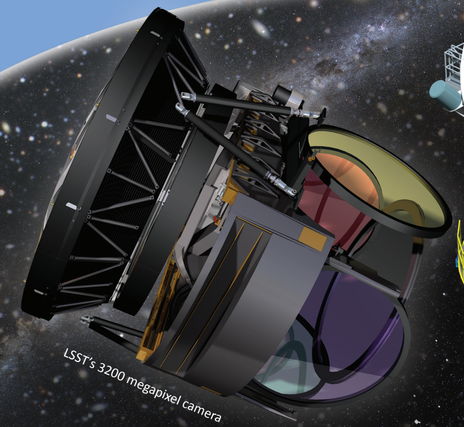
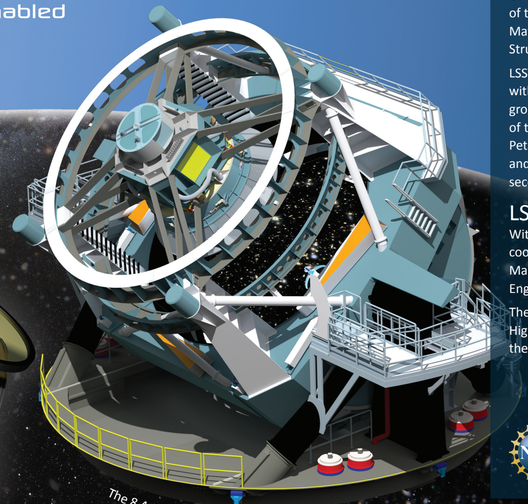
LSST is not 'just another telescope' but a truly unique discovery engine, transformative in data-enabled science, STEM education, and cyberinfrastructure.



LSST's 3200 megapixel camera



The 8.4-meter Large Synoptic Survey Telescope

Currently under construction in Chile, the Large Synoptic Survey Telescope (LSST) is designed to conduct a ten-year survey of the dynamic universe to address four main science areas with one universal cadence: Understanding Mysterious Dark Matter and Dark Energy, Hazardous Asteroids and the Remote Solar System, The Transient Optical Sky, and The Formation and Structure of the Milky Way.

LSST's design of three large telescope mirrors and three refractive camera lenses leads to a 10 square degree field of view with excellent image quality. The telescope's 3200 Megapixel camera will be the largest digital camera ever constructed for ground-based optical astronomy. Over ten years of operations, hundreds of deep exposures will be acquired for every part of the sky over 18,000 square degrees. LSST will produce 15 Terabytes of raw data per night, yielding a total database of 150 Petabytes. Dedicated data facilities will process the data in real time. Nightly and annual data products will be available to all US and Chilean astronomers, as well as our International Contributors. Alerts will be ready for world-wide distribution within 60-seconds, EPO data enabled learning experiences will be available for all.

LSST is an Interagency Construction Project

With Major Research Equipment and Facility Construction (MREFC) funding at a not-to-exceed cost of $473M, and under cooperative agreement with AURA, the National Science Foundation supports construction of the: Telescope & Site facility, Data Management system, and Education and Public Outreach components of LSST, as well as the Project Management and System Engineering efforts.

The Department of Energy supports fabrication of the LSST Camera as a Major Item of Equipment (MIE), through the Office of High Energy Physics in the Office of Science, with a total projected cost of $168M and SLAC National Accelerator Laboratory as the lead DOE lab.

LSST Project Office | 950 North Cherry Avenue, Tucson, AZ 85719 | www.lsst.org, contact@lsst.org

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

Rough site level complete

NSF PDR review

DOE CD-1 review

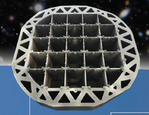
NSF FDR review

NSF MREFC funding begins

DOE CD-2 review

DOE CD-3 review

SLAC I&T facility ready



Focal Plane Grid Received

50% Sensor Production Complete

Light up LSST network

Summit substantial completion

Auxiliary Telescope data processing system available

Camera L1 L2 assembly complete

Telescope & Site substantial completion. System integration & test start

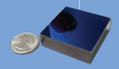
Data Access Services available at US DAC

