

Sonoma Skies

Newsletter of the Sonoma County

A nonprofit scientific and

www.sonomaskies.org



Astronomical Society

educational organization

July 2005

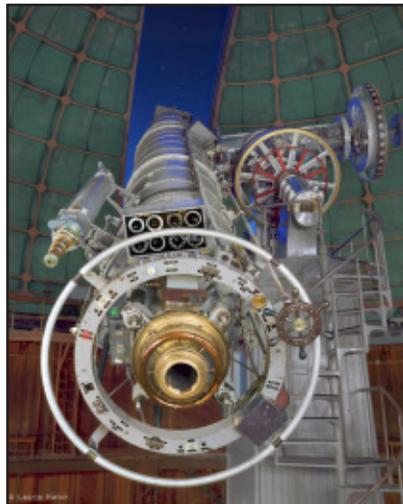
Volume XXVIII No. 6

Lick Observatory From the Frontier to the Future of Astronomy

SCAS July 13 Meeting, Proctor Terrace School

Although it may seem to have been lost in the glare of the “glamorous” observatories like Keck, or lost in the glare of San Jose’s urban (b)light, Lick Observatory continues its long tradition of shining in its own way. From gathering its first light to utilizing the latest, cutting edge tools to whittle clues from shards of starlight, Lick has been in the forefront for the astronomical community for 125 years. It has a fascinating history of scientific discovery as well as being the center of an interesting community.

Our program for the July meeting will feature the above-titled program presented by a brother/sister team with a long association and enthusiasm for Lick Observatory. Brother Sandy Bumgarner has a degree in astronomy, and worked at Lick in the 1960’s, and now teaches astronomy at a community college and works as a computer and electronics engineer. But for fun he enjoys doing CCD work studying lunar and astroidal occultations.



©Laurie Hatch & Smithsonian Institution

Mt. Hamilton resident Laurie Hatch captured this image of the The Great Lick 36-inch Refractor. The blue colors are “true,” not digitally enhanced.

Sister Jo Dempsey spent her childhood on Mt. Hamilton at the observatory. Her father was a director there, and her mother was a teacher for the children of the astronomers who lived on the mountain before UC Santa Cruz took over operation of the facility. That was in the days before WiFi remote observatories doing CCD work or some other exotic sensors replaced astronomers working their craft with cold hands, in the dark, on film. In those days the scientists lived at the site. She now teaches geology and astronomy at Analy High School, and is active with the Planetary Society. I have known her for years when she was a flight instructor in her own airplane and taught ground school at the JC.

DECISION TIME FOR STRIKING SPARKS 2006

by Dickson Yeager

At the June meeting I brought the members up to date on the SCAS Board’s thoughts regarding the future of the Striking Sparks program. As most of you know, March 19, 2005 marked the 20th year and 200th telescope awarded by the Striking Sparks program. Now, the question is where do we go from here?

Astronomy has changed a lot since 1985, when a telescope of any quality was hard to come by at a reasonable price. Today one can obtain a quality 6” reflector telescope on a Dobsonian mount for around \$250, or a 4.5” for under \$200. So the discussion at the last two SCAS board meetings has centered on the question of whether to continue making or to buy the 2006 Sparks telescopes.

It is hard to let go of the past. Those involved in the building of the telescopes have many fond memories. However, when one looks at the facts, it is hard to argue that we should continue to build the scopes. Not enough members are interested in working on them, especially the mirror grinding. Also, the hand-built scopes weigh 44 lbs., making them hard to lug around. By comparison, a purchased 6” Dobsonian reflector weighs around 34 lbs. and a 4.5” scope made especially for kids weighs about 17 lbs. It is, therefore, the Board’s choice to purchase the 2006 Striking Sparks telescopes and I, as the Striking Sparks Coordinator, am in agreement.

There will be time scheduled at the July meeting for discussion and a membership vote on the matter. Please feel free to contact Board members or me if you have questions. Our phone numbers and email addresses appear on page 2, lower left of this newsletter.

Lick has been at the forefront for observational astronomy starting with the 1881 Venus transit. In addition to accumulating a collection of magnificent instruments through the years, it now continues to be on the forefront for new technologies, like adaptive optics. Plus, it is a lovely place.

They gave their presentation at the Riverside Telescope Makers Conference this year, where it was well received. They will bring their program “home” to us here in Sonoma County, bringing an often first-hand account of the place, the history, the people, and the direction of Lick Observatory. Come join us for this inside look at the July SCAS meeting.

