Large Synoptic Survey Telescope
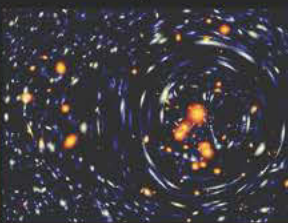
E-News

FROM THE DIRECTOR, STEVEN KAHN

The long awaited news has arrived – LSST has received its federal construction start! On Friday afternoon, August 1, the NSF authorized the LSST project for construction with $27.5M in FY14 and a budget plan that stays within a $473M overall budget cap. AURA received NSF support to manage construction of LSST; the NSF press release describes LSST construction as "taking astronomy to the next level". This marks the official federal start of the LSST project.

The effort that brings us to this important step in making LSST a reality started in the late 1990's when design requirements for a telescope that would detect faint solar system bodies and those needed to map dark matter via weak gravitational lensing merged into a single wide-field survey telescope initially known as the Dark Matter Telescope. A decade of further developing the science case, refining instrument requirements, and building community support resulted in the LSST, as it was now known, rising from a runner-up in the 2000 NRC Decadal Survey to the top ranking for a large-scale ground-based facility in the 2010 NRC Decadal Survey. In May 2014, the National Science Board gave the NSF conditional approval to move the project to construction status. The NSF support of AURA to manage construction of the LSST marks the official federal start of the LSST project construction.

We gratefully acknowledge the hard work by so many that contributed to this milestone:

- the LSST Corporation for their leadership role in promoting the concept and securing initial funding, organizing the necessary support within both the astronomy and physics communities for the construction and operations of LSST

- our private donors – led by the Charles and Lisa Simonyi Fund for Arts and Sciences and including Bill Gates, Richard Caris, the W.M. Keck Foundation, Wayne Rosing and Dorothy Largay, Eric and Wendy Schmidt, and Edgar Smith – whose early contributions kept the project viable and supported the early construction efforts

IN THIS ISSUE

- the staff at the National Science Foundation and Department of Energy for continued support for design and development of the LSST concept and whose perseverance and diligence navigated LSST through the federal procedures at the most challenging time in US history to initiate a major research project

- to Sidney Wolff, John Schaefer, and Don Sweeney for their early leadership roles on the project

- to our hundreds of science collaborators who volunteered their time to provide valuable feedback and to document a compelling science case as presented to the National Research Council as the LSST Science Book

- and especially to the hundreds of project team members who have worked so hard and endured hundreds of reviews to define and defend the LSST concept with their expertise, experience and passion.

From a twinkle in the eye of Tony Tyson in 1996 to relentlessly scanning the sky in 2022, the LSST has broken through the technology, science, and political challenges and is on its way to revolutionizing both our cosmic knowledge and the open and collaborative methods of acquiring that knowledge. With every confidence in the project team to complete the construction task, we are excited to begin this next phase for LSST and look forward to sharing the adventure.

Article written by Steven Kahn, LSST Director

LSST'S CALYPSO TELESCOPE MOVED FROM KITT PEAK TO TUCSON

Calypso leaving Kitt Peak. (LSST / Gary Poczulp)

Early in the morning on May 28th, 2014, LSST's 1.2-meter Calypso telescope took the first step of a long voyage from Kitt Peak National Observatory to Chile's Cerro Pachón mountain, where it will accompany LSST as an essential calibration instrument. Through the efforts of a skilled team and thorough preparation, the move was successful, and by late-afternoon on the same day, Calypso had been delivered to the NOAO loading bay in Tucson.

As part of LSST's calibration work package, Calypso is slated for transport to Chile in 2017. Until then, it will reside at NOAO, where it is being upgraded with a new control system, new drives, and a recoated mirror.

Once the only privately-owned telescope among the state-of-the-art suite of astronomical facilities on Kitt Peak, Calypso was generously donated to LSST in 2008 by its proprietor, astrophysicist and entrepreneur Dr. Edgar Smith.

Smith named Calypso after the sharp-sighted Greek goddess who captured Odysseus for seven years – "about the time it took to build [the telescope]," he recalls in Timothy Ferris's book Seeing in the Dark.

Now, more than a decade after its initial installation, LSST engineers were faced with the colossal task of dismantling Calypso and removing it from its site before the onset of the summer monsoon season.

Perched 35 feet off the ground on a 14,000-pound mount, Calypso's uninstallation was a dedicated operation, requiring over one month of planning, a $25,000 investment in transportation costs, 6 NOAO staff members for

truss and optics removal and 8 individuals involved in lifting the telescope from its mount, and a 175-ton crane to complete the job.

