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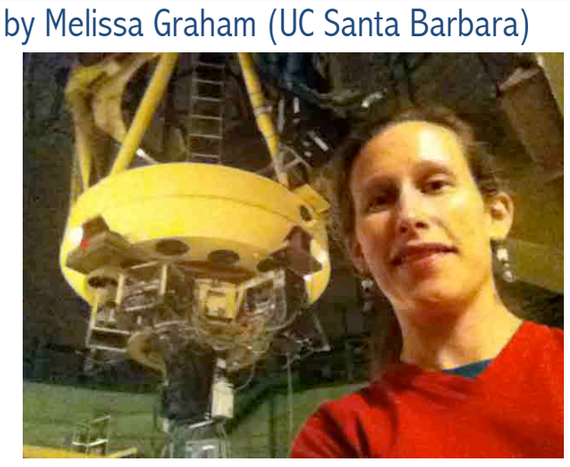
University of California Observatories

The LICK OBSERVER

Lick Observatory Est. 1888

NO TRANSIENT LEFT BEHIND: SPECTROSCOPIC FOLLOW-UP FOR PALOMAR TRANSIENT FACTORY SUPERNOVAE

by Melissa Graham (UC Santa Barbara)

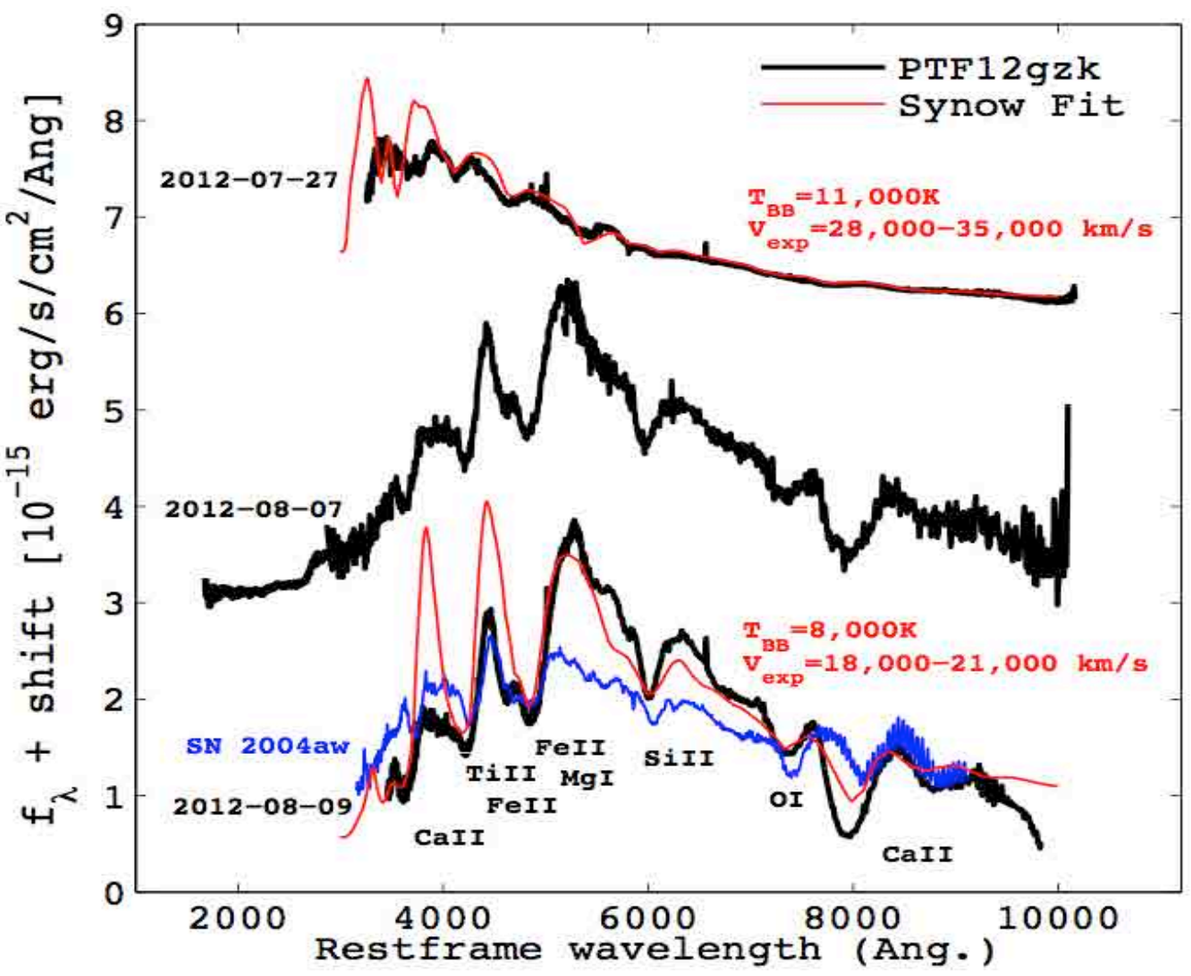


The Palomar Transient Factory (PTF) has discovered and spectrally classified 1800 supernovae, more than any previous survey. To date, the Kast spectrograph on Lick Observatory's Shane 3-m telescope has taken over 100 spectra of PTF supernovae. PTF comprises approximately 50 scientists at 8 institutions in 3 countries, including UCB, LBNL, UCSB, and CalTech, with its primary survey camera on the 48-inch telescope at Palomar. With its unique survey design and extensive follow-up resources, PTF is building a large, unbiased, low-redshift set of Type Ia supernovae (SNeIa, thermonuclear explosion of carbon–oxygen white dwarf stars) to reduce the systematics in cosmological analyses. The PTF is also finding rare SNIa events that place specific constraints on the progenitor system, and identifying new types of transients, including two faint SNIa-like classes. Our No Transient Left Behind program with the Kast spectrograph provides crucial low-resolution spectroscopy. A spectrum is needed to confirm the supernova type and phase of each transient source detected in the survey images, and repeated spectral monitoring increases the number of uncommon, peculiar SNe identified.

The spectrum I took of PTF12gzk using Lick+Kast was the third spectrum of the transient, but the first one in which the supernova could be given a classification (see Figure). Ben-Ami et al. (2012, *ApJL*, **760**, L33) show this SN is spectroscopically similar to SNe associated with gamma-ray bursts (GRBs), but in this case no GRB was seen. Dilday et al. (2012, *Science*, **337**, 942) demonstrated that for SNIa PTF11kx, Ca, Na, and H absorption lines are clear evidence for a system surrounded by expanding circumstellar material that evolved in depth and velocity. This analysis included 4 Kast spectra from the No Transient Left Behind program, and showed unambiguously that in some SNeIa progenitor systems, the white dwarf companion star is a red giant. PTF11lky was