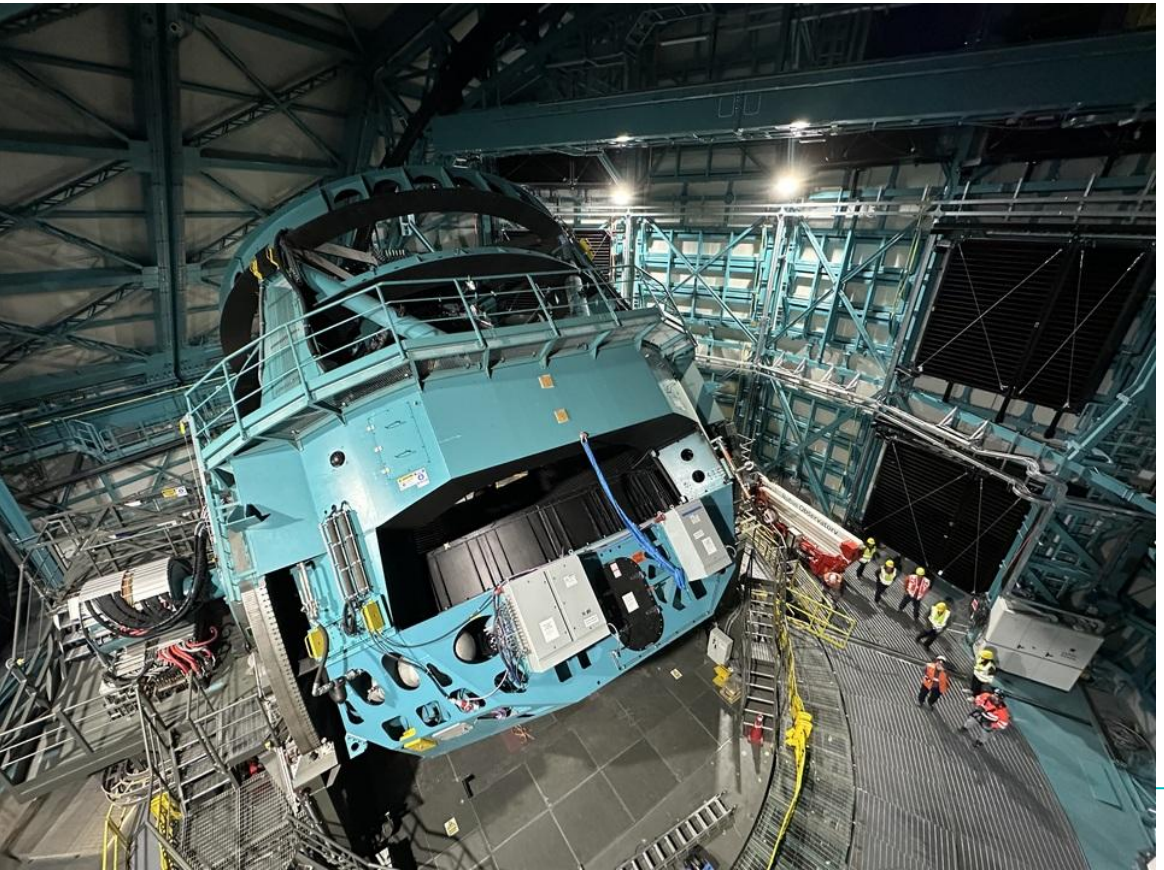
Here comes Vera C. Rubin Observatory!

