

Sonoma Skies

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



www.sonomaskies.org

December 2005/January 2006

Volume XXVIII No. 10

Measuring Things, Part 2

with Jack Welch

SCAS December 14 Meeting, Proctor Terrace School

Those of you who attended last December's meeting should recall our own Jack Welch's program on astronomical measurements. His program covers the units, methods and tools astronomers use to measure the cosmos, determine their distances, speeds, temperatures, compositions and more. That is a tall order to adequately cover in one session, so this December's meeting he will present part 2 of "Measuring Things".

It could be argued that astronomy is the oldest of sciences. The very meaning of the word means to measure the stars. By applying mathematical principles to measuring—and therefore understanding—the natural world around us, early philosophers blazed a path toward using logical principles to understand pragmatic truths about nature. This is science by definition and is implied by the rules of the scientific method.



Some of the earliest measurers of stars were, of course, astrologers. They were commissioned to understand the positions and motions of the heavenly bodies for their portent to their patrons. Their purposes may have been questionable, but their methods of observation and record-keeping built the foundation for astronomy. The great Tycho Brahe (see illustration) developed some beautiful instrumentation for his observatory, but still used visual methods to measure the firmament. How far we've come!

Despite our access to observatories on earth and space, the basics for measuring the universe can still be usefully applied by us amateurs. Jack Welch developed quite a capable grasp of astronomical methods, especially after coming to RFO. He always impresses me, not only with his great lectures for the Night Sky Class there, but by the ease with which he can perform estimates of stellar distances in his head after a visual observation. He has an encyclopedic grasp of astronomical subjects, but also an impressive knowledge of many subjects relating to natural sciences.

Come to the meeting on December 14th and listen to Jack explain how we've come to understand so much of the universe around us, simply by "Measuring Things".

—John Whitehouse

EDITOR'S NOTE

This is a double issue of Sonoma Skies, covering December 2005 and January 2006. Keep it handy for January meeting times and events. Happy Holidays.

SCAS Then and Now, and a Swap Meet

SCAS January 11 Meeting, Proctor Terrace School

This January join your fellow astronomy fans for a meeting devoted just to us. Len Nelson has offered once again to give his nicely crafted presentation based on SCAS activities of the past year. He always has an archive of photographs, much of which he has taken, that he blends into a nice program.

We will have an astronomy gear swap meet/auction. If you'd like, you could send Len Nelson an image of what you'll bring to auction and he'll include it in the PowerPoint slide show. He'll probably devote the last section of the 2005 wrap-up to an auction if members bring items. If in doubt, contact Len to discuss.

We will be welcoming our new board members, most especially a new President to replace our outgoing Keith Payea. You did come to the December meeting to cast your vote or (hopefully) offer your own services, didn't you? I encourage all of you to consider helping out by holding a position of the board. Remember, we're a group of volunteers giving our time and ideas to make our club fun and worthwhile. Why don't you think about joining in? The January meeting will be a time for mapping out our goals for 2006, and we would welcome your fresh ideas!

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@sbcglobal.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 John Roush at 792-1199, jroush@spamlion.com.

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

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

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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, ablots@sonic.net

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Striking Sparks Off and Running

by Dickson Yeager

ESSAY CONTEST: 134 packets have been sent to 134 schools inviting 1st through 8th graders to petition their teachers to nominate them for the essay contest. Each teacher is limited to nominating three students. This year we are encouraging nominees to attend Young Astronomers meetings between now and the February 18th contest deadline. They will have an opportunity to attend three meetings.

RAFFLE: Now we need to focus on the raffle. The raffle proceeds go to the Young Astronomers. The raffle held at the Striking Sparks Awards Dinner features astronomical related item. You can support the raffle in several ways:

- ◆ Donate an item. It can be new or a like-new item that needs a new home.
- ◆ Donate money that SCAS will use to purchase raffle prizes.
- ◆ Solicit raffle prizes from friends and businesses.

Raffle prizes can be anything from telescope accessories to jewelry, tee shirts, books, DVDs, posters and more as long as it is astronomically related. So be imaginative and bring in the items.

DECORATIONS: Joan Thornton has agreed to be in charge of decorations for the Awards Dinner. She will need help and would love to hear from you. You can find her email address and phone # at the bottom of the box on page 2 of this newsletter.