System First Light

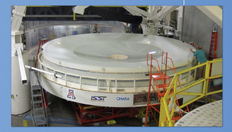
Full science operations Survey Begins

Calendar Year 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023

Prototype science sensor received



Primary mirror complete

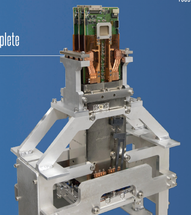


First Stone Ceremony

Lower enclosure ready for dome

First Prototype Science Platform

First production science raft complete

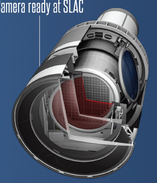


Base facility complete

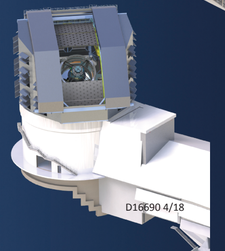
Commissioning Camera ready for testing

Engineering first light

Camera ready at SLAC



Science verification complete



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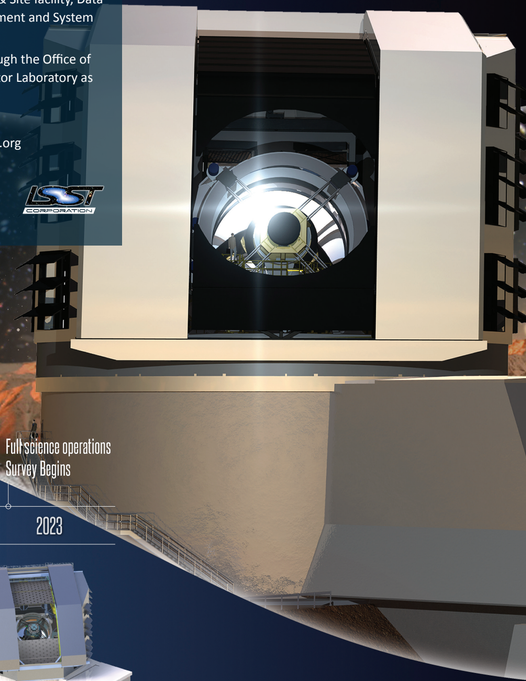
SEEING invisible dark matter and mysterious dark energy, SEARCHING for asteroids which threaten Earth, DISCOVERING how the Milky Way was formed, and WATCHING the cosmos unfold.



"Treasure Trove of Discovery"
- NRC Decadal Survey #1 Ranking

"Giant Peripheral to the Universe"
- Bill Gates

"A Million-Dollar Piece of Lab Equipment in Every Classroom"
- Educator

Large Synoptic Survey Telescope

What lies beyond? From a child's repeated "why?" to the boldest expeditions of discovery, the question is the essence of being human. Evolution has "wired" us with a need to know more of our world, our past, and our future. Of mankind's many journeys of the mind, none continues to be stranger, more wonderful, and more rewarding of effort than our contemplation of the world beyond Earth.

Ever since Galileo first turned his telescope to the heavens and banished us forever from the center of the Universe, each technological advance in our ability to observe the sky has led to new wonders, greater understanding, and deeper questions. Technology is now ready to enable the next great advance in our vision: The Large Synoptic Survey Telescope (LSST). Progress in large telescope design will enable LSST to search deeply into space over half the celestial sphere for change and evolution. Advances in computing and communications will capture an unprecedented wealth of data and bring the search to anyone with a connection to the Internet.

In the first year of operation, LSST will see more asteroids, stars, quasars, and galaxies in the Universe, and will issue more alerts, than all previous telescopes combined. Its rapid-fire, 3-billion-pixel digital camera will open a movie-like window on objects that change or move; its superb images will enable mapping the cosmos in 3D as never before. Surveying the entire sky visible from its location on Cerro Pachón in northern Chile every few days, LSST will provide data in real time to both astronomers and the public. For the first time, everyone can directly participate in our journey of cosmic discovery.

The Large Synoptic Survey Telescope (LSST) will open a movie-like window on the Universe and address some of the most pressing questions in astronomy and physics, while driving advances in data-intensive science and computing.

A Deep Digital Survey of the Sky Each Week

LSST
Large Synoptic Survey Telescope

LSST ranked as the highest priority large ground-based facility for the next decade in the NAS/NRC Decadal Survey - Astro2010.

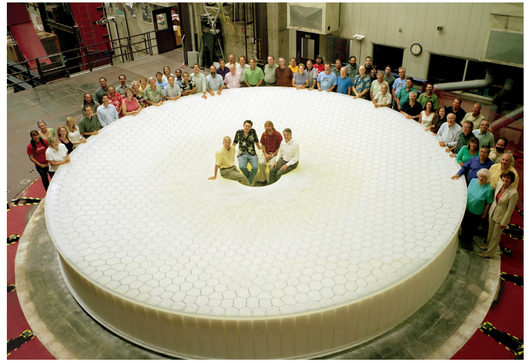
The Digital Future of Astronomy

For centuries we have peered ever more deeply into space, and the Universe has rewarded us with an extravagant richness of phenomena from galaxies to black holes to dark energy. But to make sense of it all, we must do more than collect images; we must watch the Universe evolve. Observing change is the key to understanding the cosmos we live in.

LSST is a new kind of telescope. With a light-gathering power among the largest in the world, it can detect faint objects with short exposures. Its uniquely wide field of view allows it to observe large areas of the sky at once; compact and nimble, it can move quickly between images. Taking more than 800 panoramic images each night, it can cover the sky twice each week. A powerful data system will compare new with previous images to monitor change.