found shortly after explosion (Nugent et al., 2011, *Nature*, **480**, 344), and because it was in such a nearby galaxy, Li et al. (2011, *Nature*, **480**, 348) used deep archival *HST* images of the host galaxy to rule out a red giant companion. Taken together, PTF11kx and PTF11kly clearly indicate, for the first time, that there are at least two progenitor channels for SNeIa! Such significant physical implications could not have been realized without a wide-field survey like PTF coupled with regular spectroscopic follow up. The Kast Spectrograph at Lick Observatory has helped ensure that no transient will be left behind.

PI: Melissa L. Graham, Postdoctoral Fellow, UCSB. Co-Is: Peter Nugent, Staff Scientist, LBNL/UCB; D. Andrew Howell, Adjunct Professor, UCSB; Nao Suzuki, Postdoctoral Fellow, LBNL; Brad Cenko, Postdoctoral Fellow, UCB.

KAST Double-Beam Spectrograph; 7–8 nights per semester



Black show spectra of transient PTF12gzk from the Palomar 200-inch Double Spectrograph (top), *HST* (center), and Lick+Kast (bottom). Blue shows the best fit to Type Ic supernova SN2004aw.

LICK OBSERVATORY CELEBRATES 125 YEARS THROUGHOUT 2013

Lick Observatory, the first permanently occupied mountaintop observatory in the world, will celebrate its 125th anniversary throughout 2013 with several special programs and events.

The Anniversary Gala

The capstone of will be the Anniversary Gala, to be held on Saturday, September 7th. Look for more details in your next *Lick Observer*.

You may also wish to take advantage of the other new offerings for next summer.

Extra Summer Program Nights in September

To commemorate the 1888 commissioning of Lick Observatory, next summer we're adding two Public Program weekends in September, for a total of eight Friday Night Visitors Programs and an equal number of Saturday night Music of the Spheres Concerts. Concert attendees will receive a special souvenir wine glass or mug in recognition of the occasion.

We're also presenting some great new acts in 2013. Information on performers and speakers will be available after March 1 at www.ucolick.org/public.

A First: Bed-and-Breakfast Option for VIPs

In 2013, for the first time, we're exploring a Bed-and-Breakfast option for VIP ticket holders. Space will be limited, so make a note of the ticket sale date.

