Have you heard of Comet Lovejoy? Unless you’re a comet aficionado or live in the Southern Hemisphere, you may not have. Sadly, one of the most spectacular comets in years passed relatively unnoticed just a few months ago. If you’ll indulge me for a few minutes, I’ll tell you a quick story of why Lovejoy was so unexpected and why it was of particular interest to me.

Comet Lovejoy was discovered on November 27, 2011 as a faint, fuzzy smudge. However, a few days of observations revealed that it wasn’t just any ordinary comet, but a Kreutz sungrazing comet who would reach perihelion (closest approach to the Sun) in a couple of weeks. This got comet enthusiasts excited since the Kreutz group of sungrazing comets includes some of the most spectacular comets in history, e.g., Ikeya-Seki in 1965. Kreutz comets have highly elongated orbits that nearly graze the Sun’s surface at perihelion and extend well beyond Pluto. During the short time when they are close to the Sun, they become incredibly bright if they survive the blazing temperatures. The Kreutz group was likely produced by the breakup of a single very large (tens of km) comet in the relatively recent past (a few thousand years). On subsequent orbits, the pieces apparently broke up into more pieces, resulting in a string of large km-sized comets with similar 500 to 1,000 year orbits separated in time by decades to centuries. When such large comets reach the Sun, they light up the nighttime sky and sometimes even the noontime sky! The advent of space telescopes dedicated to looking at the Sun such as SOHO* and STEREO* has revealed that there are also thousands of very small (less than 100 m) comets on the same orbits, debris produced in the breakup of their larger brethren.

Every few days a new Kreutz comet is seen in SOHO images; since 1996 roughly 2,000 such comets have been discovered. These small comets are too faint to be seen from the ground, and they disintegrate before reaching perihelion. There isn’t a lot of information to be gleaned in the day or so that each comet is observed, but much can be learned when you aggregate the information from many hundreds of such comets. I did just that for my Ph.D. thesis, and was therefore ideally prepared to study Lovejoy. Comet Lovejoy was the first Kreutz comet to be discovered from the ground since 1970. This alone made it exciting, because it allowed a bit of time to plan comet-specific observations with the telescopes on SOHO and STEREO. Based on its brightness and distance from the Sun at discovery, I estimated that Lovejoy was very likely to become the brightest “small” Kreutz comet ever seen, roughly as bright as Jupiter. Lovejoy appeared likely to be considerably fainter...
Director’s Update

by Jeffrey Hall

All eyes at Lowell these days are focused on arguably the biggest deadline in the institution’s history: First Light for the Discovery Channel Telescope (DCT).

I was fortunate enough to be giving a tour of the facility to some visiting colleagues from Boston University on January 20. We got to the observing floor just in time to see the engineers complete the installation of the telescope’s 1.4-meter secondary mirror. That was the last major component of the telescope proper to arrive – a major milestone.

At the same time, our instrument group was mounting an all-out effort to complete the complex instrument cube, the component that goes at the back of the telescope and provides essential functions to allow the telescope to point correctly and maintain its image quality, as well as providing mounting surfaces for five different instruments. The completed cube went from our shop here on Mars Hill out to the site in early February and was mounted successfully and smoothly.

At that point, the DCT was, in essence, complete.

Complete, however, does not mean operational. Telescopes like DCT require an extensive period of commissioning, which is a somewhat technical way of saying debugging. But with installation of the secondary mirror and the instrument cube, we were ready to begin testing the full optical system, and after some early and encouraging performance results, meeting the key deadline of obtaining a first light image in time for Discovery’s summer feature was well in hand.

We’re looking forward to the big event.

It would be hard to overstate the significance of completing a project like DCT on time and on (even a bit under) budget, but through the collective effort of Lowell’s entire staff, it happened. Other challenges have fallen into place as well. We have assumed the financial strain of finishing the telescope with our operating budget stable while also – in response to the economic downturn – significantly reducing our reliance on earnings payouts from the Percival Lowell Trust to support operations. The scientific staff has maintained an excellent record of winning grant funding for their research, despite increasing competition and ever-greater pressure on funding agencies’ budgets.