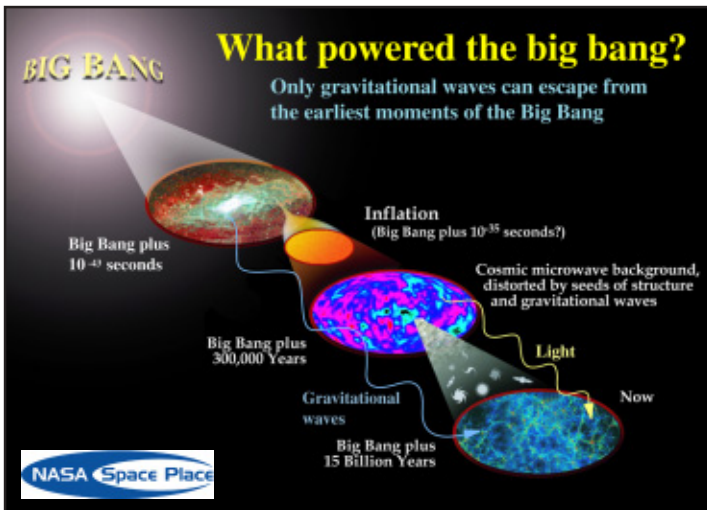
Radio Astronomy

by David Cranford

Usually radio stations have better judgement, but KSVY in Sonoma (91.3 FM) has asked me to join their morning show Wednesdays and Fridays at 7:40 AM (PST) to talk about astronomy, space science, and RFO.

This opportunity arose when Veronica Torres, one of the hosts of KSVY's weekday morning show, came up to RFO for the Public Night on November 5. After visiting the 24" & 8" telescopes, she settled in with the crowd in the East Wing to be captivated by the CCD technology and presentation (or maybe just to sit next to the heater). Later, she asked if I'd be interested in talking about RFO on her radio show sometime. After discussing it with George, Jack, & Colleen, we agreed that I probably couldn't do too much damage and so I was given their blessings and a list of rambling points. I went into the studios the following Wednesday and avoided humiliation by a great enough margin that they asked if I'd like to make it a regular thing. Go figure.

If you want to listen, do it soon before they wise up. If you're not in the Valley of the Moon, you'll need listen on the internet. Go to www.ksvy.org and click under "Stream it!" in the upper right corner of their webpage. There's even a call-in number, 707.933.9133, if you feel the need to heckle. And if you have suggestions for things to talk about, drop me a note at dcranford@earthlink.net.



LISA will be able to detect gravitational waves from as far back as 10^{-36} second after the Big Bang, far earlier than any telescope can detect.

Voices from the Cacophony

by Trudy E. Bell and Dr. Tony Phillips

Around 2015, NASA and the European Space Agency plan to launch one of the biggest and most exacting space experiments ever flown: LISA, the Laser Interferometer Space Antenna.

LISA will consist of three spacecraft flying in a triangular formation behind Earth. Each spacecraft will beam a laser at the other two, continuously measuring their mutual separation. The spacecraft will be a mind-boggling 5 million kilometers apart (12 times the Earth-Moon distance) yet they will monitor their mutual separation to one *billionth* of a centimeter, smaller than an atom's diameter.

LISA's mission is to detect gravitational waves—ripples in space-time caused by the Universe's most violent events: galaxies colliding with other galaxies, supermassive black holes gobbling each other, and even echoes still ricocheting from the Big Bang that created the Universe. By studying the shape, frequency, and timing of gravitational waves, astronomers believe they can learn what's happening deep inside these acts of celestial violence.

The problem is, no one has ever directly detected gravitational waves: they're still a theoretical prediction. So no one truly knows what they "sound" like.

Furthermore, theorists expect the Universe to be booming with thousands of sources of gravitational waves. Unlike a regular telescope that can point to one part of the sky at a time, LISA receives gravitational waves from many directions at once. It's a cacophony. Astronomers must figure how to distinguish one signal from another. An outburst is detected! Was it caused by two neutron stars colliding *over here* or a pair of supermassive black holes tearing each other apart in colliding galaxies *over there*?

"It's a profound data-analysis problem that ground-based astronomers don't encounter," says E. Sterl Phinney, professor of theoretical physics at the California Institute of Technology in Pasadena.

Profound, but not hopeless: "We have lots of good ideas and plans that work—in theory," he says. "The goal now is to prove that they

The Astronomer's Sinner

by Herb Larsen



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 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

actually work under real conditions, and to make sure we haven't forgotten something."

