construction Project Manager

- You will have access to Rubin/LSST data in 2024
- There are resources available **now** to help you get involved
- We are working hard to build **community** and increase **inclusion**

We want **your** input!

Credit: Y. AlSayyad/Rubin Obs/NSF/Princeton

VERA C. RUBIN OBSERVATORY

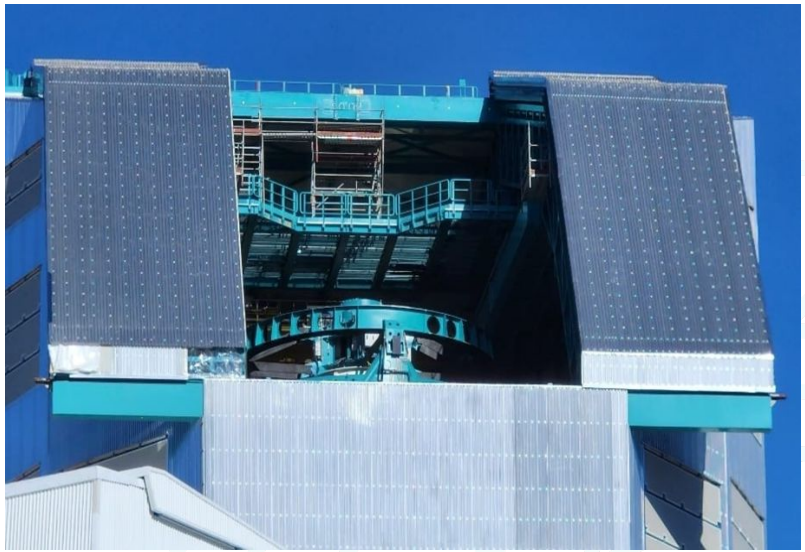
When is LSST Data Going to be Available?

Željko Ivezić, Stephanie Deppe & Bob Blum

and the Rubin Construction and Operations Teams

NSF NOIR Lab AURA SLAC U.S. DEPARTMENT OF ENERGY

Construction Progress Highlights



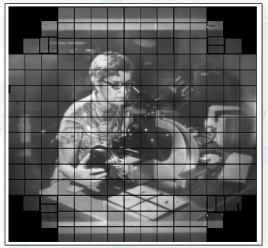
- The covid challenges are slowly disappearing...
- Telescope Mount Assembly is “99%” complete!
- The dome is progressing well (but work remains).
- LSSTCam is essentially ready to be shipped.
- Data Management: pipelines on schedule, new data facility (USDF) at SLAC, pipelines deployed for Subaru’s HSC and alert distrib. for ZwickyTF
- System Integration and Commissioning is well under way (including data taking, transfer from the summit and subsequent processing at USDF).
- Education and Public Outreach (EPO) just passed their close-out review and the team has moved to Operations!

Schedule Forecast for the Remaining Work

Schedule updates:

- Recent (Nov ‘22) construction schedule updates:

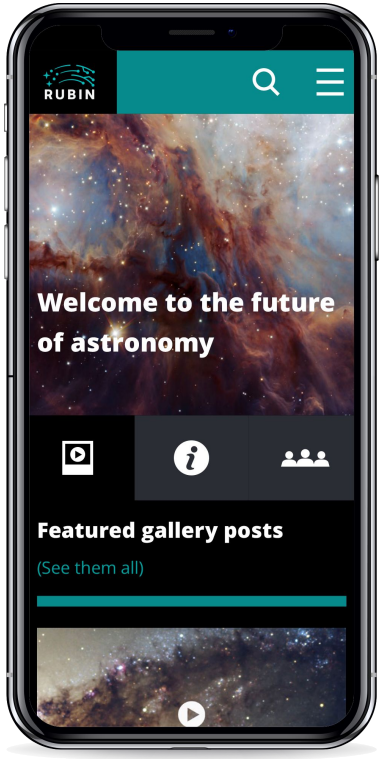
  forecast date for **System First Light** is now **July 2024**.
- System First Light is expected about 3 months after First Photon, and scheduler-driven LSST data taking will start about 4 months after System First Light.
- There will be no engineering first light with ComCam (originally expected in 2023); the Operations Team is updating their data and data products distribution plans.



This year in particular:

- In about half a year, another major milestone: **shipping LSSTCam from SLAC to Chile!**
- The dome contract is expected to be complete by the end of calendar year 2023.
- **2023 will be a key year** for full system integration and commissioning!

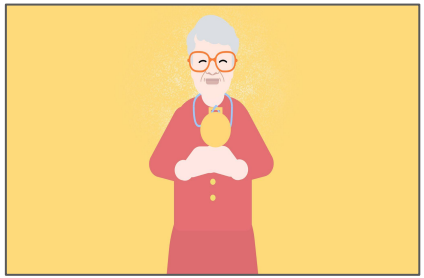
EPO Program construction is completed!

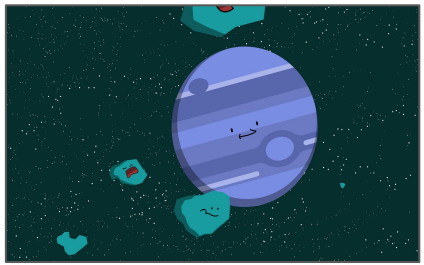


Website will be **rubinobservatory.org**

Public launch on social media in Jan/Feb 2023 (see also this AAS program)

