Large Synoptic Survey Telescope

E-News
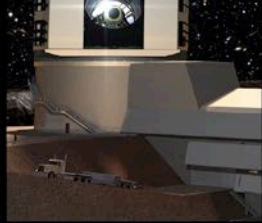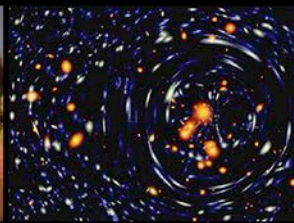
FROM THE DIRECTOR'S DESK

" I take great pleasure in welcoming you to this issue of LSST E-News, the first since I became LSST Director on July 1, 2013. Communication is a high priority of the LSST Project Office, both internally with our distributed staff, and externally to the many individuals interested in the project. LSST is in great shape; being named in the President's proposed budget to Congress is certainly evidence of that. Sidney Wolff has done an outstanding job of navigating many hurdles and bringing the project to this excellent position. I'm looking forward to working with a great team of talented individuals as we prepare for the NSF Final Design Review in October and the anticipated construction start that follows.
Steve Kahn, LSST Project Director "

## COMPUTING THE COSMOS: HANDS-ON WITH GOOGLE COMPUTE ENGINE

The LSST software stack had a leading role at this year's Google I/O, an annual conference for developers featuring the latest tools and techniques from Google's product teams and partners. Simon Krughoff, astronomer at the University of Washington and member of the LSST Data Management and Image Simulation teams, co-presented a session with Google's Jonathan Simon on using the LSST software stack to search for previously unseen objects in the Sloan Digital Sky Survey (SDSS).

This particular session, a "codelab", used Google's compute engine to create co-added images that contain faint optical counterparts to objects detected by the Wide-field Infrared Survey Explorer (WISE) survey. The technique was to find sources in the WISE catalog that have no nearby match in the SDSS. For each unmatched WISE source, images from the SDSS "Stripe 82" (a region that was repeatedly scanned by SDSS over a period of about 10 years) that overlap with the WISE pointing were identified. The SDSS images were then warped and aligned to produce a co-added image of the relevant part of the sky in three bands and to generate a color image. This co-added color image was then examined to search for optical counterparts to the WISE survey detection.

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Simon Krughoff, astronomer at the University of Washington presents at Google I/O

The 200+ developers who participated, more than expected, learned how to get started using the Google Compute Engine by first installing software and setting up a firewall. Then participants went through the steps of using Compute Engine instances for stacking and aligning individual SDSS images with the LSST software stack. In the two hour session the students were able to process color postage stamps for more than 3000 WISE targets. The LSST software stack was exercised strenuously in this codelab and held up well. Krughoff comments " it was very nice to see how easy the stack was to install and run. It was also really nice to see that the LSST primitives are at a place where we can do a relatively complicated task with relatively few lines of code."

There was a lot of excitement in the room as people realized that they might be the first to look at this part of the sky. The results of participants' work were combined to create a gallery of images of outer space containing numerous astronomical objects, some potentially new counterparts to the WISE infrared detections.

Krughoff plans to participate in Google IO next year as this experience allows the LSST software to be tested and used under strenuous conditions. It is too early to tell if any new discoveries were made but the LSST code did well while being used by a large number of highly talented and motivated young software professionals, the future developers and perhaps users of LSST!

Article written by Suzanne Jacoby, Simon Krughoff, and Andy Connolly

DATA MANAGEMENT EXCEEDS WITH AWARD

LSST Data Management was awarded a computing resource allocation from the Extreme Science and Engineering Discovery Environment (XSEDE) in June 2013. This award of 530,000 service units and 148 terabytes of storage is a renewal of previous awards that LSST has been granted by XSEDE. It allows DM to continue the larger scale runs associated with the sequence of Data Challenges and large-scale middleware and infrastructure tests that are necessary in preparation for the Construction phase of LSST. This allocation will be in effect for the period from July 1, 2013 to June 30, 2014. The XSEDE is supported by the National Science Foundation.

Three discrete LSST activities will utilize this award. First, the science quality and performance of the photometric calibration pipeline will be quantified, resulting in globally calibrated photometric catalogs of simulated data. Second, co-added images and catalogs of SDSS Stripe 82 will be produced at two sites then compared and merged to demonstrate the

coordination of large-scale processing at two heterogeneous sites, as is being planned for LSST Operations. The third activity is to optimize the LSST software stack and orchestration software to perform efficiently while running on 10,000 cores.