Now, as we begin to commission DCT, further hurdles loom. Our shop is working hard to complete the first light instruments, including the NSF*-funded Large Monolithic Imager (LMI) and the NASA-funded Near Infrared High Throughput Spectrograph (NIHTS). Moving into full operations at DCT over the next few years will boost our operating budget from $6.5M this year to perhaps $8.5-9M by 2014 or 2015. The continued and increasing uncertainty in Federal budgets makes the degree of our reliance on grants worrisome and is spurring us to take aggressive action to diversify our sources of revenue.

All these things conspire to create some fretful moments, but going out to Happy Jack and looking up at our new seven-story creation always gives me confidence. Lowell was told a number of times that the DCT couldn’t be done – technically, logistically, or financially – by an institution like ours. But here it is. If we can do that, we can handle these other issues, too.

Thanks as always for your interest and support of Percival Lowell’s fine observatory.

*NSF: National Science Foundation

Lowell Observatory was named Organization of the Year at the 2012 Viola Awards, Flagstaff’s cultural and scientific awards. To no one’s surprise, Outreach Manager Kevin Schindler took home the inaugural Science Educator of the Year Award. The Flagstaff Festival of Science won Best Event.
A Night with the Clark
by Todd Gonzales

I have been working at Lowell Observatory a little more than a year and every night holds its own treasure for me. One of the greater perks of working here is operating the 116-year-old Alvan Clark Refractor. This telescope is by no means ordinary; it was exactly a century ago that Vesto Slipher would discover the first evidence of the expanding universe with this historic device. It is by no accident that one hundred years later everyone that peers through the eyepiece of this great telescope retrieves the evidence to expand their own ideas about the universe.

There was one particular night this last winter that I was standing by the scope as it peered 450 million miles away at the distant giant Jupiter. Visitation was light that night as the temperature was uncomfortably low. However, it is the cold winter nights that reveal the clearest and most pristine skies and reward the brave and hardy. Up the darkened steps came a wonderful couple, Florence and Charlie, as I recall. Florence was celebrating her 80th birthday and part of her gift was a trip from Williams, Arizona to see this telescope. Both Florence and Charlie looked up at the Clark with the same admiration that children do when seeing this telescope for the first time.

As I began to explain what the telescope was fixed on and how to begin viewing, Florence cautiously approached the telescope and turned to me and said, “This is my first time looking through a telescope.” That was the very moment that I realized that my job is anything but routine; I was not only educating people on some of the wonders of the night sky, I was there for their first steps into a bigger place. I carefully guided Florence to the telescope’s eyepiece and as she lowered her eyes closer, I could see Jupiter’s focused light moving across her cheek as she aligned her eye. Once the light, which had travelled millions of miles, connected with her eye, Jupiter and Florence were meeting for the first time. Florence took in a breath and held it as one does when they first see the Grand Canyon. There is something beautiful in looking at planets through a telescope, something deep within us that tells us they are real, more than seeing pictures in a book. Florence stared at Jupiter for almost a solid minute unable to complete sentences as if interrupted by what she was seeing through the eyepiece. This wonderful woman waited 80 years to meet the beautifully complex universe through the Clark Telescope and, equally, it had waited 116 years to show her a small fraction of what the universe has to show us.

This experience is just one of many the educators of Lowell Observatory will take part in on any given night. This is by far the most rewarding job I have experienced; I meet visitors from all walks of life and all ages and guide them, some for the first time, through the beauty and mysteries of the cosmos.