To that end, theorists and instrument-designers have been spending time together brainstorming, testing ideas, scrutinizing plans, figuring out how they'll pluck individual voices from the cacophony. And they're making progress on computer codes to do the job.

Says Bonny Schumaker, a member of the LISA team at the Jet Propulsion Laboratory: "It's a challenge more than a problem, and in fact, when overcome, a gift of information from the universe."

For more info about LISA, see lisa.nasa.gov. Kids can learn about black holes and play the new "Black Hole Rescue!" game on The Space Place Web site at <http://spaceplace.nasa.gov/en/kids/blackhole/>

—Article was provided by the JPL/NASA

STEREO Spacecraft to Scan Sun in 3D

Two NASA probes are running a gauntlet of tests and checks in preparation for their mission to watch some of the Sun's largest explosions in three dimensions.

Engineers are ensuring the space worthiness of NASA's twin STEREO spacecraft for their upcoming hunt of coronal mass ejections (CMEs), enormous solar eruptions of high-energy particles that can interfere with satellites and pose a danger to orbiting astronauts when directed at Earth.



The two STEREO probes leave Earth bound to take positions fore and aft of the planet in order to observe the Sun.

Once launched, the two STEREO probes will take up Sun-watching positions ahead and behind Earth to record the first real-time "3D" images of our nearest star. "From the space weather standpoint, this will be very important," said Michael Kaiser, STEREO project scientist at NASA's Goddard Space Flight Center—where the probes are currently

being tested—in a telephone interview. "The events on the Sun that you're very interested in are the one's coming right at you. We'll be viewing them from the side."

Keeping tabs on CMEs and the radiation spewed from the Sun will become even more important in the future, when astronauts leave the relative protection of the Earth's magnetic field on long-duration spaceflights, Kaiser added.

By launching two spacecraft instead of one, researchers hope the STEREO mission will shed new light on how massive CMEs form and propagate throughout the Solar System. Previous 3D observations of the Sun taken by the Solar and Heliospheric Observatory (SOHO) used images caught one at a time, during which time conditions may have changed, Kaiser said.

Each of the Sun-watching probes carries a set of coronagraphs and imagers similar to those aboard SOHO, which has spent nearly 10 years observing our parent star. Both STEREO will relay real-time observations of the Sun to Earth, where researchers expect to combine them to build three-dimensional views of the star, as well as its CME and solar wind activity. A trio of antennas on each spacecraft will also record the radio signal bursts from the energetic solar events.

STEREO A is slated to fly just inside Earth's orbit but ahead of the planet, completing one full orbit in about 347 days. Because it will fly closer to the Sun, the star will appear larger to the probe's coronagraphs and required larger occulting disks used to blot out the Sun's body during corona observations.

Both spacecraft will swing past the Moon, using its gravity to fling them toward their final orbits, though STEREO A will have to fly

(continued back page)

Events

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, DECEMBER 10

Sunset: 4:50 PM PST

End Astronomical Twilight: 6:25 PM PST

Moonset: 2:04 AM PST 12/11

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

SILICON VALLEY ASTRONOMY LECTURE SERIES

Jan. 25, 7:00 PM: "Beyond Pluto: The Discovery of the "10th Planet"—Astronomer Michael Brown of Caltech

The Second Century Lectures celebrate the centennial of the American Astronomical Society, the main body of professional astronomers in the U.S.

Arrive early—seating is limited. Location: Smithwick Theater, Foothill College, Los Altos Hills. Free and open to the public. Parking \$2. Info: 650/949-7888

MORRISON PLANETARIUM DEAN LECTURE SERIES

Dec. 19, 7:30 PM: "Supernovae with a Robotic Telescope"—Dr. Weidong Li, UC Berkeley

Finding supernovae systematically is crucial for the study of these violent stellar explosions billions of times brighter than the Sun. The Katzman Automatic Imaging Telescope at Lick Observatory is a robotic 30-in. telescope and the world's most successful nearby supernova search engine, and discovers close to 100 supernovae each year.

Jan. 23, 7:30 PM: "Digging a Comet: Results from NASA's Deep Impact Mission"—Dr. Peter Schultz, Brown University, Co-Investigator, Deep Impact Mission

In July 2005, the Deep Impact spacecraft flew by Comet Tempel 1 and released a probe which steered itself into the comet's path. Overtaken at about 10 kilometers per second, the impactor collided with the comet while the flyby spacecraft watched. Data from this mission is providing an amazing glimpse into the life of a comet, and telling us important information about the early solar system.