All activities provide information that helps Data Management refine their cost and schedule estimates, resulting in a more robust and accurate construction plan with fewer risks. Use of the XSEDE framework leverages NSF's investment in cyber infrastructure for the Big Data telescope of the future, LSST.

Article written by Mike Freemon/ NCSA, LSST Deputy Manager for Data Management

CREATING COMMUNITY THE DRUPAL WAY

The LSST web team made its annual trip to DrupalCon in May to network with other Drupal users and to keep abreast of technical developments in the content management system used by LSST and nearly one million people in more than 200 countries. The conference theme of "Building Bridges, Building Community" emerged in several ways over the three-day conference. In addition to the usual developer sessions, the Portland, Oregon conference encouraged informal interactions and embraced Drupal users' social conscience. Before the meeting officially began, the Drupal community held a happy hour fundraiser to help renowned developer Aaron Winborn pay bills associated with his fight against amyotrophic lateral sclerosis (ALS). And on Tuesday, a team of volunteer Drupal developers gathered to build a website used by FEMA to help the victims of the Oklahoma tornado.

Because Drupal is free, modular, and open source, community is a concept of particular relevancy to Drupal users and developers. Much of Drupal's functionality comes from thousands of community developed modules that are not part of Drupal core. Events such as DrupalCon, the largest gathering of Drupal developers and users, afford them the opportunity to meet, brainstorm, and share lessons learned.

The LSST web team took advantage of the opportunity to meet face-to-face for the first time with Rain Breaw of The Cherry Hill Company, who has developed two web-based Drupal workflows for LSST, one for the Publication Board and another for the Change Control Board. Breaw offered advice to LSST Web Designer Emily Acosta and colleague Mark

Newhouse on how best to implement Drupal for LSST's upcoming website redesign and reorganization. Based on her experience, Breaw advised against LSST's plan to use one large multisite for all of the project's websites even though a multisite allows several sites to be served by a single shared Drupal installation. At one time, Cherry Hill had one big multisite, but they discovered that in order to upgrade to the newest version of Drupal, they needed to wait until certain modules were updated. She suggested creating several multisites with sites using similar modules grouped together.

Also with LSST's website redesign in mind, Acosta attended sessions such as "Designing on Purpose," "What Users Want," and "Secrets to Awesomizing Your Editors' Backend Experience." The sessions stressed designing a website around a thorough understanding of what content is necessary to serve the site's purpose and how pieces of content relate to one another. Designers should organize content as a hierarchy of importance, particularly to maximize utility for mobile device users. Unlike PC users who visit sites for knowledge, mobile device users visit sites looking for quick answers to fundamental questions. She also learned about modules to control content layout and to mitigate the sometimes steep learning curve for content editors.

Similarly, through a session on "gamification," Newhouse learned about Drupal tools that may be useful for LSST Education and Public Outreach (EPO). Gamification refers to the application of gaming structures and elements to something other than a game in order to increase engagement with a community of users. When properly applied, these game-like elements can help to draw in community members, keep them engaged, and develop them into experts and evangelists for the community.

"Clearly, gamification is not something that will apply to all aspects of the LSST project," Newhouse said. "But in the area of EPO, we've already discussed adopting some of these strategies, and I am excited to see that Drupal has some tools that will enable them to work."

Other interactions forged connections that could be leveraged in the future. Newhouse was chosen to participate in a pilot program called DrupalCon Stories. As a storyteller, he related his DrupalCon experience via blog posts, tweets, and images. Later while Newhouse spoke with the DrupalCon Stories developer and a developer he met at the Aaron Winborn event, they were joined by Dries Buytaert, the creator of Drupal.

"He was genuinely interested in meeting us and learning how we were using Drupal," Newhouse said. "Connections were made, and somehow the meeting of more than 3,000 people didn't seem so overwhelming anymore."

Article by Robert McKercher, Mark Newhouse, and Emily Acosta

STEVE RITZ — MANAGING MYRIAD SUBTLE CHARACTERISTICS

New Camera Project Scientist Steve Ritz jumped at the opportunity to join LSST, seeing the excellent team, the breakthrough capabilities of the observatory, and the challenge of understanding myriad subtle performance characteristics that will enable "game-changing" science.

