

Sonoma Skies

Newsletter of the Sonoma County Astronomical Society
A nonprofit scientific and educational organization

June 2011

www.sonomaskies.org

Volume XXXIV No. 6

It's Time to Renew Your SCAS Membership

What an exciting time to be interested in Astronomy! New, ever larger telescopes, exploration by NASA and other space agencies around the world and research by talented scientist are providing new information every day about our wonderful universe.

Here in our small place in the Universe, the Sonoma County Astronomical Society is promoting a better understanding of the wonders of the universe in an increasing number of ways:

Monthly Meetings: Offer a wide array of expert speakers specializing in explaining astronomy to the general public .

Public Star Parties: Members share their enthusiasm for astronomy with school children and other local organizations. This is one of the most popular activities and gives seasoned veterans a chance to share their telescopes and knowledge with the public and new members get a chance to get hands-on information on the workings of telescopes and stargazing.

SCAS Newsletter: Our members receive *Sonoma Skies*, our Award Winning Newsletter providing up-to-date listings of local astronomy happenings and events, information important to Young Astronomers, observing highlights for the month and concise information on important astronomical research.

Social Gatherings: Our Annual Star B Que held each August at the Robert Ferguson Observatory open only to members and guests, as well as many other outings including a Yosemite Star Party.

continued page 2

A special SCAS trip to the "Beyond" exhibition in Petaluma is scheduled for Wednesday, June 15th. See President's Message on page 2 for details.

Astrophotography by Ken Crawford

SCAS June 8 Meeting, 7:30 PM
at Proctor Terrace School

For the June meeting, SCAS is very pleased to welcome renowned astrophotographer Ken Crawford to talk about imaging and what a dedicated and accomplished amateur astronomer can do.



Ken's interest in astronomy started, as for many of us, early in life. He built his first telescope in the 8th grade while growing up in Gary, Indiana. Despite living under light-polluted skies, his first forays into the universe were kept motivated by his visits to the Adler Planetarium, even through his teen years. His life took a happy turn when he married his "lovely wife Lisa"

(his words, how sweet) and they moved to the foothills of the Sierra. There he found his dark skies which inspired him to begin imaging in 2001. The following year he built his Rancho Del Sol observatory and was off and running!

By 2004 Ken was one of the founders of the Advanced Imaging Conference held yearly in San Jose, and became its President in 2007. In 2008 he was invited to sit on the advisory committee for "Astronomy Picture of the Day" to participate in the future planning and funding of that well known (to us) website. That same year he sold his business and retired to pursue his hobby in earnest, and has established himself as one of the foremost imagers of our day. His work has been featured in numerous magazines, websites, movies, and public displays.

At the same time Ken joined an international team of professional astronomers headed by Dr. David Martinez-Delgado of the

continued page 2

LINKS TO WHAT'S INSIDE

President's Message.....	2	Young Astronomers.....	8
James Webb Space Telescope	3	"Type Ia Supernova"	9
Semi-Sirius Astronomer.....	3	June Sky Chart	11
Events.....	4	June Calendar	12
School Star Parties	5	SCAS Membership, Info	13



President's Message

May was a busy month! On May 12 Larry McCune and I traveled to the Stockton Astronomical Society (SAS) at their request to make a presentation at their monthly membership meeting on the merits of the Striking Sparks program which the SCAS has had in place for 26 years now. We believe that our program was well received.

They had many questions and over the course of our presentation we feel that we convinced them that Striking Sparks was a worthy outreach program that would, over time, lead many young people or their subsequent generations to embrace or better understand the world about them. If we can lead a few of them toward a career in the sciences, so much the better.



Beyond: Yes, I have gone there and back many times! I refer, of course, to the “Beyond- Visions of Planetary Landscapes” Smithsonian traveling exhibition showing at the Petaluma Museum through July 4th. This is a ‘must see’ event for anyone with any appreciation of what we have accomplished in

our space explorations over the last 40 years. Michael Benson has poured through the reams of images taken by our many robotic space missions and has gleaned the best from them in many ingenious and painstaking ways to bring to us a gallery of images to awe and inspire. Please take that one step to Petaluma to bring you to the great Beyond!

Beyond for Members: The SCAS is planning a special night at “Beyond” on June 15 from 7:30 - 9:00 for our members and docents of the Robert Ferguson Observatory (RFO), most of whom are SCAS members or serve us well when we venture to our favorite dark sky site in Sonoma County. This will be in addition to our regular meeting on June 8.

The SCAS is also committed to providing Saturday evening star parties at the Museum throughout its stay. Thus far, out of the 3 opportunities we have had for such, only Saturday, May 21st, was clear enough for us to set up. On that occasion, four Young Astronomers participated along with Eric Swanson, Loren Cooper and me.

The YA were: Noah Dove, Blaine Eldred, Conrad Smith (not shown), and Ray Pan. Petaluma’s light pollution wiped out views of all but Saturn and a few stars and constellations but that was enough for us to work with. The seeing was very good and great views of Saturn were had by many.



Photo: Len Nelson

—Len Nelson, SCAS President

Astrophotography *(from page 1)*

Max Planck Institute searching for tidal star streams which are the remnants of galactic mergers, especially around our own galaxy. His work shows that serious contributions can be made by amateurs with modest equipment if they have the interest and dedication (with dark skies as a bonus). There has been a trend recently toward the “pro-am” (professional/amateur) collaboration which shows that significant contributions can still be made by amateurs working with a professional attitude. We have many examples of this, and Mr. Crawford will fill us in on his part of this research.

Ken has been giving talks and clinics on combining the art and technology of astro imaging throughout the country, and will be conducting a clinic at the Robert Ferguson Observatory for imaging docents.

Be sure to join us for this great program, hearing about Ken’s fascinating research and no doubt being treated to some gorgeous “eye-candy”! Visit his website for a preview at www.imagingdeepsky.com.

—John Whitehouse, SCAS VP

Membership Renewal *(from page 1)*

Don’t forget some of the other benefits: Membership in The Astronomical League and a subscription to their *Reflector* magazine; Discounted subscriptions for *Sky and Telescope* and *Astronomy* magazines; and access to the SCAS Library of astronomical related material.

So, now is the time not only to renew your membership but to invite your friends to become a part of the exciting field of astronomy by joining the Sonoma County Astronomical Society.

To renew your annual membership, please print the membership form on the last page of this newsletter, and send it with a check payable to SCAS in the amount of \$25 to:

SCAS Membership
P.O. Box 183, Santa Rosa, CA 95402-1083.

This membership renewal period applies to all members. Don’t miss a single benefit. Make sure you get your renewal check sent to us now. Thanks for being part of the Sonoma County Astronomical Society.

—Mike Dranginis, SCAS Membership Director

TELESCOPE FOR SALE

Orion XT8 Classic 8" Dobsonian Telescope. Approximately 8 years old. Very nice condition. The base has been rebuilt with hardwood plywood. Includes padded carrying case for the tube, Orion EZFinder red dot finder plus original 6x30 finder scope, 1.25" focuser, 25mm Plossl eyepiece. \$250. Contact Keith Payea at kpayea@bryantlabs.net or (707) 566-8935



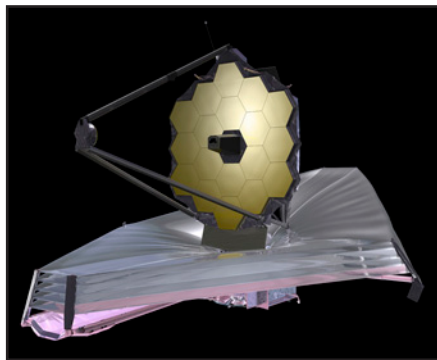
The James Webb Space Telescope

An Update Coming in the Next Newsletter

It's déjà vu. The James Webb Space Telescope (JWST), like its predecessor, the Hubble Space Telescope (HST), has gone way over budget, by \$1.5B. The \$5B lifecycle estimate for JWST is being revised upward to \$6.5B. The JWST Independent Comprehensive Review Panel report, issued in October 2010, revealed, "The problems causing cost growth and schedule delays on the JWST Project are associated with budgeting and program management, not technical performance. The technical performance on the Project has been commendable and often excellent. However, the budget baseline accepted at the Confirmation Review did not reflect the most probable cost with adequate reserves in each year of project execution. This resulted in a project that was simply not executable within the budgeted resources."