Animated videos on YouTube, available in English and Spanish



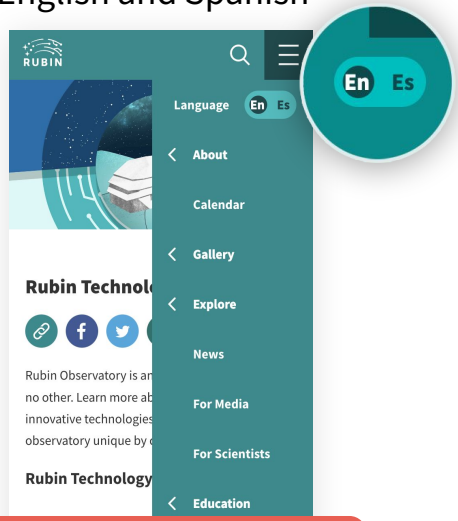


Try for a high score at spacesurveyors.app

Introducing the Rubin Education & Public Outreach program

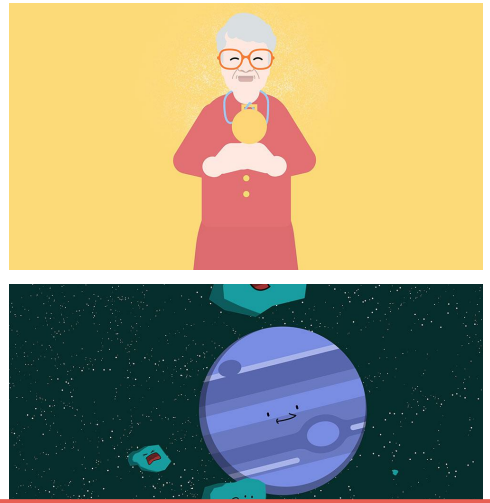
Speaker: Stephanie Deppe

A new mobile-first, accessible website with engaging, conversational content in English and Spanish



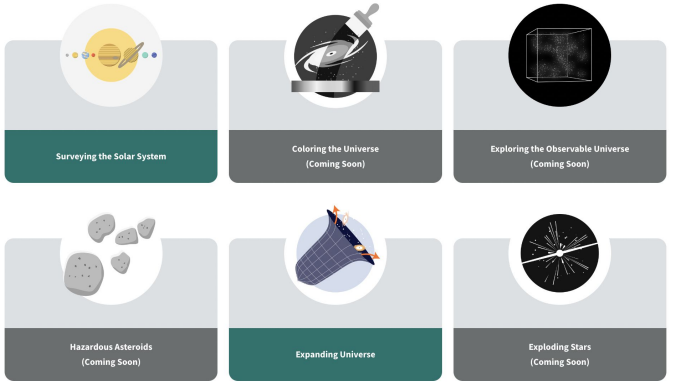
rubinobs.org
(soon to be rubinobservatory.org)

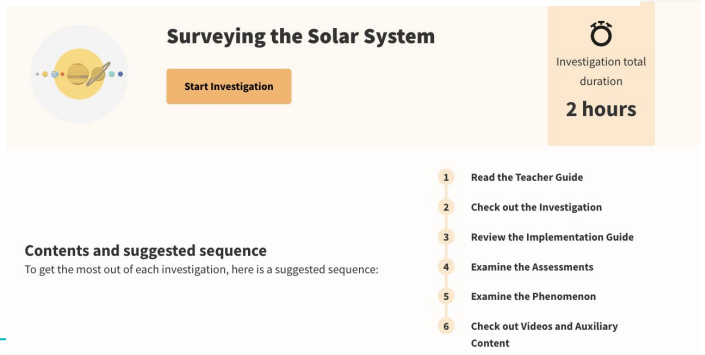
Animated videos about Rubin and its science, on Youtube in English and Spanish



youtube.com/RubinObservatory

Formal education investigations with resources for teachers



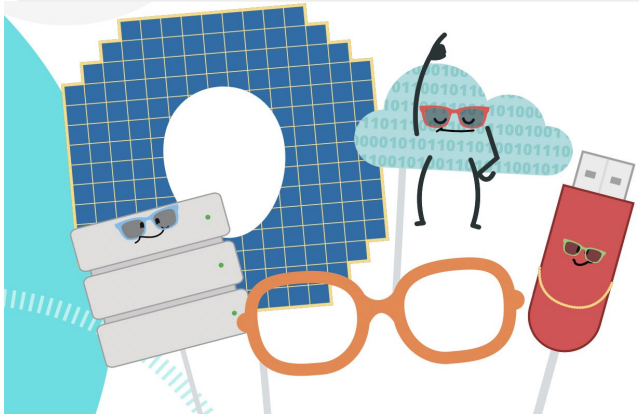


Learn more about our EPO program and celebrate its launch with us at our booth

Speaker: Stephanie Deppe

Booth 202G in the NSF Pavilion

Choose a photo prop and attend our **teal carpet premiere**



Enter a drawing for prizes by trying for a high score in **Space Surveyors**

spacesurveyors.app

Learn more about what else we have in store

Coming soon

Skyviewer

Orbitviewer

Citizen Science with Zooniverse

Engage with us on social media!

- /VRubinObs
- /rubin_observatory
- /company/rubinobservatory
- /VRubinObs
- /RubinObservatory

Start of Operations

- Given new Construction Schedule (see DMTN-232), Operations plans a formal start of the operations phase of Rubin at the end of 2024 (November - December)
- Considering there may need to be some readiness activities still to be done at that time, we plan for a start to the LSST between November 2024 and March 2025

Your LSST Early Science Plan:
2023: Develop analysis against simulated data on the Rubin Science Platform (data previews, DPs)
2024: Preparation for real data; First Light; data preview release and analysis
2025: Survey starts, first Alerts; significant data preview release and analysis
2026: Data release 1 and analysis (first 6 months of Legacy Survey of Space and Time)

What does the new schedule mean for data previews/releases

- We still plan **3 data previews and annual data releases**.
  - Data Preview 0
  - Data Preview 1
  - Data Preview 2
  - Data Release 1

DP0, active: simulated data. Summer 2023, solar system synthetic catalog as DP0.3

DP1, data from LSSTCam around First Light. Deliver Fall 2024

DP2, science validation surveys, ~ 1 yr after First Light, 2025.