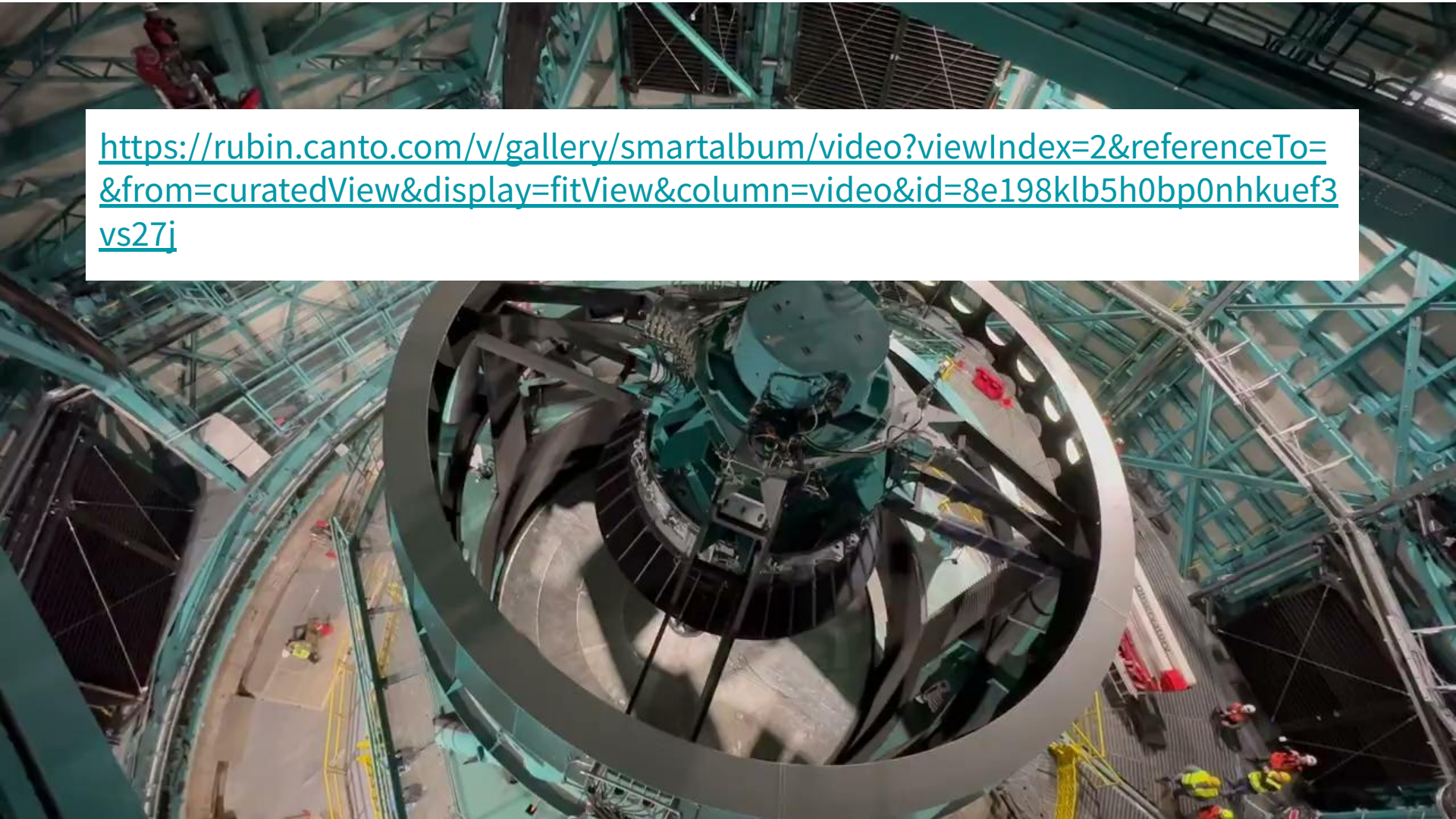
Current status and some resources for getting ready