Location: Kanbar Hall, Jewish Community Center, 3200 California Street (at Presidio). Parking in the UCSF Laurel Heights campus parking lot is \$1.25/night. Parking in the JCC garage is \$1.25 per half-hour. Tickets \$4 at the door or by email. Contact: 415/750-7141, <http://www.calacademy.org/planetarium/dean.cfm>

Events

ROBERT H. FERGUSON OBSERVATORY

Quadrantid Meteors, Monday, January 2
Public Viewing begins 7PM; Best times 2-5AM

Public Viewing Saturday, January 28
Solar Viewing: 11:00 AM - 3:00 PM
Night Viewing begins 7:00 PM

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

Jan. 27 Observing Lab, 6:30 PM (raincheck Feb. 1)
Classes are held at the Observatory. Reservations recommended. (707) 833-6979, <http://www.rfo.org> or nightsky@rfo.org

SRJC PLANETARIUM

“Christmas and the Calendar”—Through Dec. 18

In this program we will learn about our calendar and how it evolved from its early Roman beginnings. Discover how the months and days came to be and how they were given their specific names. We will present the fascinating history that ties our calendar to the time of the birth of Christ.



“Stories from the Stars”—Begins Jan. 20

The Greeks grouped the stars into a variety of patterns called constellations, naming them after heroes, monsters, and other characters of myths and legends. Today, stories from the stars are still being told by astronomers as they discover the true nature of these distant objects. Travel with us as we take you on a guided tour of the life cycle of a Sun-like star.

Shows are held at Santa Rosa Campus, Lark Hall, Room 2001, on Fridays and Saturdays at 7:00 PM and 8:30 PM, Sundays at 1:30 PM and 3:00 PM during the Fall and Spring semesters. Admission is \$5 General; \$3 Students and Seniors (60+). Tickets are sold at the door only, beginning 30 minutes before show time. A parking permit is required and is included in the Planetarium admission price. Pick it up at the planetarium when you pay admission. Please arrive early enough to place your permit on your vehicle's dashboard before the show starts.

Info: 527-4372, <http://www.santarosa.edu/planetarium/>

SCAS School Star Parties

The school star party season is in full swing and the SCAS fully supports astronomy outreach to our local Sonoma county schools. Your help is needed. If you can volunteer in any capacity at these functions, please email me, Len Nelson, at lennelsn@comcast.net. I'll then add you to my volunteer roster and contact you about the details of upcoming events. Here's the schedule:

2006

- Jan. 5** Guerneville Elementary, Thurs. at 6:45 PM
- Jan. 19** Meadow Elementary in Petaluma, Thurs. at 6:45 PM (alternate Jan. 20)
- Jan. 24** Austin Creek Elementary in Santa Rosa, Tues. at 6:45 PM
- Feb. 23** Windsor Elementary “Science Night,” Thurs. at 6:45 PM
- Mar. 7** Miwok Elementary in Petaluma, Tue. at 6:45 PM
- Mar. 22** Evergreen Elementary in Rohnert Park, Wed. at 6:45 PM (alternate Mar. 23)
- Mar. 29** Grant Elementary in Petaluma, Wed. at 6:45 PM

There is no obligation to commit yourself to all the events. Come and see what it's all about. You do not even have to have a telescope—you can assist those who do. Contact me with any questions. These are fun events and educational for everyone!

OBSERVATORY COMMEMORATION CEREMONY SATURDAY JANUARY 21

On Saturday, January 21, 2006 you have the opportunity to participate in the unveiling ceremony of the State Historical Marker for the first astronomical observatory in California. This is in the town of Volcano, in the dark skies of the Sierra foothills!

In cooperation with Amador County, Mount Diablo Astronomical Society member Marshal F. Merriam has been organizing the effort to have the monument erected in the correct location in Volcano. This ceremony is the culmination of that effort. The program begins at 10 am at the Volcano Town Hall. You'll have the opportunity to meet family descendants of George Maderia, the man who built the observatory in 1860, and learn about the life and history of this miner turned astronomer.

For more details and to secure a lunch reservation, please contact Marshal at mferriam@yahoo.com or call 925-778-7496.