DR1, first 6 mo. data from LSST. Late 2025 - early 2026.

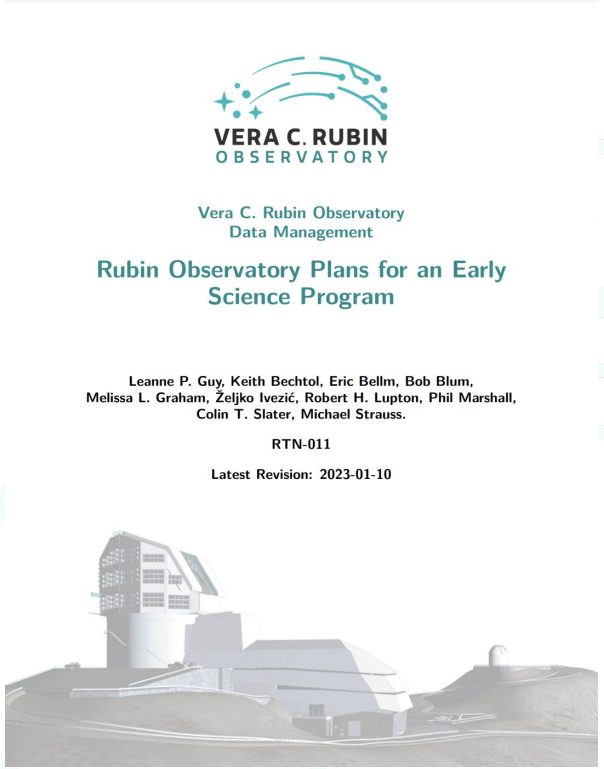
First Light summer 2024

Early Science

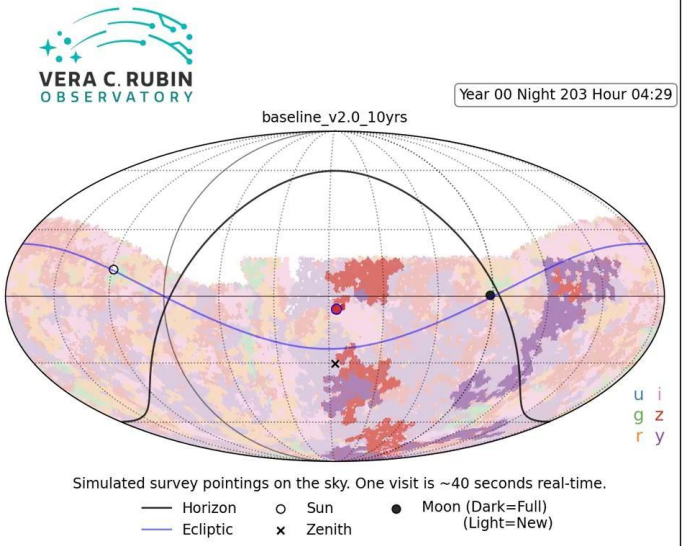
- All the science the community can do with data previews and through DR1.
- DP and DR plan enables early science even before the survey starts.
- Alert production (AP) requires templates produced in data release processing. Not available over full sky and all filters until Year 2
- Key elements that remain to be determined for early science program are choices for alert generation before DR1.

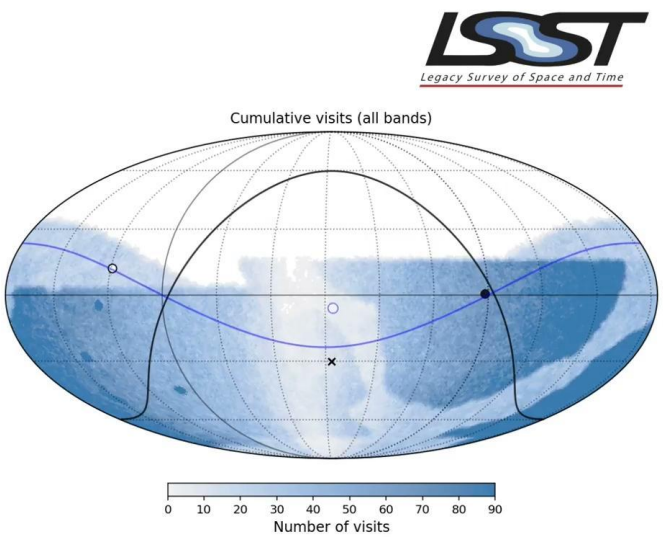
Stay up to date via the citable Early Science Plan paper RTN-011 at **https://ls.st/esp**

Research grant and fellowship proposers, see https://community.lsst.org/c/sci/early-science



Survey Strategy: unprecedented community involvement



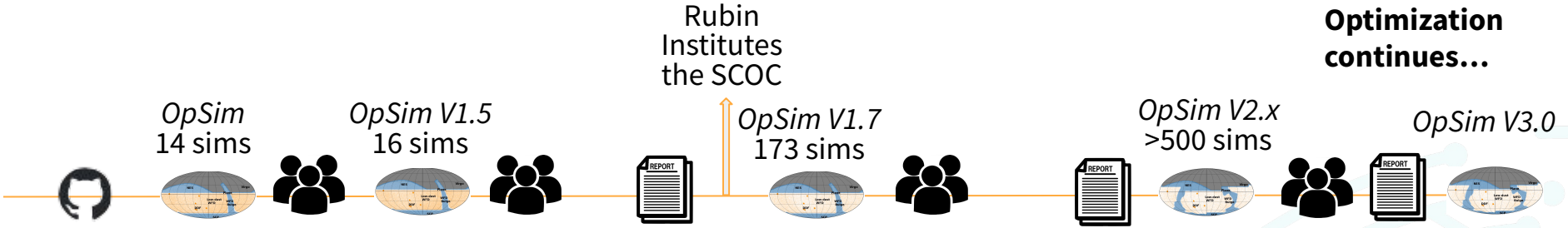


For nearly 10 years Rubin has engaged with the scientific community to optimize the design of the LSST