An immediate quarter of a billion dollars is needed in 2011 to keep the project on track, an amount that is unlikely to be granted this year, considering the tough economic times. Instead, the program will likely slip beyond the planned 2015 launch date and reach an even higher cost plateau to complete, launch, and operate. This follow-on analysis won't be completed until later in 2011.

To put this into perspective, however, JWST's interdisciplinary scientist, Heidi B. Hammel, indicated that the Hubble Space Telescope has cost \$10B over its lifetime. Regardless of such comparisons, NASA may have all but killed most of the science planned for this decade. One industry expert suggested, "Even at the best case, the \$1.5 billion [increase] will virtually wipe out the inspirations of the newly released decadal survey in astrophysics for 2010-2020."



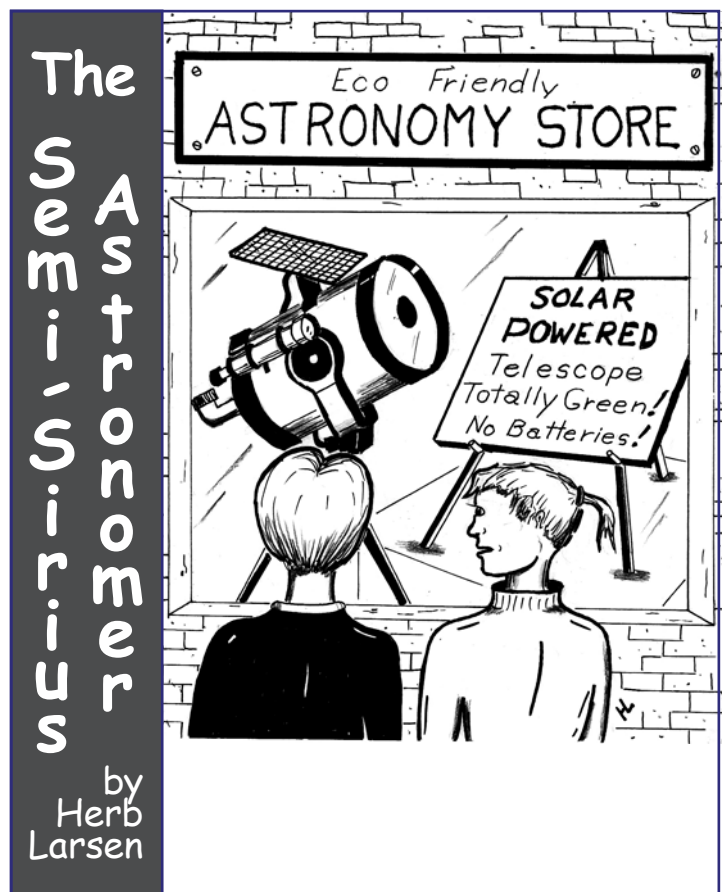
JWST unfurled in space, graphic courtesy of NASA

From another perspective, however, enthusiasts believe the awesomeness of the JWST will prevail and it will ultimately find its place in the heavens, searching for the end of time. As Hank Green says, "We have to make good things happen." Be sure to check out his video about the top 5 reasons to build the James Webb Space Telescope. "It is tense." <http://www.youtube.com/watch?v=ihpNNBmJypE> (Warning: The F-bomb is used or alluded to several times, though in an enthusiastic context).

Look for an article by SCAS member R.K. Koslowsky updating readers on the status of the JWST, due to launch in 2015, in the next newsletter.

SOCIAL AMENITIES

Many thanks to Bruce MacEvoy for providing refreshments at the May meeting.



SCAS cartoonist Herb Larsen can be contacted at hlarseni@yahoo.com

AN APPRECIATION

Dickson Yeager wants to let you all know how grateful he is for the overwhelming support he has received from our astronomy community. He's getting back into action bit by bit and is open to phone calls. If you don't have his number email Cecelia.

WELCOME, NEW MEMBER

The SCAS wishes to welcome new member Michael Eckstein who has been attending the Night Sky Classes at RFO and is interested in supporting the local astronomical community.

Scope City

NEW MEMBER BONUS!

Scope City at 350 Bay Street, San Francisco, is offering a **\$25 merchandise discount to new members.**

Manager Sam Sweiss has supported SCAS and Striking Sparks and offers a huge selection of telescopes, accessories and more. Obtain a receipt from Dickson Yeager, Membership Director, showing you have paid the \$25 SCAS membership dues. To arrange for your merchandise discount, contact Sam at 415/421-8800 or at <http://www.scopecity.com>

Events

ROBERT FERGUSON OBSERVATORY

Public Observing Nights

Saturdays, June 4 and 25

Solar Viewing: Noon - 4:00 PM

Night Viewing begins 9:00 PM

The Observatory features four telescopes: A 14-inch SCT with CCD camera in the East wing, an 8-inch refractor under the dome, a radio telescope for observing Sun activity, and a 24-inch reflector in the West wing. SCAS members may set up telescopes in the observatory parking lot to assist with public viewing. Auto access closes at dusk; late arrivals must carry equipment from the horse stable parking area.

Fees: No admission fee for the solar viewing, but donations are appreciated. The Park charges \$8 per vehicle for entry. A \$3 donation is requested from adults 18 and over for admission to the observatory during night viewing sessions.

Info: www.rfo.org

Night Sky Classes—Summer Series

May 31 June 7 June 28

July 26 Aug. 2 Aug. 23

Classes begin at 7:30 PM. Series of six sessions. Each class includes a lecture on the constellations of the season, their history and mythology, and how to find stars and deep sky objects within them. Includes observing.

Fees: \$75 for the series. (Single session fee is \$23). 10% discount for VMOA members. Classes are held at the Observatory. For information or to register: (707) 833-6979, [nightsky\(at\)rfo.org](mailto:nightsky(at)rfo.org)

Observing Lab

Sunday, June 26, 8:30 PM: “Diffuse Nebulae, Star Formation and Open Clusters”—This Lab examines the process by which new stars are formed in our Milky Way galaxy, as well as clusters of such recently formed stars that are apparent in the night sky. Rain check: Wed. 6/29. Reservation required. (707) 833-6979, [nightsky\(at\)rfo.org](mailto:nightsky(at)rfo.org)

RENT THE FERGUSON OBSERVATORY!

Groups of up to 50 can be accommodated. Astronomer docents provide sky interpretation and operate telescopes, and you can stay up as late as you want! Make your reservation at least two weeks prior to your event. Best times for optimal sky gazing are around a week away from a Full Moon.

For information or to make a reservation, visit www.rfo.org or email George Loyer: [gloyer\(at\)rfo.org](mailto:gloyer(at)rfo.org).

THE SMITHSONIAN PRESENTS “BEYOND”

VISIONS OF PLANETARY LANDSCAPES

at the Petaluma Museum through July 4

A Smithsonian Exhibit featuring 35 large-scale (ranging from 3 feet to 5 feet in width) framed prints containing 59 individual photographs, all digitally processed by artist Michael Benson. The exhibit paints a rarely seen and mesmerizing portrait of our solar system’s diverse worlds and their moons.