This effort is supported by two AANC Member clubs: the Stockton Astronomical Society and Sacramento Valley Amateur Astronomers.

Marshal was awarded this year's prestigious AANC Special Award at the AANC-CON 2005 held at the Randall Museum on August 27th for his exhaustive work on this project. <http://aanc-astronomy.org/awards-AANC.html>

—Ken Frank, AANC VP

Young Astronomers



RECENT, NEW, AND FUTURE NASA MISSIONS

YA December 9 Meeting, 7:30 PM
at Apple Blossom School

What has NASA been up to lately? What do they have planned, and what's in store for after the Space Shuttle? All these questions and more will be answered at the December Young Astronomers meeting! Adult Advisor Gary Jordan will be giving a presentation on the new and exciting things that are to come with regards to spaceflight, manned and unmanned.

Also, be sure to bring a telescope for viewing after the meeting. Friends are welcome!

SATURN, PLUTO, AND BEYOND

YA January 13, 2006 Meeting, 7:30 PM
at Apple Blossom School

We've all been hearing about the amazing discoveries being made recently by space probes. Current missions to Saturn and other planets have been yielding a great deal of information about how those places and the solar system exactly came to be.

Be sure to attend the January Young Astronomers meeting where there will be a presentation on those missions and what scientists have learned about the outer reaches of the solar system... and beyond!

YA INFORMATION

Meetings: 7:30 PM the second Friday of each month of the school year, at Apple Blossom School, 700 Water Trough Road, Sebastopol, in the Multipurpose Hall. Open to all Sonoma County students. **Telescope viewing** is held in the upper parking lot after the meeting. **Directions:** From Hwy. 116 in Sebastopol, turn west onto Bodega Ave. Continue on Bodega Ave. almost two miles to Water Trough Rd. Turn left and go about 1/3 mile to the school, on your right. From Hwy. 12, go straight through Sebastopol, past Main Street, and continue as above.

YA ELECTED OFFICERS

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LIBRARIAN: Jacob Gaynor

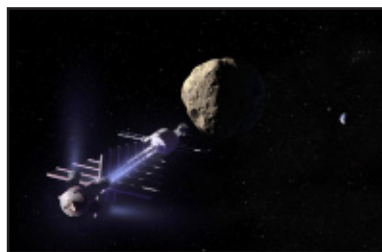
ADULT ADVISER: Gary Jordan 829-5288

Gravity Tractor as Asteroid Mover

Movie producers love the idea, partly because it's so scary and partly because it could actually happen. The setup is this: An asteroid is screaming toward Earth. A collision is inevitable. When the rocky object hits the planet, lots of people will die. In the movies, a daring hero comes up with a crazy plan to destroy or divert the asteroid and save the day. In real life, scientists have come up with more reasonable plans that might actually work.

One solution, say two NASA scientists and astronauts, is a 20-ton spacecraft called a gravitational tractor. First, the tractor would zoom up to the threatening asteroid and stop a short distance away. It would hover there, firing its thrusters just enough to overcome the force of gravity between the spacecraft and the asteroid.

The tractor could then use its own gravity to tug the asteroid off course. It would take about a year for the spacecraft to drag a medium-sized asteroid that measures 200 meters (660 feet) across and weighs 60 million tons away from Earth's path.



A massive spacecraft could use its gravity to divert an asteroid headed for Earth.

An asteroid this large could cause major damage to our planet. Some asteroids are even larger than this, and it would require bigger tractors to pull them enough to remove the threat. The tricky part is that the spacecraft would have to arrive at the asteroid about

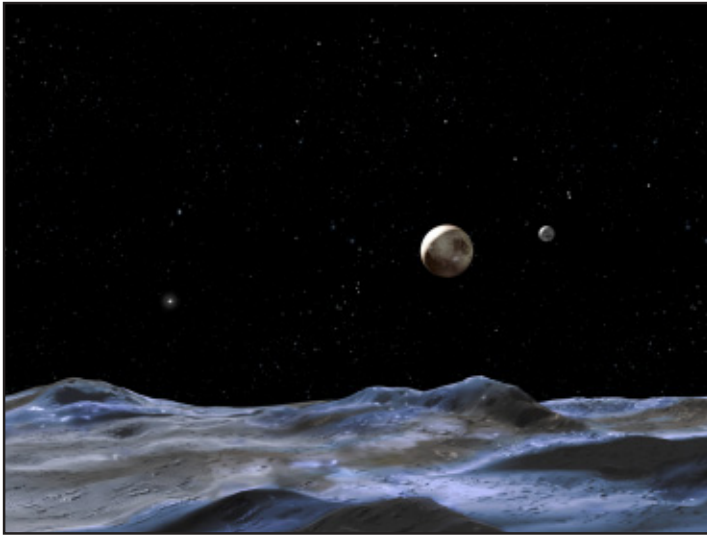
20 years before the asteroid was due to hit Earth. It would take a much smaller nudge then to move the asteroid out of the way than it would take if the asteroid were closer to its impact time.