"I think it was JFK who cited the ancient Greek definition of happiness as the full use of one's powers along the lines of excellence, and that always sounded right to me," Steve said. "It didn't take long to see that there are many excellent, hardworking LSST people – scientists, engineers, programmers, managers, and administrative support staff – using the full extent of their powers to build a science facility at the edge of what is possible. It's an exhilarating environment to work in."

Steve joined the LSST project in April 2013. As Camera Project Scientist, he ensures that the camera system will be scientifically successful, a charge he interprets broadly. Immediately obvious technical challenges are the scale of integration, tight tolerances, and the necessity to understand

Camera Project Scientist Steve Ritz

many subtle characteristics of the optics and sensors, and he says an appropriate program of increasingly integrated prototype testing, coupled with detailed simulations, will overcome those challenges by enabling the project to track its understanding of LSST performance.

In addition to his LSST duties, Steve is a physics professor and the Director of the Santa Cruz Institute for Particle Physics (SCIPP) at UCSC, where he has worked since 2009. Prior to LSST, he worked on the Fermi Gamma-ray Space Telescope. He was Project Scientist

for the whole mission (formerly known as GLAST) from 2003-2009 and Deputy PI for the Large Area Telescope instrument from 2004 to 2013. Before Fermi, he worked on several accelerator-based particle physics experiments in Europe and in the United States.

Among the many LSST science topics, Steve is most interested in improving the understanding of Dark Energy by using a combination of techniques that exploit the full capabilities of the observatory.

"That means understanding systematic errors in great detail," Steve said. "Cosmic surveys can also provide unique information about the nature of Dark Matter and even neutrino properties. More generally, LSST's breakthrough time-domain capabilities at good depth and with minimal observing bias are a great combination for uncovering surprises. It is quite possible that our greatest contributions will be in topics we don't yet know."

Steve is excited to learn the nuances of such a complex project and contribute to moving it forward. When not teaching physics at University of California, Santa Cruz or participating in consequential science projects like LSST, he writes classical music. The enduring scientific symphony to be produced by this polyphony of a truly great team from a large variety of backgrounds was hard to resist.

Joining LSST? "Not a difficult decision!"

Article written by Robert McKercher and Steve Ritz

LSST MEET YOURSELF

LSST Project Office staff interview each other at LSST Meet Yourself, June 12, 2013.

The 25 or so members of the Tucson-based LSST team gathered in June for some lunch, some information exchange, and a chance to know each other a bit better. As the newest AURA Center, the LSST Project Office (LSSTPO) has an opportunity to start off right with everything, including our institutional culture and workforce climate. To that end, the LSSTPO participated for the first time in an AURA-wide climate survey, whose purpose was to identify any areas of concern, understand and improve the quality of the workplace, and evaluate the state of readiness at LSSTPO in supporting AURA's diversity initiatives in the astronomical community. Results of the survey were shared at the LSST Meet Yourself gathering.

The 68-question survey provided an opportunity to evaluate the workforce climate in several different areas: Respect; equal treatment regardless of gender, race/ethnicity, and age; biases; communication; fair treatment; diversity initiatives; policies and practices; and organization and leadership.

Overall, LSSTPO is a small but happy AURA Center. Nearly all – 98% of the questions received a positive (slightly to strongly agree) response from 100% of participating employees. 88% of the questions received a strongly positive (agree or strongly agree) response from 100% of participating employees.

No immediate concerns were identified and future team meetings will take place to keep communications open. Training on Unconscious Bias, which only LSSTPO team members on hiring committees have had so far, will be expanded to include all staff.

Incoming LSST Director Steve Kahn has said our mission is "to build one of the most important scientific experiments in human history." With continued gatherings like LSST Meet Yourself, LSSTPO Management shows its commitment to building LSST within a climate that promotes respect, communication, fairness, and inclusion for all employees.

Article written by Suzanne Jacoby, AURA Diversity Advocate for LSST

LSST REPRESENTS AAS IN MAY 2013 CNSF EXHIBIT

The LSST exhibit is ready to go and Director Steve Kahn ready to meet the crowds at the 19th annual Coalition for National Science Funding exhibit in Washington, DC, May 7, 2013.

LSST exhibited at the 19th Annual Coalition for National Science Funding (CNSF) reception in the Rayburn House Office Building on May 7, 2013. The American Astronomical Society is a member of CNSF and sponsored LSST to participate in this year's event with the theme: Investments in STEM Research and Education: Fueling American Innovation.