In 2019 the Survey Cadence Optimization Committee was created to study input from the community and the Observatory and make a survey recommendation to Rubin Operations Director for the initial implementation of the LSST

The *OpSim* enables simulations of the 10-year LSST based on sets of requirements.
Delgado et al. 2014, Delgado & Roiter 2016, Nabib et al. 2019

Survey Strategy: an iterative ongoing process



2014 Opsim and MAF software ([Jones et al. 2014](#))

2015-2017
COSEP
Marshall & The Science Collaborations
https://ui.adsabs.harvard.edu/abs/2017arXiv170804058L/abstract
Initial science driven optimization of LSST

2018
Community contributions:
46 Community White Papers
https://www.lsst.org/submitted-whitepaper-2018

5/01/2019
SAC report
baseline v1.7

2021
Community contributions:
39 Community Cadence Notes
https://www.lsst.org/content/survey-cadence-notes-2021

31/12/2021
Phase 1 report released
pstn-053.lsst.io
baseline v2.0
Major changes to the footprint

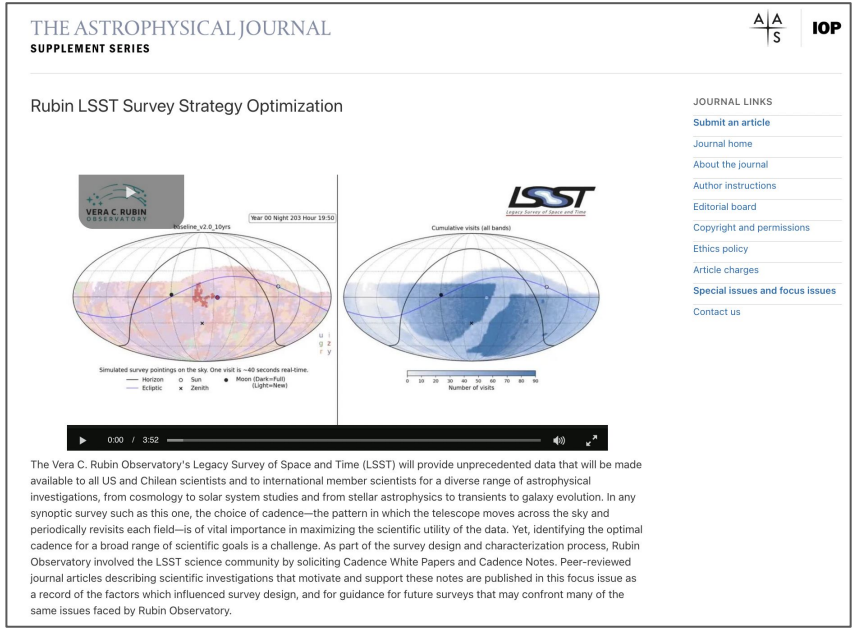
31/12/2022
Phase 2 report released
pstn-055.lsst.io
baseline v3.0
Selection of Euclid Deep Field South as 5th DDF, rolling, footprint, filter balance

SCOC webpage ls.st/rubinscoc

SCOC Phase 2 report available at pstn-055.lsst.io

Baseline_v3.0 simulation available at ls.st/opsims

Survey Strategy: an iterative ongoing process



THE ASTROPHYSICAL JOURNAL
SUPPLEMENT SERIES

Rubin LSST Survey Strategy Optimization

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The Vera C. Rubin Observatory's Legacy Survey of Space and Time (LSST) will provide unprecedented data that will be made available to all US and Chilean scientists and to international member scientists for a diverse range of astrophysical investigations, from cosmology to solar system studies and from stellar astrophysics to transients to galaxy evolution. In any synoptic survey such as this one, the choice of cadence—the pattern in which the telescope moves across the sky and periodically revisits each field—is of vital importance in maximizing the scientific utility of the data. Yet, identifying the optimal cadence for a broad range of scientific goals is a challenge. As part of the survey design and characterization process, Rubin Observatory involved the LSST science community by soliciting Cadence White Papers and Cadence Notes. Peer-reviewed journal articles describing scientific investigations that motivate and support these notes are published in this focus issue as a record of the factors which influenced survey design, and for guidance for future surveys that may confront many of the same issues faced by Rubin Observatory.

OPEN ACCESS
Optimization of the Observing Cadence for the Rubin Observatory Legacy Survey of Space and Time: A Pioneering Process of Community-focused Experimental Design
Federica B. Bianco *et al* 2022 *ApJS* **258** 1
+ Open abstract View article PDF

OPEN ACCESS
Preparing to Discover the Unknown with Rubin LSST: Time Domain
Xiaolong Li *et al* 2022 *ApJS* **258** 2
+ Open abstract View article PDF

OPEN ACCESS
Blazar Variability with the Vera C. Rubin Legacy Survey of Space and Time
Claudia M. Raiteri *et al* 2022 *ApJS* **258** 3
+ Open abstract View article PDF

OPEN ACCESS
The Impact of Observing Strategy on the Reliable Classification of Standard Candle Stars: Detection of Amplitude, Period, and Phase Modulation (Blazhko Effect) of RR Lyrae Stars with LSST
Nina Hernitschek and Keivan G. Stassun 2022 *ApJS* **258** 4
+ Open abstract View article PDF

OPEN ACCESS
Optimizing Cadences with Realistic Light-curve Filtering for Serendipitous Kilonova Discovery with Vera Rubin Observatory
Igor Andreoni *et al* 2022 *ApJS* **258** 5
+ Open abstract View article PDF