The exhibition is divided into several sections, including the Inner Solar System, Mars, Jupiter and Saturn. The show’s compositions include rare pictures of the sand dunes on Mars, storms on Neptune and the fiery eruptions of the sun.

In addition to Benson’s photography the exhibition will include a display of rare meteorites on loan from the California Academy of Science, memorabilia and artifacts concerning space exploration, an Astronomy night and speaker series including noted NASA representatives and scientists.

Each weekend on Saturday at 3:00 PM, a new speaker will come to the fore to lecture on some aspect of astronomy. Upcoming schedule:

June 4: NASA representative Doris Daou’s topic will be “Galaxies, Nebulae, Solar Systems and Life”

June 5: “The Kepler Mission: Music From the Stars”—Jon Jenkins

June 11: SSU Professor, Lynn Cominski’s topic will be “Exploring the Extreme Universe with Fermi”

June 25: GTN Director Dr. Kevin McLin, NASA EPO Group, Sonoma State University. Topic: “Forget Dark Matter and Dark Energy: Where Did the Other 4% Come From?”

SCAS and RFO astronomers will provide outdoor public observing.

The film “The Dream is Alive” focusing on the Space Shuttle missions will be presented every Saturday at 1 PM.

Location: 240 4th Street, Petaluma, 707/778-4398
More info: www.petalumamuseum.com

TAYLOR OBSERVATORY

Located in Kelseyville off Highway 29

June 11, Public Event, 8-11 PM: “Current Space Missions”—Stephen Kane. Evening event includes lecture, planetarium show and telescope viewing.

These events are held even in cloudy or rainy weather, although telescope viewing will not be possible. There is a suggested donation of \$3 per person. No reservation required. Info: 707/262-4121 or <http://www.taylorobservatory.org>

Community Outreach Event Horizons

Star parties do happen ☺

Wednesday, April 27th was an “iffy” day with clouds that couldn’t make up their minds whether to hang around or go elsewhere. Wendy Schwrtz, the science teacher at Sequoia Elementary School made the call to go ahead and have the star party. It was estimated that 150 students and members of their families enjoyed views of Saturn, the Double Cluster and at least six M-objects, including M-13, which rose over the eastern horizon shortly before “closing time.”

Thanks go out to Loren Cooper, Eric Swanson, David Simons, Walt Bodley, John Whitehouse and the four SPARKS volunteers; Hand Jafari, Conner Nelson, Olivia Pemintel, Austin Henderson and their mentors for providing their telescopes and their time to make this event a success.

Thursday, Cinco de Mayo, was a balmy, but slightly windy evening at Alexander Valley School. A three-day old moon provided something to view during the lingering twilight until the sky darkened enough to sight in Saturn and three of its satellites. Mizar and M-13 were also featured at this star party. This was the school’s Spring Open House, so it was likely that all 148 students and at least one other member of their family were in attendance.

Volunteers who provided their time and telescopes included Lynn Anderson, Loren Cooper, Eric & Mary Swanson, Al Stern and Sparks winner, Zander Voge and his father, Ed. Both Zander and his dad spoke very highly about the SPARKS program and it is likely that we will have several applications for SPARKS telescopes submitted from next year’s Alexander Valley School students.

It has been great to see our SPARKS winners participating at star parties and sharing their telescopes with the public. See also Len Nelson’s recap of YA assistance at Petaluma events on Page 2.

On Wednesday evening, May 25th, Eric Swanson, Loren Cooper and Lynn Anderson provided sunset solar viewing between the clouds from the playground at Rincon Valley’s Austin Creek Elementary School. About 100 students and their parents got to see one small sunspot through Eric’s and Loren’s neutral density filters and some small prominences through Lynn’s h-Alpha filter. Many RFO schedules and several SCAS information pamphlets were handed out.

Speaking of the RFO, the RFO board recently clarified one item in the Docents Handbook: RFO docents who participate in certain SCAS volunteer activities and also promote the RFO may count those hours for RFO credit.

Lynn has sent an email that lists the recommended dates for star parties during the 2011-12 school year to all of the teachers and principals with whom he has been in contact over the last



two years. So far, he has booked star parties in Monte Rio for Thursday, September 29th, Austin Creek Elementary School for Wednesday, November 2nd, and Windsor Creek for February 16th. He plans to have this same letter (revised with only the remaining dates) sent to the Sonoma County Office of Education to be distributed to all Sonoma County public schools.

Private schools are not getting this information, so if you know of a private school teacher who might be interested in having a classroom presentation or star party, please let them know how to contact Lynn.

School is out until mid-August, so there will be little SCAS public astronomy until then. We occasionally get requests for telescope volunteers from community service or private industry groups. If anything comes up, Lynn will be contacting those of you who are on his list of volunteers. If you have an interest in participating in public astronomy and are not already on that list, contact Lynn at [astroman\(at\)sonic.net](mailto:astroman(at)sonic.net) to receive email announcements about upcoming volunteer opportunities.

—Lynn Anderson, SCAS Director of Community Activities



Last year’s crew gathered at the campground. Photo by Len Nelson

SCAS YOSEMITE STAR PARTY August 19 and 20

The SCAS will provide public astronomy at Glacier Point this year on August 19 and 20, and camp at the Bridal Veil group campground. All participants bring their own telescopes. Park entry and campground fees are a gift from the park for our service.

Len Nelson ([lennelnsn\(at\)comcast.net](mailto:lennelnsn(at)comcast.net)) will coordinate the signups for this event. Let him know who you are, how many in your party and how many telescopes you will be bringing.

ALCON 2011

Bryce Canyon National Park Utah
June 29 - July 2, 2011

Registration is now open for ALCon, the Astronomical League Convention at Bryce Canyon. Details and registration information at: <http://alcon.astroleague.org/>

Events

MORRISON PLANETARIUM DEAN LECTURE SERIES

June 6, 7:30 PM: “Galaxy Zoo: Citizen Science”—Dr. M. Jordan Raddick, Education Director, Institute for Data-Intensive Engineering and Science, Johns Hopkins University

Anyone can help discover new stuff in Galaxy Zoo- but why do people bother in the first place? Dr. Raddick responds with some unexpected insight into why people donate their time for open science and what they have discovered through the process. More than 250,000 people have taken part in Galaxy Zoo so far, producing a wealth of valuable data and sending telescopes on Earth and in space chasing after their discoveries. The images used in Galaxy Zoo, from NASA’s Hubble Space Telescope, are more detailed and beautiful than ever, and allow us to look deeper into the Universe than ever before.

Lectures sell out early, so reserve now. Call 800-794-7576 for reservations. Adults \$12, Seniors \$10, Members \$6. <http://www.calacademy.org/events/lectures/>

MT. TAMALPAIS ASTRONOMY

June 4, 8:30 PM: “The Milky Way as a Dark Matter Laboratory”—Dr. Michael Kuhlen, Theoretical Astrophysics Center

Over the next decade, a combination of astronomical observations and particle physics experiments hold great promise to finally shed light on the nature of dark matter, the dominant contributor to the matter content of the universe.

Sponsored by the Mt Tamalpais State Park and coordinated by volunteers of the Mt Tam Interpretive Association. FREE and open to the public. Families and students encouraged to come. Presentations held in the Mountain Theatre. Viewing afterwards in Rock Springs Parking Area, provided by San Francisco Amateur Astronomers. Dress warmly and car pool if possible. Bring a flashlight! Info: 415/455-5370; <http://www.mttam.net/>

GOLDEN STATE STAR PARTY 2011

Wednesday, June 29 through Sunday, July 3

The Golden State Star Party is a 4 night dark-sky event held each summer at Frosty Acres Ranch in North-Eastern California, near Mount Lassen, alongside rural Adin, California. GSSP has dark skies from horizon to horizon.