Peter Ferguson
with
Jeff Carlin and Alex Drlica Wagner
DGSCS 2024

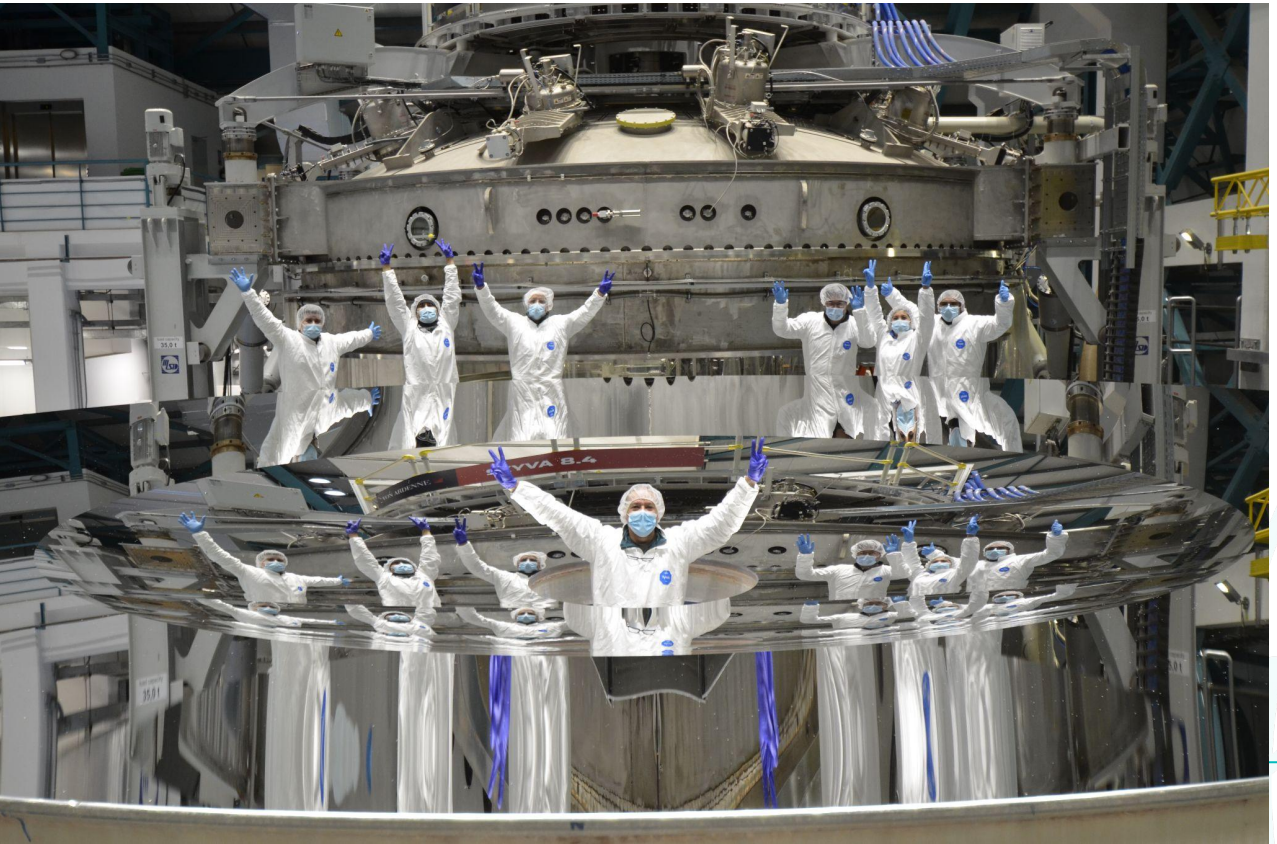
So far in 2024….



Dynamic testing of the TMA (Telescope Mount Assembly)


https://rubin.canto.com/v/gallery/smartalbum/video?viewIndex=2&referenceTo=&from=curatedView&display=fitView&column=video&id=8e198klb5h0bp0nhkuef3vs27j

So far in 2024….



Coating the primary mirror M1M3

https://rubin.canto.com/v/gallery/album/HDSNU?display=curatedView&viewIndex=2&column=video&id=l0mmphnind6krdvmp52e3mqf0l

So far in 2024….