OPEN ACCESS
Give Me a Few Hours: Exploring Short Timescales in Rubin Observatory Cadence Simulations
Eric C. Bellm *et al* 2022 *ApJS* **258** 13

OPEN ACCESS
The Impact of Observing Strategy on Cosmological Constraints with LSST
Michelle Lochner *et al* 2022 *ApJS* **259** 58
+ Open abstract View article PDF

OPEN ACCESS
Target-of-opportunity Observations of Gravitational-wave Events with Vera C. Rubin Observatory
Igor Andreoni *et al* 2022 *ApJS* **260** 18
+ Open abstract View article PDF

OPEN ACCESS
Simulating the Legacy Survey of Space and Time Stellar Content with TRILEGAL
Piero Dal Tio *et al* 2022 *ApJS* **262** 22
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OPEN ACCESS
The LSST Era of Supermassive Black Hole Accretion Disk Reverberation Mapping
Andjelka B. Kovačević *et al* 2022 *ApJS* **262** 49
+ Open abstract View article PDF

OPEN ACCESS
LSST Survey Strategies and Brown Dwarf Parallaxes
John E. Gizis *et al* 2022 *ApJS* **263** 23
+ Open abstract View article PDF

iopscience.iop.org/journal/0067-0049/page/rubin_cadence

11 Peer review publications resulting from the community contributions to the Survey Cadence optimization, several more under review

Financial support for the publications provided by Heising Simons Foundation grant 2021-2975 to the Science Collaborations, *Preparing for Astrophysics with LSST Program.* PI Rachel Street

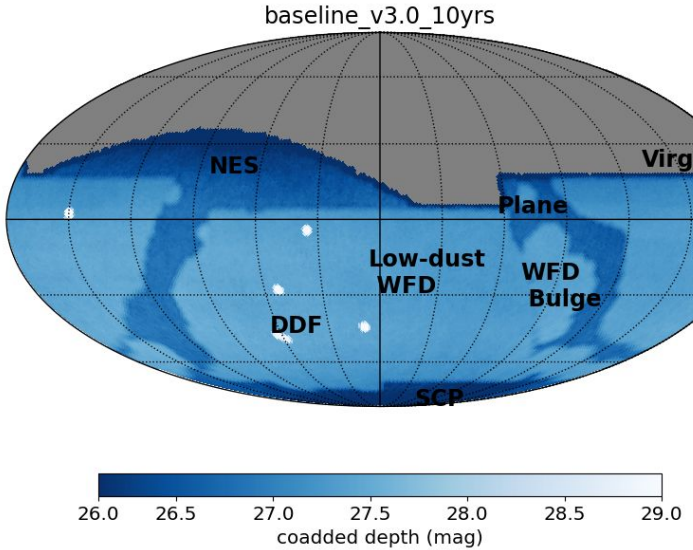
Survey Strategy: Phase 2 SCOC report

- Filter Balance & Footprint refinements
- Intranight Cadence recommendations
- Finalized DDF Selection
- Recommends twilight NEO microsurvey and Northern Stripe microsurvey to start in year 1
- Recommending ½ sky Rolling Cadence
- Recommending a ToO program to <=3% of the LSST time

pstn-055.lsst.io

To be defined:

- Details of the observing strategy for DDFs
- Details of the observing strategy for ToOs
- Details of Galactic sky footprint and strategy
- Year 1 observations (work with Early science Ops team)



Welcoming the new members

Timo Anguita Universidad Andres Bello
Louise Edwards Cal Poly
Saurabh Jha Rutgers University
Rachel Mandelbaum CMU
Adam Miller Northwestern University
Steven Smartt Oxford University
Rachel Street Las Cubres Observatory
Kat Volk University of Arizona, Planetary Science Institute

Continuing members

Franz Bauer Universidad Catolica
Knut Olsen NOIRLab
Colin Slater University of Washington
Jay Strader Michigan State University
Lynne Jones Rubin
Federica Bianco Rubin

With gratitude to the outgoing SCOC members

Sarah Brough University of New South Wales
Reneé Hlozek University of Toronto
Mansi Kasliwal Caltech
Hiranya Peiris University College London
Meg Schwamb Queen's University Belfast
Dan Scolnic Duke University

VERA C. RUBIN OBSERVATORY

What Support is Available Now to Engage in Rubin/LSST Science?

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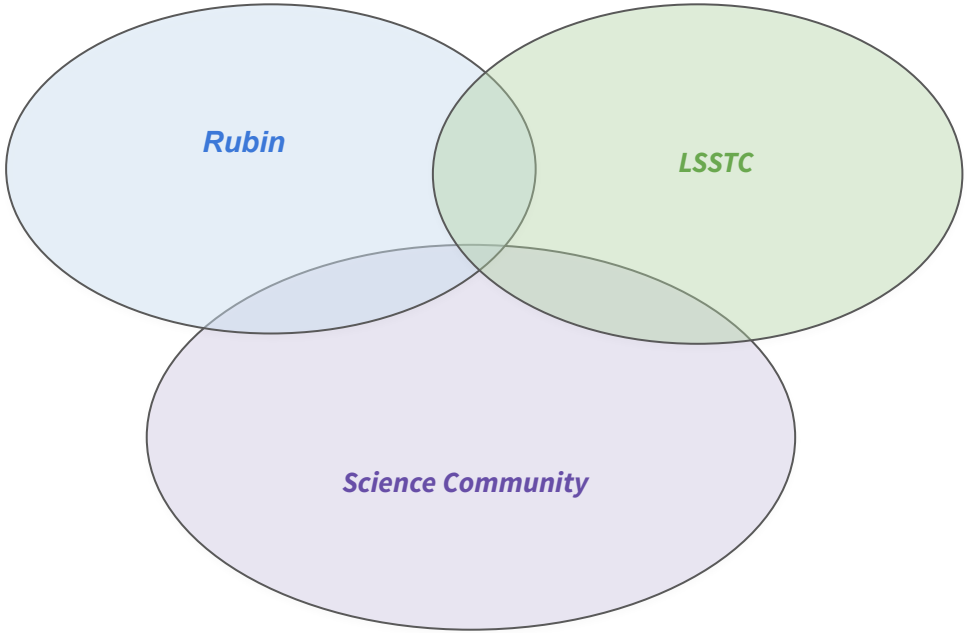
The Rubin Ecosystem



The **Rubin Project** is building and will operate the observatory system that will conduct the **L**egacy **S**urvey of **S**pace and **T**ime.