Special Perks for Friends of Lick Observatory

All "Friends of Lick Observatory" members are entitled to order Summer Program tickets beginning Tuesday, April 2nd at 12 noon, fully two weeks ahead of the general public. Those who joined at the Nebula Circle level and above will receive preferred seating at Music of the Spheres concerts. Tickets will be offered to the general public starting on April 16th at 12 noon.

If you're not already a member you can join the Friends by going to www.ucolick.org/public/friends. You may also register for free to receive Public Program e-mails by signing up online at our web site www.ucolick.org/public/mailinglist.html.

New This Year: Group Viewing Parties

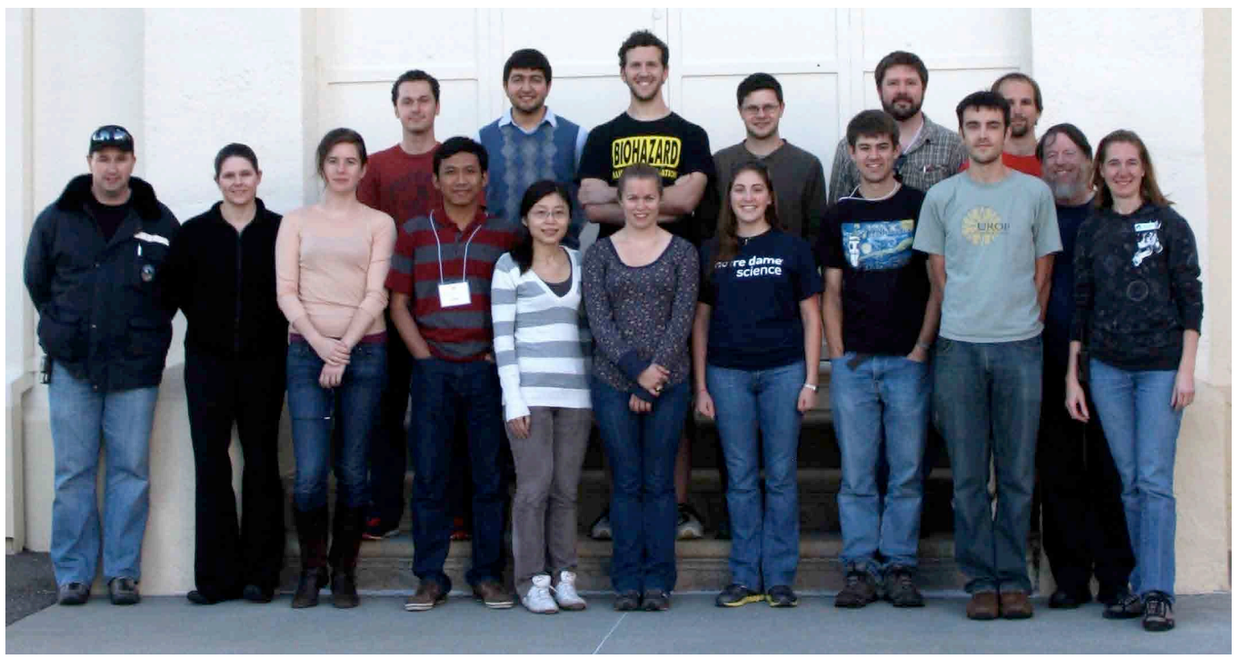
This summer we're also introducing Viewing Parties for groups of up to 40 persons, on seven Saturday nights, June through September. We expect these to be popular with amateur astronomy clubs, scout troops, church groups and other organizations. The program will include viewing through the 36-inch Great Lick Refractor and, for amateur astronomy groups, the 40-inch Nickel Reflector.

Overnight Camping, Too!

Group Viewing Parties may also have the option to camp overnight. To reserve a group night, or for further details, email publicprograms@ucolick.org.

Save these dates! Red indicates the Friday Night Summer Visitors Program dates. Yellow denotes Music of the Spheres concerts. Green shows the nights available for our new Group Viewing Parties. Our 125th Anniversary Gala is shown in purple

2012 OBSERVATIONAL ASTRONOMY WORKSHOP



Observational Astronomy Workshop, November 1st–5th at Lick Observatory, Mount Hamilton, CA.
Front row: Paul Lynam, Kelsey Clubb, Clare Saunders, Dyas Utomo, Karen Ng, Emily Martin, Michelle Consiglio, Kaylan Burleigh, Joe Barthel, Elinor Gates. Back row: Isaac Shivvers, Ali Khostovan, Adam Greenberg, David Stenning, Gerald Rude, Bryant Benson, Patrick Maloney. Not pictured: Andrew Crooks, Marie Lau.