Still, the tractor idea is better than many previously proposed strategies for asteroid avoidance. Blowing them up, for example, wouldn't work because the rocky bodies are too full of air holes to burst apart. Nor is it reasonable to have a spacecraft attach itself to an asteroid and use its engines to steer the object away, because asteroids spin. Unless the craft stopped the asteroid from spinning, each thrust would push the asteroid in a different direction. A gravitational tractor could get around these problems.

Don't spend too much time worrying about asteroids falling on your house, however. The chances of a collision occurring in your lifetime are very slim. If it does happen, though, scientists will do everything they can to keep you from getting hurt. Sounds pretty heroic to me!—*E. Sohn*

NOVEMBER MEETING UPDATE

At the November Young Astronomers meeting, everyone had a great time learning about the constellations in the night sky. There were a variety of activities including creating your own planisphere, reading about the histories of the constellations, and locating them on paper. After everyone brushed up on what the sky had to offer, the tension mounted as we all went outside to do some hands-on viewing! Luckily the sky was crystal clear, and the moon was conveniently hidden behind the trees. Thanks to everyone, especially Mr. Jordan, for making this meeting such a success!



The imagined surface of one of the two newfound moons of Pluto shows the planet above the horizon. The previously known moon, Charon, lies to the right of the planet, and the other new moon is at the far left.

Pluto's New Moons

The first time that you learn about the planets, it all seems so simple. There are nine of them, including Earth. All orbit the sun. Then, you learn about moons, and things get a little more complicated. Moons orbit planets. We have one. Saturn has more than 45.

As soon as you've memorized the planet lessons in your textbook, however, you've got more work to do. The Hubble Space Telescope has just spotted two more moons around Pluto, adding to the one we already knew about. If the finding is true, astronomers will have to rethink what they know about the planet and about the Kuiper belt—a collection of small, icy objects that lingers way out on the edge of our solar system.

Until now, scientists had supposed that Pluto had just one moon, called Charon. This object follows an orbit 19,600 kilometers (12,200 miles) from the planet and measures 1,270 kilometers (790 miles) across. Charon is about half as wide as Pluto.

The new moons have been named S/2005 P1 and S/2005 P2. The first one lies about 48,000 kilometers (30,000 miles) from Pluto and has an estimated diameter of 56 kilometers (35 miles). The second lies about 64,000 kilometers (39,800 miles) from Pluto and has a diameter of about 48 kilometers (30 miles).

For every 12 times that Charon goes around Pluto, it looks like S/2005 P1 goes around 3 times, while S/2005 P2 goes around twice. Based on this information, scientists suspect that the moons formed at the same time that Charon formed, when some massive object smashed into Pluto soon after the planet's birth 4.5 billion years ago. Chunks that flew off in the collision then became moons when they were trapped by the planet's gravity.

More observations are needed to confirm that the two objects actually orbit Pluto, but astronomers have reason to believe that they do. The same two objects also appear in pictures taken by Hubble 3 years ago.

After finishing with your textbook, keep watching the news. It's the only way to keep up with our constantly changing map of outer space.—*E. Sohn*

Dec./Jan. Observing Notes

- Dec. 8** First Quarter Moon; Venus at peak brightness
- Dec. 11** Moon near Mars
- Dec. 12** Mercury Greatest Elongation West; Mars retrograde ends
- Dec. 15** Full Moon
- Dec. 19** Moon near Saturn
- Dec. 21** Winter Solstice
- Dec. 23** Last Quarter Moon
- Dec. 27** Crescent moon near Jupiter
- Dec. 30** New Moon
- Jan. 2** Quadrantid Meteors
- Jan. 5** Vesta at Opposition
- Jan. 6** First Quarter Moon
- Jan. 9** Mars 1.3° S of Moon
- Jan. 21** Spica 0.6° S of Moon
- Jan. 22** Last Quarter Moon
- Jan. 25** Antares 0.02° S of Moon
- Jan. 27** Saturn at Opposition
- Jan. 29** New Moon
- Jan. 30** Moon at perigee, large tides