LSST Cam leaves SLAC and arrives at the Observatory!

System Integration and Commissioning

Completed:

- Dynamic testing of the TMA (Telescope Mount Assembly)
- Coating and installation of the M1M3
- LSST Camera in Chile

Soon:

- M2 installation
- ComCam on sky late summer (we are an observatory)!

Early 2025:

- System First light with LSST Cam

Late 2025:

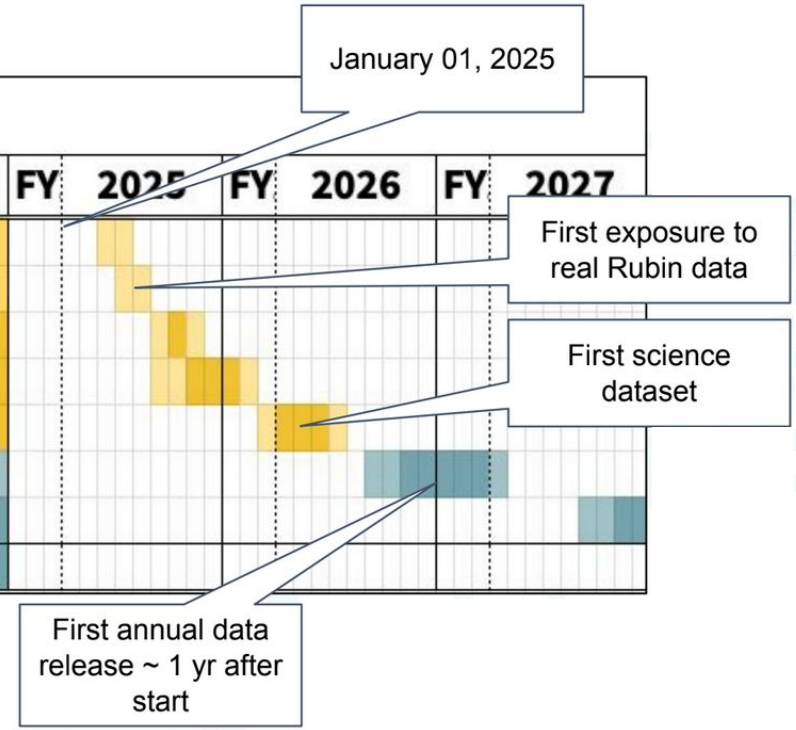
- Survey Begins

Operations Timeline: Data releases

Rubin Operations Survey and Data Release Timeline

Nominal LSST Survey Start Date: August 2025

Event		Date Range
RFL	Rubin First Light	Mar 2025 - Apr 2025
DP1	ComCam/LSSTCam Data	Apr 2025 - May 2025
OPS	Start of Operations	Jun 2025 - Aug 2025
SVY	Start of Survey	Jun 2025 - Nov 2025
DP2	LSSTCam Science Validation Data	Dec 2025 - Apr 2026
DR1	LSST First 6 Months Data	Jun 2026 - Jan 2027
DR2	LSST Year 1 Data	Jun 2027 - Jan 2028
DR3	LSST Year 2 Data	Jun 2028 - Nov 2028



Rubin Early Science Data Release Scenario

Data Product	DP0.1 DC2 Simulated Sky Survey	DP0.2 Reprocessed DC2 Survey	DP0.3 Solar System PPDB Simulation	DP1 ComCam or early LSSTCam Data	DP2 LSSTCam Science Validation Data	DR1 LSST First 6 Months Data	DR2 LSST Year 1 Data	DR3 LSST Year 2 Data
Raw Images	●	●	–	●	●	●	●	●
DRP Processed Visit Images and Visit Catalogs	●	●	–	●	●	●	●	●
DRP Coadded Images	●	●	–	–	●	●	●	●
Object and ForcedSource Catalogs	●	●	–	–	●	●	●	●
DRP Difference Images and DIASources	–	●	–	–	●	●	●	●
DRP ForcedSource Catalogs including DIA output	–	●	–	–	●	●	●	●
PP Processed Visit Images	–	–	–	–	–	●	●	●
PP Difference Images	–	–	–	–	–	●	●	●
PP Catalogs	–	–	–	–	●	●	●	●
PP SSP Catalogs	–	–	●	–	●	●	●	●
DRP SSP Catalogs	–	–	–	–	–	●	●	●