—John Whitehouse

Young Astronomers: See page 6

Sonoma Skies

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 the last Wednesday of each month.** Mail to: Editor, SCAS, P.O. Box 183, Santa Rosa, CA 95402, or email Editor: Cecelia Yarnell, ceceliay@sbglobal.net

SCAS Membership Information

MEMBERSHIP MEETINGS: 7:30 PM on the second Wednesday of each month, in the Multipurpose Room of Proctor Terrace Elementary School on Bryden Lane near Fourth Street in 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 may pay partial-year dues of \$12.50.

SCAS STAR PARTIES: See the Events section for dates and times. The Geysers observing site is locked to public access. For use during monthly star parties, SCAS members may obtain the combination to the gate lock at the site by contacting any board member listed below.

RENTAL TELESCOPES: Members are eligible to borrow telescopes for a \$10 per month donation, or **FREE** each month you participate in a SCAS-related Public Star Party. Five telescopes are available: 8" and 5" Celestron SCTs, 8" and 12.5" Newtonians on Dobsonian mounts; and an 80mm refractor. Contact Joan Thornton at 707-762-0594.

SCAS EGROUPE URL: Any SCAS member is welcome to join. Hosted by Robert Leyland at r.leyland@verizon.net the majority of traffic is about going observing, observing reports and astronomy-related news. We get news items from AANC and Sky & Telescope and chat about astronomy. To join, either 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 Magazine*, 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. For renewals, send him your check with the completed renewal card and return envelope. Discount subscriptions to *Astronomy Magazine* occur annually in October. Check *Sonoma Skies* for details.

LIBRARY: SCAS Librarian Joan Thornton 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.

SCAS Elected Board

President: Keith Payea, 566-8935, kpayea@bryantlabs.net

Vice-President & Program Director: John Whitehouse, 539-5549, jmw@sonic.net

Treasurer: Larry McCune, (415)492-1426, llmcune@comcast.net

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Membership Director: Walt Bodley, 823-5268, wbodley@sonic.net

Community Activities Director: Len Nelson, 763-8007, lennelsn@comcast.net

Publications Director: Cecelia Yarnell, 569-9663, ceceliay@sbglobal.net

SCAS Appointed Positions

Amateur Telescope Making: Steve Follett, 542-1561, stollett@sonic.net

Young Astronomers Advisor: Gary Jordan, 829-5288, SieraMolly@aol.com

Striking Sparks Program Coordinator: Dickson Yeager, 539-2385, deep6@sonic.net

Librarian: Joan Thornton, 762-0594, phonyjoanie@earthlink.net

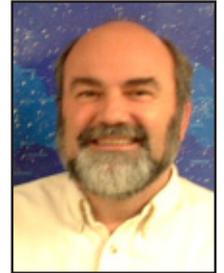
Public Star Party Coordinator: Bruce Lotz, 576-7833, ablotz@sonic.net

www.sonomaskies.org

Science, Astronomy and Other Joys

by Keith Payea

In my last column I talked about moving up from "Viewing" to "Observing" and the ways that doing so can not only make astronomy as a hobby more enjoyable, but also allow you to contribute to real science. Well, as you might know by now, I consider myself an Amateur Scientist and not simply an Amateur Astronomer. I have my own seismometer and I'm currently working on a couple of Radio Astronomy projects. I got started doing this many years ago from reading the "Amateur Scientist" column in *Scientific American*. Sadly, *SA* dropped that column from their monthly lineup, but you can buy all of the columns on a CD-ROM collection.



Ten years ago a group of amateur scientists who followed the column over the years got together and formed the Society for Amateur Scientists (SAS). They have a nice web page full of resources, including the CD-ROM I mentioned above, at www.sas.org. They have an on-line newsletter and many great links to information about amateur science. Topics in the most recent newsletter range from Geology and Biology to Chemistry and Meteorology. All experiments and observations made by amateurs in their spare time.

Another Amateur Scientist web page I ran across lately is at <http://laestrellitaobservatory.com/index.html>. This site is run by Raul Alvarez where he explains his efforts to measure the world around him and shares his results on the web. He has an interesting background and looks like he's having a lot of fun. Definitely read the pages under the link "The Making of a Geek", where he has some scans of newspaper articles about his early Science Fair entries. I envy his location, lots of room in the Colorado high country. Land doesn't cost a million dollars an acre there!

You don't have to be a career engineer like me to be able to try some of these experiments. Many can be accomplished with a few items from the hardware store or drug store and a few spare hours. For instance, if you have a computer with a sound card you can connect a spool of wire to the microphone input, run some free software and observe all kinds of atmospheric electrical effects.

If you have the inclination, you can teach yourself all kinds of new things.