Preregistration is strongly recommended. Space is limited to 400 participants. Preregistration Fee: \$70. On-site registration (if space is available): \$75. Kids under 18 are free. <http://www.goldenstatestarparty.org/home>

Vacation Astronomy

As you make your summer plans, consider contacting an astronomy club in the area you’re going to visit, especially if it has good dark skies. Then you can coordinate your trip with their observing events.

A good resource for finding clubs is <http://nightsky.jpl.nasa.gov/index.cfm>. You can search geographically, and then go to a club’s website for contact numbers and schedules.

Be sure to tell folks where you’re from. Many clubs are friends of SCAS and we share ideas and resources. Everyone enjoys the feeling of being connected with this community of sky delight.

Completely unrelated to astronomy, but very much related to our amazing, expanding virtual community, is this presentation on TED about a virtual choir. It gave me chills. <http://www.wimp.com/choirvoices/> If you like that, go to <http://ericwhitacre.com/the-virtual-choir> for the full final piece.

—Cecelia Yarnell, SCAS Editor

SETI INSTITUTE COLLOQUIUM

June 1 (Evening): “First Contact: Scientific Breakthroughs in the Hunt for Life Beyond Earth”—(BOOK LAUNCH and panel), Marc Kaufman, Washington Post

For untold centuries, people have looked to the distant skies in search of life—be it God-like or heavenly, demonic or the whole gamut of bizarre extraterrestrials imagined. Today, for the first time in human history, science is getting close to answering the eternal question of what lies beyond, and the science is generally pointing in one direction: That life is most likely a commonplace in the universe. Discoveries about the census and makeup of exoplanets, about the vast array of long-hidden extremophiles alive here in brutal environments that seem more extraterrestrial than Earthly, the presence of potentially biologically-produced methane on a Mars now known to have once been wet and warm, and the presence of complex carbon and other elements and compounds needed for life as we know it across the universe—these discoveries and more have the field of astrobiology abuzz. No one factor makes the case that life exists, or once existed beyond Earth, but together they are making an ever-stronger case for extraterrestrial life. And if life exists elsewhere, what’s to say it hasn’t evolved into complex and intelligent beings?

June 8: “Analyzing the atmosphere of Super Earth GJ1214b”—Eliza Kempton, Dept of Astronomy and Astrophysics, UC Santa Cruz

Astronomers currently know of over 500 planets orbiting distant stars beyond the confines of our solar system. Of these 500 “extrasolar” planets, most are large gas-rich planets, similar to Jupiter or Saturn. However, more recently, due to improvements in discovery techniques and instrumentation, astronomers have started to discover much smaller extrasolar planets, which are only slightly larger (or more massive) than the Earth. This new class of planets, which have masses of 1-10 times that of the

Events

SETI Colloquiums *(from page 6)*

Earth, have come to be known as super-Earths. Super-Earths are particularly interesting because planets in this mass range are not present in our solar system, and they therefore represent a fundamentally new class of planets for astronomers to study. Recently, the first observations of a super-Earth's atmosphere were obtained. They reveal a unique planetary atmosphere that may bear some similarities to objects in our solar system but requires further study.

June 15: "Fly Cheap, Fly Often, Fly Safe—Science research & education opportunities on commercial suborbital vehicles"—Kim Ennico, Ames

Access to suborbital space, the realm above 100 km altitude, by vehicles not traveling fast enough to go into orbit about the planet, has a long history, from the 1950's early unmanned scientific sounding rockets for meteorological and upper atmosphere studies, to Alan Shepard's historic Freedom 7 flight 50 years ago, continuing today with multi-science disciplined sounding rocket programs launched from spaceports around the globe. These vehicles follow a parabolic-arc trajectory that also provides many minutes of low gravity enabling "microgravity" experiments. Access to suborbital space is soon to be revolutionized by a series of frequent flights by new providers from the commercial space sector.

June 22: "Laser Plasma Spectrochemistry"—Richard Russo, UC Berkeley Lawrence Berkeley Lab and Applied Spectra

Laser ablation (LA) with optical (LIBS) or mass (ICP-MS) detection is an excellent technology for direct sample (solid, liquid, gas) analysis. Benefits of laser ablation include no sample preparation, no consumables, every sample, real-time analysis, standoff (LIBS) measurements, and more. Knowledge of ablation processes, reliable system components, and development of methods has led to excellent performance metrics (accuracy and precision) of this technology. In general, LIBS provides ppm sensitivity for elemental analysis and molecular characterization based on database libraries and chemometrics. LA-ICP-MS provides ppb elemental analysis and isotopic ratios. New research shows the ability to perform isotope measurements in the laser plasma at atmospheric pressure.

June 29: "Looking back in time 13 billion years to when the Universe was young: searching for the earliest galaxies with Hubble"—Garth Illingworth, Lick Observatory, UC Santa Cruz

The Hubble Space Telescope recently finished taking the deepest image of the Universe ever in the near-infrared. This unique new image was assembled from data taken in 2009 and 2010, and has enabled us to look billions of years back in time to find some of the earliest galaxies that were forming when the Universe was very young, just 5% of its current age. These tiny galaxies are the seeds that grew into the myriad great galaxies of today, like the nearby Andromeda galaxy and our own Milky Way.

Colloquiums run from Noon to 1 PM on Wednesdays and at 7:30 PM one evening per month. Location: SETI Headquarters at 189 N. Bernardo Ave., Mountain View ([map](#)). Free. Lectures are available on YouTube at: <http://www.youtube.com/setiinstitute>

NASA Scientists on the Trail of Mystery Molecules

Space scientists working to solve one cosmic mystery at NASA's Ames Research Center, Moffett Field, CA, now have the capability to better understand unidentified matter in deep space. Using a new facility so sensitive that it can recognize the molecular structure of particles in space, researchers now are able to track unidentified matter seen for the last century absorbing certain wavelengths of light from distant stars.

Astronomers suspect that one family of carbon-containing compounds, called polycyclic aromatic hydrocarbons (PAHs), are the long-sought matter that produces holes in astronomical observations from multiple wavelengths. Researchers compared laboratory data of PAHs, measured in this unique facility that simulates space-like conditions, with an extensive set of high-resolution optical astronomical data. With this approach, they were able to survey the mysterious spectral signatures seen in both light absorption and emission that are common throughout interstellar space and determine the abundance of PAHs.

"It is important to understand how PAHs absorb stellar radiation, and how they emit it back, because it contributes to the global energy balance in space," said Farid Salama, a space science researcher in the Astrophysics Branch at Ames. "Now, we can offer a clear and unambiguous explanation for the presence (or the absence) of specific PAH molecules in the interstellar medium."

The research helps solve a problem scientists have struggled with for most of the century. They have detected more than 500 interstellar absorption lines in the spectra (range of frequencies or color) of starlight approaching Earth.

"PAHs are excellent candidates to account for the infrared emission bands seen in the interstellar medium," said Salama. "But their signature also must be seen in the visible and ultraviolet. This evidence was missing until now, because of the lack of relevant laboratory data." PAHs are very stable and thought to be ubiquitous in the interstellar medium. They are flat molecules of carbon and hydrogen that form hexagons their skeleton looks like chicken wire. On Earth, they can be found in coal, soot, and automobile exhaust.

By mimicking realistic interstellar conditions in the laboratory, Salama and his colleagues measured the spectra (fingerprints of molecules) of large PAHs and ions in the ultraviolet and visible light bands and compared the data to high-resolution astronomical data from the Ultraviolet and Visual Echelle Spectrograph instrument of the Very Large Telescope at the European Southern Observatory.