TABLE 1: Summary of data products expected in each data preview and early survey data release.

https://rtn-011.lsst.io/

Acronyms & Glossary

The DP0.2 Simulated Data (Available Now!)

Simulated LSST-like images and catalogs generated by the LSST Dark Energy Science Collaboration (DESC) for their Data Challenge 2 (DC2; arXiv:2101.04855).

Simulated images over 300 deg^2 for 5 years of an early baseline survey strategy in the wide-fast-deep (WFD) region (no deep drilling fields; non-rolling cadence).

Simulated astrophysical objects in the WFD images include galaxies (with large-scale structure), Type Ia supernovae, and stars (10% are one of 3 types of variables).

Imaging data products include:

- processed visit images (PVIs), deep coadds, and difference images

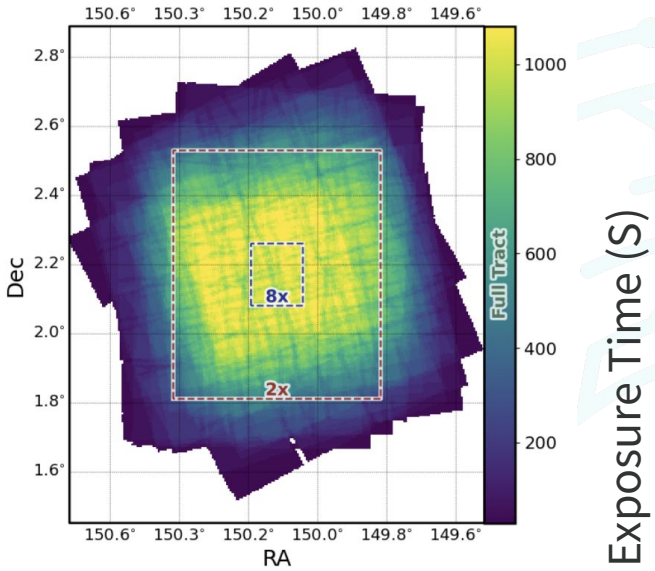
Catalog data products include:

- SNR>5 detections and forced photometry in all image types

Early Data Products

- **DP1: LSSTCam/ComCam data**
  - As is data taken, likely a few individual fields at different stellar densities
  - Raw images and visit level catalogs
- **DP2: Science Validation data**
  - First science dataset
  - No promises
  - Possibly a field (~10 sq deg) to 20 year depths and 1000 sq deg to year 1 depths (~30 visits per band)
- **DR1: First 6 months of data**

Simulated ComCam data



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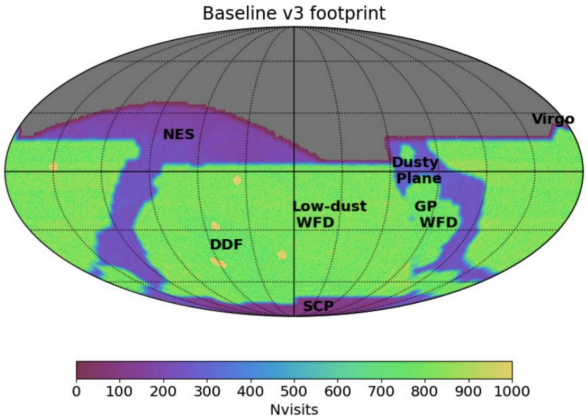