LSST is a new way of observing. Traditional telescopes conduct individual experiments, one at a time. Looking deeply at small parts of the sky, they lack the power to detect change when and where it happens – they are too often looking somewhere else. LSST is a survey telescope, relentlessly scanning the sky and immediately storing images in a massive database. Nearly 1000 images of each patch of the sky obtained over 10 years will capture the sky's evolution in a 60-million-gigabyte color time-lapse movie. Astronomers and the public will "observe" this rich repository using technology and software developed by LSST and the community, replaying the movie and mining the data in ways unimagined when the survey was designed. In this way, a single powerful survey instrument enables a vast number of experiments to be carried out simultaneously.

The scientific impact of LSST will be transformative across all fields of astronomy and astrophysics and, through its study of dark matter and dark energy, transformative for physics as well. It is the top-ranked large-scale ground-based project for the next decade as recommended by the National Research Council's Astronomy and Astrophysics decadal survey (Astro2010). To realize its promise in the shortest possible time, a consortium of more than 35 universities, institutes, corporations, and individuals began building LSST as a public-private partnership. While the majority of funding is coming from the U.S. federal government, private contributions have shaved years from the time to "first light," enabling completion of the 8.4-meter primary mirror in 2015, a component which took seven years to complete.


Members of the LSST team gather to celebrate the successful casting of the telescope's 27.5-foot-diameter mirror blank.

The Changing Universe

Since its creation in the Big Bang, the Universe has been evolving for almost 14 billion years, yet this stately progress is punctuated by events which occur on quite human timescales. Supernovae are brief stellar explosions; they occur without warning but are so powerful they can be seen across half the Universe. They forge the elements from which stars and people are made and provide a window into the behavior of matter under extremes of temperature and density unattainable in the laboratory. LSST is more than a hundred times more capable of discovering cosmic explosions than current surveys.

The Unseen Universe

The more we see, the more we realize is hidden. Ordinary matter makes up only 4% of the Universe, yet it is the only matter we can see. Like the bulk of an iceberg which lies hidden beneath the sea, the nature of the remaining 96% of the Universe can only be inferred.

One-quarter of this missing mass is called dark matter. While dark, it can still be detected; its gravity bends the path of light coming from distant galaxies, subtly distorting their images. LSST will measure this distortion on four billion galaxies across the sky and make a map of cosmic mass, both luminous and dark, allowing us to "see" invisible dark matter and measure its properties in detail.

More mysterious yet is dark energy. In the past generation, and against all expectation, the expansion of the Universe was discovered to be accelerating, the result of an energy field that pervades all space and that physicists call dark energy. Evidence for this acceleration was first seen in the light from supernovae in 16 distant galaxies; LSST will catch millions of these supernovae in the act. Charting billions of galaxies, LSST will provide new windows on dark energy by following its effect on the evolution of cosmic structures through time. The exquisite precision of these measurements will enable us to see beyond the tip of the iceberg to learn the nature of the 96% of the Universe that was previously hidden.

The Universe in Motion

LSST's time-lapse picture of the heavens gives it an exquisite ability to track the motions of celestial objects. It will be a powerful tool for measuring the motions of stars throughout our galaxy and discovering new objects in our solar system.

With the sensitivity to detect a golf ball at the distance of the Moon, LSST will greatly enhance our ability to detect and track potentially hazardous asteroids. By providing warning years in advance of a potential threat, LSST will give time for the world to devise a strategy for its mitigation.


LSST provides an unprecedented opportunity for the integration of research and education.

LSST's ability to discover moving objects extends to the outermost reaches of the solar system. It will discover numerous new bodies, some as large as Pluto, all frozen remnants of the solar system's early history. By mapping the distant parts of our own planetary neighborhood, LSST will allow us to compare ourselves with solar systems around other stars and better understand the origins of Earth.

The Telescope for Everyone

LSST's survey mode of operations and data products with vast potential for discovery provide a unique and powerful opportunity to share the science of LSST with a broad audience. LSST's educational data products will be completely "open access," and plans for sharing them with the public are as ambitious as the telescope itself.

Tens of millions of people will view LSST sky on screens of all sizes, participate in citizen science projects at many levels of intellectual engagement, and pursue authentic research projects in classrooms and free-choice learning environments. LSST will give them the tools to ask new questions and participate in the scientific process.

A dynamic web portal will report on LSST discoveries and connect participants, drawing them into learning experiences as citizen scientists. These programs support U.S. efforts in STEM (science, technology, engineering, and mathematics) education and are designed to advance scientific and technological literacy and workplace skills, especially in data mining and technology. All will help to build public awareness of the importance of science and technology.

What lies beyond? LSST is the next step toward finding out. What we will discover we can only imagine.