SOCIAL AMENITIES

Thanks to John Whitehouse for providing refreshments at the June SCAS meeting in addition to all his fervent work on behalf of the SCAS and RFO. September remains open, so if you'd like to volunteer please call or email Cecelia Yarnell.

WE ARE SAD TO REPORT THAT MANY OF OUR MEMBERS HAVE YET TO RENEW THEIR MEMBERSHIPS. Dues were due on June 1st. **If you haven't paid your dues yet,** please send \$25 to SCAS, Box 183, Santa Rosa, CA 95402. You'll be glad you did.

LAGRANGE POINTS AND SUPERTUBES

by *Ralph Mansfield*

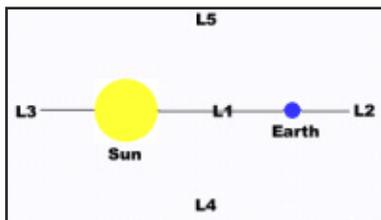
Space engineers have learned to generate spacecraft trajectories by consideration of the gravitation between the craft and one other body. For example, the trajectory for the Apollo lunar mission required the calculated effect of earth's gravity upon the craft at the start of the trip and the effect of the moon's gravity at the end. Both these interactions are considered a two-body problem, the only forces acting on them each other's gravity.

Newton solved the two-body problem in the 17th century by calculating that two bodies rotate about their common center of gravity. Space engineers add in the forces from the spacecraft's engines to create its trajectory. He learned that the paths obtained by this procedure have other effects and he was unable to solve the problem of three bodies influenced by their mutual gravity.

Mathematicians have simplified the three-body problem by restricting it to two massive bodies with the third one a spacecraft exerting negligible gravitational pull on the other two. Then, to visualize the effects, mathematicians plot the three bodies in a rotating coordinate system that turns along with the sun and earth, maintaining the sun and earth constantly at two fixed points.

During the 18th century, mathematicians Leonhard Euler and Joseph Louis Lagrange found that in this rotating frame there are five gravitational equilibria, now called Lagrange points, at which the opposing pulls on the third body balance so that it remains motionless.

Because the motion takes place in a rotating system, centrifugal force must be considered. Using a good astronomy textbook, one can determine that on a straight line through the sun and earth centers there are three Lagrange points (L1, L2 and L3).



The 5 Lagrange points for sun-earth

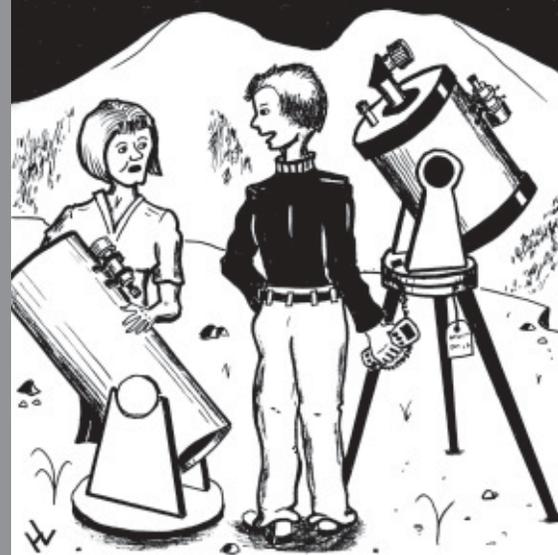
L2 lies between the sun and earth close to the sun; the other two lie on the far sides of the sun and earth. L4 and L5 are at the vertices of the two equilateral triangles established with the earth and sun centers as the other vertices of the triangle. L1, L2 and L3 are unstable equilibrium points; L4 and L5 are stable points—an object placed at one of them will stay fixed there.

Thus the Lagrange points have caught the attention of astronomers and space explorers. L1 affords an unobstructed view for sun-watching spacecraft, like the Solar and Heliospheric Observatory. At L2 a telescope looks away from the sun and earth and is a prime location for the Wilkinson Microwave Anisotropy Probe that measures the cosmic background radiation. L3 is the favored site for imaginary Planet X on the opposite side of the sun and earth.

Applying mathematical chaos theory to the three-body problem demonstrates that two objects starting from nearly the same point can spiral off wildly into different regions of space. Despite the chaos, it's possible to organize paths through a three-body system into special surfaces. Thus in the late 1960s two mathematicians discovered a group of these special surfaces shaped like tubes that spiral in and out of orbit around the unstable Lagrange points. In 2000 it was shown that these tubes wind chaotically through space, a great boon for designing spacecraft trajectories. Near a Lagrange

The Astronomer's Seminar

by Herb Larsen



Hey! This computerized telescope I got for Father's Day doesn't work! When I punch in the "Orion Nebula," it points at the ground.