Between November 1st and 5th Lick Observatory hosted what has become an annual fixture: the Observational Astronomy Workshop, intended as an introduction to observing, and open to UC graduate students. Lick staff astronomers Paul Lynam and Elinor Gates conducted the event. This year the Workshop expanded from three days to five. It was also held later in the academic term, to enable the first-year participants to settle comfortably into their respective UC programs.

Fifteen students, representing six UC campuses, participated: three from Davis, four from Berkeley, three from Los Angeles, three from Riverside, and one each from Irvine and Santa Cruz.

Despite being scheduled a few weeks later in the year than previous years' Workshops, seeing through the telescopes was only minimally affected by variable weather. The additional days enabled some flexibility to re-schedule observing activities in response to high humidity. Participants also had more time to explore and enjoy the setting of Mount Hamilton.

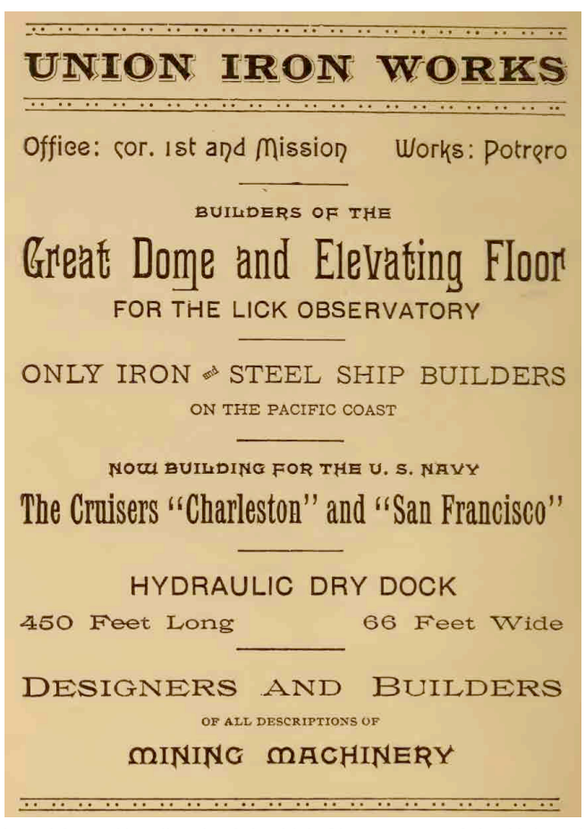
All benefited from a naked-eye, night-sky orientation on the Great Lick Refractor, gained hands-on experience with the Kast Spectrograph on the Shane 3-m Telescope, the Hamilton Spectrograph on the Coudé Auxiliary Telescope—CAT—and direct imaging with the Nickel 1-m Telescope. In addition, introductory lectures on observational astronomy, use and characteristics of CCDs, infrared astronomy and adaptive optics techniques served as primers to later interactive observing planning and data reduction sessions.

Feedback provided by the attendants was overwhelmingly positive, including good suggestions to incorporate in future workshops, and we thank them for their participation. We must also acknowledge the Lick staff for their enthusiasm while coordinating and supporting the Workshop, as well as contributions from Kelsey Clubb (UCB) and Lick volunteer Patrick Maloney, vital to the delivery of the Workshop's practical curriculum. We're looking forward to next year's event.

~ Paul Lynam

Lick Observatory participated in the 2012 Bay Area Science Festival held at AT&T Park on Saturday, November 3rd attended by over 30,000 kids and adults. We offered viewing of the sun through our SolarMax II telescope while promoting our new Friends of Lick Observatory organization. Lick volunteer Bob Kibrick provides shade at the eyepiece for an interested event-goer.

Lick Observatory hosted a booth at the Take Flight for Kids event at Reid–Hillview Airport in San José on October 13th. Volunteer Michael Maloney is shown above with the SolarMax II telescope, which affords views of active regions, flares, filaments and other features on the Sun's surface.



An ad from *Handbook of the Lick Observatory of the University of California,* by its first director, Edward S. Holden, 1888.