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

LSSTC is an independent, non-profit coalition of 33 member institutions that are invested in the scientific and societal impact of LSST.

Engage in Rubin LSST Science in 2023

Data Preview 0

- **Simulated** "LSST-like" images over 300 deg^2 include galaxies, clusters, SNIa, and stars (some variable) created by the LSST Dark Energy Science Collaboration (DESC; arXiv:2010.05926).
- **Processed** by Rubin staff using the LSST Science Pipelines (with difference image analysis), images and catalogs are available in the same format as will be used for future data releases.
- **Data products** are available in the Rubin Science Platform via the same query and analysis tools as will be used for future (real) data releases.
- **Documentation, tutorials, and support** are all available now to accelerate learning and preparation for LSST early science.

Get started anytime at dp0-2.lsst.io

Vera C. Rubin Observatory Documentation for Data Preview 0.2 (DP0.2)

This site provides information about the Rubin Observatory's Data Preview 0.2 (DP0.2).

DP0.2 Release Date: June 30, 2022

Data Preview 0 (DP0) is the first of three data previews during the period leading up to the start of Rubin Observatory Operations. The goals of DP0 are to serve as an early integration test of the Legacy Survey of Space and Time (LSST) Science Pipelines and the Rubin Science Platform (RSP), and to enable a limited number of astronomers and students to begin early preparations for science with the LSST.

Important

New to DP0? Welcome! See the Getting started with DP0 checklist. Anyone with Rubin data rights may submit a request to participate in DP0 using this form.

Term definitions are provided on the Rubin Observatory Glossary & Acronyms webpage.

Resources for DP0 delegates

DP0 delegates are the 600 data rights holders who have RSP accounts for access to the DP0 data set.

Support for Learners with DP0

"DP0 Delegates"

- Term adopted for DP0 participants to recognize their roles of representing the science community as testers and providers of feedback, and sharing what they learn with their local communities.
- **Learning & support resources** includes documentation and recorded videos for self-paced learning, and weekly live virtual sessions for hands-on demos, co-working, and Q&A with staff.
- **Rubin Community Forum** (Community.lsst.org) is available to everyone, and the posting of any and all Rubin/LSST-related questions is encouraged.
- *Planning is underway for a potential June 2023 "Rubin/LSST Summer School".*

Rubin Users Committee

Charged with soliciting feedback from the science community and recommending science-driven improvements to the LSST data products and the Rubin Science Platform tools and services.

They're looking forward to hearing from you.

Find contact info at:
lsst.org/scientists/users-committee

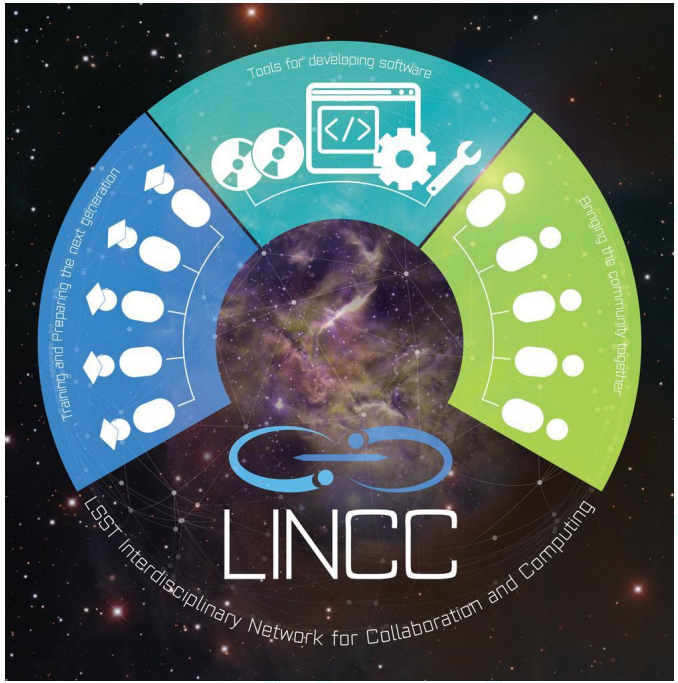
Get started anytime at dp0-2.lsst.io

LINCC: LSSTC Interdisciplinary Network for Collaboration and Computing

speaker: Beth Willman

LINCC Pillars:

- Training
  - Catalyst Postdoc Program
  - Data Science Fellowship Program
- Software and tools
  - LINCC Frameworks
- Community building



LSSTC Catalyst Postdoc

- **LSSTC Catalyst funded by the Tempeton Foundation is** an independent postdoc for scientists with extraordinary promise in Rubin LSST science and positive impact in the LSST community.
- Second cohort selection is underway.