WELCOME, NEW MEMBERS!

The SCAS is happy to welcome our newest members: Kay Lambert and John Roush.

A reminder to pay your dues for the 2005-06 membership year. Avoid annoying reminders — send your check right away!

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 the Striking Sparks project by donating merchandise for the awards. He offers a huge selection of telescopes, accessories and more.

Obtain a receipt from Walt Bodley, 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 sanfrancisco@scopecity.com

point a spacecraft can use a tiny thrust to hop between tubes leading off in different directions.

The tubes create the freeways of interplanetary superhighways, and the five Lagrange points are a small part of the entire project. The restricted three-body problem applies not only to the sun-earth pair but also to earth-moon, sun-Jupiter and other solar pairs.

Events

ROBERT H. FERGUSON OBSERVATORY

Public Viewing: Saturdays, July 9, July 30

Solar Viewing: 12:00 AM - 4:00 PM

Night Viewing: Begins 8:30 PM

Antares Occultation, July 17, 7:00 PM -

Special event for viewing lunar occultation of Antares. The occultation is from about 8:09 PM (before sunset) to 8:59 PM. General public is welcome, but main focus is for persons bringing their own observing equipment. Binoculars recommended for persons without scopes. There may be some general observing after the occultation, as participants see fit. Docents will provide technical details for observers and general explanation for public. Attendees with scopes must arrive before 7:00 PM to access setup area with their vehicles.

The Observatory: Three scopes are operating: The 14-inch SCT with CCD camera in the East wing, the 8-inch refractor under the dome and the 24-inch Dobsonian in the West wing. No admission fee for the solar viewing, but donations are appreciated. The Park charges \$6 per vehicle for entry. A \$2 donation is requested from adults 18 and over for admission to the observatory during night viewing sessions.

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.

Classes

July 12 Night Sky Summer Series, 7:30 PM

Aug. 2 Night Sky Summer Series, 7:30 PM

Classes are held at the Observatory. Reservations recommended. Info: (707) 833-6979, <http://www.rfo.org> or email nightsky@rfo.org

A SIDEWALK ASTRONOMER

**A film about astronomy, cosmology and John Dobson
Opens July 15 at San Francisco's Roxie Cinema**



On any given night around the world, thousands of people peer into deep space because of John Dobson. An 89-year-old with a white ponytail and a knack for comedy, he is the inventor of the Dobsonian telescope mount, which made telescopes accessible to the public on every continent. A former Vedanta monk of the Ramakrishna Order, he is a cofounder of

"Sidewalk Astronomers." The film follows John as he tours the country from San Francisco to Vermont.

Information: www.telescopepictures.com. The Roxie Cinema is located at 3117 16th Street, San Francisco, (415) 863-1087

SCAS PUBLIC STAR PARTIES

These are public events—all are invited. Members with scopes are encouraged to attend.* Great for planetary astronomy with fellow observers at an easily accessible site.

SATURDAY, JULY 9

Sunset: 8:37 PM PDT

End Astronomical Twilight: 10:31 PM PDT

Moonset: 10:58 PM PDT

SANTA ROSA: Youth Community Park in Santa Rosa, on the west side of Fulton Road, between Guerneville Road and Piner Road, just opposite Piner High School. Contact: Bruce Lotz, Coordinator (707) 576-7833, ablotz@sonic.net

HEALDSBURG: Healdsburg Square, corner of Healdsburg Ave. and North St. between 8:00 and 10:00 PM. Contact Bob Schalck at lensmaker@ap.net

***Note!** Rental telescopes listed on Page 2 are *free* each month you participate in a SCAS-related Public Star Party.

UC BERKELEY ASTROPHYSICS CLUB

Institute for Particle Astrophysics Journal Club Seminars

The following Journal Club schedule for the Institute for Nuclear and Particle Astrophysics is tentative. The seminar becomes final usually a few days before the Friday of the talk!

July 15—Lloyd Knox (UC Davis) Speaking on cosmic shear

July 22—Joshua Bloom (UCB) Speaking on GRBs and cosmology

July 29—Steve Boggs (UCB/SSL) Speaking on last year's massive solar flare

August 5—Reyco Henning (LBNL/INPA) Speaking on Majorana

About the Club: All seminars are on Fridays (unless otherwise noted) and start at 12:00 (noon) with a brief presentation of the weekly scientific news. Typically the talks end by 13:00. The seminars take place in Bldg. 50, room 5026 (the INPA common room), Lawrence Berkeley National Laboratory, 1 Cyclotron Rd., Berkeley. If you have questions, comments, or suggestions please contact, preferably via email, Vitaliy Fadeyev VAFadeyev@lbl.gov. To read abstracts on the talks, visit: <http://stokstad.lbl.gov/INPA/journalclub.html#aboutjclub>

SCAS YOSEMITE PUBLIC STAR PARTY

July 15 and 16

As of this writing, the SCAS Yosemite trip is completely booked. A big thanks goes to all who are participating in this public service.

