

# Vera C. Rubin Observatory



Capturing the Dynamic Universe







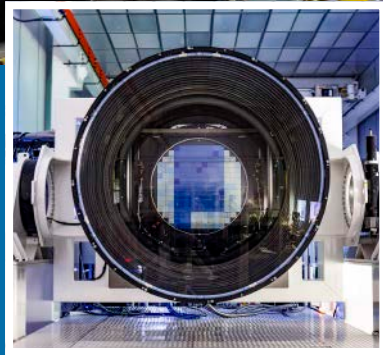
## Vera C. Rubin Observatory

Vera C. Rubin Observatory is a revolutionary new astronomical observatory located in the Chilean Andes, at an altitude of 2647 meters (8684 feet) on the mountain of Cerro Pachón. Rubin Observatory will conduct a ten-year survey of the southern hemisphere sky (the Legacy Survey of Space and Time, or LSST) to answer some of the biggest questions about the Universe.

Rubin Observatory comprises an 8.4-meter wide-field telescope seamlessly integrated with the largest digital camera ever constructed for astronomy and astrophysics, comparable in size to a small car. This cutting-edge observatory will use its 3200-megapixel camera and six different optical filters to image the sky every night for a decade. Each image will cover an area larger than 40 full Moons, and the telescope's swift repositioning capability (taking less than five seconds) will enable the entire visible southern sky to be imaged every 3–4 nights.

These capabilities will make Rubin Observatory particularly good at detecting objects that have changed in brightness, like supernovae, or in position, like asteroids. Additionally, Rubin Observatory's light-collecting power and sensitive camera will help us detect about 20 billion galaxies and a similar number of stars.

Rubin Observatory data will be processed in real time, and Rubin will issue an alert, available to anyone in the world, when a change in the sky is detected (about 10 million alerts per night). Each night, Rubin will generate 20 terabytes of data, resulting in a 60-petabyte database over the ten-year survey.



The astronomical community is honored to have the opportunity to conduct astronomical research on Cerro Tololo and Cerro Pachón in Chile.

### Vera C. Rubin Observatory Facts

**Funding:** Principally funded by the U.S. National Science Foundation and U.S. Department of Energy

**Operations Partners:** NSF NOIRLab (managed by AURA) and SLAC National Accelerator Lab

**International Affiliate Partners:** LSST UK and IN2P3 in France

**Name:** The observatory is named after Vera C. Rubin, an American astronomer known for providing evidence for the existence of dark matter.

**Location:** 80 kilometers (50 miles) east of La Serena, Chile

**Altitude:** 2647 meters (8684 feet)

**Mirror:** 8.4-meters (27.6 feet) in diameter

**Camera weight:** 2800 kilograms (6200 pounds)

**Filters:** 6 filters (*u*, *g*, *r*, *i*, *z*, and *γ*)

**Image size:** 9.6 square degrees (area of more than 40 full Moons)

**Image resolution:** 3200 megapixels (it would require 378 ultra-high-definition TVs to display one image)

**Total Images:** 5.5 million images in the full ten-year survey

**Objects detected:** 38 billion objects will be detected during the ten-year survey

**Total data:** 60 petabytes of data in the ten-year survey

**Auxiliary Telescope:** Small telescope near the main observatory that will repeatedly observe a small set of well-known, bright stars and measure how their colors change when they pass through the atmosphere. Astronomers use these measurements to 'color-correct' images taken by Rubin Observatory.

### About the Images

**Front:** This image captures Vera C. Rubin Observatory and one of the celestial specimens it will observe: the Milky Way. The bright halo of gas and stars on the left side of the image highlights the very center of the Milky Way galaxy. The dark path that cuts through this center is known as the Great Rift, because it gives the appearance that the Milky Way has been split in half, right through its center and along its radial arms. *Credit: Rubin Observatory/NSF/AURA/B. Quint*

**Back:** This image captures the wide view of the telescope inside the dome. This steel structure was designed to be rigid yet lightweight to reduce vibration as the telescope moves from one field of view to the next within seconds. *Credit: Rubin Observatory/NOIRLab/NSF/AURA/H. Stockebrand*

**Back:** (Inset) The Rubin Observatory LSST Camera is the largest digital camera ever constructed. At about 1.65 meters (5.5 feet) by 3 meters (9.8 feet), it's roughly the size of a small car and weighs almost 2800 kilograms (6200 pounds). It is a large-aperture, wide-field optical imager capable of viewing light from the near-ultraviolet to near-infrared wavelengths (0.3–1  $\mu\text{m}$ ). *Credit: J. Ramseyer Orrell/SLAC National Accelerator Laboratory*

Rubin Observatory is a joint initiative of the U.S. National Science Foundation (NSF) and the Department of Energy (DOE). Its primary mission is to carry out the Legacy Survey of Space and Time, providing an unprecedented data set for scientific research supported by both agencies. Rubin is operated jointly by NSF NOIRLab and SLAC National Accelerator Laboratory (SLAC). NOIRLab is managed for NSF by the Association of Universities for Research in Astronomy (AURA) and SLAC is operated for DOE by Stanford University. France provides key support to the construction and operations of Rubin Observatory through contributions from CNRS/IN2P3. Additional contributions from a number of international organizations and teams are acknowledged.