To achieve these results, Salama and his team used a unique specialized facility, called the Cosmic Simulation Chamber (COSmIC), which integrates a variety of state-of-the-art instruments to allow scientists to form, process and monitor simulated space conditions for interstellar materials in the laboratory. The chamber recreates the extreme conditions in space, where average temperatures can be as low as 100 Kelvin (less than -170 degree Celsius), densities are quadrillionths of Earth's average atmospheric density at sea level, and interstellar molecules and ions are bathed in stellar ultraviolet and visible radiation. Interstellar molecules and ions must be stable enough to survive in this harsh environment.



Hello Young Astronomers

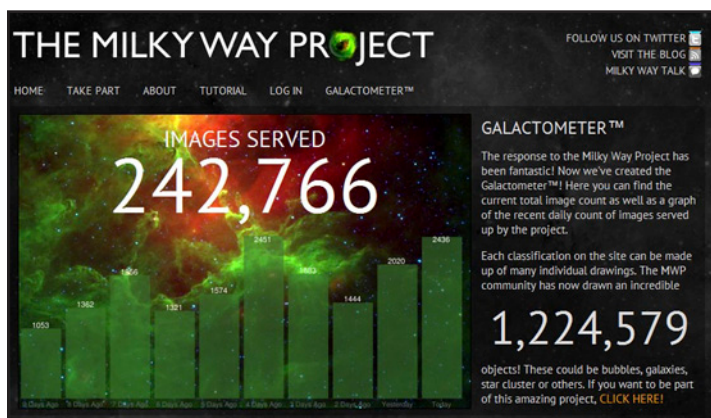
Your assistance at future “Beyond” star parties in Petaluma would be much appreciated.

It is important that the SCAS has a few of you there to show to all that come that there are outstanding individuals like you in our midst.

I will be sending out periodic requests for help when we have an occasional night of expected good seeing conditions. Thus far, our batting average is only 33.3% and that is probably typical for Petaluma on any given night. If you are not on my select list of YA who are interested in participating at public star parties, please contact me at [lennelsn\(at\)comcast.net](mailto:lennelsn(at)comcast.net) to get your name on that list of the esteemed!

YA at RFO: June also has not one but two public nights at the RFO. Those dates are Saturdays June 4 and June 25. The RFO will have a dedicated YA coordinator to assure that you fit comfortably in our ‘small scope’ telescope assembly and that you are assisted in finding and appreciating many celestial splendors. Let me know if you have any questions and/or suggestions. I’d be pleased to hear from you.

—Len Nelson, SCAS President



Volunteers study infrared images of our galaxy from the Spitzer Space Telescope, identifying interesting features using the special tools of the Milky Way Project, part of the Citizen Science Alliance Zooniverse web site.

Milky Way Safari

by Dauna Coulter and Dr. Tony Phillips

Safari, anyone? Citizen scientists are invited to join a hunt through the galaxy. As a volunteer for Zooniverse’s Milky Way Project, you’ll track down exotic creatures like mysterious gas bubbles, twisted green knots of dust and gas, and the notorious “red fuzzies.”

“The project began about four months ago,” says astrophysicist Robert Simpson of Oxford University. “Already, more than 18,000 people are scouting the Milky Way for these quarry.”

The volunteers have been scrutinizing infrared images of the Milky Way’s inner regions gathered by NASA’s Spitzer Space Telescope. Spitzer’s high resolution in infrared helps it pierce the cloaking haze of interstellar gas and dust, revealing strange and beautiful structures invisible to conventional telescopes. The Milky Way Project is helping astronomers catalogue these intriguing features, map our galaxy, and plan future research.

“Participants use drawing tools to flag the objects,” explains Simpson. “So far they’ve made over a million drawings and classified over 300,000 images.”

Scientists are especially interested in bubble-like objects believed to represent areas of active star formation. “Every bubble signifies hundreds to thousands of young, hot stars. Our volunteers have circled almost 300,000 bubble candidates, and counting,” he says.



Humans are better at this than computers. Computer searches turn up only the objects precisely defined in a program, missing the ones that don’t fit a specified mold. A computer would, for example, overlook partial bubbles and those that are skewed into unusual shapes.

“People are more flexible. They tend to pick out patterns computers don’t pick up and find things that just look interesting. They’re less precise, but very complementary to computer searches, making it less likely we’ll miss structures that deserve a closer look. And just the sheer numbers of eyes on the prize mean more comprehensive coverage.”

Along the way the project scientists distill the volunteers’ data to eliminate repetitive finds (such as different people spotting the same bubbles) and other distortions.

The project’s main site (<http://www.milkywayproject.org>) includes links to a blog and a site called Milky Way Talk. Here “hunters” can post comments, chat about images they’ve found, tag the ones they consider especially intriguing, vote for their favorite images (see the winners at <http://talk.milkywayproject.org/collections/CMWS00002u>), and more.

Zooniverse invites public participation in science missions both to garner interest in science and to help scientists achieve their goals. More than 400,000 volunteers are involved in their projects at the moment. If you want to help with the Milky Way Project, visit the site, take the tutorial, and ... happy hunting!

You can get a preview some of the bubbles at Spitzer’s own web site, <http://www.spitzer.caltech.edu/>. Kids will enjoy looking for bubbles in space pictures while playing the Spitzer concentration game at <http://spaceplace.nasa.gov/spitzer-concentration/>.

—Article provided by JPL/NASA

JANE’S “WHAT’S UP” PODCAST

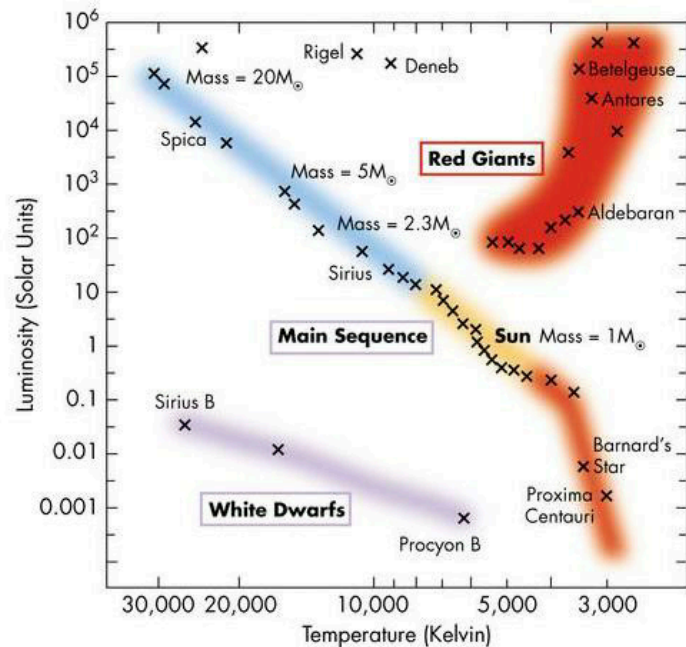
Jane Houston Jones produces a monthly “What’s Up” podcast that features objects we can observe each month. Find Jane’s podcasts here: <http://solarsystem.nasa.gov/news/whatsup.cfm>

Type 1a Supernovae – The Most Interesting!

The last installment of What Physicists Do at Sonoma State University for the spring 2011 semester was held on May 9th. Invited speaker, Dr. Tony Piro of Caltech [1], presented Type Ia Supernovae.

Start with Stars Aging

Piro began the talk with a review of the three main groups of stars. This is shown in the Temperature-Luminosity curve or the Hertzsprung–Russell diagram [2], which is a relationship between the absolute magnitude of the stars versus their classifications or spectral types by temperature.