Even so, "Calypso was built to be relocated," says LSST Telescope and Site subsystem manager Bill Gressler.

Gressler's team crafted a custom-made stand in-house for test and transport of the telescope. All optics were carefully removed and placed in special containers to protect them from shock during transportation. The container carrying the mirror – insured at $2.5 million – was carried on a truck with air-ride suspension.

But the biggest challenge was navigating a 5-axle crane down the narrow road to the Calypso site, a meticulous ¼-mile journey that took 30 minutes.

Refurbished Calypso "will be a cool robotic machine with a slick, jazzy instrument," promises Gressler.


View a video and image gallery of the Calypso Relocation at: **ls.st/v3h** (LSST / Gary Poczulp)

Once installed on Cerro Pachón, Calypso will be used for atmospheric monitoring, measuring water vapor and overall assisting with post-processing of astronomical data produced by LSST. Adjacent to the main telescope on a mound casually known as "Calibration Hill," Calypso will withstand the same environmental conditions as its much larger companion, surviving 120 mile-per-hour winds while functioning autonomously to provide precise calibration data.

In the meantime, Calypso's vacant site at Kitt Peak is up for sale - great views!

Article by Gretchen Stahlman

JOHN ANDREW — DRAWING A STRAIGHT LINE FROM CONCEPT TO HARDWARE
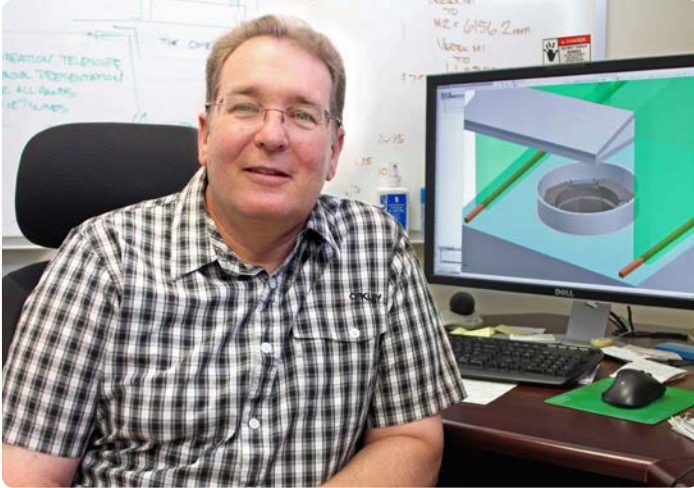
LSST Design Engineer John Andrew (LSST / Emily Acosta)

LSST Design Engineer John Andrew always enjoyed taking things apart, seeing how they worked and putting them back together again – an interest put to good use during his recent project coordinating the disassembly and relocation of the Calypso telescope from Kitt Peak to NOAO in Tucson. Although arguably also applicable to his childhood aspiration of becoming a doctor, it is a predilection probably more suitable for engineering. Medicine's loss is LSST's gain.

John previously worked on the SOAR project, where he tested components and participated in final assembly of the primary mirror lateral link assembly. Those kinds of moments represent what he described as the most satisfying element of his work – seeing a design go from a basic concept to a complete working piece of hardware. It is a satisfaction he looks forward to experiencing with LSST. At SOAR, John worked with Victor Krabbendam (now LSST Project Manager) and future members of the LSST Telescope and Site subsystem team. John "enjoyed working with everyone on the SOAR project, so when LSST was looking for a designer, I applied." He joined the LSST in project in November 2005.

John credits his grandfather for sparking his interest in mechanical things. "He worked in the locomotive casting industry and got me interested in mechanical drawing. I took mechanical drawing in school and really enjoyed it."

At first John thought he wanted to be a doctor, but "when I found out how long I had to go to school for it I decided it wasn't for me." Instead he graduated from Hudson Valley Community College in 1985 and took a job with General Electric Large Transformer Operations in their drafting department. In 1988, Beloit Corporation hired him as a mechanical designer for automated paper making equipment. In 1996, he moved to Tucson and joined NOAO in the instrumentation department.

In addition to being responsible for LSST's future calibration telescope, John oversees the observatory coating chamber and the Project's repository of Computer Aided Design (CAD) drawings. LSST will be the most complex system John has worked on. The current CAD database for the LSST Telescope and Site subsystem contains more than 13,400 files.

"I estimate that when we finish construction," John said, "that database will have tripled in size."

To wrangle that amount of data, John has implemented a product data management (PDM) system. PDM is a tool focused on managing and tracking the creation, change and archiving of all information within the CAD database. It serves as a central repository for the drawings, their metadata, and their history.