Events

THE GEYSERS STAR PARTIES

Excellent dark sky observing at ~2700' for members and guests.

Location: Palmieri Observatory, Mercuryville (near The Geysers). Longitude: 122deg 49min., Latitude: 38deg 46min.

SATURDAY, JULY 9

Sunset: 8:37 PM PDT

End Astronomical Twilight: 10:31 PM PDT

Moonset: 10:58 PM PDT

Dress warm. If it's your first time to the Geyser site, go with someone who has gone before, or contact Mario Zelaya at (707) 539-6423, zelayadesigns@sbcglobal.net

MT. TAMALPAIS ASTRONOMY

Saturday, July 9, 8:30 PM

"Postcards From Saturn," Dr. Mark Showalter of the SETI Institute. Cassini Explores the Lord of the Rings: An update on the latest and greatest results from the Cassini Spacecraft, revealing wonders of the Saturn's rings, moons and clouds.

Presentations held in the Mountain Theatre. Viewing afterwards in Rock Springs Parking Area, provided by San Francisco Amateur Astronomers. The Madrone Picnic Area (next to the Mt. Theater) is reserved 1-1/2 hours before each program for informal gathering. Bring your picnic supper and meet the speakers before the talk. Information: <http://www.mttam.net/>

LICK OBSERVATORY

MUSIC OF THE SPHERES CONCERTS

Lick Observatory presents a summer concert series to benefit the Lick Observatory Visitors Program. Seating begins 1/2 hour before the concert. Talks by our famous research astronomers begin right after the music. Viewing through the 36-inch telescope follows. Amateur astronomer volunteers provide additional outside viewing. Not advisable for children under ten years old.

July 29 (Friday) 8:00 PM: Broceliande plays Celtic music from the British Isles and the Medieval and Renaissance music of the European castles and countrysides. **Talk:** TBA

July 30 (Saturday) 8:00 PM: Tingstad & Rumbel perform music of nature and grace. The skillful combination of a single guitar and woodwind produces music that is both intimate and grand in scope. Talk: Alex Filippenko, "Dark Energy and the Runaway Universe"

Tickets: Order soon! Only 160 seats are available each night. Concerts sell out quickly. Information : <http://www.ucolick.org/public/music.html>

Lick Observatory's website homepage links to their other programs, at www.ucolick.org



Folks and scopes from last year's gathering

SCAS Star-B-Que August 6

Come to the SCAS Annual Star-B-Que at the Robert Ferguson Observatory in Sugarloaf Ridge State Park! Get to know your fellow astronomers and their families in daylight! After dark there will be a sky tour, pointing out the different constellations and many interesting features and names in our Summer Sky.

It's a good time for beginners to get help learning the sky or using a telescope. Striking Sparks winners can get help adjusting their new telescopes. Bring your scope and its instruction manual, your planisphere, and a list of questions you'd like to ask.

Times and what to bring: We are allowed in at noon. Solar viewing will begin at 2 PM. The barbecue fire will be started about 5 PM so we can begin cooking around 6 PM. SCAS will provide the barbecue fire and marshmallows. You bring food to barbecue, a favorite potluck dish to share, other food, drinks and utensils, red cellophane for your flashlight, and a measure of good cheer.

To camp overnight: Immediately around the Observatory is the Group Campground parking area, campsites, running water, large barbecue pits, and outhouses. You may camp overnight (no RV hookups). Everyone must leave by noon Sunday. Please remember the Star-B-Que is for SCAS and YA members, Striking Sparks winners, their families and a few guests.

Directions to Sugarloaf Ridge State Park: Take Hwy. 12 from Santa Rosa toward Sonoma. Turn left onto Adobe Canyon Rd. just before you reach Kenwood. It is 8.6 miles from Fourth and Farmer's to the Adobe Canyon Rd. turnoff. From Sonoma, it's a right turn after Kenwood. The Park is 3.4 miles farther.

Fees and Parking: At the Park entrance kiosk, identify yourself as part of the Sonoma County Astronomical Society headed for the Star-B-Que at the Observatory. There will be no individual fees. Pets must be kept on a leash, with a \$1.00 charge for each animal. Parking is limited, so carpool if possible. To minimize jarring white light from backup lights after dark, please park by backing in. Park close together, with just enough room to open your door. Parking on pavement is prohibited. If you arrive after 8:30 PM, or if campground parking is full, park next to the group campsite entrance gate, about 100 yards away.