OBSERVING TREATS

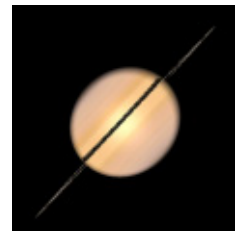
Venus shows its bright crescent before sunset New Year's Day. The crescent shape may well be visible in binoculars.

Mars reverses its apparent direction on December 12, resuming eastward motion and shrinking to 12" by month's end.

Saturn rises 7:30 PM by the end of December. Its plane is steadily changing as shown in these images. Its inclination increases to 20.2° in March, making 2006 a good year to observe details in the rings. By December 2008 we will be seeing it edge-on. Saturn is moving closer to the Beehive Cluster, passing just 1° south of it the end of January. At that time Saturn will be in opposition to the Sun, reaching peak brightness (mag. -0.2) and remaining visible all night long.



March 2006



December 2008

M 42, the Orion Nebula, measures 10 parsecs across, equivalent to 20,000 solar systems lined up end to end! It's an emission nebula whose ionized gasses are energized by hot young stars, giving it its famous fan shape. A medium-sized telescope will show a great amount of detail. At the center is Theta Orionis, a multiple star with four bright members known as the Trapezium.

FEATURED LINKS

Telescope Field of View and Power Calculator—This calculator is designed to give the true field of view and magnification of a telescope. <http://www.csghnetwork.com/telefov.html>

Large Binocular Telescope on Mt. Graham, thanks to Merlin Combs. Some of the mirror cleaning photos truly show how huge each mirror is. <http://medusa.as.arizona.edu/lbto/news/uaneews2.htm>

Board Elections

by *Keith Payea*

Now it is time for our yearly elections and we have the following nominees for office:

John Whitehouse – President
Lynn Anderson – Vice President
Larry McCune – Treasurer
Loren Cooper – Secretary
Len Nelson – Community Activities Director
Cecelia Yarnell – Publications Director
Walt Bodley – Membership Director

If you were at the November meeting, you might remember that Lynn had volunteered to run for President. Well, after talking it over with John, they came up with this arrangement. John gets a promotion, and Lynn has a chance to see how it all works from the VP spot.

I will open the nominations for one last time at the December meeting before bringing the matter to a vote. If you feel that you would like to run for any of these jobs, please step forward.

I've had a great two years as President of the SCAS. I've enjoyed the job, and I would like to think I brought a few new ideas to our organization. I still intend to be an active member and support the club in any way I can. Happy New Year — Keith



Stereo Spacecraft *from Page 4*

past the Moon twice in order to accelerate past Earth to its intended station, NASA officials said.

“We’re sort of hooked to the lunar cycle,” Dreisman said, adding that while the STEREO mission plans to launch sometime between April and June 2006, there is actually more flexibility to make the space shot. “We have a launch window [almost] every month of the year.” It should take the two STEREO probes about three months to take up their respective sun-watching positions.

But before STEREO A and B can leave Earth, engineers must be sure they’re fit to fly. Over the next few months, the probes will be locked away in vacuum chambers, subjected to the intense vibrations and noise they will experience at launch and witness the extreme temperatures they must endure in order to successfully perform their mission. “It’s been such a long road here, we’ve been looking forward to this,” Kaiser said of the testing phase. “I think [the mission] is going to open up a whole new world for us.”

—Excerpted from a Space.com article by Tarik Malik.

Read the entire article at http://www.space.com/business/technology/051116_stereo.html

2006 OBSERVER’S GUIDES AND CALENDARS

Three 2006 astronomy calendars (\$7.70 each) and two 2006 Observer’s Handbooks (\$15.70 each) are yet available. See Len Nelson at the December 14 SCAS meeting..

**Sonoma County
Astronomical Society**

P.O. Box 183
Santa Rosa, CA 95402



Sonoma Skies

December 2005/January 2006

DECEMBER 14

**Jack Welch
Measuring Things 2**

JANUARY 11

**Len Nelson
Then and Now**