Arrykrishna Mootoovaloo


Azalee Bostroem


Christopher Carroll


Somayeh Khakpash

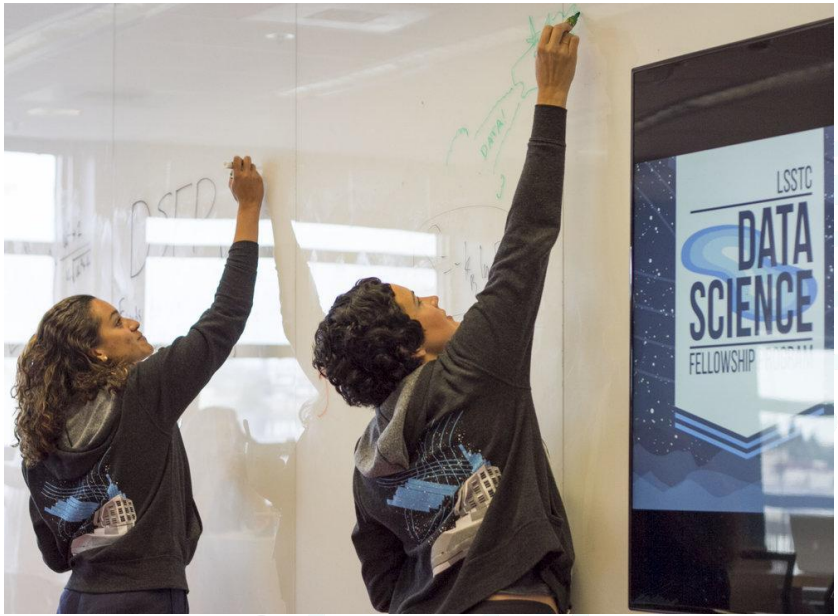

Tansu Daylan


Emily Cunningham

Get to know our Current Fellows

Data Science Fellowship Program

- **DSFP** is a two-year training program, designed to teach astronomy students essential skills for dealing with big data from LSST.
- **Northwestern/Ciera** leads the program with support from **LSSTC.**
- Next application opportunity will be announced **this Spring**.

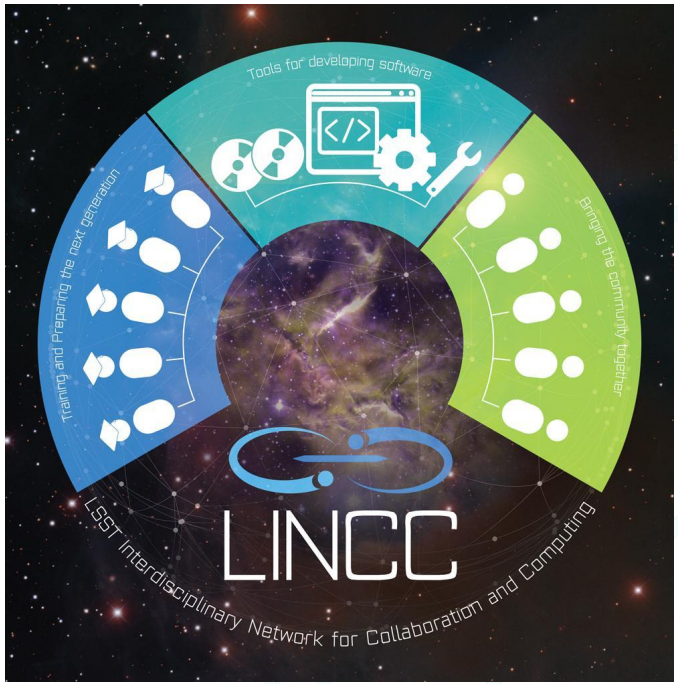


The Brinson Foundation

GORDON AND BETTY MOORE FOUNDATION

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 funded by the Schmidt Futures Foundation.
- Funded software Incubators are **rolling out NOW**.

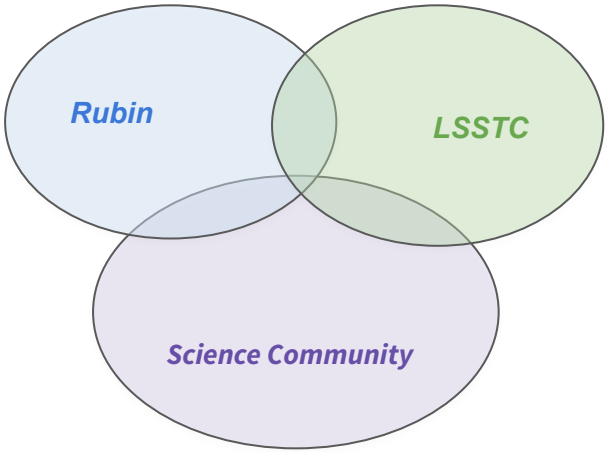


VERA C. RUBIN OBSERVATORY

What Are We Doing to Build Community and Increase Inclusion?

NSF AURA U.S. DEPARTMENT OF ENERGY SLAC CHARLES AND LISA SIMONYI FUND FOR ARTS AND SCIENCES LSST CORPORATION

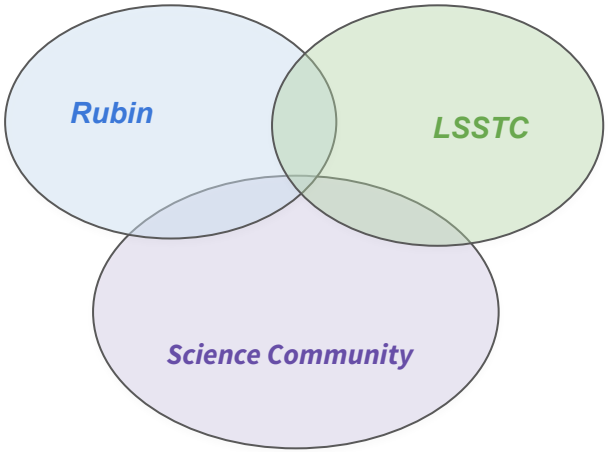
Building an Inclusive Rubin Ecosystem



IDEA = Inclusion, Diversity, Equity and Accessibility

- Science Collaboration Efforts through the DEI council
- Data Previews reach out underserved institutions
- Increase forums to discuss IDEAs issues at various projects-community meetings
- Resources available to increase inclusion, e.g. LSSTC and IceCube are partnering with HSF to provide childcare funding for two Rubin/LSST and two IceCube conferences in 2023.
- Community impact and inclusivity are selection criteria for the Catalyst postdoc.