Call Len Nelson at 763-8007 or email lemelsn@comcast.net if you have questions. Hope to see you there!

Young Astronomers



Chaos in the Early Solar System

Once upon a time, many years ago, the giant planets in our solar system took different paths around the sun than they follow now. Jupiter, Saturn, Uranus, and Neptune were once bunched together closer to the sun, says an international team of scientists. Under the influence of gravity, the planets broke out of their original orbits and began violently rearranging the outer solar system. It's "a fairy tale of the early solar system," says Hal Levison. He's a planetary scientist with the Southwest Research Institute in Boulder, CO, and one of the researchers who developed a computer simulation of the planets' movements.

As the scientists tell it, the tale starts a few million years after the solar system's birth. At first, the four giant planets had compact orbits. Neptune, for example, was only half as far away from the sun as it now. A slowly circulating band of ice, dust, and gas lay beyond these planets. Ice, dust, and gas might not seem like much of a match for huge planets. But researchers say that the pull of gravity between the particles and the planets caused the planets to gradually break out of their tight-knit group. Jupiter moved a bit closer to the sun, and the other three planets moved further away.



A new theory suggests that the four giant planets, shown here in their current orbits around the sun, were once much closer together.

All was peaceful in the solar kingdom until the orbits of Saturn and Jupiter aligned so that Saturn took exactly twice as long as its neighbor to go around the sun. The increased gravitational tug of the two planets acting together caused an avalanche of effects. Saturn's orbit changed shape slightly, which threw off the orbits of Uranus and Neptune. The orbits of these two planets started looking like squished ovals. At times, the two planets even crossed paths. They started hurtling through the band of ice, dust, and gas, scattering the debris throughout the solar system. The planets themselves ended up in their current orbits.

In the meantime, some of the scattered material became trapped around Jupiter. This could account for the presence of objects, known as the Trojan asteroids, that both lead and trail the planet. Some of the debris could have been flung closer to our home, slamming into the moon and the solar system's inner planets. This bombardment may have created the huge craters on the moon.

No one knows for sure whether all this really happened. But, by using computers to play complex games of "what if," scientists can get a better sense of what might have happened to create the solar system as we know it.—K. Ramsayer

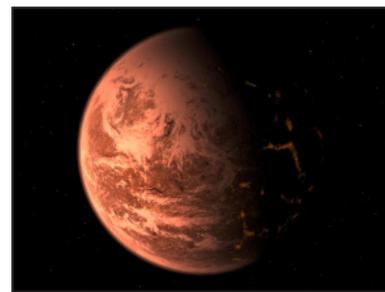
KECK FINDS MOST EARTH-LIKE PLANET OUTSIDE SOLAR SYSTEM

MAUNA KEA (June 13, 2005) Aloha. Data obtained at the W. M. Keck Observatory has resulted in the discovery of the most Earth-like world to ever be discovered.

The discovery centers around the smallest extrasolar planet to ever be discovered and the first in a new series of rocky, terrestrial planets orbiting stars other than our sun. It took more than 150 observations of this star to obtain the necessary data for this result.

The newly-discovered planet orbits a red dwarf star named Gliese 876, which is just one-third the mass of the Sun, and is located about 15 light years from Earth.

This new planet is a very unusual world—more than seven times the mass of the Earth, orbiting its star in just two days at a distance of .021 astronomical units, less than one-tenth that of Mercury's orbit inside our own solar system.



This image shows an artist's impression of what a newly detected planet that could be Earth's closest cousin beyond the solar system might look like. Credit: Trent Schindler, NSF

Theoretical astronomer Jack Lissauer of NASA's Ames Research Center, and post-doctoral researcher Eugenio J. Rivera of UCO/Lick have been analyzing Keck data on the Gliese 876 system to model the unusual motions of the two known planets, and three years ago got an inkling that there might be a smaller, third planet orbiting the star. In fact, if they hadn't taken account of the resonant interaction between the two known planets, they never would have seen the third planet.

"We had a model for the two planets interacting with one another, but when we looked at the difference between the two-planet model and the actual data, we found a signature that could be interpreted as a third planet," Lissauer said.

A three-planet model consistently gave a better fit to the data, added Rivera. "But because the signal from this third planet was not very strong, we were very cautious about announcing a new planet until we had more data," he said.