LSST team members Steve Kahn, Victor Krabbendam, and Suzanne Jacoby, along with Susan Hutchison from the

Simonyi Fund for Arts and Sciences, engaged in numerous conversations with congressional representatives and staffers, policy makers, and representatives of national agencies during the two-hour, well attended event. Conversations of note included those with Dr. Cora Marrett (NSF Acting Director), Dr. Fleming Crim (NSF/MPS), Representative Bill Foster (IL-11) and Representative Jerry McNerney (CA-09) who has since made a one-minute speech on the House floor and entered LSST officially into the Congressional record (http://ls.st/dsi).

LSST's booth stood out from others with its bright graphic poster, a can of "Dark Matter" from the Brooklyn Superhero Supply Company, a video available from the online LSST image gallery and handouts created specifically for our recent Washington, DC visits.

The CNSF is an alliance of over 120 organizations united by a concern for the future vitality of the national science, mathematics, and engineering enterprise. CNSF supports the goal of increasing the national investment in the National Science Foundation's research and education programs in response to the unprecedented scientific, technological and economic opportunities facing the United States.

INAUGURAL MEETING OF LSST@ILLINOIS

LSST Institutional Members from Illinois met at Argonne National Laboratory on May 30 for the inaugural meeting of LSST@ Illinois. Organized by Salman Habib, the meeting was attended by about 40 individuals from Adler Planetarium, Argonne, Fermilab, University of Illinois/ NCSA and Northwestern University. Many in the group "bonded" previously at a Washington, DC LSST Board Meeting and decided to continue their discussion of current projects, what each institution would individually like to get out of LSST, and how they can work together to help LSST@Illinois as well as the LSST project. The agenda included short overviews from each institution in the morning session, and 'breakout' discussions in the afternoon on a number of subtopics. The final session elicited various ideas on collaborative activities and associated action items. Salman soon will provide a URL to share LSST@ Illinois activities and perhaps inspire other similar collaborations.

CHUCK CLAVER RECEIVES AURA TECHNOLOGY / INNOVATION AWARD

LSST Systems Scientist Chuck Claver

AURA announced LSST Systems Scientist Chuck Claver as one of the 2013 recipients of its Technology/Innovation Award (see http://www.aura-astronomy.org/ news/awards.asp). He is being recognized for his outstanding contribution to LSST as Project Systems Engineer over the previous five years.

He has successfully led LSST systems engineering through major NSF reviews, including the Preliminary Design Review and the Joint Interface and Management Review, both of which were prerequisites for NSB approval of advancing the project to the final design phase. The LSST systems engineering effort was cited as a key project success by the committee that conducted the Preliminary Design Review.

Chuck was originally trained as a scientist, but set aside his personal science interests over this period to move the LSST Project forward. His combination of scientific background with experience in instrumentation and optical design enabled him to carry out the systems engineering role and to bridge the gap that sometimes exists between the wishes of the scientists and engineering reality.

To perform the role of systems engineer, Chuck had to train himself in SysML, the cornerstone of LSST's Model Based Systems Engineering approach. SysML captures requirements, flow down, traceability, and validation of the entire project. Through Chuck's efforts, the LSST Project has carried out the systems engineering required to define a complete observing system that will meet the challenging scientific and technical requirements.

Chuck led a team of subsystem engineers to complete the requirements flow down, develop the requirements documentation, complete analysis and simulations, and develop the tools necessary to organize and manage the LSST engineering enterprise.

Chuck has been working on LSST since the late 1990's, but it is his contributions as the Systems Engineer that are particularly noteworthy and are the reason that the LSST Project Office nominated him for this technical excellence award.

Chuck played a key role in bringing the Project through a critical period. The LSST Project has now added two Systems Engineering staff members to the group, who have validated Chuck's approach including his selection of SysML. In the future, Chuck will continue with the Systems Engineering group as Systems Scientist and will focus on the scientific impact of project decisions as well as on the planning for commissioning.

LSST E-NEWS TEAM:

- Suzanne Jacoby (Editor-in-Chief)
- Robert McKercher (Staff Writer)
- Mark Newhouse (Design & Production: Web)
- Emily Acosta (Design & Production: PDF/Print)
- Sidney Wolff (Editorial Consultant)
- Additional contributors as noted