In his free time, John enjoys golf, camping, off-roading, and watching football and auto racing. He said off-roading and auto racing appeal to him for the same reasons he was originally drawn to mechanical engineering. "The rest just keeps me sane."

Article by Robert McKercher

PERSONNEL

Eduardo Serrano, Site Manager for the Telescope and Site team in Chile

Eduardo Serrano

The LSST Project welcomes Eduardo Serrano as the Site Manager for the Telescope and Site team in Chile. Eduardo joins the LSST team in La Serena, most recently working at the SOAR telescope as site manager since 1998. He will work closely with Jeff Barr, the Project Architect, to support the upcoming summit facility construction activities and operate as the overall onsite safety manager to ensure compliance to LSST safety policies. Eduardo has a degree in mechanical engineering from the University of La Serena and previously worked at CTIO in support of telescope engineering activities.

Carol Chirino

The LSST Project Office is pleased to welcome Administrative Assistant Carol Chirino to the LSST team. Carol will support daily operation of the LSST office in Chile, including providing support for local and visiting staff. She will coordinate LSST administration in Chile with the LSST Project Office in Tucson. Most recently a bi-lingual administrative specialist for Gemini South Operations Support, Carol has 12 years experience in demanding office environments. Before Gemini, she worked as an administrative assistant for the University of Alberta Hospital in Edmondton, Alberta, Canada.

Carol Chirino, Administrative Assistant in Chile

Mario Juric, Data Management Project Scientist

Mario Juric

Mario Juric, LSST's Data Management Project Scientist, has accepted a new position at University of Washington, where he joins the Astronomy Department and the eScience Institute as a faculty member. Beginning in September, Mario will relocate to Seattle, while continuing his duties for LSST remotely and through monthly trips to Tucson. Despite spending less time in the LSST Project Office, Mario's new post is mutually beneficial, offering fresh challenges in data science, as well as opportunities to connect with cutting-edge research and researchers, overall contributing positively to LSST. Congratulations, Mario!

HIRING CAMPAIGN

LSST is taking the show on the road with an energetic new hiring campaign aimed at attracting a diverse and talented team to lead the project into its official construction phase. Equipped with a newly-designed website and a proactive recruitment strategy, LSST team members recently attended the American Astronomical Society Annual Meeting in Boston, Massachusetts, and the SPIE Astronomical Telescopes + Instrumentation conference in Montréal, Quebec, Canada, personally interacting with top scientists, engineers, educators and administrators in fields related to telescope construction and operation. Through active outreach efforts, word-of-mouth and a strong online presence, LSST is seeking highly-skilled individuals to join the project at this critical and exciting time in astronomical history.

The LSST Hiring Campaign website will be updated to show new positions as they become available. There are 12 open positions as we go to press with this issue of E-News.

INTERNS
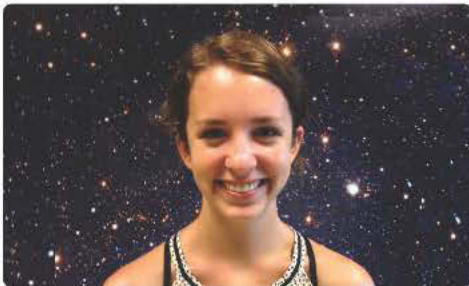
Victoria Strait. (Tony Tyson)

Gretchen Stahlman. (Shemyr Caro Muñoz)

Zachary Reyna. (LSST / Emily Acosta)

Furman University junior **Victoria Strait** is a 2014 summer REU intern at UC Davis, working with Tony Tyson, Sam Schmidt, and James Jee. Victoria is applying her knowledge of astronomy and python programming to the problem of star-galaxy separation in very deep imaging surveys. The Deep Lens Survey is an LSST precursor survey. Using Deep Lens Survey data, plus recent infrared coverage of those same fields, Victoria is designing an optimal star-galaxy separation algorithm, which makes use of all the multicolor and morphology information.

Gretchen Stahlman, a doctoral student at the UA School of Information Resources & Library Sciences, is working with Suzanne Jacoby and the Communications Team to update LSST's image use policy and communication processes as well as designing a web-based timeline and framework to digitally archive historical information about the development and construction of LSST, among other projects related to communication.

Zachary Reyna, an undergraduate engineering student from Iowa State University, is working with LSST Safety Officer Chuck Gessner to conduct a safety/human factors/ergonomic analysis of the dome and its subsystems.

Welcome, Interns!

Approximately 3,300 people attended DrupalCon Austin, including the LSST web team.