Bay Area SCIENCE FESTIVAL

MOUNT HAMILTON SUMMER INTERNSHIPS

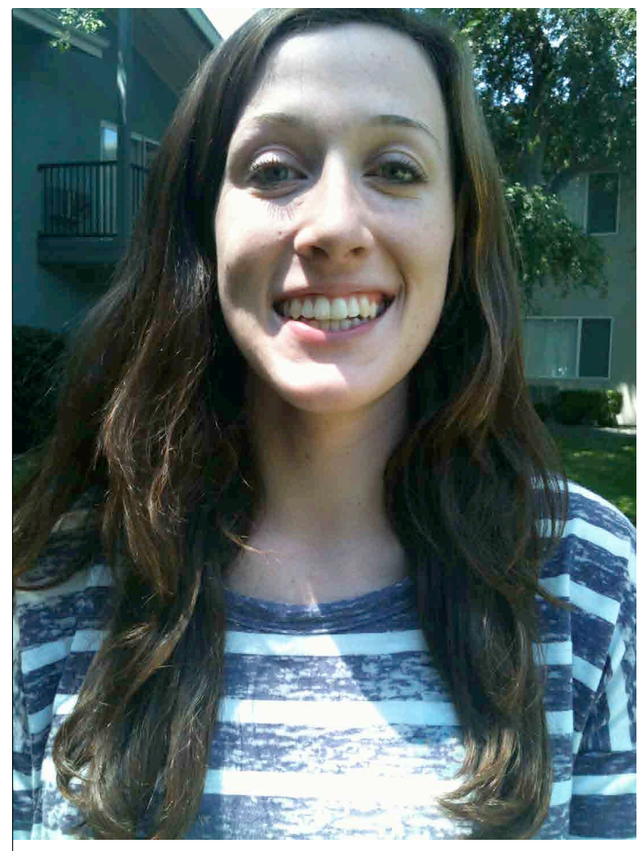
Mount Hamilton has hosted several Summer Interns in the past, with participants subsequently pursuing their interests to become, among others, an assistant professor, or involved with the development of next generation web browser technology in Silicon Valley.

During the Summer of 2012, UC Davis undergraduate, Megan Clendenin attended on a part-time basis to assist with rationalization of the Mount Hamilton filter library, selection of archetypal spectral sources for education/outreach initiatives (deployed successfully during the 2012 Graduate Student Workshop on Observatonal Astronomy) and assisted with aircraft avoidance measures in support of Laser Guide Star observations at the Shane telescope.

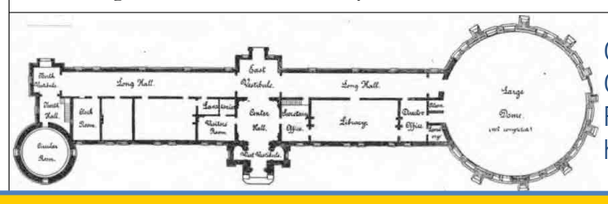
Highlights of a pleasureable, positive learning experience included the variety of work, freedom to work independently, helping to operate the Great Lick Refractor and seeing the nuts and bolts of telescopes. Staff and residents valued Megan's interactions with the Mt. Hamilton community, wish her well in her future endeavours, and look forward to her expressed wish of volunteering at future public events/tours.

Consideration of applications for Summer 2013 internships on Mount Hamilton shall begin in in the early part of the year. For further information email SA@ucolick.org.

~ Megan Clendenin, Paul Lynam and Elinor Gates



2012 Lick Observatory Summer Intern Megan Clendenin.



Original plan of Lick Observatory. From Holden, E.S. "The Lick Observatory," *The Sidereal Messenger* 7(2):49–65, 1888. Full-sized image is in the public domain and can be viewed at http://upload.wikimedia.org/wikipedia/en/b/b8/LickObservatoryDiagram.jpg

BBQ WITH THE STARS A SEPTEMBER SUCCESS!

Over 200 astronomy enthusiasts enjoyed an opportunity to rub elbows with four world-renowned scientists on September 15 at Lick Observatory. BBQ With The Stars brought together Professors Alex Filippenko, Sandra Faber, Geoffrey Marcy and Timothy Ferris, all of whom gave short talks and held small-group question-and-answer sessions. Before that, patrons enjoyed a picnic catered by Bruno's BBQ of Scotts Valley, listened to 1970s cover band Dr. West and classical guitarists Yuri Liberzon & Patrick O'Connell.

In the photographs, clockwise from top left, are: Writer and film-maker Timothy Ferris, Lick Observatory archivist Tony Misch, and UC Observatories Interim Director Sandra Faber; Bill Sautter and his son Justin with Geoff Marcy, and Alex and Noelle Filippenko; Alex Filippenko answering questions after his talk; Yuri Liberzon and Patrick O'Connell entertaining guests in between talks and viewing through the telescopes—looking on are the UCO Director's Executive Assistant Paula Towle, far left, and next to her Assistant Director Maureen McLean; Dr. West, whose members donated their time and talents, and Lick Observatory's own Greg Sulger (center), who coordinated the effort. Thanks to the whole group!

The LICK OBSERVER

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If you have an idea for something you'd like to see included in *The LICK OBSERVER*, please email your suggestion to brodie@ucolick.org or wareham@ucolick.org