The three groups include the Main Sequence, the Red Giants, and the White Dwarfs. The Main Sequence, which includes our sun with a luminosity of one and a temperature of 6,500 degrees Kelvin, is the most populous group. The Red Giants, which include the Supergiants, are shown in the upper right-hand corner. They get very bright with age. Last but not least is the White Dwarfs category, stars that are “like cooling embers with a restricted radiation area.” Piro, with a tongue-in-cheek comment, said, “The white dwarfs are the most exciting stars,” even though they are so small and dim.

Evolve to Dying Stars

Next, a refresher was offered on how a star dies. Depending upon its mass, it will collapse, explode, or expel its envelope. The table below highlights the three scenarios.

Death Scenario	Mass of the Dying Star	Which leads to a...
Collapses	> 25 solar masses	Black hole
Explodes	10 – 25 solar masses	Neutron Star
Expels its envelope	< 10 solar masses	White Dwarf

It appears that our Sun’s fate, in a few billion years, is to become a white dwarf. The remaining cosmic embers contain carbon and oxygen and the Ring Nebula is a good example of a white dwarf. The barely visible white dwarf is located in the center of the expelled and radiating envelope [3]. This expanding shell

of debris is an object known as a planetary nebula. It is called this because early observers thought it looked like the planets Uranus and Neptune. The layered colors reveal radiation from different chemical elements in different stages of ionization, blue from ionized helium, yellow-green from doubly-ionized oxygen, and red from ionized nitrogen.

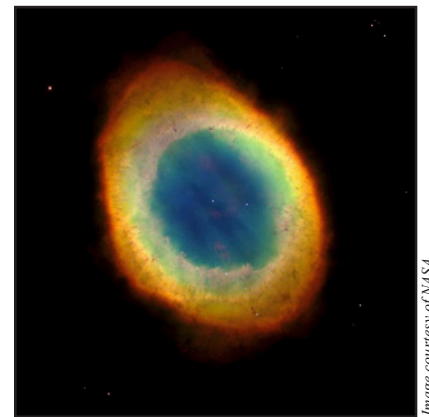


Image courtesy of NASA

The Physics of the White Dwarf

Finally, a review of the Chandrasekhar limit was shared. It is the upper bound on the mass of a stable white dwarf star. This limit was named after the Indian astrophysicist who predicted it in 1930. White dwarfs, unlike main sequence stars, resist gravitational collapse primarily through electron degeneracy pressure, rather than thermal pressure. The Chandrasekhar limit is the mass above which electron degeneracy pressure in the star’s core is insufficient to balance the star’s own gravitational self-attraction, which is typically about 1.4 solar masses. When a white dwarf approaches this mass pressure, “the central density increases quickly, causing interesting things to happen.”

In a close binary system, when a star expands, mass falls off and onto the white dwarf. This is seen with the characteristic emission of ultraviolet radiation or x-rays. Concurrently, carbon burning or fusion begins in the white dwarf, because it gradually accretes mass from its binary companion. A cycle of burning carbon, which consumes oxygen and carbon, increasing temperatures, and then a constrained core that can’t expand causes a “time bomb” to begin ticking [4].

The white dwarf finally explodes as a Type Ia supernova [5], a process that from the beginning of the star’s life to its cosmic death takes 200 million to three billion years to occur.

Why Study White Dwarf-based Supernovae – The Interesting ‘Type Ia’s’?

Astrophysicists, many who are colleagues of Piro, use Type Ia supernovae to measure the expansion of the universe. The impetus for this was a breakthrough in 1998, when astronomers introduced a model to predict how bright a supernova would appear at any given distance. By recording forty-eight Type Ia supernovae in one study [6] and matching them up with redshifts, they hoped to find out how much the universe’s expansion was slowing. The redshift readings revealed a huge surprise – the expansion rate for distant supernovae was lower than the expansion rate for closer supernovae. This meant that the universe’s galaxies were flying apart from each other at a faster rate as time went on. Researchers suggested there must be a ‘dark energy’ that permeates the universe and that has overcome the force of gravity.

So, while theorists are puzzling over what this all means for their understanding of the universe, measurements continue to be made while observing Type Ia Supernovae. Piro, and others

continued page 10

Type Ia Supernova *(from page 9)*

who are building up the Type Ia database, are fitting the pieces of the puzzle together, linking gravity and dark energy, and ultimately the fate of the Universe.

—Submitted by R.K. Koslowsky, SCAS member

Notes:

[1] Dr. Tony Piro's research is in the field of theoretical astrophysics, focusing on the properties of accreting compact bodies such as neutron stars and white dwarfs. Some of the topics he has investigated are low mass x-ray binary evolution and accretion stability, non-radial mode spectrum and stability on rotating neutron stars, and interactions between accretion disks and white dwarf surfaces. More recently, he has been interested in Type Ia supernovae and mergers of compact objects, and the interesting nucleosynthesis that powers these events. These astrophysical "laboratories" allow for the exciting prospect of studying a wide variety of fields in physics (including gravity, fluid dynamics, magnetic fields, and condensed matter) in extreme physical environments, many of which cannot be replicated in experiments on Earth. He says, I don't use Type Ia supernovae to measure the expansion of the Universe, but my colleagues do. My research is more focused on the progenitors of the explosions and the actual burning during the explosion.

[2] More on the H-R diagram: <http://www.astronomy.ohio-state.edu/~pogge/Ast162/Unit1/hrdiag.html>

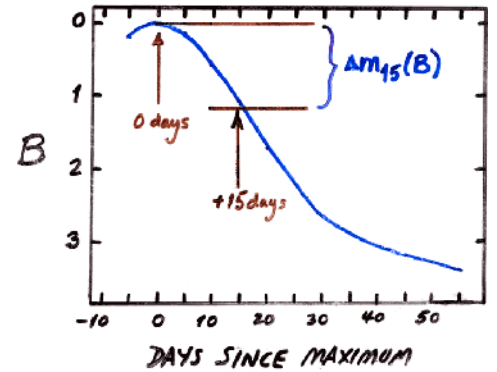
[3] When a star is finished consuming its helium and producing carbon it isn't quite hot enough to be able to burn the carbon it created. Since the star isn't hot enough to ignite the carbon in its core, it succumbs to gravity once again. As the core of the star contracts, it causes a further release of energy that makes the envelope of the star expand. The star will not be very stable at this point and will lose mass. This continues until the star finally blows its outer layers off, as shown by the Ring Nebula image above. The core of the star, however, remains intact, and this remnant becomes a white dwarf.

[4] If a white dwarf gradually accretes mass from a binary companion, the general hypothesis is that its core will reach the ignition temperature for carbon fusion as it approaches the limit. Eventually its temperature will rise past the nuclear fusion ignition point. Within a few seconds of initiation of nuclear fusion, a substantial fraction of the matter in the white dwarf undergoes a runaway reaction, releasing enough energy to unbind the star in a supernova explosion. Note that carbon burning doesn't take place throughout the whole time the white dwarf is accreting from another star. The burning ignites rather suddenly, once the center reaches a sufficiently high temperature and density. Note also that once the carbon is ignited in a white dwarf, the star doesn't actually explode right away. Instead, the center of the star boils (or convects) for about 1,000 years. Only after this period of convection, where the central core is increasing in temperature, does the explosion finally begin. This then destroys the white dwarf in few seconds.

[5] There are many kinds of novae: dwarf, classical, luminous blue, and red. Piro, with another tongue-in-cheek comment, claims that these are "not exciting." Since the 1980s, the classification of supernova has evolved. Currently, there are supernova of Type I and Type II. The Type I have no hydrogen gas while the Type II have hydrogen gas present. The Type II supernovae go by sub-names such as IIP, IIL, and IIn and they eventually form neutron stars. The hydrogenless Type I supernova are designated with sub-names such as Ic (also no helium), Ib (with helium), and the Ia (with silicon, but no helium). Piro claims the latter are the interesting, exploding white dwarfs. Spectra are used to classify the many supernovae detected across the cosmos.