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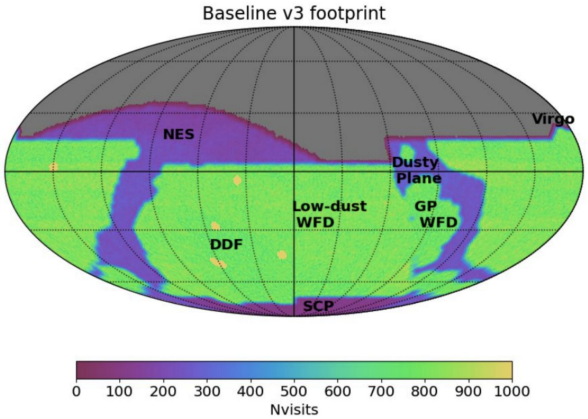
Early Data Products

- Expected single-image depths (point source; AB)
  - *ugrizy* = 23.9, 25.0, 24.7, 24.0, 23.3, 22.1 mag
- Year 1 (Dr2) ~ 30 visits per band over footprint ~1.8 mag deeper
- LSST year 10:
  - *ugrizy* = 26.1, 27.4, 27.5, 26.8, 26.1, 24.9 mag



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Rubin Science Platform (RSP)

It will not be possible to download the entire LSST data set, and scientists will need a venue for **“next-to-the-data analysis”**.

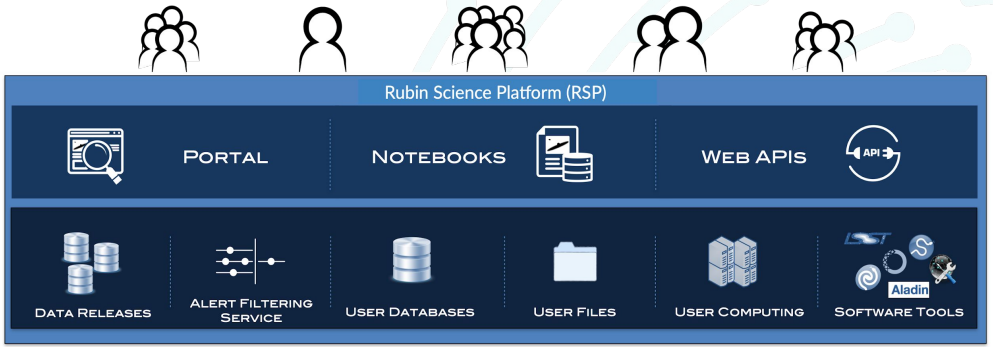
The **Rubin Science Platform (RSP)** is a set of integrated web-based applications and services running at the Rubin Observatory Data Access Centers (DACs).

Portal Aspect
exploratory analysis and visualization of the Rubin archive

Notebook Aspect
in-depth ‘next-to-data’ analysis and creation of added-value data products

API Aspect
remote access to the Rubin archive via industry-standard APIs

The RSP will include tools to query, visualize, subset, and analyze the full LSST data archives in a stable software environment located “next-to-the-data”, along with storage space, compute resources, and remote access options.



Resources

DP0 Documentation & Resources	dp0.lsst.io
Rubin Community Forum	community.lsst.org
Rubin Science Platform	data.lsst.cloud
up-to-date project schedule, milestones	https://dmtn-232.lsst.io/
webpage for scientists	lsst.org/scientists
project website	rubinobservatory.org
Rubin Community Workshop 2024	project.lsst.org/meetings/rubin-2024/

What should we (You!) help with?

- Star galaxy separation beyond default morphological selection 

Dark Energy SC

- Advanced lsb detection and measurement
  LSB background subtraction 

Galaxies SC

- Transient objects and variable stars 

Transients and Variable Stars SC

- Crowded field photometry
  Astrometry 

Stars, Milky Way, and Local Volume SC

Find out how to join at: https://lsstdiscoveryalliance.org/lsst-science-collaborations/

Thanks for listening!