Animations and Photos: <http://www2.keck.hawaii.edu/news/science/gl876/050613.html> More links at: http://www.exoplanets.org/index_gl.html and <http://exoplanets.org/>

YA INFORMATION

Meetings: None held during the summer. Meetings will resume in the Fall when the next school year begins. In the meantime, you are welcome to participate in SCAS events announced in this newsletter. You'll receive an email announcement in mid-August to remind you of the Fall YA schedule as the new school year resumes.

YA ELECTED OFFICERS

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ADULT ADVISER: Gary Jordan 829-5288

Moving a Mountain of a Dish

by Patrick L. Barry

Your first reaction: “That’s impossible!” How on earth could someone simply *pick up* one of NASA’s giant Deep Space Network (DSN) antennas—a colossal steel dish 12 stories high and 112 feet across that weighs more than 800,000 pounds—move it about 80 yards, and delicately set it down again? Yet that’s exactly what NASA engineers recently did. One of the DSN dishes near Madrid, Spain, needed to be moved to a new pad. And it had to be done gingerly; the dish is a sensitive scientific instrument full of delicate electronics. Banging it around would not do.

“It was a heck of a challenge,” says Benjamin Saldua, the structural engineer at JPL in charge of the move. “But thanks to some very careful planning, we pulled it off without a problem!”



Giant Deep Space Network antenna in Madrid is moved using four 12-axle, 24-wheel crawlers.

The Deep Space Network enables NASA to communicate with probes exploring the solar system. Because Earth is constantly rotating, a single antenna on the ground can communicate with a probe for only part of the day, when the probe is overhead. By placing large dishes at three locations around the planet—Madrid, California, and Australia—NASA can maintain contact with spacecraft around the clock. To move the Madrid dish, NASA called in a company from the Netherlands named Mammoet, which specializes in moving massive objects. (Mammoet is the Dutch word for “mammoth”).

On a clear day (bad weather might blow the dish over!), they began to slowly lift the dish. Hydraulic jacks at all four corners gradually raised the entire dish to a height of about 4.5 feet. Then Mammoet engineers positioned specialized crawlers under each corner. Each crawler looks like a mix between a flatbed trailer and a centipede: a flat, load-bearing surface supported by 24 wheels on 12 independently rotating axes, giving each crawler a maximum load of 194 tons!

One engineer took the master joystick and steered the whole package in its slow crawl to the new pad, never exceeding the glacial speed of 3 feet per minute. The four crawlers automatically stayed aligned with each other, and their independently suspended wheels compensated for unevenness in the ground.

Placement on the new pad had to be perfect, and the alignment was tested with a laser. To position the dish, believe it or not, Mammoet engineers simply followed a length of string tied to the pad’s center pivot where the dish was gently lowered.

It worked. So much for “impossible.”

Find out more at <http://deepspace.jpl.nasa.gov/dsn/>. Kids can learn about these amazing antennas and make their own “Super Sound Cone” at <http://spaceplace.nasa.gov/en/kids/tmodact.shtml>

July Observing Notes

- July 6 New Moon 5:02 AM
- July 7 Venus conjunct Mercury
- July 9 Mercury greatest elongation E (25°)
- July 11 Double Shadow Transit on **Jupiter** (Io, Europa) beginning 7:35 PM
- July 14 First Quarter Moon 8:02 AM
- July 17 **Antares** 6° S. of Moon, occultation from 8:08 PM to 8:59 PM; Mars at perihelion
- July 21 Full Moon 4:00 AM, at perigee (largest of 2005). Expect large tides.
- July 22 Venus 1.2° N of Regulus (29° E)
- July 24 Uranus 2° N of Moon
- July 27 Last Quarter Moon 8:19 PM, Mars 4° S of Moon
- July 30 Moon 0.6° S of **Pleiades** (M45)

OBSERVING TREATS

The Stargate asterism in Corvus is a small triangle within a large triangle, a real star party treat: RA 12h 35.7', Dec. -12°, 00'

The Meerschaum Pipe in Cygnus: RA 19h 51.45', Dec. +30° 05.14'

The Fairy Ring in Cygnus: Get out your widest field eyepiece to begin with. Its a biggie, composed of a number of double stars forming a large circle, with a pair of higher magnitude doubles in the center. Just lovely.

The Toadstool in Delphinus, found and named by Sue French of *Sky and Telescope* and now known as French 1: RA 21h 07.4', Dec. +16° 18'. Don’t forget to look at the beautiful pair of double stars in the Dolphin’s nose, Gamma Delphini.