[6] <http://arxiv.org/abs/astro-ph/9812133>. 1998 was the year

it was announced that dark energy was inferred from Type Ia supernovae observations. The width-luminosity relation (or the Phillips relation as it's called) was discovered earlier. This is the relationship between the peak luminosity of a Type Ia supernova and the speed of luminosity evolution after maximum light, a curve used by researchers who authored papers like the one here.



Reference:

[1] A very good narrative describing the process for a Type Ia supernova to occur is found in Robert P. Kirshner's *The Extravagant Universe: exploding stars, dark energy and the accelerating cosmos* (2002). Chapter 2 entitled *Violent Agents of Cosmic Change* is particularly helpful.

Interesting Links

Photopic Sky Survey: Nick Risinger endured a lot of hard weather to photograph the entire Milky Way from different points on the Earth. This survey is a 5,000 megapixel photograph of the entire night sky stitched together from 37,440 exposures. Then he created a wonderful interactive tool we can all use from our browsers. Enjoy! And thank you, Nick! <http://skysurvey.org/>

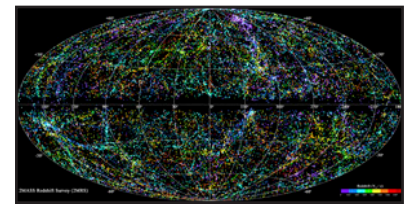
Total Eclipse June 15: We can't see it here in the US, but a guy named Larry created created this animation as a visual way to understand what's happening (scroll down to the third item): <http://shadowandsubstance.com/> Isn't it just amazing what people will create to share their enthusiasm?

The Space Place for Kids has been redesigned. There are games, activities, fun facts and portals to particular areas of interest: <http://spaceplace.nasa.gov/>

NASA Images: NASA has made available for the public a new online collection of images of our solar system and locations on Earth where astrobiology researchers travel to conduct field research. Called "From Earth to the Solar System," or FETTSS, the images showcase the excitement of planetary exploration and the journey to understand the origin and evolution of the solar system, and the search for life elsewhere. Images may be downloaded and displayed with the proper photo credit: <http://fettss.arc.nasa.gov/collection/>

3-D Map of our Universe:

Astronomers have created the most complete 3-D map of our local universe, revealing new details about our place in the cosmos.



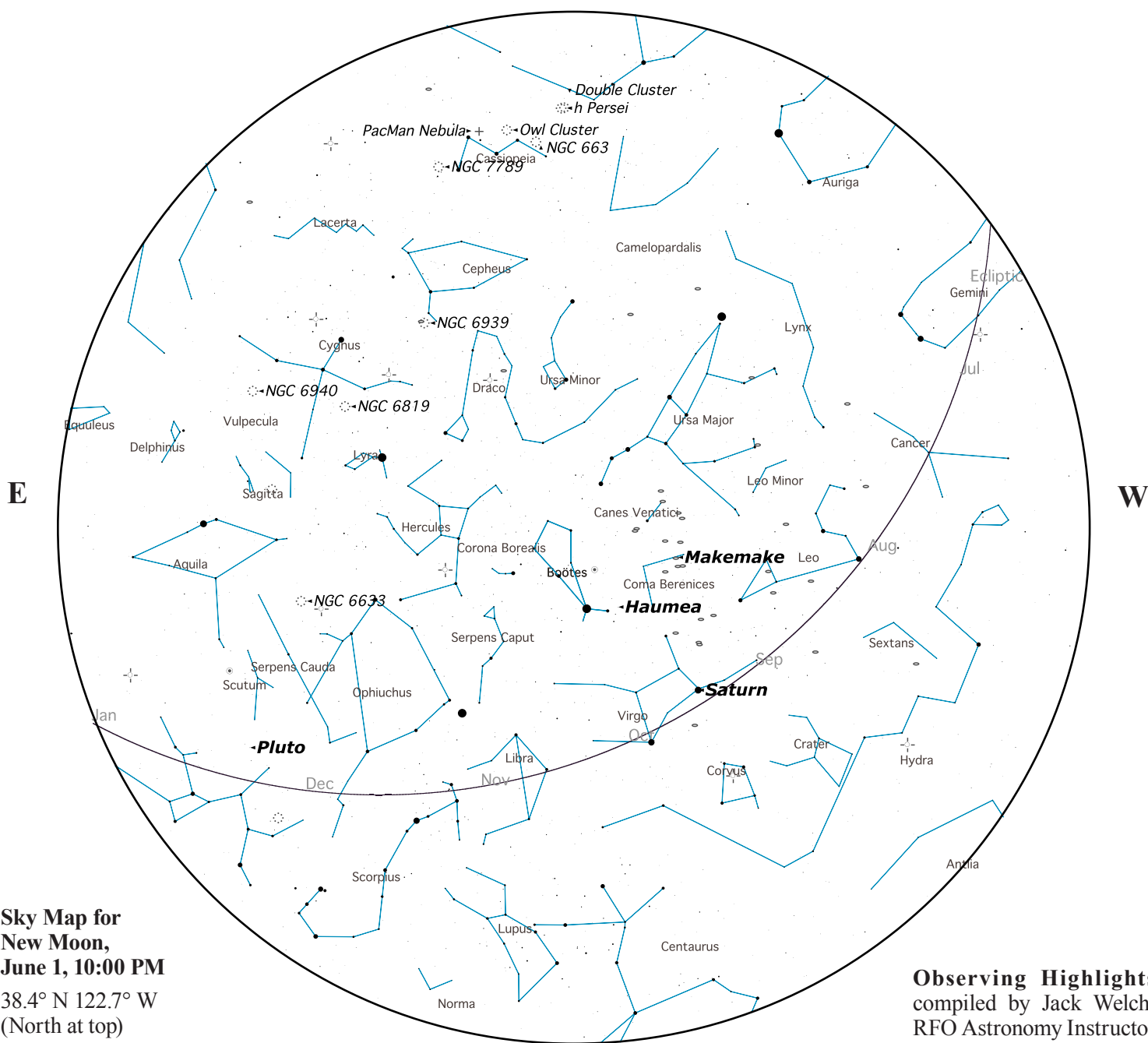
The map shows all visible structures out to about 380 million light-years, which includes about 45,000 of our neighboring galaxies (the diameter of the Milky Way is about 100,000 light-years across). <http://www.space.com/11781-3d-map-universe-photo-revealed.html>

June 2011 Observing Highlights

- 6/1 Saturn near Porrima through 5/21. Saturn is very near the bright star Porrima (gamma Virginis) for about 3 weeks.
- 6/1 New Moon, 14:00
- 6/2 1.8% Crescent Moon, 5° altitude 25° north of due west at 21:00
- 6/13 Saturn stationary, 22:00. Saturn ends retrograde motion
- 6/21 Summer Solstice is at 10:16
- 6/23 Mercury in West through 7/28. Mercury provides its best evening apparition of the year. Look for it 30 minutes

after sunset (or shortly after 9:00pm). It is brightest early in this period and fades quickly starting around 7/20. Low to the horizon at the start, it climbs quickly each night reaching maximum altitude on 7/8 (about 10° 30 minutes after sunset).

- 6/26 Crescent Moon near Jupiter, 03:30
- 6/27 Pluto opposition, 23:00, mag 14.1 in Sagittarius
- 6/28 Crescent Moon near Mars & M45, 04:30. During mid-twilight the crescent moon will lie between M45 (above) and Mars (below).