Behind-The-Scenes Experience

Lowell’s Behind-The-Scenes Experience allows visitors to explore a working research observatory while experiencing its distinctive scientific legacy. Opportunities like this are rare since access to research observatories is very limited. Once at Lowell, those who sign up get to meet our astronomers, instrument scientists and engineers; to see the telescopes of the past, present and future; and to observe at 7,000 feet under clear, dark skies. You can enjoy an exclusive night on Percival Lowell’s 24-inch Clark refractor as well as a tour of the state-of-the-art 4.3-meter Discovery Channel Telescope, now nearing completion. The opportunity to explore America’s premier independent astronomical observatory in these ways is generally unavailable to the casual visitor. For more information, e-mail BehindTheScenes@lowell.edu or call 928-233-3267.

Got curious kids in your life?

Sign them up to be charter members in Uncle Percy’s Kids Club!

Write to unclepercy@lowell.edu
Comet Lovejoy
continued from page 1

than any of the eight Kreutz comets seen from the ground in the last 200 years or so, and was likely to behave in a manner similar to the SOHO-observed ones. Thus, I expected it to reach a peak in brightness a few hours before perihelion, then rapidly fade away as it evaporated under the Sun’s unrelenting heat. I expected a better show than any of the other approximately 2,000 Kreutz comets seen by SOHO, but nothing that was likely to be visible from the ground. I followed Lovejoy’s progress in the days leading up to perihelion eagerly, measuring the brightness in each new batch of data downlinked from SOHO and STEREO, and communicating these measurements to the instrument teams so they could optimize subsequent observations.

For days it brightened almost exactly as I had predicted. Then, just when I expected it to begin to fade away, it didn’t! Instead, it continued to brighten until it disappeared behind the disc that near-Sun telescopes use to block out the Sun so they can see fainter things nearby (see SDO image on page 1). This was shocking, but what followed was even more surprising: the comet survived perihelion less than 100,000 km from the Sun’s surface (and temperatures exceeding 3,000 K) and re-emerged brighter than it had been prior to perihelion! Lovejoy initially re-emerged as a very bright point before quickly re-growing its tail. (One of the many fascinating questions generated by Lovejoy is why did it lose its tail?) Within a few days, southern hemisphere observers willing to get up a couple of hours before dawn were treated to a spectacular show. Lovejoy had become an easy naked-eye object, with a stunning tail stretching some 30 degrees across the sky. It was quickly anointed a “Great” comet, and placed aside other Great Comets of the past such as Hale-Bopp, Hyakutake, and its cousin, Ikeya-Seki. Following Lovejoy’s unexpected survival, I quickly initiated an ambitious observing campaign to study this once-in-a-generation comet with as many telescopes as possible. I secured “Director’s Discretionary Time” (astronomer jargon for “emergency” time) on space telescopes Hubble, Spitzer, and Swift, and found colleagues at Siding Spring Observatory (Australia) and Las Campanas Observatory (Chile) willing to try to observe it. The observations proved extremely challenging for a number of reasons. Once Lovejoy was far enough from the Sun for telescopes to safely point at it, it was over the south pole, greatly restricting which telescopes could observe it. Worse, although Lovejoy exhibited a spectacular tail, there was no central condensation of brightness at the “head,” meaning it was nearly impossible to measure its position with the kind of accuracy necessary to point space telescopes. Finally, it faded rapidly and, with no “head,” was challenging to observe systematically.

My collaborators and I are now analyzing the data from these various telescopes and will present early results at the upcoming Asteroids, Comets, and Meteors meeting in Niigata, Japan in May. Preliminary analysis suggests that Lovejoy’s nucleus probably disrupted and disintegrated within a few hours to days of perihelion. The unexpected brightening I measured near perihelion was likely due to the increased surface area of all those newly exposed bits and pieces. I hold out hope that further analysis of our Hubble or Spitzer images will reveal a heretofore unnoticed fragment of the nucleus that is big enough (~50 m) to survive for another 500 to 1,000 years and return to flare up briefly for a future generation of astronomers.