(Thanks to SCAS member Linda Mahan for providing the above)

...And more summer treats. **SPARKS WINNERS, try these:**

M8 (Lagoon Nebula) in Sag. at RA 18h 03.3m, Dec. -24° 2'

M20 (Triffid Nebula) in Sag. at RA 18h 01.9m, Dec. -23° 01'

M13 (Great Hercules Cluster) at RA 16h 41.8m, Dec. 36° 26.8'

M51 (Whirlpool Galaxy) in Canes Venatici at RA 13.h 30.1m, Dec. 47° 10.8'

M7 (Ring Nebula) in Lyra at RA 18h 53.7m, Dec. 33° 2'

LINKS FEATURED THIS ISSUE

A new Supernova, known as 2005CS, has been discovered in M51, the Whirlpool Galaxy just south of the nucleus on 6/27. It is approximately 13th magnitude and rising. CCD imagers can start taking successive images and derive a light curve. More at: <http://www.supernovae.net/supernova.html#2005cs>

CCD info on flats & darks: <http://www.iceinspace.com.au/index.php?id=63,211,0,0,1,0>

“Where on Earth...?” **Mystery Image Quiz** from NASA SpacePlace: <http://www-misr.jpl.nasa.gov/>

The Emoticonstructor from NASA SpacePlace “evolves” a face to match your mood, just like computers evolved a new spacecraft antenna design using artificial evolution. <http://spaceplace.nasa.gov/en/kids/st5/emoticon/>

**Sonoma County
Astronomical Society**

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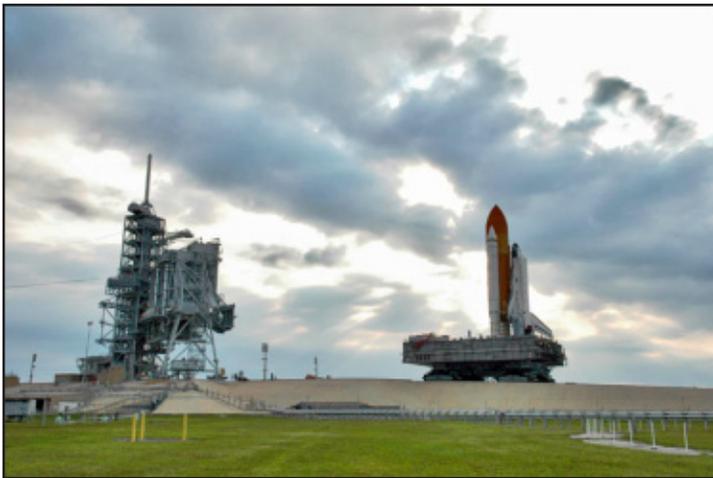
Sonoma Skies

July 2005

JULY 13

**Sandy Bumgarner
& Jo Dempsey
Lick Observatory**

***Reminder:*
It's Membership Renewal Time!**



NASA's Crawler/Transporter hauls the space shuttle Discovery's launch stack back to the Vehicle Assembly Building on May 26, 2005. Credit: NASA/KSC.

**WIDE LOAD: HAULING DISCOVERY
ONE CRAWL AT A TIME**

By Tariq Malik

As one team of shuttle engineers works to pry NASA's Discovery orbiter from its external tank, another is patiently waiting to fulfill its role as spaceship movers. Shuttle transport workers rely on a series of specialized vehicles to move orbiters and support hardware from place to place and ultimately to the launch pad at NASA's Kennedy Space Center in Cape Canaveral, Florida.

"We actually have three systems that maintain and operate, the biggest and most notable is the Crawler/Transporter and its [Mobile Launch Platform]," said Ray Trapp, crawler/transporter manager for shuttle contractor United Space Alliance, in a telephone interview. "It's not something that you'd jump in and turn the key and it starts."

"You've got a \$3 billion spaceship that you're carrying, so you have more of a feeling of responsibility," said Trapp, himself a crawler driver, of hauling Discovery to the pad. "And these guys have a lot of pride in what we do."

NASA's Discovery spacecraft is currently scheduled to launch no earlier than July 13 under the agency's STS-114 mission, its first shuttle flight since the 2003 Columbia disaster that killed seven astronauts and destroyed their orbiter during reentry.

Crawling toward launch

Standing up to 26 feet (eight meters) high at its tallest, NASA's two crawler vehicles are each 113 feet (34 meters) wide and 131 feet (40 meters) long. They carry a complement of 25 engineers and technicians under full operations and weigh up to 18 million pounds when capped with a shuttle launch stack and launch platform. A laser-guided docking system allows drivers position the massive load accurately within a quarter of an inch at the launch pad.

While its one mile an hour speed may seem slow for some, it's fast enough for Discovery.

Complete Coverage of Space Shuttle Return to Flight:
<http://www.space.com/returntoflight/>