The LSST web team made its annual trip to DrupalCon June 2-6 with the maturing LSST website redesign project in mind. Drupal is a free, modular, and open source content management framework used by LSST for its websites. DrupalCon, the largest gathering of Drupal developers and users, afforded the LSST web team the opportunity to meet, brainstorm, and share lessons learned with the approximately 3,300 other Drupal users who attended. During the week in Austin, Texas, the team focused on sessions addressing "Frankensites," accessibility, security, and best practices for upgrading to new Drupal versions.

LSST Web Designer and Graphic Artist Emily Acosta concentrated on content strategy, particularly avoiding "Frankensites," or websites built piecemeal from a hodge-podge of elements from other existing sites. The key is thoughtful site architecture and content mapping.

Palantir shared a robust spreadsheet template that can be used to create a build spec for a website project.

"Basically, it takes everything I plan out in my head and maps it nicely so I can coherently talk it over with team members," Emily said. "The tool helps to foresee potential redundancies and problems in a site's overall configuration."

LSST Document Specialist Rob McKercher attended a session on Accessible Design, in other words, how to maximize website design for the largest audience, keeping in mind that different disabilities have specific design considerations. The presenter shared web-based resources for accessibility testing one's site.

"He pointed out that accessible design is universally applicable because everyone suffers from at least situational disabilities such as age, background noise, or the inability to read a smartphone screen in bright sunlight," Rob said.

Beyond enabling common accommodations such as closed captioning and screen readers, designers should employ less obvious solutions for conditions such as color blindness, light sensitivity, and cognitive disabilities. Font line weights, cues other than color to emphasize text, and screen contrast all contribute to whether content is accessible. Busy sites with lots of animation, video, and sound can disorientate people with cognitive disorders. Rapid, repetitive animations can also have physical, medical implications for some users. Pages should have narrow focus in line with their purposes and should provide contextual clues to make calls to action as obvious as possible.

LSST Systems Administrator Iain Goodenow sought out best practices for securing LSST's Drupal stack. The primary take-away was that whenever possible, LSST sites should be on a DMZ. As a sub-network that contains and

exposes an organization's external services to the internet, a DMZ provides an extra security layer between the organization's local area network and an external attacker, who only has direct access to the DMZ's contents.

> " *Printed work which cannot be read becomes a product without purpose*
> *- Emil Ruder*

Iain also was introduced to mandatory access control (MAC) and two factor authentications (TFA) as potential security enhancements. MAC restricts the ability to assign security attributes to the administrator only; users cannot override or modify security attributes, accidentally or intentionally. TFA implements a two stage process to verify the identity of an entity attempting to access the network.

NOAO Web Designer Mark Newhouse, who contributes ten percent of his time to LSST, attended a session providing guidance on how to mitigate the inevitable glitches associated with migrating one's sites to a new version of Drupal. LSST uses Drupal 7; the Drupal community plans to launch Drupal 8 sometime in 2015.

"The 'Future-Proof Your Drupal 7 Site' session was a good survey of modules that can be installed in Drupal 7 that will provide the same functionality as what will be in core in Drupal 8," Mark said.

"Core" is the standard release of Drupal; it contains basic features common to content management systems, such as user administration, menu management, taxonomy, and system administration. However, the Drupal user community contributes add-ons, known as "modules," to extend core's capabilities, add new features, or customize site behaviour and appearance. As of February 2014, more than 30,000 free community-contributed modules were available.

More than one million people in 200 countries, and organizations such as The White House, The Economist, and Edmonton International Airport, use Drupal as the back-end framework for their websites. LSST began using Drupal in 2010. The non-profit Drupal Association hosts and organizes the annual DrupalCon.

Article by Robert McKercher

IN THE NEWS

2014 August 6 U of A News - UA Optics at Heart of Telescope Poised to Catch the Action in the Universe

2014 August 5 Science Magazine - Unusual new telescope gets green light

2014 August 4 Texas A&M - AURA's Large Synoptic Survey Telescope to Begin Construction, Thanks to National Science Foundation Funding Support

2014 August 4 UC Davis - Funds awarded to begin construction of Large Synoptic Survey Telescope

2014 July 21 BNL Newsroom - Instrumentation Division Nears Production Phase for LSST Camera Sensors

2014 June 27 Symmetry Magazine - Getting the jump on big data for LSST

2014 June 25 - Quality Magazine - CMS Announces William Gressler as Keynote Speaker for 2014 CMSC

2014 June 23 - Phys.org - UK astronomers debate involvement in the Large Synoptic Survey Telescope

2014 June 19 - Ball Aerospace - Ball Aerospace Selected to Build Lens Assembly for the LSST Camera

Find more at lsst.org/lsst/news/news-coverage

LSST

Large Synoptic Survey Telescope