**Sky Map for
New Moon,
June 1, 10:00 PM**
38.4° N 122.7° W
(North at top)

Observing Highlights
compiled by Jack Welch,
RFO Astronomy Instructor

June 2011

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
5	6	7	<div style="display: flex; justify-content: center; align-items: center;"> 1 </div> <div style="font-size: 0.8em; margin-top: 5px;">Saturn near Porrima</div>	<div style="display: flex; justify-content: center; align-items: center;"> 2 </div> <div style="font-size: 0.8em; margin-top: 5px;">1.8% Crescent Moon</div>	<div style="display: flex; justify-content: center; align-items: center;"> 3 </div>	<div style="display: flex; justify-content: center; align-items: center;"> 4 </div> <div style="color: #800000; font-weight: bold; margin-top: 5px;"> RFO Pubic Observing Solar: Noon-4 Night: 9PM > </div>
12	13	<div style="display: flex; justify-content: center; align-items: center;"> 8 </div> <div style="color: #800000; font-weight: bold; margin-top: 5px;"> SCAS Meeting 7:30 PM </div>	<div style="display: flex; justify-content: center; align-items: center;"> 9 </div>	<div style="display: flex; justify-content: center; align-items: center;"> 10 </div>	<div style="display: flex; justify-content: center; align-items: center;"> 11 </div>	
19	20	<div style="display: flex; justify-content: center; align-items: center;"> 14 </div> <div style="color: #800000; font-weight: bold; margin-top: 5px;"> RFO Night Sky Class 7:30 PM </div>	<div style="display: flex; justify-content: center; align-items: center;"> 15 </div> <div style="color: #800000; font-weight: bold; margin-top: 5px;"> SCAS Member Night at "Beyond" Exhibit 7:30-9:00 PM </div>	<div style="display: flex; justify-content: center; align-items: center;"> 16 </div>	<div style="display: flex; justify-content: center; align-items: center;"> 17 </div>	<div style="display: flex; justify-content: center; align-items: center;"> 18 </div>
26	27	<div style="display: flex; justify-content: center; align-items: center;"> 21 </div> <div style="font-size: 0.8em; margin-top: 5px;">Summer Solstice</div>	<div style="display: flex; justify-content: center; align-items: center;"> 22 </div>	<div style="display: flex; justify-content: center; align-items: center;"> 23 </div> <div style="font-size: 0.8em; margin-top: 5px;">Mercury in West through 7/28</div>	<div style="display: flex; justify-content: center; align-items: center;"> 24 </div>	<div style="display: flex; justify-content: center; align-items: center;"> 25 </div> <div style="color: #800000; font-weight: bold; margin-top: 5px;"> RFO Pubic Observing Solar: Noon-4 Night: 9PM > </div>
<div style="color: #800000; font-weight: bold; margin-bottom: 5px;"> RFO Observing Lab 7:30 PM </div> <div style="font-size: 0.8em;">Crescent Moon near Jupiter</div>	<div style="display: flex; justify-content: center; align-items: center;"> 28 </div> <div style="color: #800000; font-weight: bold; margin-top: 5px;"> RFO Night Sky Class 7:30 PM </div> <div style="font-size: 0.8em; margin-top: 5px;">Pluto Opposition</div>	<div style="display: flex; justify-content: center; align-items: center;"> 29 </div> <div style="font-size: 0.8em; margin-top: 5px;">Crescent Moon near Mars</div>	<div style="display: flex; justify-content: center; align-items: center;"> 30 </div>	<div style="display: flex; justify-content: center; align-items: center;"> 31 </div>	<div style="display: flex; justify-content: center; align-items: center;"> 31 </div>	

See Pages 4-6 for more detailed information on events.

SCAS Membership Application/Renewal

Annual Membership dues are \$25 due June 1.
(New members joining after Nov. 30 pay \$12.50)

Please complete this form and give to the Membership Director or a Board member with your check, payable to "SCAS," at the next meeting, or mail your dues to: SCAS, P.O. Box 183, Santa Rosa, CA 95402-0183.

New Renewal Family (no extra charge)

Name(s): _____

Email: _____
(Required for *Sonoma Skies*)

Address: _____

City/State/Zip: _____

Telephone: _____

I am interested in serving in one or more of these areas:

- School Star Parties SCAS Board
 Newsletter Striking Sparks
 Mentoring Young Astronomers
 Yosemite Star Party Other _____

New Members please note interests and hobbies you would like us to know about:

New Members please share your reason(s) for joining SCAS, and how you heard about the club:

Your dues include our monthly newsletter *Sonoma Skies*, membership in the Astronomical League and its *Reflector* magazine, discounted subscriptions for *Sky and Telescope* and *Astronomy* magazines, great guest speakers at our monthly meetings, the annual Star-B-Que, and opportunities to meet new and interesting people who share your passion for the night sky and many aspects of astronomy and science.

Welcome to the SCAS!

Sonoma County Astronomical Society (SCAS)

Membership Information

Meetings: 7:30 PM on the second Wednesday of each month, in the Multipurpose Room of Proctor Terrace Elementary School, 1711 Bryden Lane at Fourth Street, Santa Rosa, unless otherwise announced in this publication. The public is invited.

Dues: \$25, renewable June 1 of each year. New members joining between December 1 and May 31 pay partial-year dues of \$12.50.

Star Parties: See the Events section for dates and times.

Rental Telescope: Members are eligible to borrow the club's 80mm refractor with tripod. Contact any Board member listed below.

Egroup URL: Connect with other members about going observing, observing reports and chat about astronomy and news items from AANC and *Sky & Telescope*. Hosted by Keith Payea at kpayea@bryantlabs.net. Any SCAS member is welcome to join. Visit <http://groups.yahoo.com/group/scas> and click the "Join" button, or send an email to scas-subscribe@yahoo.com

Discount Subscriptions: For *Sky & Telescope*, new subscribers may send a check for \$32.95 payable to "SCAS", with your complete mailing address, directly to: Larry McCune, 544 Thyme Place, San Rafael, CA 94903. Once you have received the discount rate, you may renew your subscription by sending your personal check with the renewal notice directly to Sky Publishing. Discount subscriptions to *Astronomy* Magazine occur annually in October. Check *Sonoma Skies* for details.

Library: SCAS Librarian David Simons hosts a library of astronomy books that may be checked out by members at SCAS meetings, to be returned at the next meeting. Videotaped lectures on astronomy may be rented for \$3 per month.

Sonoma Skies is the monthly newsletter of the Sonoma County Astronomical Society (SCAS). Subscription is included as part of membership. Articles and member announcements are welcome and are published on a first come, first served basis, space permitting, and may be edited. **The deadline for submissions is 7 days prior to the end of each month.** Mail to: Editor, SCAS, P.O. Box 183, Santa Rosa, CA 95402, or email publications@sonomaskies.org

SCAS Elected Board

- President:** Len Nelson 763-8007 lennelsn@comcast.net
Vice-President & Program Director: John Whitehouse 539-5549
jmw@sonic.net
Treasurer: Larry McCune, (415)492-1426 llmccune@comcast.net
Secretary: Eric Swanson, 762-3118 emswanson@comcast.net
Membership Director: Mike Dranginis 523-4373
mike880@comcast.net
Director of Community Activities: Lynn Anderson 433-1154
astroman@sonic.net
Publications Director: Cecelia Yarnell 569-9663
publications@sonomaskies.org

SCAS Appointed Positions

- Striking Sparks Program Coordinator:** Larry McCune
(415)492-1426 llmccune@comcast.net
Amateur Telescope Making: Steve Follett 542-1561
follett@sonic.net
Librarian: David Simons 537-6632 davidsimons@planetatm.com

Visit us on the web at:
www.sonomaskies.org