But if, as is likely, this was the end for Comet Lovejoy, then I consider myself extremely privileged to have been along for the ride. ☮

*SOHO: Solar and Heliospheric Observatory
*STEREO: Solar TErrestrial RElations Observatory
Jim Davies has always been interested in science, astronomy, and astrophotography. Although the skies around Phoenix weren’t nearly dark enough, he photographed Comet Halley with a 4 x 5 view camera during its 1986 apparition. He had recently finished reading a book about Clyde Tombaugh’s discovery of Pluto at Lowell Observatory, when he received a postcard in the mail describing our Friends program. Although Jim had never visited the Observatory before, he came to Flagstaff for one of the first Friends events in the early 1980’s. Jim believes he’s missed only a few Friends events since then. He fondly remembers his first tour of the Mars Hill campus, early speakers, and telescope viewing on the patio outside the Rotunda. He purchased an old chair from our attic at one of the Friends’ auctions that his cat particularly loves. He most recently bought some photographs of the Moon produced at Lick Observatory that he shared with a young Friend of Lowell during our Friend’s event last September.

Because of his long association with the Observatory, Jim has decided to become a member of the Percival Lowell Society, joining other Lowell Friends who plan on leaving the Observatory a legacy gift. “I saw Pluto through the Clark telescope at one of the first Star Parties I attended. It brought back what I had read about Pluto’s discovery and how the Clark was the first telescope used to observe Pluto with the naked eye. I remember touring the Naval Optical Interferometer when it was under construction and going into the Rotunda and seeing all the instruments that were made.

All of us at Lowell Observatory are grateful for the extraordinary generosity of the many individuals who have made bequests, charitable trusts, or other testamentary gifts. Call 928-233-3216 to learn how you can benefit Lowell, yourself, and your family through a charitable planned gift.

Every Thursday evening from 7 to 8 p.m., relax on our Rotunda Museum patio and listen to one of Flagstaff’s local bands. Then, as the skies darken, you will have the opportunity to view celestial objects through telescopes.

For more news, events, information and images, find us on Facebook
Members of astronomy clubs are always looking for new and exciting activities. In June of 2010 Lowell Observatory launched a program giving astronomy-club members the opportunity to enjoy an all-access visit to Mars Hill and its satellite facilities. Last year, two clubs participated in multi-day visits. The Astronomical Society of the Palm Beaches travelled from Florida in June 2011 to spend three days in Flagstaff, then did a tour of the Grand Canyon, Meteor Crater, and several other regional attractions on their own. In September, a group from the Leisure World Astronomy Club, based in southern California, enjoyed a two-day field trip. Both clubs had ample time to do some exciting night observing using the historic 24-inch Clark refractor. There were great views of planets and deep-sky objects, and the Palm Beaches group was fortunate enough to be observing on the night after supernova 2011dh was first spotted in M51.

Each club took part in a detailed guided tour of the Mars Hill Campus, which included visits to several facilities not open to the public. The instrument lab, where we make the Charge-Coupled Device (CCD) imagers and spectrographs for our telescopes, was a particular favorite. The Pluto Discovery Telescope, with its unique features, was also a crowd pleaser. Both groups requested presentations covering topics of their choosing. Lowell astronomers Lisa Prato and Travis Barman gave well-received talks.

Another exciting part of the field trip was a visit to Anderson Mesa, where the venerable 72-inch Perkins telescope and the Naval Optical Interferometer were of particular interest. The only thing that could possibly top that was a visit to the Discovery Channel Telescope site. The opportunity to see a major telescope under construction was unique and quite fascinating, although most agreed it would also be great to someday see the finished product. Astronomy club members seem to delight in asking the most challenging questions they can possibly think up. Fortunately, our staff members always seemed to be up to task of providing clear answers to complex topics.

