

## Dark matter and dark energy



# LSST LEGACY SURVEY OF SPACE AND TIME

Tracking transient events in the Universe

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- **Scientific leader:** Pierre Antilogus (LPNHE) \*
- **Laboratories involved:** APC (Paris), CC-IN2P3 (Lyon), CPPM (Marseille), IJCLab (Orsay), IP2I (Lyon), LAPP (Annecy), LPC (Clermont-Ferrand), LPNHE (Paris), LPSC (Grenoble), LUPM (Montpellier)
- **Nature:** research infrastructure
- **Status:** project under construction, under US leadership and mainly funded by the National Science Foundation (NSF) and the Department of Energy (DOE)
- **Website:** <https://www.lsst.fr>

### SCIENTIFIC OBJECTIVES

The main scientific objective of this project is to determine the nature of dark energy and to map dark matter. The LSST will also catalogue near-Earth asteroids and small solar system objects, study the dynamics of stars, search for new cosmic phenomena, and better understand the formation and structure of the Milky Way. The LSST will photograph the southern night sky for ten years at a rate of one image every forty seconds. The complete coverage of the sky will take three nights and will be repeated nearly 800 times to obtain a true film of the dynamics of the Universe, the Milky Way and the solar system.

### RESOURCES DEPLOYED

- Construction on Mount Pachon in Chile, at an altitude of 2 700 m, of a Paul-Baker type telescope, i.e. composed of three mirrors and with a very wide field of view of 9.6 square degrees (equivalent to forty full moons), as well as a focal plane of sixty-four cm in diameter.
- Construction of a 3.2 gigapixel camera with 201 CCDs, three corrective lenses and a filter system for observing the sky at six different wavelengths. The whole system weighs 2.4 tonnes.
- Implementation of a system for automated management of the telescope.
- Implementation of a data management infrastructure (twenty terabytes per night) shared between the United States and France.

- 20** terabytes of data each night
- 39** international contributors
- 25** participating countries
- 10** years of operation
- 550** million euros (construction cost)
- 3** main contributors: USA, France, Chile

### IN2P3 CONTRIBUTIONS

- The teams designed and developed the readout electronics and participated in the development of the camera's sensors.
- They produced the camera's filter changer system, the result of collaboration between five IN2P3 laboratories.
- The IN2P3 CC also provides a computer data processing infrastructure, with a strong contribution to data processing (50%) and storage.

**2000**

The LSST is given priority by the US Academy of Sciences

**2003**

Mount Pachon (Chile) is selected

**2007**

The IN2P3 teams join the project

**2011**

End of the civil work

**2015**

Construction of the telescope and camera begins

**2019**

Delivery of the filter changer by IN2P3

**2024-2034**

Telescope data collection over a ten-year period