Building an Inclusive Rubin Ecosystem



IDEA embedded in Rubin LSST EPO program

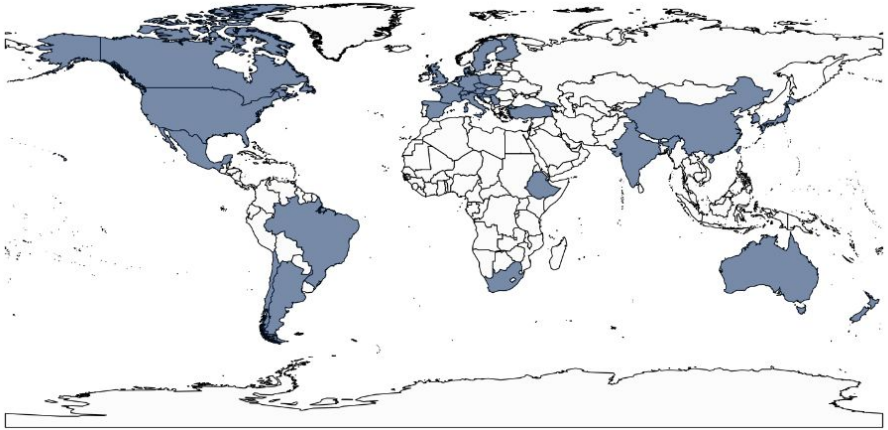
- Education investigations designed with low barriers for use & extensively tested with underserved audiences
- Website designed for accessibility & optimized for mobile devices
- Strategic use of social media to reach audiences traditionally excluded from science
- Citizen science infrastructure encourages IDEA initiatives from PIs

IDEA = Inclusion, Diversity, Equity and Accessibility

The Science Collaborations

The Rubin Observatory Science Collaborations (SCs) is a federation of independent, worldwide communities of scientists, self-organized into groups based on research interests & expertise.

>2000 people, 2500 affiliations, 6 continents, 33 countries, 8 autonomous, self-managed teams.



SC Coordinator Will Clarkson, UMich-Dearborn (here with Alistair)

Main activities:

- prepare for LSST
- provide expert advice and analysis to Rubin
- train, educate, engage the scientific community
- fundraise for our teams and their projects
- develop and implement research inclusion practices
- collaborate on software development (including in-kind)

For more information, including how to join: https://www.lsstcorporation.org/science-collaborations

Growing the Rubin Community via the SC's

The LSST SCs aspire to be an inclusive and supportive environment for anyone interested in pursuing science with Rubin LSST.

No membership fees. No requirements on organizational affiliation. No minimum time commitment for basic membership. Most SCs do not require Rubin Data holder status

Community growth and inclusion

SC driven programs

- Pan-SC's DEI council, with involvement from AURA/NSF, NOIRLAB, SLAC/DoE
- HSF-funded* 35 "Kickstarter" projects ($10-20k) with a focus on meaningful partnerships with newcomers and underserved communities
  - Partnerships with faculty-student teams from minority-serving institutions;
  - Improving data accessibility through sonification and 3D prints;
  - Collaboration visits to involve new international LSST research groups;
- HSF-funded* access to professional training in software development

Partnering with Rubin and LSSTC (e.g. LINCC framework and Catalyst fellowship, DP0)

*Multi-SC program "Preparing for Astrophysics with LSST" PI Rachel Street

AGN	Niel Brandt (Penn State), Gordon Richards (Drexel)
Dark Energy	Katrin Heitmann (Argonne), Renee Hlozek (Toronto)
Galaxies	Sugata Kaviraj (Herts), Simona Mei (Obs. Paris)
Informatics & Statistics	Tom Loredo (Cornell), Francois Lanusse (CNRS)
Strong Lensing	Timo Anguita (UNAB), Graham Smith (Birmingham)
Stars, Milky Way & Local Volume	Peregrine McGehee (SLAC), Will Clarkson (UMich-Dearborn)
Solar System	Meg Schwamb (QUB), Colin Orion Chandler (UW)
Transients & Variable Stars	Sara Bonito (INAF), Igor Andreoni (U. Maryland)

For more information, including how to join: https://www.lsstcorporation.org/science-collaborations

Research Inclusion for DP0

Goal: Democratize science by removing barriers to participation in LSST.

In order to seed expertise across the community during DP0 and inform how we are developing LSST support infrastructure we have:

- Prioritized DP0 access to those who identify as under-represented in astronomy
  - *Applied a selection algorithm when applications were oversubscribed*
  - *~40% of DP0 delegates voluntarily identify as a member of an underrepresented group*
- Ongoing recruitment of researchers at small institutions, minority-serving institutions (MSIs) and primarily undergraduate institutions (PUIs).
- Began directly engaging with researchers at small institutions, MSIs and/or PUIs.
  - *One-on-one virtual meetings with ~20 delegates to learn about research goals, potential barriers and offer individualized support to expedite LSST preparatory work.*
- Engaged with researcher-led partnerships between institutions
  - *Can facilitate group access to Rubin resources and onboarding.*

An inclusive era of LSST discoveries

I want to be a part of Rubin's inclusive science future. What do I do now?

Students, scientists, teachers, institutions of any kind and size a.k.a. YOU

- Join a Science Collaboration.
- Become a Delegate to learn how to use the data.
- Talk to LSST Corporation about how to get involved.
- Reach out to the Rubin Science Advisory Committee.
- Request a 1-on-1 meeting with Melissa and Gloria (contact@lsst.org).

… Democratizing astronomy together!

Come talk to us!

Look for staff wearing the button

Come to our booth in the NSF Pavilion