We were confident that the field trips would be favorably received, because a lot of careful planning and preparation was done by a diverse group of people before the program was launched. However the actual positive responses to the trips truly exceeded our expectations. Comments received from club attendees were sincere and heartwarming. But perhaps the best accolade was in the form of a lengthy poem written for the occasion by the wife of a club member. In it, she summarized the many highlights of their visit and had kudos (some quite humorous) for each of the thirteen Lowell people who helped make their visit special and something to remember.

With this in mind, we would encourage all of our Friends to spread the word about this program. You’ll no doubt be doing someone a favor, and earn some thanks of your own in the process.

For more information about astronomy club field trips, interested parties can call Rusty Tweed at 928-233-3267 or email him at tweedr@lowell.edu.
The 2012 Lowell History Series was recognized as an official Arizona Centennial event. Outreach Manager Kevin Schindler put together an engaging slate of talks, which began in February and will run through November. Topics of upcoming talks include the search for the Observatory’s site in 1894 (May 28th) and the origin of Meteor Crater (June 23rd).

Check http://www.lowell.edu/visit_events.php for monthly event updates.

Lowell Amateur Research Initiative (LARI)

A passionate researcher, Percival Lowell always sought to communicate new ideas and the joy of astronomy research to the public. In that same spirit, LARI brings together professional and amateur astronomers in mutually beneficial ways and makes important research opportunities accessible to the public. Currently, Lowell astronomers are conducting several projects that would benefit from the participation of amateur astronomers.

For more information, visit http://www.lowell.edu/LARI_welcome.php

ARRIVALS
Danielle Sahlin, Payroll/HR
Ian Avilez, Educator
Leslie Wells, Administrative Assistant for Development
Ryan Narce, Educator
Samantha Thompson, Educator/Archives Intern
Sone Sithonnorath, Educator
Stephanie Bewley, Accountant

DEPARTURES
Aubrey Tamietti, Educator
James French, Engineering Technician
Jamie Money, Educator
Joe Meakem, Media Intern
Robin Melena, Grants and Accounting Manager
Upcoming Flagstaff Nights: Weds. 6/6 & 7/4
Upcoming History Series: 5/28, 6/23, & 7/18
Meet an Astronomer: June and July Mondays 7 p.m. - 9 p.m.
Music & the Stars: June and July Thursdays 7 p.m. - 8 p.m.

MAY
Regular Public Hours:
M/W/F/Sat 9 a.m. - 9:30 p.m.
T/TH/Sun 9 a.m. - 5:00 p.m.

MON 28
History Series at Lowell Observatory
(5:00 p.m. - 9:30 p.m.) – Tonight we celebrate the expedition that led to the Observatory’s founding on May 28, 1894. At 7 p.m. Lowell educator Steve DaCosta will present, “Simply Call it Lowell Observatory: The 1894 Lowell Expedition to Arizona.” Hear about Andrew Douglass’s adventures around the Arizona Territory and how he and Percival Lowell chose Flagstaff as the site for a new astronomical Observatory. In addition to this presentation, view breathtaking celestial objects through telescopes and enjoy exciting multimedia programs.

JUNE
Regular Public Hours:
9:00 a.m. - 10 p.m.

TUE 5
The 2012 Transit of Venus
(2:00 p.m. - 10:00 p.m.) – Today’s transit of Venus is visible from northern Arizona. Though Flagstaff isn’t the best place to see it, we will still be able to have some decent views if the weather allows.

At 2 p.m., join author and science historian William Sheehan for an indoor presentation about this unusual and fascinating celestial event. Later, we will have specially filtered telescopes to allow you to safely view the shadow of Venus passing over the sun. The transit starts at about 3:05 p.m. and viewing will continue until the sun passes behind trees. Later, enjoy exciting multimedia programs and view breathtaking objects through telescopes.

JULY
Regular Public Hours:
9:00 a.m. - 10 p.m.

SAT 21
First Light Gala Celebrating the Commissioning of the Discovery Channel Telescope